Buchanan–Cestos City Junction Road Corridor (60.9 km)
Mano River Union Road Development and Transport Facilitation Programme (MRU/RDTFP)-Liberia



Biodiversity Action Plan (BAP)

FINAL DRAFT

November 11, 2026

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Table of Acronyms

Acronym	Meaning / Full Term
AfDB	African Development Bank
AoI	Area of Influence
BAP	Biodiversity Action Plan
BJ-01	Buchanan Junction Ecological Node
BOQ	Bill of Quantities
CESMP	Construction Environmental and Social Management Plan
TR-01	Timbo River Ecological Node
EPA	Environmental Protection Agency (Liberia)
ESF	Environmental and Social Framework (WB)
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
E&S	Environmental and Social
ESSs	Environmental and Social Standards
FE-01	Forest-Edge Ecological Node (Big Joe Town–Garpu Town Segment)
FDA	Forestry Development Authority
GRM	Grievance Redress Mechanism
km	kilometer(s)
NBSAP	National Biodiversity Strategy and Action Plan
OS3	Operational Safeguard 3 (AfDB – Biodiversity and Ecosystem Services)
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
ROW	Right-of-Way
SC	Stream Crossing Ecological Node (SC-01–SC-08)
WB	The World Bank
WD	Wetland Depression Ecological Node (WD-01–WD-06)

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Table of Key Terms

Term	Meaning
Adaptive management	An approach in which biodiversity mitigation and monitoring measures are adjusted over time based on monitoring results, site conditions, and the effectiveness of implemented actions.
Argro-mosaic landscape	A mixed land-use pattern dominated by smallholder farms, fallow land, and plantations with scattered patches of natural or regenerating vegetation.
Area of Influence (AoI)	The defined spatial boundary for biodiversity assessment and management extends 250 meters from the road alignment (approximately 125 meters on each side of the road centerline) and includes the right-of-way (ROW), construction support areas, and sensitive habitats potentially affected directly or indirectly.
Avoidance	The first step in the mitigation hierarchy involves design and planning measures to prevent impacts by keeping work out of sensitive habitats such as wetlands and riparian zones.
Biodiversity	The variety of living organisms, including plants, animals, and microorganisms, together with their habitats and ecological processes within the project area.
Biodiversity offsets	Measurable conservation actions intended to compensate for significant residual biodiversity impacts after mitigation; not required where impacts are localized, manageable, and critical habitat is not triggered.
Buffer zone (Riparian buffer)	A vegetated strip is maintained along rivers and streams to reduce erosion, filter runoff, protect aquatic habitats, and maintain ecological connectivity.
Critical habitat	Under AfDB Operational Safeguard 3 (OS3), areas of high biodiversity value are defined as those meeting the criteria, such as the presence of threatened species, endemic or restricted-range species, unique ecosystems, migratory or congregatory species, or legally protected areas.
Cumulative impacts	Impacts resulting from the project, in combination with other existing or reasonably foreseeable activities, lead to incremental pressures over time.
Direct impacts	Biodiversity impacts occurring within the defined construction footprint, including vegetation clearing, earthworks, and river crossing works.
Disturbance	Disruption to habitats and wildlife is caused by construction activities such as clearing, noise, vibration, human presence, and the operation of machinery.

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Term	Meaning
Erosion and sediment control	Measures implemented to prevent soil loss and sediment discharge into rivers and wetlands, including silt fencing, sediment traps, diversion drains, and staged earthworks.
Habitat fragmentation	The division of habitats into smaller patches potentially restricts wildlife movement and reduces habitat integrity.
Hydromorphic soils	Water-influenced soils are typically found in wetlands and seasonally waterlogged areas, often more sensitive to disturbance and erosion when exposed.
Indirect impacts	Impacts occurring outside the immediate construction footprint often result from improved access, altered land use, or the spread of invasive species.
Invasive species	Non-native or aggressive species that colonize disturbed areas and suppress the regeneration of native vegetation.
Minimization	The second step in the mitigation hierarchy involves the reduction of the extent, duration, or intensity of impacts that cannot be fully avoided.
Mitigation hierarchy	A structured approach to impact management consisting of avoidance, minimization, restoration or rehabilitation, and monitoring, with offsets considered only if significant residual impacts remain.
Modified habitat	Habitat is substantially altered by human activity, such as settlements, agricultural fields, plantations, and roadside environments.
Natural habitat	Habitats that retain many natural ecological functions and native species, even if partially disturbed, wetlands and riparian zones may qualify under this classification.
No net loss	A management objective whereby biodiversity losses are balanced by effective mitigation and restoration so that overall biodiversity value within the AoI is maintained.
Performance targets	Measurable criteria used to evaluate mitigation or restoration success, such as minimum vegetative cover thresholds, stable riverbanks, or absence of invasive species dominance.
Progressive restoration	Implementation of stabilization and revegetation measures during construction as sections are completed, rather than deferring restoration to the project end.
Residual impacts	Impacts that remain after mitigation and restoration measures are applied are expected to be localized and manageable with full compliance.

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Term	Meaning
Restoration	Actions undertaken to re-establish vegetation cover and ecological function in disturbed areas.
Rehabilitation	Practical measures to stabilize disturbed sites and facilitate ecological recovery, including regrading, topsoil replacement, and revegetation.
Riparian/ Riverine vegetation	Vegetation occurring along rivers and streams that provides bank stabilization, erosion control, shading, and habitat connectivity.
Sedimentation	Deposition of eroded soil particles into rivers and streams potentially affects aquatic habitats and species.
Sensitive habitat/feature	Ecological areas require enhanced protection due to functional importance or vulnerability, including rivers, wetlands, riparian buffers, and erosion-prone slopes.
Threshold for action	A defined monitoring trigger requires corrective measures when performance indicators are not met.
Wetlands	Seasonally or permanently waterlogged areas supporting aquatic and semi-aquatic species and contributing to hydrological regulation; treated as high-sensitivity features within the AoI.

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0.1Executive Summary

This Biodiversity Action Plan (BAP) has been prepared for the Buchanan–Cestos City Junction Road Project (60.9 km), including the 5.3 km Port of Buchanan link, under the Mano River Union (MRU) Transport and Trade Facilitation Programme. The project will upgrade the existing earth and gravel road to paved standard along the current alignment, with associated drainage structures, culverts, bridge works, slope stabilization, pavement construction, and use of approved borrow areas. All works are confined to the existing Right of Way (RoW) and defined engineering construction footprint.

The BAP operationalizes biodiversity commitments established in the Environmental and Social Impact Assessment (ESIA) and has been prepared earlier in accordance with the African Development Bank (AfDB) Operational Safeguard 3 (OS3) on Biodiversity and Ecosystem Services, and World Bank Environmental and Social Standard (ESS6), that is Biodiversity Conservation and Sustainable Management of Living Natural Resources under World Bank Environmental and Social Framework (ESF)[1], Liberia's Environmental Protection and Management Law (2003)and national priorities defined in Liberia's National Biodiversity Strategy and Action Plan (NBSAP). The Plan further translates ESIA findings into location-specific mitigation, monitoring, and restoration measures, with clearly defined responsibilities and budget allocations integrated into the Contractor's Environmental and Social Management Plan (C-ESMP).

For biodiversity assessment and management purposes, the project adopts a 250-meter Direct Area of Influence (AoI) defined as approximately 125 meters on each side of the road centerline, consistent with the ESIA. The AoI represents the spatial boundary within which ecological conditions were assessed and biodiversity management measures apply. Actual physical disturbance remains confined to the approved RoW and defined engineering work areas such as river crossings, culverts, slopes, and borrow sites. Because the project follows an existing transport corridor, most vegetation disturbance represents re-clearance within an already modified right-of-way, and no new alignment or widening beyond approved limits is proposed.

The ecological baseline was established during the ESIA and subsequently supplemented by targeted field assessments conducted between 12 and 20 February 2026. The assessment also incorporated information gathered through community consultations and a review of relevant scientific literature.

The species included in BAP were identified based on the ESIA baseline findings, field observations recorded during the February 2026 verification, community-reported information, and literature-based screening. Where species presence was not directly confirmed, their potential occurrence was considered on a precautionary basis, considering the availability of suitable

[1] The updated BAP keeps the contents intact where already aligned with the WB ESF /ESSs and strengthened where needed.

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habitats within the Project area. The assessment confirms that the corridor is predominantly a modified agro-mosaic landscape characterized by agricultural fields, settlements, and regenerating secondary vegetation.

Ecological sensitivity along the corridor is localized rather than continuous and is concentrated at specific environmental interfaces along the alignment. The most important ecological features identified within the AoI include the Timbo River crossing, several perennial stream crossings, seasonal wetland depressions, and a forest-edge segment between Big Joe Town and Garpu Town. These features are classified within the BAP as ecological sensitivity nodes requiring enhanced management attention. Outside these sensitivity nodes, the corridor largely traverses landscapes that have already been significantly modified by long-term agricultural and settlement activities.

A map illustrating the road alignment, ecological sensitivity nodes, and key aquatic features along the corridor is provided in the main report to support spatial understanding of the biodiversity context and the location of sensitive habitats along the route.

[2]**Species Records and Sources of Information:** To distinguish confirmed field observations from community-reported information and literature-based records, species have been classified according to their respective sources of information, as presented below.

1. Species recorded during ESIA baseline surveys and February 2026 field verification

The following species or taxonomic groups were recorded during the ESIA baseline surveys and/or February 2026 field verification:

- Freshwater fish: Tilapia spp. and Clarias spp.
- Amphibians: Afrixalus dorsalis, associated with seasonal wetland habitats.
- Primates: Primate activity was observed within riverine and forest-edge vegetation. However, observations were brief and did not allow reliable identification to the species level.

2. Species reported through community consultations

Community consultations provided supplementary information on local biodiversity and wildlife occurrence within the wider project landscape. Any species specifically reported by community

[2] At this stage, the Project alignment and design have been substantially finalized, and the ESIA has been conducted using a 250 m AoI along the project corridor. The assessment covers the anticipated E&S impacts associated with the current design and alignment. However, the Indirect AoI may extend beyond this boundary depending on nature and extent of indirect impacts on surrounding ecological and environmental receptors, including habitats, biodiversity, ecological connectivity and downstream water resources.

In the event of any changes to the approved alignment/design before site mobilization, the CC will undertake the necessary supplementary E&S assessments, including the identification and assessment of any additional areas falling within the revised Indirect AoI. These assessments will be completed before mobilization and commencement of the relevant works, with the findings submitted to the CSC and PIU for review and approval.

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members should be identified separately in the ESIA consultation records, including the species name, location and nature of the reported observation.

3. Species identified through literature-based screening

A precautionary review of regional biodiversity literature and Liberia's National Biodiversity Strategy and Action Plan (NBSAP) identified additional species of conservation concern potentially associated with suitable habitats in the wider landscape surrounding the project corridor. These include:

- Primates: Western chimpanzee (Pan troglodytes verus) and Diana monkey (Cercopithecus diana).
- Pangolins: Multiple pangolin species potentially associated with forest and woodland habitats.
- Forest antelopes: Jentink's duiker (Cephalophus jentinki) and zebra duiker (Cephalophus zebra).
- Birds: African grey parrot (Psittacus erithacus), reported in southeastern Liberia.

These species were not confirmed within the project footprint during the field surveys. Their inclusion is based on published regional distribution information and the presence of potentially suitable habitats within the broader landscape.

4. Implications for biodiversity management

The distinction between directly observed species, community-reported records and literature-based potential occurrences has been considered in developing the wildlife protection measures under this BAP. Precautionary measures will be applied during construction, particularly in areas containing suitable habitats. Any additional wildlife observations made during pre-construction surveys and construction activities will be documented, verified and incorporated into the biodiversity monitoring records.

Critical habitat screening is undertaken in accordance with AfDB Operational Safeguard 3 and the World Bank ESS6, critical habitat criteria confirms that critical habitat is not triggered within the 250-meter Direct Area of Influence (DAoI). The corridor does not intersect legally protected areas, intact primary forest, or ecosystems of irreplaceable conservation value. Biodiversity within the project corridor is therefore classified primarily as modified habitat with localized natural features, and biodiversity offsets shall be considered only as a last resort where significant residual impacts persist after the implementation of feasible avoidance, minimization and restoration measures. However, where critical habitat is identified during construction phase, the project must satisfy the relevant critical habitat conditions, including achieving net gains in the biodiversity values for which the habitat qualifies. [3]

[3] Critical habitat screening has been completed as part of the ESIA and BAP in accordance with AfDB OS3 and WB ESS6. The assessment was based on baseline ecological data, field verification conducted between 12 and 20 February

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Potential biodiversity impacts associated with the project are expected to be localized, temporary, and primarily construction related. These include vegetation clearing within the ROW, temporary sediment disturbance at river and stream crossings, short-term disturbance to wildlife in the forest-edge segment, and erosion risks at slopes and borrow areas. Indirect impacts associated with improved accessibility are considered limited but may include localized increases in opportunistic hunting pressure in surrounding landscapes.

In accordance with AfDB Operational Safeguard 3 and WB ESS1, the BAP applies the mitigation hierarchy of avoidance, minimization, restoration, and monitoring. Key management measures include strict erosion and sediment control at river and stream crossings, restoration of disturbed riparian and wetland vegetation, controlled vegetation clearing within the ROW, progressive stabilization of slopes and borrow areas, prohibition of hunting and wildlife trade by project workers, and biodiversity awareness training for the construction workforce.

Monitoring activities are scaled according to ecological sensitivity and include structured surveillance and reporting of wildlife observations along the corridor during construction activities to detect the presence of sensitive or protected species and enable adaptive management if necessary.

Enhanced monitoring will apply at the Timbo River crossing and other aquatic nodes, while periodic inspections will apply along the forest-edge segment and rehabilitated construction areas. Monitoring will be implemented by the Contractor and verified by the Supervising Consultant, with oversight by the Project Implementation Unit (PIU). Post-construction monitoring will continue for up to one year following completion of works to confirm vegetation recovery and stabilization of disturbed areas.

2026, community consultations, relevant biodiversity literature and conservation database reviews. Based on the available findings, none of the critical habitat criteria are triggered within the 250 m DAoI. The project corridor is predominantly composed of modified habitats, with localized natural features, including riparian vegetation and seasonal wetlands.

Similarly, a dedicated Critical Habitat Net Gain Plan or biodiversity offset is not currently warranted. However, the BAP includes precautionary biodiversity protection, habitat restoration and monitoring measures. If any additional biodiversity values potentially qualifying as critical habitat identified during pre-construction verification, the PIU, with support from the CSC and qualified biodiversity specialist, will undertake further assessment before commencement of the work.

If critical habitat is confirmed, a site-specific Biodiversity Management and Net Gain Plan will be prepared, specifying avoidance and mitigation measures, habitat restoration and enhancement activities, implementation responsibilities, budget, timelines and measurable monitoring indicators. The PIU will ensure the availability of the required financial resources, while the CC will implement the approved measures under CSC supervision. Works affecting confirmed critical habitat will not commence until the required assessments, management arrangements and financing have been established.

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Field verification photographs documenting key ecological features, aquatic habitats, and representative environmental conditions along the corridor are included in the annexes of this report.

Stakeholder consultations conducted during the February 2026 field verification included local residents, fishermen, hunters, and bushmeat resource users, whose knowledge contributed to understanding wildlife presence, seasonal resource use patterns, and potential biodiversity pressures within the landscape. This local ecological knowledge informed the precautionary wildlife protection measures included in the Biodiversity Action Plan.

Implementation responsibilities are clearly defined. The Contractor will implement biodiversity mitigation and restoration measures through the Construction Environmental and Social Management Plan (CESMP). The Supervising Consultant will verify compliance and monitoring performance. The Project Implementation Unit (PIU) will oversee contractual enforcement and coordination with regulatory authorities, while the Environmental Protection Agency (EPA) will exercise national environmental oversight in accordance with permit conditions.

The total Biodiversity Management Budget is estimated at USD 210,374, covering mitigation measures, ecological restoration, biodiversity monitoring, workforce awareness programs and contingency provisions for corrective actions.

Based on the ESIA baseline, targeted field verification conducted in February 2026, literature screening and community consultations, the biodiversity risk associated with the project is assessed as low to moderate and site-specific. Ecological sensitivity is localized at identified river crossings, seasonal wetlands and limited forest-edge habitats, while most of the corridor traverses landscapes that have already been substantially modified by agriculture, settlements and long-term infrastructure use.

In summary, biodiversity conditions along the Buchanan–Cestos corridor are largely associated with modified landscapes with localized ecological features of sensitivity. With effective implementation of the mitigation and monitoring measures outlined in BAP, the project is expected to achieve compliance with AfDB Operational Safeguard 3, World Bank ESS6 and Liberia's environmental regulatory framework while ensuring that biodiversity impacts shall remain limited, manageable and reversible.

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1. Introduction and Background

1.1 Project Background and Context

The Buchanan–Cestos City Junction Road (60.9 km), including the 5.3 km link to the Port of Buchanan, forms part of Liberia's national road network under the Mano River Union (MRU) Transport and Trade Facilitation Programme. The corridor connects Buchanan, Big Joe Town, Garpu Town, Rock Town, Sand Town, and other roadside settlements toward Cestos City Junction. It supports regional trade, agricultural production, fishing activities, and port operations.

The project will upgrade the existing earth and gravel road to paved standard along the current alignment. Works include drainage improvements, culvert and bridge construction, slope stabilization, pavement works, and the use of approved borrow areas. All activities are confined to the established right of way RoW and approved construction footprints.

The ESI confirmed that biodiversity sensitivity along the corridor is not uniform. Large sections pass through areas already modified by farming, settlements, and regenerating secondary vegetation. More sensitive locations are concentrated at river crossings, wetland areas, and limited forest-edge sections.

This Biodiversity Action Plan (BAP) builds directly upon the ESIA findings and integrates biodiversity-related comments raised during the ESIA review process. The BAP has been prepared in accordance with the AfDB OS3 on Biodiversity and Ecosystem Services; WB ESS6 and relevant national environmental legislation administered by the EPA of Liberia. The BAP refines and operationalizes those findings through additional field verification, clearer location-specific measures, defined monitoring protocols, and costed implementation responsibilities. It provides a structured framework for implementing biodiversity mitigation, monitoring ecological sensitivity nodes identified along the corridor and ensuring that biodiversity risks associated with road construction and operation are appropriately managed.

This report is organized into several sections. Following this introduction, the report presents the project location and area of influence, describes baseline biodiversity conditions along the corridor, assesses potential biodiversity impacts associated with project activities, and outlines the Biodiversity Management Plan (BMP), including mitigation measures, monitoring framework, implementation responsibilities, and budget allocations. Supporting technical information and verification records are provided in the annexes.

1.2 Location and Area of Influence

The alignment begins at Buchanan Junction and extends southeast toward Cestos City Junction, following an existing disturbed transport corridor that has been in use for many years.

For biodiversity assessment purposes, the Direct Area of Influence (DAoI extends to 125 meters from the road centerline on each side of the alignment, resulting in a total ecological assessment corridor of 250 meters consistent with the ESIA. The 250-meter DAoI defines the assessment and management boundary; actual physical disturbance is confined to the approved ROW and defined

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engineering work sites. All biodiversity management and monitoring measures defined in this BAP apply within this 250-meter corridor. Field verification visits were conducted along representative sections of the corridor to confirm current land use conditions, habitat characteristics, and ecological features within the defined Area of Influence.

Within Direct AoI, land use is predominantly agricultural fields, fallow land, roadside settlements, and secondary vegetation. Ecological sensitivity is localized and primarily associated with:

- The Timbo River crossing;
- Perennial stream crossings identified in the approved engineering drainage schedule;
- Seasonal wetland depressions in low-lying areas; and
- A forest-edge segment between Big Joe Town and Garpu Town.

River and stream crossings referenced in this BAP correspond to those identified in the approved engineering drawings and drainage register (see Annex 1). Biodiversity measures described in this report apply directly to those documented crossing locations.

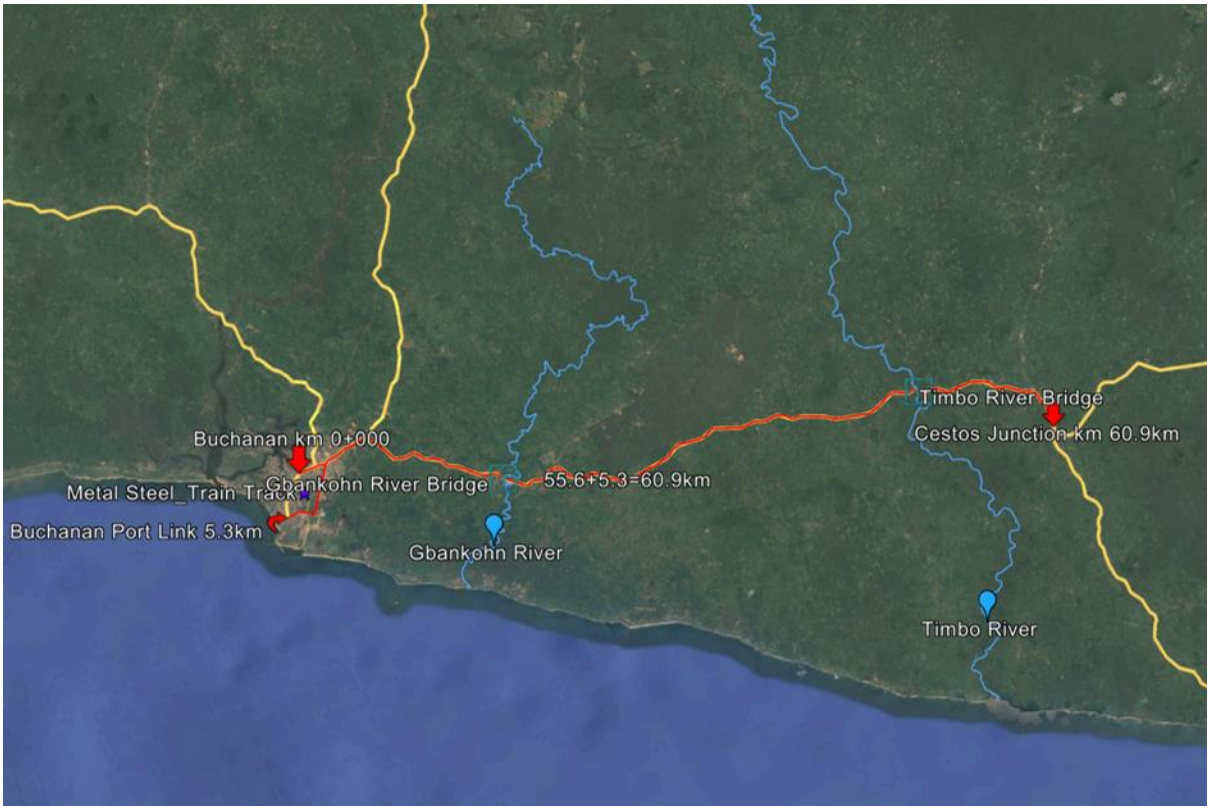


Figure 1: Key Waterways along the Project Corridor

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1.3 Legal and Administrative Framework

This BAP has been prepared in accordance with the AfDB Integrated Safeguards System (ISS), specifically OS3 on Biodiversity and Ecosystem Services, together with the relevant national environmental legislation and international biodiversity conventions applicable in Liberia. It also addresses the applicable requirements of the World Bank ESF, particularly ESS6, where safeguard requirements differ/stringent or requires strengthening.

AfDB OS3 and WB ESS6 require development projects to avoid or minimize impacts on biodiversity and ecosystem services through application of the mitigation hierarchy, consisting of avoidance, minimization, restoration, and monitoring. The safeguard further requires screening of project activities to determine whether natural habitat or critical habitat may be affected and to ensure that biodiversity risks are appropriately managed throughout the project lifecycle. Since BAP is a living document, therefore, during construction phase, consistent with ESS6, the BAP shall additionally address the classification of Modified (MH), Natural Habitat (NH), Critical Habitat (CH), assess direct, indirect and cumulative biodiversity impacts and incorporate appropriate measures to manage ecosystem services as reflected in C-ESMP.

In addition, where NH is affected during implementation, the applicable ESS6 requirements for no-net loss of biodiversity shall be addressed. Likewise if CH is identified, the Project shall demonstrate compliance with the relevant ESS6 conditions, including achieving net gains in the biodiversity values for which the habitat qualifies. Biodiversity offsets shall be considered only as a last resort for eligible residual impacts after feasible avoidance, minimization and restoration measures have been implemented.[4]

At the national level, biodiversity conservation and environmental management in Liberia are governed through a combination of environmental legislation, sectoral resource management laws, and institutional oversight mechanisms. These frameworks establish the legal basis for environmental assessment, wildlife protection, and sustainable management of natural resources. The implementation of BAP shall therefore be consistent with applicable Liberian legislation, relevant international conventions and the Project's applicable World Bank ESF commitments.

[4] Habitat classification, critical habitat screening, identification of species of conservation concern and assessment of direct, indirect and cumulative biodiversity impacts have been undertaken during ESIA and BAP preparation. It is based on the available ecological baseline, field verification, community consultations and literature review. The findings have informed the Project design and the biodiversity mitigation and management measures included in the BAP. As a living document, the BAP will be reviewed and updated during pre-construction and construction, where necessary, to incorporate any newly identified biodiversity features, unforeseen impacts or changes in the Project footprint. Where natural habitat is affected, the Project shall address the applicable ESS6 no-net-loss requirements. If critical habitat is identified through any subsequent verification, the Project will demonstrate compliance with the relevant ESS6 conditions, including achieving net gains in the biodiversity values for which the habitat qualifies. Biodiversity offsets shall be considered only as a last resort for eligible residual impacts after all feasible avoidance, minimization and restoration measures have been implemented. Ecosystem services and associated biodiversity risks will also be addressed through the C-ESMP and relevant site-specific management plans.

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Screening undertaken for the Project corridor confirms that the 250-meter DAoI is predominantly a modified agro-mosaic landscape characterized by agricultural land use, settlements, and regenerating secondary vegetation. The project alignment does not intersect designated protected areas or internationally recognized biodiversity sites. Consequently, critical habitat criteria under AfDB OS3 and as per WB ESS6 are not triggered within the Direct AoI (see Section 2.3). However, the preliminary findings should not be considered conclusive evidence that CH is absent within 250m AoI. Wherever ecological impact pathways warrant, the assessment shall consider associated facilities and potential indirect and cumulative impacts to establish the appropriate biodiversity management measures during construction.

The regulatory and institutional framework relevant to biodiversity management for the project is summarized in the following subsections.

1.3.1 National Legal and Institutional Framework

Environmental management in Liberia is primarily governed by the Environmental Protection and Management Law of Liberia (2003). This law establishes the national framework for environmental protection and sustainable resource management and mandates environmental assessment for development projects with potential environmental impacts.

The law designates the EPA as the principal regulatory authority responsible for environmental policy implementation, environmental impact assessment review, environmental monitoring, and enforcement of environmental compliance. Development projects such as the Buchanan–Cestos City Junction Road must therefore comply with environmental permitting requirements administered by the EPA.

Environmental impact assessment procedures are implemented under the EIA Procedural Guidelines, which provide the regulatory framework for screening, assessment, public consultation, environmental approval, and monitoring of development projects.

Biodiversity conservation and forest resource management in Liberia are also governed through the National Forestry Reform Law (2006), administered by the Forestry Development Authority (FDA). This law establishes the legal framework for sustainable forest management, wildlife conservation, and the administration of Liberia's protected area network.

Liberia's NBSAP provides the national policy framework for biodiversity conservation and sustainable use of biological resources. The NBSAP identifies strategic priorities for conservation of ecosystems, protection of threatened species, and integration of biodiversity considerations into national development planning.

Within the context of the Buchanan–Cestos City Junction Road project, these national legal and institutional frameworks require that biodiversity impacts associated with road construction be identified, avoided where feasible, minimized where unavoidable, and managed through appropriate mitigation, restoration, and monitoring measures in accordance with national environmental regulations and AfDB and World Bank safeguard requirements.

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Table 1: National Institutions relevant to biodiversity management

Institution	Mandate Relevant to Biodiversity	Relevance to the Project
Environmental Protection Agency (EPA)	National authority responsible for environmental regulation, environmental impact assessment review, and enforcement of environmental compliance	Provides regulatory oversight for environmental permitting, monitoring, and compliance during project implementation
Forestry Development Authority (FDA)	Responsible for sustainable forest management, wildlife conservation, and management of protected areas	Relevant for protection of wildlife species and forest resources potentially occurring within the project Area of Influence
Ministry of Agriculture (MOA)	Responsible for agricultural policy and sustainable land management	Relevant to management of agricultural landscapes along the project corridor
Project Implementation Unit (PIU)	Responsible for project coordination and supervision of contractors and consultants	Ensures implementation of biodiversity mitigation measures and compliance with the BAP and CESMP

1.3.2 International Biodiversity Conventions Relevant to the Project

Liberia is a Party to several international environmental conventions that promote biodiversity conservation and sustainable natural resource management. These conventions provide an important policy framework that complements national legislation and supports environmental management within development projects.

The most relevant international agreements applicable to the project include the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Ramsar Convention on Wetlands.

The Convention on Biological Diversity (CBD) promotes conservation of biological diversity, sustainable use of biological resources, and integration of biodiversity considerations into national development planning. Liberia's NBSAP represents the national implementation framework for the CBD.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade in endangered species of wild fauna and flora to ensure that such trade does not threaten their survival. The convention supports national measures aimed at preventing illegal wildlife trade and protecting threatened species.

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Liberia is also a Party to the Ramsar Convention on Wetlands, which promotes the conservation and wise use of wetlands and their ecological functions. Although no designated Ramsar sites occur within the Buchanan–Cestos City Junction corridor, the principles of wetland protection and sustainable management remain relevant to the seasonal wetlands, riparian zones, and river systems identified within the project Area of Influence.

These international agreements reinforce national biodiversity conservation objectives and support the application of precautionary environmental management measures within infrastructure development projects.

Table 2: International conventions relevant to biodiversity management

Convention	Mandate Relevant to Biodiversity	Relevance to the Project
Convention on Biological Diversity (CBD)	Conservation of biodiversity and sustainable use of biological resources	Supports biodiversity assessment, monitoring, and mitigation measures implemented through this Biodiversity Action Plan
Convention on International Trade in Endangered Species (CITES)	Regulation of international trade in endangered wildlife and plant species	Reinforces the prohibition of wildlife hunting, trade, or trafficking by project workers
Ramsar Convention on Wetlands	Conservation and wise use of wetlands and their ecological functions	Relevant to the protection of seasonal wetlands, stream crossings, and riverine habitats within the project Area of Influence
Convention on the Conservation of Migratory Species of Wild Animals (CMS)	Conservation of migratory species and their habitats across their migration ranges	Where applicable to species recorded or potentially present, informs assessment and mitigation of disturbance, habitat fragmentation, and barriers to wildlife movement.
United Nations Convention to Combat Desertification (UNCCD)	Combating land degradation and promoting sustainable land management	Relevant to erosion control, rehabilitation of borrow areas, restoration of disturbed land, and maintenance of soil and vegetation functions, as applicable to the project setting.

Although the Buchanan–Cestos City Junction Road corridor does not intersect any protected areas or internationally recognized biodiversity sites, the principles established under these conventions reinforce the need for responsible biodiversity management and environmental protection within the project corridor.

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1.4 Methodology

This Biodiversity Action Plan is grounded in the ecological baseline established in the ESIA)and refined through targeted field verification and species classification review.

The ESIA identified habitat types within the 250-meter Direct Area of Influence (AoI) defined as approximately 125 meters on each side of the road centerline, and described river and wetland systems, and documented species recorded during baseline surveys. The ESIA concluded that biodiversity sensitivity is not uniform along the corridor alignment and is primarily concentrated at river crossings, wetland areas, and limited forest-edge sections, while the majority of the alignment traverses modified agricultural and settlement landscapes.

To refine and operationalize these findings, targeted field verification was conducted between 12 and 20 February 2026 within the 250-meter Direct AoI. The same technical team that prepared the ESIA undertook this exercise to ensure consistency in habitat interpretation and sensitivity classification.[5]

Field verification included:

- Walkover inspections along representative sections of the alignment;
- Detailed inspection of the Timbo River crossing and other perennial stream crossings identified in the approved drainage schedule;
- Observation of wetland depressions and the forest-edge segment between Big Joe Town and Garpu Town; and
- Consultations with community members in Buchanan Junction, Big Joe Town, Garpu Town, Rock Town, Sand Town, and nearby settlements.

The purpose of the verification was to confirm current habitat conditions, validate ecological sensitivity nodes identified in the ESIA, and strengthen the location-specific mitigation and monitoring framework. The verification supplemented, but did not replace, the ESIA baseline study.

Species referenced in this BAP are derived from four sources: ESIA baseline surveys, February 2026 field verification observations, community consultation inputs, and precautionary habitat-based screening where suitable ecological conditions exist.

[5] The February 2026 exercise was designed to supplement and verify the existing ESIA ecological baseline rather than serve as a comprehensive seasonal biodiversity survey along the 60.9 km corridor. The verification was supported by existing baseline information, community consultations, regional biodiversity literature and conservation database reviews. The same technical team undertook the exercise to ensure consistency in habitat classification and ecological sensitivity assessment. Recognizing the limitations of a single survey period, precautionary biodiversity measures have been incorporated into the BAP, with further targeted surveys to be undertaken at sensitive locations, where necessary, before the commencement of relevant construction activities.

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Freshwater fish such as Tilapia spp. and Clarias spp. were confirmed in the Timbo River and other perennial streams. Amphibians, including Afrixalus dorsalis, were observed in seasonal wetland depressions. Primate activity was observed near the Timbo River crossing and within the forest-edge segment between Big Joe Town and Garpu Town. Primate observations were visual and for a short duration; taxonomic identification to species level was not confirmed during verification.

The Slender-snouted Crocodile (Mecistops cataphractus) was not recorded during the ESIA baseline, was not observed during the February 2026 field verification, and was not confirmed through community consultations. It is included solely under precautionary habitat-based screening due to suitable riverine habitat at the Timbo River crossing and its national conservation significance. This precautionary inclusion does not alter the conclusion that critical habitat criteria are not triggered within the 250-meter DAoI. the combined ESIA review and targeted verification confirm that biodiversity sensitivity remains localized and consistent with the predominantly modified landscape characterization described above.

The Contractor shall prepare a site-specific C-ESMP in accordance with World Bank ESS6 to verify and update biodiversity baseline data for construction areas, ancillary facilities, and relevant ecological impact pathways beyond the 250 m DAoI, where necessary. The assessment shall prioritize sensitive habitats, including the Timbo River, perennial streams, seasonal wetlands, and the Big Joe–Garpu forest edge. Pre-construction targeted survey requirement for Mecistops cataphractus at TR-01 shall be required, i.e., to be completed and documented before in-stream works begin, with any positive finding triggering a re-screening against the five ESS6 critical habitat criteria. The C-ESMP shall evaluate direct, indirect, and cumulative impacts, determine habitat classification and applicable ESS6 requirements, and establish mitigation, restoration, and monitoring measures for integration into the C-ESMP.[6]

1.5 Report Structure

This Biodiversity Action Plan is structured as follows:

- Section 0.1 provides the Executive Summary.
- Section 1 presents the project background, legal framework, area of influence, and methodology.
- Section 2 describes baseline biodiversity conditions and ecological sensitivity nodes.
- Section 3 assesses anticipated construction and operational impacts.

[6] The BAP already establishes the ecological baseline, habitat classification, critical habitat screening, assessment of direct, indirect and cumulative impacts and the associated mitigation, restoration and monitoring requirements. The C-ESMP will translate these requirements into site-specific method statements, restoration plans and monitoring programmes for construction areas and ancillary facilities. Targeted pre-construction verification, including the survey for Mecistops cataphractus at TR-01, will be completed before the commencement of relevant in-stream works. Any discrepancies, newly identified biodiversity features or potential critical habitat values will be reported to the CSC, PIU and relevant regulatory authorities for further assessment and appropriate action.

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- Section 4 summarizes stakeholder engagement specific to biodiversity.
- Section 5 sets out the Biodiversity Management Plan, including mitigation measures, monitoring framework, responsibilities, and budget allocations.
- Section 6 provides conclusions and recommendations.

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2. Baseline Biodiversity Conditions in the Project Area

2.1 Habitat Characterization Along the Corridor

The 250-meter Direct Area of Influence (AoI) is predominantly a modified landscape shaped by long-term agricultural use, settlement expansion, and secondary vegetation regeneration. Farming areas, fallow land, roadside settlements, and fragmented shrubs and tree cover dominate most sections of the alignment. Ecological sensitivity is localized and concentrated at specific natural interfaces rather than continuous along the corridor. These localized features include river crossings, perennial streams, seasonal wetland depressions, and a short forest-edge segment.

The most significant aquatic feature is the Timbo River crossing (Node ID: TR-01), which supports perennial flow and riparian vegetation. In addition, eight perennial stream crossings (Node IDs: SC-01 to SC-08) occur along the alignment as identified in the approved engineering drainage register (Annex 1). These crossings are narrow and localized and do not form extensive riverine forest systems.

Six seasonal wetland depressions (Node IDs: WD-01 to WD-06) occur in low-lying sections of the Direct AoI. These wetlands retain water during the rainy season and provide amphibian habitat, but are spatially limited and embedded within modified agricultural landscapes.

A forest-edge segment between Big Joe Town and Garpu Town (Node ID: FE-01) contains fragmented secondary vegetation and regenerating tree cover. It does not represent an intact primary forest or a continuous canopy habitat.

Buchanan Junction (Node ID: BJ-01) is classified as an urban and peri-urban interface characterized by settlement expansion and historical disturbance. While the ESIA and field verification confirmed that habitat conditions here are highly modified, intermittent primate presence has been observed in the broader Buchanan Junction area through community consultations. Wildlife presence does not alter the modified habitat classification but informs precautionary management controls. Accordingly, precautionary wildlife management measures apply in this zone despite its Low Sensitivity classification.

Overall, habitat characterization confirms that the corridor is predominantly modified with localized natural features concentrated at identified ecological nodes (see Annex 2).

2.2 Ecological Sensitivity Nodes

Ecological sensitivity within the 250-meter Direct AoI is categorized using a node-based classification system tied directly to the engineering drawings and drainage register (Annex 1). Sensitivity classification reflects habitat type, species presence, hydrological function, and precautionary screening outcomes. The spatial location and classification of these nodes are illustrated in the corridor biodiversity sensitivity mapping presented in Annex 2.

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Timbo River Crossing (TR-01) – High Sensitivity

The Timbo River crossing represents the highest ecological sensitivity within the corridor. The habitat consists of a perennial river channel with riparian vegetation.

ESIA baseline surveys and February 2026 field verification confirmed freshwater fish species typical of river systems. Community consultations confirmed active fishing use and seasonal variability in aquatic species. Amphibians were observed along river margins, and primate activity was recorded in adjacent vegetation within or immediately bordering the Direct AoI.

Although suitable riverine habitat exists for nationally significant reptile species, including the Slender-snouted Crocodile (*Mecistops cataphractus*), no such species were recorded during baseline surveys, field verification, or community consultations. No confirmed breeding populations or resident populations of threatened species were recorded within the Direct AoI. Precautionary habitat-based screening was applied at this node (see Annex 4).

This node is therefore classified as High Sensitivity due to hydrological importance, aquatic habitat function, and precautionary conservation relevance.

Perennial Stream Crossings (SC-01 to SC-08) – Moderate Sensitivity

Eight perennial stream crossings occur along the alignment as identified in Annex 1. These streams are narrow, exhibit seasonal flow variability, and contain limited riparian vegetation.

Fish and amphibian species typical of small freshwater systems were confirmed during baseline and field verification activities. Community members reported small-scale domestic and seasonal fishing use.

No confirmed breeding or resident populations of threatened species were recorded at these crossings. However, due to their role in maintaining aquatic connectivity and localized hydrological function, they are classified as Moderate Sensitivity.

Wetland Depressions (WD-01 to WD-06) – Moderate Sensitivity

Six seasonal wetland depressions occur within low-lying portions of the Direct AoI. These wetlands retain water during the rainy season and support amphibian species observed during field verification.

Community consultations confirmed seasonal water retention and occasional domestic use. These wetlands are fragmented and embedded within agricultural landscapes.

Given their ecological function during the rainy season, they are ***classified as Moderate Sensitivity.***

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Forest-Edge Segment (FE-01) – Moderate Sensitivity

The forest-edge segment between Big Joe Town and Garpu Town consists of fragmented secondary vegetation and regenerating tree cover.

Primate activity was observed during the February 2026 verification, and community members reported occasional monkey movement within this area. The observations were brief and did not allow reliable taxonomic identification to species level; therefore, the animals were recorded as unidentified guenon-type monkeys (*Cercopithecus* spp.), which are commonly associated with secondary forest and forest-edge habitats in southeastern Liberia.

No confirmed threatened mammal species were recorded during the ESIA baseline surveys or the February 2026 field verification within the Direct Area of Influence. However, it is recognized that several primate species occur within Liberia's Upper Guinean Forest ecosystem, including species of conservation concern such as the Diana monkey (*Cercopithecus diana*) and the Western chimpanzee (*Pan troglodytes verus*), as documented in Liberia's National Biodiversity Strategy and Action Plan (NBSAP). All primates are considered protected wildlife under national conservation frameworks and are therefore treated as sensitive biodiversity receptors in the management measures described in this BAP.

Although the habitat is fragmented and not an intact primary forest, the presence of semi-natural vegetation and observed wildlife activity justifies classification as Moderate Sensitivity.

Buchanan Junction (BJ-01) – Low Sensitivity (Precautionary Controls Applied)

Buchanan Junction is highly modified by settlement, commercial activity, and transport infrastructure. Baseline surveys and the February 2026 field verification did not identify habitat of conservation significance within this node.

While intermittent primate sightings have been reported in the broader landscape through community consultations, habitat quality within Buchanan Junction is substantially altered and does not support conditions typically associated with stable primate habitat. The node is therefore classified as Low Sensitivity. Nevertheless, because primates are protected wildlife under national conservation frameworks, precautionary wildlife protection measures are applied, including contractor codes of conduct prohibiting hunting and bushmeat trade, worker awareness training, and monitoring of wildlife observations during construction.

To strengthen the biodiversity baseline, the assessment was complemented by a review of relevant literature beyond the original ESIA, including Liberia's National Biodiversity Strategy and Action Plan (NBSAP), national conservation assessments, Forestry Development Authority (FDA) biodiversity information, and publicly available studies on wildlife occurrence and conservation threats in Liberia. These sources indicate that Liberia forms part of the Upper Guinea Forest ecosystem, a globally important biodiversity hotspot that supports a wide range of mammal species, including primates, duikers, pangolins, and riverine fauna. Conservation literature and

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national biodiversity assessments identify several threatened species associated with forest and riverine habitats in Liberia, including chimpanzees (Pan troglodytes), Diana monkeys (Cercopithecus diana), pygmy hippopotamus (Choeropsis liberiensis), pangolins (Phataginus spp.), and forest antelopes such as Jentink's duiker (Cephalophus jentinki) and zebra duiker (Cephalophus zebra).

Publicly available conservation reporting also highlights increasing pressures on wildlife populations in Liberia, particularly from bushmeat hunting and illegal wildlife trade, affecting species such as pangolins and duikers. While these species were not recorded during the ESIA baseline surveys or the February 2026 field verification within the 250-meter Direct Area of Influence (AoI), they are included in the biodiversity screening as precautionary species of conservation concern, consistent with good international practice for biodiversity risk management and literature-based biodiversity assessment.

Species listed in Table 3-1 therefore represent (i) fauna recorded during the ESIA baseline surveys and field verification within the project corridor, and (ii) species of conservation concern identified through literature review and precautionary screening based on Liberia's national biodiversity information and habitat suitability considerations.

In addition to the species recorded during field verification, habitat characteristics within the project corridor indicate the potential presence of broader wildlife assemblages associated with modified forest landscapes of southeastern Liberia. Riparian environments such as the Timbo River and perennial stream crossings may support aquatic fauna, including fish, amphibians, reptiles, and water-dependent mammals. Secondary forest fragments and forest-edge habitats may support small and medium-sized mammals, primates, and forest bird species. Wetland depressions provide seasonal breeding habitat for amphibians and aquatic invertebrates. Although not all species associated with these assemblages were observed during the limited verification survey, these habitat-based ecological associations informed the precautionary biodiversity screening and management measures described in this Biodiversity Action Plan.

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Figure 2: Map showing the Gbankohn and Timbo rivers in the proposed project area

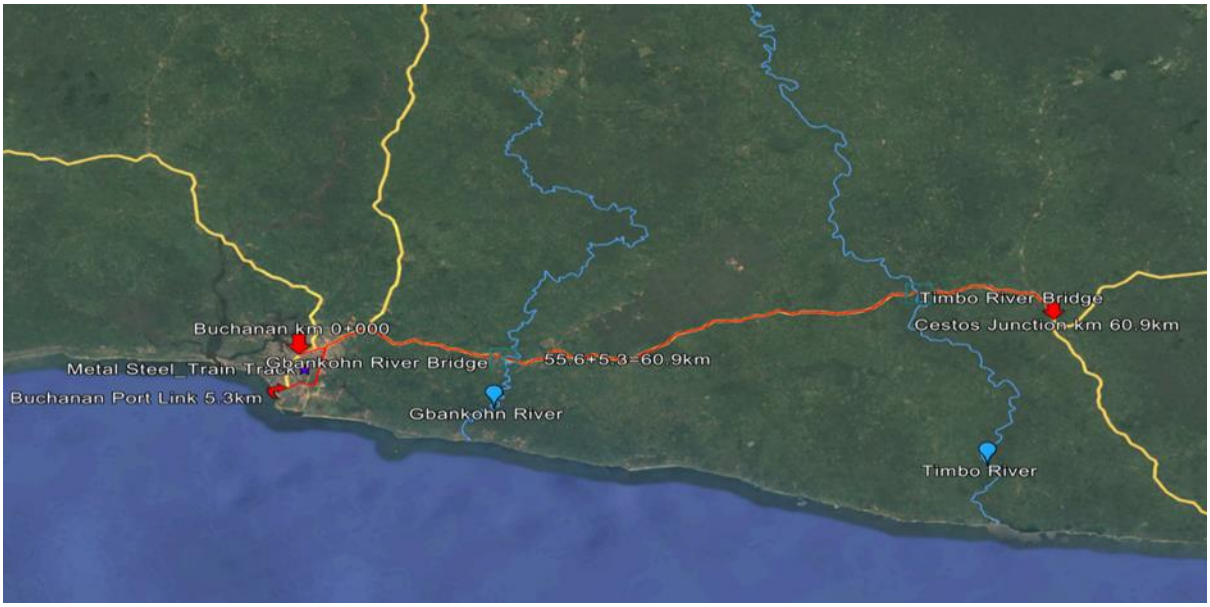


Figure 3: Map highlighting the biodiversity buffer of the proposed project area

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Table 3: Fauna Recorded During Baseline Surveys and Species Screened Through Literature Review within the 250-m Direct Area of Influence (AoI)

Species	Scientific Name	IUCN Status	Node Reference	Basis of Inclusion
Pisces (Fishes)				
Tilapia	*Tilapia* spp.	Not Evaluated	TR-01; SC-01–SC-08	ESIA baseline + Field verification + Community consultations
Catfish	*Clarias* spp.	Not Evaluated	TR-01; SC-01–SC-08	ESIA baseline + Field verification + Community consultations
Amphibia (Toads and Frogs)				
Reed Frog	*Afrixalus dorsalis*	Least Concern	WD-01–WD-06	Field verification
Reptilia (Snakes, Lizards and Crocodiles)				
Slender-snouted Crocodile	*Mecistops cataphractus*	Critically Endangered	TR-01 – Timbo River (habitat suitability screening)	Precautionary screening (NBSAP + habitat suitability)[1]
Aves (Birds)				
African Grey Parrot	*Psittacus erithacus*	Endangered	Regional occurrence (literature screening – NBSAP)	Precautionary screening (Upper Guinean forest bird assemblage)
White-crested Hornbill	*Horizocerus albocristatus*	Least Concern	Regional occurrence (literature screening)	Precautionary screening (forest-edge habitat association within Upper Guinean forest ecosystems)
Mammalia (Mammals)				
Unidentified guenon-type monkeys (observed primate activity)	*Cercopithecus* spp.	Protected wildlife (species not taxonomically confirmed)	FE-01; TR-01; BJ-01	Field verification + Community reports
Western Chimpanzee	*Pan troglodytes verus*	Critically Endangered	Regional occurrence (literature screening – NBSAP)	Precautionary screening (literature review + NBSAP)

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Species	Scientific Name	IUCN Status	Node Reference	Basis of Inclusion
Diana Monkey	*Cercopithecus diana*	Vulnerable	Regional occurrence (literature screening – NBSAP)	Precautionary screening (literature review + NBSAP)
Campbell's Monkey	*Cercopithecus campbelli*	Least Concern	Regional occurrence (literature screening)	Precautionary screening (regional primate occurrence records)
Lesser Spot-nosed Monkey	*Cercopithecus petaurista*	Least Concern	Regional occurrence (literature screening)	Precautionary screening (habitat association with secondary forest and forest-edge ecosystems)
Red Colobus	*Procolobus badius*	Endangered	Regional occurrence (literature screening – NBSAP)	Precautionary screening (literature review + NBSAP)
Jentink's Duiker	*Cephalophus jentinki*	Endangered	Regional occurrence (literature screening – NBSAP)	Precautionary screening (literature review + NBSAP)
Zebra Duiker	*Cephalophus zebra*	Vulnerable	Regional occurrence (literature screening – NBSAP)	Precautionary screening (literature review + NBSAP)
White-bellied Pangolin	*Phataginus tricuspis*	Endangered	Regional occurrence (literature screening)	Precautionary screening (literature review on pangolin occurrence and trafficking in Liberia)

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Species	Scientific Name	IUCN Status	Node Reference	Basis of Inclusion
Black-bellied Pangolin	*Phataginus tetradactyla*	Endangered	Regional occurrence (literature screening)	Precautionary screening (literature review on pangolin occurrence and trafficking in Liberia)
Giant Ground Pangolin	*Smutsia gigantea*	Endangered	Regional occurrence (literature screening – NBSAP)	Precautionary screening (regional occurrence and bushmeat trade literature)
Pygmy Hippopotamus	*Choeropsis liberiensis*	Endangered	Riverine forest habitat (regional screening)	Precautionary screening (NBSAP literature review)

Species identified under precautionary screening are included based on national biodiversity records documented in Liberia's National Biodiversity Strategy and Action Plan (NBSAP) and habitat suitability considerations. Their presence was not confirmed during the ESIA baseline surveys or the February 2026 field verification within the Direct Area of Influence (AoI). All primates are considered protected wildlife under Liberia's wildlife conservation framework and are therefore subject to precautionary protection measures under this Plan.

2.3 Critical Habitat Screening Confirmation

Critical habitat (CH) screening was conducted in accordance with African Development Bank (AfDB) Operational Safeguard 3 (OS3) and the WB ESS6 and is documented in detail in the CH Screening Table (Annex 4). The screening assessed whether any portion of the 250-meter DAoI meets AfDB OS3/WB ESS6 criteria for critical habitat designation.

The screening considered:

- Presence of legally designated protected areas or highly threatened and or unique ecosystems;
- Occurrence of globally threatened species (Critically Endangered or Endangered as listed in IUCN red list) and their breeding or resident populations;
- Unique or irreplaceable ecosystem types;
- Areas of high biodiversity value or ecological integrity; and
- Habitat is essential for migratory or congregatory species of nationally or of globally importance.

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The corridor does not intersect any legally designated protected areas. Review of national conservation datasets and mapping confirms that no protected areas, gazetted reserves, or internationally recognized biodiversity sites occur within the Direct AoI.

Habitat within the DAoI is predominantly modified with localized natural features resulting from long-term agricultural use, settlement expansion, and historical disturbance. While localized aquatic features (TR-01; SC-01–SC-08) and a semi-natural forest-edge segment (FE-01) occur, these do not constitute intact primary forest, unique ecosystem types, or areas of high ecological integrity.

Globally threatened species screening identified the Slender-snouted Crocodile (*Mecistops cataphractus*), classified as Critically Endangered on the IUCN Red List, as potentially associated with suitable riverine habitat at TR-01. However:

- The species was not recorded during ESIA baseline surveys;
- It was not observed during the February 12–20, 2026 field verification;
- It was not confirmed during community consultations; and
- No evidence of breeding sites or resident populations was identified within the Direct AoI.

Precautionary habitat-based screening was therefore applied at TR-01 due to suitable environmental conditions and national conservation relevance under Liberia's NBSAP. This precautionary inclusion does not constitute confirmation of species presence and does not, in itself, trigger critical habitat designation under OS3.

No confirmed breeding populations, congregatory species aggregations, endemic species hotspots, or unique ecosystem types were identified within the Direct AoI. Aquatic and forest-edge features are localized and embedded within a broader modified landscape context.

Based on the ESIA baseline, February 2026 field verification, species classification review, precautionary screening, and national biodiversity context, the 250-meter Direct Area of Influence does not meet AfDB OS3 criteria for CH. Therefore, it isnot triggered for this project corridor.

Based on the information provided for the Project, the assessment below provides the compliance with ESS6; and is confined to 250 m DAoI (125 m on either side of the road centerline).

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Table 4: CH Criterion and Evidence within 250m AoI

Critical Habitat Criterion	Evidence within 250 m DAoI
(a) Habitat of significant importance to Critically Endangered (CR) or Endangered (EN) species	The Slender-snouted Crocodile (Mecistops cataphractus) is identified in the supplied baseline as potentially associated with suitable riverine habitat at TR-01. It was not recorded during ESIA surveys, February 12–20, 2026 field verification, or community consultations. No breeding sites or resident populations were confirmed.
(b) Habitat of significant importance to endemic or restricted-range species	Fish, amphibians, and unidentified guenon-type monkeys were recorded or reported in the corridor. The baseline does not confirm endemic or restricted-range species, qualifying populations, or a significant proportion of a species' global distribution within the 250 m AoI.
(c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species	Fish occur in the Timbo River and perennial streams; amphibians were observed along river margins and in seasonal wetland depressions. No significant migratory or congregatory wildlife concentrations were documented within the 250 m AoI.
(d) Highly threatened or unique ecosystems	The AoI comprises predominantly modified landscapes, localized perennial rivers and streams, seasonal wetland depressions, and fragmented secondary vegetation at FE-01. No evidence was established in the Baseline that these features qualify as highly threatened or unique ecosystems.
(e) Ecological functions or characteristics necessary to maintain biodiversity values under criteria (a) to (d)	TR-01 and SC-01–SC-08 provide aquatic habitat and connectivity; WD-01–WD-06 provide seasonal wetland habitat; FE-01 may support wildlife movement. However, no qualifying biodiversity value under criteria (a)–(d) has yet been demonstrated within the assessed area.
Protected areas and recognized biodiversity sites	The supplied screening reports no legally designated protected areas, gazetted reserves or internationally recognized biodiversity sites within the 250 m AoI.

Summary Assessment: The assessment of the 250 m DAoI indicates that the corridor is predominantly modified, with localized aquatic habitats, seasonal wetlands, and fragmented secondary vegetation.

Based on the available ESIA baseline, February 2026 field verification, and community consultations, none of the five CH criteria under World Bank ESS6 has been conclusively demonstrated within the assessed corridor.

However, CH cannot be definitively excluded at this stage given the 250 m DAoI, particularly at the Timbo River crossing (TR-01), where suitable riverine habitat has been identified for the Slender-snouted Crocodile (Mecistops cataphractus), The absence of field detections does not, by itself, establish the absence of qualifying biodiversity values. Therefore, further verification required to support definitive exclusion" if project activities go beyond 250 m.[7]

[7] Based on the primary and secondary ecological information available through the ESIA and BAP, critical habitat criteria are not triggered within the 250 m DAoI under the finalized Project design and alignment. However, if the CC proposes any changes to the Project footprint or undertakes activities extending beyond the assessed area before site mobilization, supplementary ecological assessments shall be conducted, including targeted wet- and dry-season surveys by a qualified biodiversity specialist and reassessment against the five ESS6 critical habitat criteria. At TR-01, targeted surveys for Mecistops cataphractus shall be completed and documented before commencement of in-stream works. Any positive findings shall trigger a review of the critical habitat determination, updating the BAP and

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development of appropriate biodiversity management measures in consultation with the CSC/PIU. Relevant work shall not proceed until the necessary assessments and management measures have been completed and approved.

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3. Anticipated Biodiversity Impacts

3.1 Construction Phase Impacts

Construction-related impacts are expected to be localized, temporary, and confined to the approved right of way RoW and defined engineering work sites. The 250-meter AoI defines the assessment and management boundary; actual physical disturbance is restricted to the established RoW and approved construction footprint. Assessment follows the mitigation hierarchy, with avoidance achieved through retention of the existing alignment and minimization achieved through controlled design limits and construction management measures.

Timbo River Crossing (TR-01)

Construction activities at TR-01 may result in temporary sediment disturbance and localized turbidity during in-stream works, limited removal of riparian vegetation within the approved RoW and potential spill risk from equipment operating near the river interface. These activities may also affect aquatic biodiversity, riparian habitat integrity, ecological connectivity and fisheries-related ecosystem services.

Works are confined to the approved bridge and drainage footprint. Disturbance to aquatic habitat is expected to be short-term and reversible where erosion control, sediment containment, and spill prevention measures are properly implemented. The mitigation hierarchy shall be applied, prioritizing avoidance of unnecessary in-stream works and riparian vegetation clearance, followed by minimization and restoration of temporarily disturbed areas. The Contractor shall implement appropriate erosion and sediment controls, spill prevention and emergency response procedures, and water-quality monitoring upstream and downstream of the crossing, as appropriate.

No confirmed breeding or resident populations of threatened species were identified at this node; however, precautionary habitat-based screening was applied due to the ecological importance of the river system (see Section 3.3 and Annex 4).

A pre-construction targeted survey shall be required for Mecistops cataphractus at TR-01 explicit and time-bound - i.e., to be completed and documented before in-stream works begin, with any positive finding triggering a re-screening against the five ESS6 critical habitat criteria. Therefore, the CH determination shall address all five ESS6 criteria and shall not rely solely on the absence of recorded individuals within 250 AoI. If CH is confirmed, the applicable requirements of ESS6 shall be satisfied before proceeding with activities that could adversely affect its qualifying biodiversity values.[8]

[8] The CC will conduct a targeted pre-construction survey for Mecistops cataphractus at TR-01 through a qualified biodiversity specialist before mobilization to the site. The survey findings will be documented and submitted to the CSC and PIU for review and approval. Any positive detection shall trigger reassessment against all five ESS6 critical habitat criteria and, where necessary, revision of the BAP and development of additional biodiversity management measures. In-stream work will not commence until the survey is completed, the findings are reviewed, and all applicable ESS6 requirements are addressed.

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Perennial Stream Crossings (SC-01 to SC-08)

At SC-01 to SC-08, culvert installation and associated earthworks may temporarily disturb stream banks and increase sediment movement during active construction. These crossings already intersect the existing transport corridor. Impacts are therefore limited to upgrading and reinstatement within previously disturbed interfaces. Proper installation, bank stabilization, and maintenance of flow continuity will prevent long-term hydrological alteration. Therefore, the existing disturbed condition does not eliminate the ecological value of these streams. Construction activities shall assess and minimize potential effects on aquatic fauna, riparian vegetation, water quality, and ecological connectivity, including downstream receptors where relevant. Culvert design and installation shall maintain adequate hydraulic capacity and aquatic passage, as appropriate to the stream conditions, while preventing flow obstruction and excessive scour.

The Contractor shall monitor stream condition and the effectiveness of mitigation measures during construction and implement corrective actions where erosion, sedimentation, pollution, or disruption of aquatic connectivity is observed. Any potential occurrence of species of conservation concern shall be managed in accordance with the biodiversity screening and applicable ESS6 requirements.

Impacts are localized and temporary.

Wetland Depressions (WD-01 to WD-06)

Construction activities within WD-01 to WD-06 may temporarily alter surface water movement during earthworks in low-lying areas. Sediment runoff during rainfall events could affect water clarity if unmanaged. These wetlands are seasonal and fragmented within agricultural settings. No permanent filling, drainage diversion, or conversion is proposed. Maintaining natural drainage pathways and applying erosion control measures will prevent long-term hydrological disruption.

Construction shall minimize disturbance to wetland habitats and amphibian breeding areas, prevent sedimentation and contamination, maintain seasonal hydrological connectivity and restore temporarily disturbed areas using native vegetation.

Forest-Edge Segment (FE-01)

Vegetation clearing within FE-01 will be restricted strictly to the established RoW boundary. Temporary disturbance to small mammals and primates may occur during clearing activities. The vegetation consists of fragmented secondary growth and does not represent an intact primary forest. Impacts are therefore localized and not expected to increase habitat fragmentation beyond existing conditions.

The fragmented vegetation may provide habitat and movement routes for wildlife. The mitigation hierarchy shall be applied where applicable.

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Buchanan Junction (BJ-01)

Construction activities at BJ-01 occur within a highly modified urban and peri-urban interface. Habitat quality is substantially altered and does not constitute a sensitive natural habitat.

Although intermittent primate presence has been observed in the broader area, sensitivity classification reflects habitat condition rather than transient wildlife movement. Impacts are expected to be negligible from a habitat perspective. Precautionary wildlife protection measures, including enforcement of the Contractor's Code of Conduct and prohibition of wildlife harassment, will apply in this zone. Habitat classification shall be based on documented ecological conditions and biodiversity values, rather than disturbance alone. The Contractor shall avoid unnecessary vegetation clearance, prohibit wildlife hunting or capture and implement appropriate wildlife encounter and rescue procedures. Any threatened species or significant biodiversity values identified during construction shall trigger reassessment and additional mitigation in accordance with WB ESS6.

Borrow Pits and Engineered Slopes

Borrowed material will be sourced only from approved locations. No borrow pits will be opened within TR-01, SC-01–SC-08, WD-01–WD-06, or FE-01. Excavation and slope shaping may result in temporary soil exposure and erosion risk during rainfall. If unmanaged, this could contribute to sediment transport toward aquatic nodes. Progressive stabilization and revegetation will minimize residual risk. Long-term impacts are not anticipated where rehabilitation standards are met. Borrow areas shall be screened for biodiversity values and potential impacts on natural habitats before approval. The mitigation hierarchy shall be applied to avoid sensitive habitats, minimize vegetation clearance and erosion, and prevent sedimentation or contamination of nearby aquatic ecosystems. Upon completion, disturbed areas shall be rehabilitated using suitable native species, with monitoring to verify vegetation recovery, habitat stability and the effectiveness of restoration measures.

3.2 Indirect Impacts

Indirect impacts are primarily associated with improved accessibility rather than direct habitat clearance. Improved road conditions may increase mobility along the corridor; however, the alignment follows an existing disturbed route within a predominantly modified agricultural and settlement landscape. No new access roads into intact forest or protected areas are proposed. Large-scale habitat encroachment risk is low; however, localized opportunistic hunting pressure may increase near FE-01 and TR-01 and is therefore managed through preventive controls.

Although no confirmed populations of threatened species were recorded within the DAoI, wildlife disturbance risk will be managed through enforcement of the Contractor's Code of Conduct, prohibition of hunting or wildlife harassment, workforce biodiversity training, and supervision monitoring. Improperly managed earthworks at TR-01 and SC-01–SC-08 during heavy rainfall could increase sediment transport into aquatic systems. This risk is temporary and limited to active

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construction periods and is controlled through sediment containment and rapid stabilization measures.

3.3 Operational Phase Impacts

Operational impacts are expected to be lower in magnitude than construction-phase impacts.

Improved road surface conditions may increase vehicle speeds near FE-01 and TR-01, potentially elevating wildlife–vehicle interaction risk. Given the fragmented and predominantly modified habitat conditions within the DAoI, wildlife density is low. The risk is localized and manageable through signage and speed awareness measures at identified nodes.

Failure to maintain culverts at SC-01–SC-08 and drainage channels near WD-01–WD-06 could result in localized blockage and altered water flow. Routine inspection and maintenance during operation are required to sustain hydrological continuity. Properly functioning drainage systems are expected to reduce long-term erosion compared to existing gravel conditions.

3.4 Quantified Disturbance Footprint

Vegetation clearing is limited to the approved right-of-way and defined engineering footprint. The disturbance footprint is derived from the established ROW width applied across the 60.9 km alignment, combined with localized engineering works at TR-01, SC-01–SC-08, WD-01–WD-06, FE-01, and approved borrow sites.

Because the project follows an existing transport corridor, the majority of vegetation disturbance represents re-clearing of previously modified land rather than conversion of intact natural habitat. Localized disturbance at crossings, wetlands, slopes, and borrow areas represents a minor proportion of the total alignment length and is spatially confined to identified ecological nodes. No clearing beyond the approved RoW is anticipated.

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4. Stakeholder Engagement

4.1 Consultation Overview (12–20 February 2026)

Targeted stakeholder consultations were conducted between 12–20 February 2026 as part of field verification activities for this Biodiversity Action Plan. Engagement took place within the 250-meter Direct Area of Influence (AoI) and focused on ecological nodes identified in Section 3 and cross-referenced to the engineering drainage register (Annex 1). Consultations were conducted near TR-01 and selected SC and WD nodes as identified in Annex 1 .

The objective of the consultations was to validate ESIA findings, confirm local ecological knowledge, and identify biodiversity-related concerns associated with the construction and operation of the road corridor. The consultations strengthened the operational focus of the BAP and informed refinement of node-specific mitigation and monitoring measures. The 250-meter AoI defined the consultation boundary; discussions focused specifically on ecological interfaces located within or immediately adjacent to the approved right-of-way and engineering footprint.

Additionally, the consultations also covered the ESS6 requirements, and information concerning wildlife movement, fisheries, hunting, forest-edge vegetation and seasonal natural-resource use has informed biodiversity risk assessment and application of the mitigation hierarchy. The consultation's findings further support the measures to protect aquatic habitats, maintain drainage and ecological connectivity, minimize vegetation clearance, prevent hunting and wildlife harassment, and rehabilitate disturbed areas using native species.

4.2 Communities and Participants

Consultations were conducted in Buchanan Junction (BJ-01), Big Joe Town, Garpu Town, Rock Town, Yarkpah Town, and in communities located near the Timbo River crossing (TR-01) and identified perennial stream crossings (SC-01–SC-08).

Participants included local residents, fishermen, community leaders, women involved in household natural resource use, hunters, and users of river and wetland resources. Engagement emphasized individuals directly reliant on aquatic systems and seasonal wetlands, and surrounding forest resources within the Direct AoI.

Consultations also involved community members familiar with wildlife occurrence and hunting practices in the area, recognizing that local hunters and bushmeat resource users often possess detailed knowledge of wildlife presence and seasonal movements within the landscape. Community consultations also incorporated traditional ecological knowledge regarding wildlife occurrence, seasonal migration patterns, and local resource use practices. Local hunters and community members reported that small primates (commonly referred to locally as "monkeys") are occasionally observed moving through secondary forest patches and forest-edge habitats near Big Joe Town and Garpu Town. Hunters also indicated that duiker species are sometimes encountered in surrounding forest areas outside the immediate road corridor. Pangolins were reported as historically present in the wider landscape but rarely encountered in recent years, which community members attributed to hunting pressure and declining wildlife abundance. Community

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members also noted that parrots and other forest birds are occasionally observed in forest-edge areas and along riverine vegetation near the Timbo River crossing.

Although these species were not directly observed during the limited field verification survey, [9]the local ecological knowledge obtained through consultations supported the precautionary biodiversity screening approach adopted in this BAP and informed the inclusion of primates, duikers, pangolins, and forest bird species within the literature-based biodiversity baseline presented in Table 3-1

Discussions focused on:

- Aquatic resource dependency
- Seasonal habitat conditions
- Wildlife observations
- Local knowledge of wildlife presence and hunting activities
- Perceived environmental risks during construction

Information obtained from these consultations contributed to the identification of wildlife observations presented in the biodiversity baseline and precautionary species screening included in this Plan.

Identification and assessment of ecosystem services

The assessment follows the ecosystem-services approach under ESS1, recognizing that impacts on biodiversity and habitats can affect community livelihoods, health, safety and access to natural resources. ESS6 complements this by requiring biodiversity conservation and sustainable management of living natural resources. The BAP describes the corridor as a predominantly modified agro-mosaic landscape comprising agricultural areas, settlements and regenerating secondary vegetation. However, modified landscapes can continue to provide important ecosystem services.

Table 5: Identification and assessment of ecosystem services

Service and project-area relevance	Potential project impact	Preliminary significance
Fisheries and aquatic food: Fish resources, including Tilapia spp. and Clarias spp., are reported in the Timbo River and other	Sedimentation, accidental spills, and disturbance of aquatic habitats could affect fish resources and access to fishing locations.	Moderate, particularly at TR-01 and relevant SC crossings; confirm through consultation

[9] The February 2026 exercise was designed to supplement and verify the existing ESIA ecological baseline rather than serve as a comprehensive seasonal biodiversity survey along the corridor. The verification was supported by existing baseline information, community consultations, regional biodiversity literature and conservation database reviews. The same technical team undertook the exercise to ensure consistency in habitat classification and ecological sensitivity assessment. Recognizing the limitations of a single survey period, precautionary biodiversity measures have been incorporated into the BAP, with further targeted surveys to be undertaken at sensitive locations, where necessary, before the commencement of relevant construction activities.

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perennial streams. Local and seasonal fishing has been reported.		and water-quality assessment.
Water resources: Streams and seasonal wetlands retain or convey water, with some domestic use reported around wetland depressions.	Pollution, altered drainage, sedimentation, or temporary access restrictions could affect water availability or usability.	Low to moderate, subject to verification of actual abstraction and dependence.
Agricultural and natural resources: The surrounding agro-mosaic may provide crops, vegetation, fuelwood, and other plant resources.	Vegetation clearance, land take, or restrictions on access could reduce locally available resources.	Low to moderate, depending on the area affected and household reliance.
Floodwater storage and drainage: Seasonal wetlands, stream channels, and low-lying areas convey or temporarily retain rainfall runoff.	Blocked culverts, poorly managed earthworks, or altered drainage could increase localized flooding, erosion, and downstream sediment transport.	Moderate at stream and wetland interfaces.
Water purification and sediment retention: Riparian vegetation, wetland soils, and stream margins can retain sediment and help maintain water quality.	Vegetation removal and exposed soil could reduce sediment retention and increase turbidity during rainfall.	Moderate at TR-01, SC-01–SC-08, and WD-01–WD-06.
Soil stabilization and erosion control: Vegetation along forest edges, slopes, and drainage channels helps stabilize soil.	Clearing, excavation, and borrow-area activities could increase erosion and sediment movement.	Low to moderate, depending on slope, soil exposure, and proximity to watercourses.
Wildlife habitat and ecological connectivity: Stream margins, seasonal wetlands, and fragmented secondary vegetation provide habitat and potential movement routes for aquatic fauna, amphibians, and terrestrial wildlife.	Construction disturbance and vegetation clearance could reduce habitat quality or interrupt local movement.	Moderate at sensitive ecological nodes; reassess if threatened species or qualifying habitat values are identified.
Traditional and community uses of nature: Fishing locations, locally valued natural areas, and customary resource-use sites may have social or cultural importance.	Temporary access restrictions, degradation of resource sites, or disruption of customary activities could affect community well-being.	To be confirmed through targeted consultations; do not assume cultural significance without evidence.

Mitigation and Monitoring Requirements

Based on the ecosystem services assessment, the following management and mitigation measures are proposed for implementation, together with measurable monitoring indicators to evaluate their effectiveness, ensure the continued provision of priority ecosystem services and minimize adverse impacts on community livelihoods and ecological functions.

Table 6: Mitigation and Monitoring Requirements

Management measure	Implementation requirement	Monitoring indicator
Resource-use verification	Identify households, fishers, farmers, and other users who depend on potentially affected ecosystem services; record seasonal use and access.	Consultation records, mapped resource-use locations, and documented concerns.
Water quality and fisheries	Apply erosion, sediment, and spill controls at water crossings; avoid unnecessary in-stream works.	Turbidity and other relevant water-quality parameters compared with baseline and applicable standards; reported fishery disruption.

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Wetland hydrology	Maintain natural drainage, avoid unnecessary filling or drainage diversion, and protect wetland margins.	Drainage continuity, standing-water patterns during comparable seasonal conditions, and evidence of erosion or sediment deposition.
Vegetation and natural resources	Minimize clearance, restore disturbed areas using suitable native species, and prevent unauthorized extraction and wildlife harassment.	Area cleared and restored, native vegetation survival, and records of wildlife incidents.
Access and livelihoods	Assess temporary or permanent restrictions on fishing, water use, agricultural resources, and other customary uses. Coordinate mitigation with affected users.	Documented access disruptions, grievances, corrective actions, and resolution records.
Adaptive management	Investigate unexpected impacts and revise mitigation where monitoring identifies deterioration in ecosystem services.	Corrective-action register, implementation status, and evidence of recovery.

4.3 Biodiversity-Related Issues Raised

Community members confirmed reliance on the Timbo River (TR-01) and smaller perennial streams (SC-01–SC-08) for fishing, with seasonal variation in water levels and fish availability. Wetland depressions (WD-01–WD-06) were reported to retain water during peak rainy periods and support limited domestic use. Occasional monkey movement was reported near the forest-edge segment (FE-01), consistent with field verification findings.

Concerns were raised regarding:

- Potential sediment entry into rivers and streams during construction
- Risk of fuel or oil contamination near aquatic nodes
- Maintenance of drainage continuity
- Potential disturbance to wildlife movement near forest-edge segments during construction activities

All biodiversity-related concerns raised during consultations will be logged and tracked under the project's GM in accordance with the Stakeholder Engagement Plan. Complaints related to sedimentation, water quality, wildlife disturbance, or habitat impacts will be formally recorded, investigated, and addressed through the project's environmental and social management procedures. Information obtained during consultations has informed the biodiversity baseline assessment and supports the precautionary wildlife protection measures included in the Plan, particularly with respect to sediment control, pollution prevention, and restrictions on hunting and wildlife exploitation by project workers.

4.4 Integration of Consultation Outcomes into Management Measures

Consultation findings have been integrated directly into the BMP in Section 5. Implementation of these measures will be monitored by the Supervising Consultant and the PIU environmental team.

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The table below summarizes how identified concerns correspond to node-specific mitigation measures, monitoring provisions, and GRM tracking procedures.

Table 7: Integration of Consultation Outcomes into the Biodiversity Management Plan

Issue Raised	Ecological Node Reference	Management Response	BAP Section Reference	GRM Linkage
Risk of sediment entering the river during construction	TR-01	Strict erosion and sediment control during in-stream works; staged excavation; sediment containment measures	Section 6 – River Crossing Mitigation	Logged under environmental impact complaints
Protection of fish habitat and fishing livelihoods	TR-01; SC-01–SC-08	Maintain flow continuity during culvert installation; restrict work footprint; apply timing controls during peak flow	Section 6 – Aquatic Habitat Management	Fisheries-related grievances tracked through GRM
Seasonal wetland water retention	WD-01–WD-06	Maintain natural drainage pathways; prohibit permanent blockage or filling	Section 6 – Wetland Protection Measures	Hydrological complaints are recorded and monitored
Wildlife disturbance during vegetation clearing	FE-01; BJ-01 (precautionary controls)	Clearing limited to approved ROW; enforcement of worker code of conduct prohibiting hunting; biodiversity awareness training for construction workforce; precautionary protection of wildlife, including primates and other forest species of conservation concern identified through literature screening	Section 6 – Vegetation and Wildlife Controls	Wildlife disturbance complaints logged and investigated
Risk of fuel or oil spills near water bodies	TR-01; SC-01–SC-08	No refueling within designated buffer; spill prevention and response procedures; supervision monitoring	Section 6 – Pollution Prevention	Pollution incidents recorded and escalated per GRM

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Issue Raised	Ecological Node Reference	Management Response	BAP Section Reference	GRM Linkage
Concern about water quality for domestic use	SC-01–SC-08; WD-01–WD-06	Monitoring of sediment control effectiveness; corrective measures if performance thresholds exceeded	Section 6 – Monitoring Framework	Water quality complaints formally tracked

Consultation outcomes also informed the precautionary wildlife protection measures included in the Biodiversity Management Plan, particularly with respect to restrictions on hunting, control of vegetation clearing activities, monitoring of wildlife observations during construction, and protection of forest-edge habitats where primate movement has been reported.

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5. Biodiversity Management Plan

Biodiversity mitigation measures are structured according to the ecological sensitivity nodes identified within the 250-meter Direct AoI, including TR-01, SC-01–SC-08, WD-01–WD-06, FE-01, BJ-01 (precautionary controls), and approved borrow pit and engineered slope areas. These ecological nodes correspond to the habitat sensitivity classifications described in Section 3 and form the basis for the management measures presented in this section. The 250-meter AoI defines the assessment and management boundary; actual physical disturbance is confined strictly to the approved RoW and defined engineering work sites.

Cost allocations are derived from the quantified engineering footprint, disturbance areas, and the number of sensitive nodes identified in Section 3. Unit rates are derived from the Works BOQ environmental line items and supervision contract rates consistent with agreed project pricing schedules. Construction-related mitigation measures will be implemented by the Contractor under the BOQ environmental line items within the Works Contract. Monitoring and reporting responsibilities fall under the Supervising Consultant's environmental supervision allocation under the Supervision Contract. PIU oversight is exercised through contractual enforcement and review of supervision reports, while regulatory supervision applies in accordance with national environmental permitting procedures.

Management measures defined in this Plan address key ecological risks identified through the ESIA baseline, February 2026 field verification, literature screening (including the Liberia National Biodiversity Strategy and Action Plan), and community consultations. These measures include protection of aquatic habitats, control of sediment and pollution risks, management of vegetation clearing, and precautionary protection of wildlife species of conservation concern, including primates and other forest species potentially present in the wider landscape.

Implementation performance will be verified through the biodiversity monitoring framework described in Section 6, which includes site inspections, supervision reporting, and documentation of wildlife observations and environmental incidents during construction.

5.1 Monitoring Framework and Compliance Controls

Monitoring frequency is scaled according to ecological sensitivity classification and the level of potential ecological disturbance associated with construction activities at each node.

- **TR-01 (High Sensitivity):** Weekly monitoring during active in-stream works and immediately following significant rainfall events.
- **SC-01–SC-08 and WD-01–WD-06 (Moderate Sensitivity):** Inspection during active works and at least once following peak rainfall during the rainy season.
- **FE-01 and BJ-01:** Periodic inspection during vegetation clearing and workforce mobilization activities with particular attention to wildlife disturbance and compliance with hunting prohibitions under contractor codes of conduct.

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- **Borrow pits and engineered slopes:** Verification at completion of earthworks and at the end of the first rainy season.

Post-construction stabilization shall be verified at the end of the first rainy season following completion. Monitoring activities will include visual inspections, documentation of sediment control effectiveness, verification of drainage functionality, and recording of wildlife observations where relevant.

If monitoring identifies non-compliance or ecological degradation beyond predicted levels, corrective measures shall be implemented immediately. The Supervising Consultant has the authority to issue written corrective instructions and may instruct the temporary suspension of works at the affected node pending PIU direction. Corrective measures shall be financed under the contingency allocation defined in Table 6-1, subject to PIU approval and regulatory notification where required.

5.2 Vegetation Survival Thresholds

A higher vegetative survival threshold (≥80%) applies to High Sensitivity riparian zones at TR-01. A ≥70% vegetative survival or cover threshold applies to Moderate Sensitivity nodes (SC, WD, FE) and rehabilitated borrow and slope areas. These differentiated thresholds reflect ecological function, restoration priority, and hydrological importance.

Vegetation survival will be assessed through post-planting inspections conducted by the Supervising Consultant at approximately 6 months and at the end of the first rainy season following planting. Survival thresholds will be verified through visual inspection and sample plot verification to confirm vegetation establishment, erosion control effectiveness, and stability of restored areas.

In accordance with World Bank ESS6, during implementation, these thresholds shall be treated as minimum restoration performance criteria and not as standalone evidence of successful habitat restoration for achieving No-Net Loss (NNL).

Monitoring should additionally assess the recovery of habitat structure and ecological functions, the establishment of appropriate native species, natural regeneration and the effectiveness of restoration in controlling erosion, stabilizing riverbanks and maintaining riparian connectivity.

At TR-01, particular attention shall be given to the recovery of riparian habitat functions that support aquatic biodiversity, regulate sediment movement and sustain river-related ecosystem services. The Supervising Consultant shall ensure that monitoring results are documented through georeferenced photographs, permanent or repeatable sample plots, species composition records, and survival and vegetation-cover calculations.

Where feasible, restored areas shall be compared with suitable reference habitats to evaluate progress towards the intended ecological condition. Any occurrence of invasive alien species, persistent erosion, bank instability, or failure of native vegetation to establish shall trigger

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corrective action, including supplementary planting, replacement with suitable native species, invasive-species management, soil stabilization and adjustment of maintenance practices.

The Contractor shall implement remedial measures and repeat monitoring until the applicable criteria are met where the specified survival or cover thresholds are not achieved. Monitoring shall continue beyond the first rainy season where it is necessary to demonstrate sustained vegetation establishment and ecological functionality. For habitats identified as NH or CH under ESS6, restoration measures shall be informed by the relevant biodiversity assessment and habitat-specific management requirements.

Table 8: Location-Specific Biodiversity Management Budget, Performance Indicators, and Funding Sources (Construction Phase)

Ecological Node	Activity	Quantity Basis	Unit Rate (USD)	Subtotal (USD)	Performance Indicator	Responsible Entity	Funding Source
TR-01 – Timbo River Crossing (High Sensitivity)	Silt fencing	450 m	18/m	8,100	No sustained visible sediment plume exceeding 50 m downstream during active works	Contractor	Works Contract (BOQ)
	Sediment traps	4 units	750/unit	3,000	Traps installed and functional during in-stream works	Contractor	Works Contract (BOQ)
	Riparian restoration	2,000 m²	6/m²	12,000	≥80% vegetative survival 6 months after planting	Contractor	Works Contract (BOQ)

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Ecological Node	Activity	Quantity Basis	Unit Rate (USD)	Subtotal (USD)	Performance Indicator	Responsible Entity	Funding Source
	Native planting	1,200 seedlings	4/seedling	4,800	≥80% seedling survival rate	Contractor	Works Contract (BOQ)
	Water quality monitoring	12 visits	450/visit	5,400	No sustained turbidity increases above baseline during active works	Supervising Consultant	Supervision Contract
	Wildlife monitoring	6 visits	400/visit	2,400	No recorded wildlife harassment incidents	Supervising Consultant	Supervision Contract
	Subtotal – TR-01				**35,700**		
SC-01–SC-08 – Perennial Stream Crossings (Moderate Sensitivity)	Sediment control per crossing	8 crossings	2,200/crossing	17,600	No sediment deposition exceeding 50 m downstream during works	Contractor	Works Contract (BOQ)
	Bank stabilization	3,200 m²	5/m²	16,000	No active erosion observed at end of rainy season	Contractor	Works Contract (BOQ)
	Post-construction inspections	24 visits	300/visit	7,200	Crossings stable and maintaining	Supervising Consultant	Supervision Contract

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Ecological Node	Activity	Quantity Basis	Unit Rate (USD)	Subtotal (USD)	Performance Indicator	Responsible Entity	Funding Source
					flow continuity		
	Subtotal – SC Nodes				**40,800**		
WD-01– WD-06 – Wetland Depressions (Moderate Sensitivity)	Drainage protection	6 sites	2,200/site	13,200	Natural drainage pathways are maintained without blockage	Contractor	Works Contract (BOQ)
	Wetland restoration	2,400 m²	5/m²	12,000	≥70% vegetative cover established	Contractor	Works Contract (BOQ)
	Rainy season monitoring	6 visits	400/visit	2,400	No permanent hydrological alteration observed	Supervising Consultant	Supervision Contract
	Subtotal – WD Nodes				**27,600**		
FE-01 – Forest-Edge Segment (Moderate Sensitivity)	ROW demarcation	4 km	1,200/km	4,800	No clearing beyond the approved ROW boundary	Contractor	Works Contract (BOQ)
	Vegetation restoration	3,000 m²	5/m²	15,000	≥70% vegetative re-establishment	Contractor	Works Contract (BOQ)

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Ecological Node	Activity	Quantity Basis	Unit Rate (USD)	Subtotal (USD)	Performance Indicator	Responsible Entity	Funding Source
	Anti-hunting sessions	6 sessions	500/session	3,000	Zero recorded hunting incidents by the workforce	Contractor	Works Contract (BOQ)
	Compliance inspections	8 visits	350/visit	2,800	No documented wildlife disturbance reports	Supervising Consultant	Supervision Contract
	Subtotal – FE-01				**25,600**		
Borrow Pits & Engineered Slopes	Regrading & stabilization	4 ha	6,000/ha	24,000	Slopes are stable, and erosion is controlled after the rainy season	Contractor	Works Contract (BOQ)
	Revegetation	4 ha	4,000/ha	16,000	≥70% vegetative cover achieved	Contractor	Works Contract (BOQ)
	Invasive control	4 ha	1,500/ha	6,000	No dominant invasive regrowth observed	Contractor	Works Contract (BOQ)
	Post-rehabilitation inspections	6 visits	400/visit	2,400	Rehabilitation verified and certified by the Supervising Consultant	Supervising Consultant	Supervision Contract

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Ecological Node	Activity	Quantity Basis	Unit Rate (USD)	Subtotal (USD)	Performance Indicator	Responsible Entity	Funding Source
	Subtotal – Borrow & Slopes				**48,400**		
Capacity Building & Awareness (All Nodes)	Biodiversity induction training	2 sessions	1,500/session	3,000	100% workforce attendance documented	PIU/Contractor	Project Budget
	Refresher training	2 sessions	1,200/session	2,400	Delivered prior to peak construction activities	PIU/Contractor	Project Budget
	Environmental signage	10 signs	350/sign	3,500	Installed at all identified sensitive nodes	Contractor	Works Contract (BOQ)
	Community meetings	4 meetings	600/meeting	2,400	Biodiversity issues recorded in supervision reports	PIU	Project Budget
	Subtotal – Capacity & Awareness				**11,300**		
Post-Construction Monitoring & Contingency	Half-yearly biodiversity monitoring for two years following completion of construction	4 rounds	2,500/round	10,000	Half-Yearly biodiversity monitoring reports submitted to PIU	Supervising Consultant	Supervision Contract

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Ecological Node	Activity	Quantity Basis	Unit Rate (USD)	Subtotal (USD)	Performance Indicator	Responsible Entity	Funding Source
	Monthly environmental reporting	12 reports	450/report	5,400	Monthly supervision reports reviewed by PIU	Supervising Consultant	Supervision Contract
	Contingency (2.65%)	—	—	5,574	Corrective measures implemented where monitoring identified ecological impacts exceeding predicted levels	PIU	Project Environmental Budget
	Subtotal – Monitoring & Contingency				**20,974**		

Total Biodiversity Management Budget: USD 210,374

5.3 Monitoring Framework

Monitoring is undertaken relative to the ecological baseline established in the ESIA and confirmed during the February 12–20, 2026, field verification. Monitoring frequency is scaled according to ecological sensitivity classification and the construction phase. All monitoring records shall be documented, geo-referenced where applicable, archived, and incorporated into Monthly Environmental Compliance Reports submitted to the PIU. Reporting to the EPA shall occur in accordance with applicable regulatory requirements and permit conditions. Monitoring is linked directly to the performance indicators and budget allocations defined in **Table** 8 and 9 of the report..

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Table 9: Biodiversity Monitoring Framework by Ecological Node

Location	Species / Ecological Feature	Monitoring Indicator	Frequency	Responsible Party	Trigger for Corrective Action	Reporting Line
TR-01 – Timbo River Crossing	Freshwater fish (*Tilapia spp., Clarias spp.*)	No sustained visible sediment plume exceeding 50 m downstream; riverbanks stable	Weekly during active in-stream works and after significant rainfall	Supervising Consultant	Sediment plume exceeds threshold or observable bank erosion	Contractor → Supervising Consultant → PIU; EPA notification if persistent
TR-01 – Timbo River Crossing	Primate activity observed	No harassment, hunting, or habitat disturbance within the work zone	Monthly during construction	Contractor & Supervising Consultant	Any wildlife disturbance or workforce hunting incident	Immediate notification to PIU
TR-01 – Timbo River Crossing (Precautionary Screening)	Slender-snouted Crocodile (*Mecistops cataphractus*)	No injury to observed individual; no obstruction of river channel; no interference with aquatic passage	Continuous vigilance during in-stream works	Contractor & Supervising Consultant	Verified sighting within 50 m of active works	Immediate temporary suspension of in-stream works; Supervising Consultant notifies PIU; PIU determines further direction and regulatory consultation if required
SC-01–SC-08 – Perennial Stream Crossings	Aquatic habitat function	No sediment accumulation downstream; culverts installed and maintaining	During culvert installation and once the post-rainy season	Supervising Consultant	Sediment deposition beyond the footprint or flow	Immediate stabilization and drainage correction; PIU notified if recurrent

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Location	Species / Ecological Feature	Monitoring Indicator	Frequency	Responsible Party	Trigger for Corrective Action	Reporting Line
		flow continuity			obstruction was observed	
WD-01–WD-06 – Wetland Depressions	Seasonal wetland hydrology (*Afrixalus dorsalis* habitat)	Seasonal hydrology maintained; no permanent drainage blockage	Rainy season inspections	Supervising Consultant	Sustained wetland drying or blockage observed	Drainage restoration required; PIU informed
FE-01 – Forest-Edge Segment	Primate activity (observed & reported)	No clearing beyond approved ROW; zero workforce hunting incidents	Weekly during the vegetation clearing phase	Contractor & Supervising Consultant	Unauthorized clearing or a wildlife disturbance incident	Written compliance instruction issued; PIU notified
Borrow Pits & Engineered Slopes	General habitat recovery	≥70% vegetative cover after the first rainy season; no active erosion gullies	Post-rehabilitation and end of the first rainy season	Supervising Consultant	Vegetative cover below threshold or active erosion present	Replanting and slope stabilization measures were implemented
All Sensitive Nodes	Biodiversity protection controls	Environmental signage intact; workforce trained and compliant	Quarterly	PIU & Supervising Consultant	Missing signage or repeated non-compliance	Replacement, corrective training, and documentation

Monitoring Duration and Adaptive Management

Construction-phase monitoring shall apply throughout active earthworks at each ecological node. Post-construction monitoring shall continue for one year after completion of works at sensitive nodes, or until vegetation survival thresholds (≥80% at TR-01; ≥70% at Moderate Sensitivity nodes) and stabilization criteria are achieved, whichever occurs later.

If performance indicators are not met, corrective measures shall be implemented immediately by the Contractor under supervision and oversight and financed under the contingency allocation

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defined in **Table 8**. The Supervising Consultant may issue written corrective instructions and, where necessary, instruct the temporary suspension of works pending PIU directions.

Persistent non-compliance may result in contractual enforcement measures by the PIU, including withholding certification of completed works, and regulatory engagement where required. All monitoring data shall be retained for audit purposes and made available during supervision missions and regulatory inspections.

5.4 Restoration and Rehabilitation Measures

Restoration and rehabilitation measures apply to all areas disturbed during construction within the 250-meter DAoI. The AoI defines the assessment and management boundary, while physical disturbance remains confined to the approved right of way RoW, engineered slopes, crossings, and approved borrow sites.

Rehabilitation shall be implemented progressively in accordance with the approved earthworks schedule. Stabilization and revegetation shall follow immediately after completion of works in each section and shall not be deferred to project completion. All restoration outcomes shall be monitored under the framework defined in Section 6.2 and verified against the performance indicators defined in Tables 8 and 9 **.** Verification of restoration criteria shall be completed prior to issuance of the section completion certification by the Supervising Consultant.

Slope Restoration

Slope restoration applies to all cut and fill sections identified in the approved engineering drawings. Following grading, slopes shall be shaped to stable gradients, compacted where required, and protected using erosion control measures appropriate to soil conditions. Topsoil shall be replaced on exposed surfaces where available, and revegetation shall utilize native grass and shrub species suited to local ecological conditions. No engineered slope shall remain exposed beyond one construction cycle without stabilization.

Success shall be measured by the absence of active erosion gullies and the achievement of at least seventy percent vegetative cover within the first rainy season following completion of works in that section. Where these criteria are not met, corrective stabilization and replanting shall be implemented under supervision and oversight and financed under the contingency allocation defined in Table 8..

Forest-Edge Stabilization (FE-01)

Forest-edge stabilization applies to the fragmented secondary vegetation belt between Big Joe Town and Garpu Town. Permanent clearing shall be strictly limited to the approved ROW boundary. Boundary demarcation shall be completed prior to vegetation clearing to prevent encroachment beyond design limits. Temporary disturbance outside the permanent footprint shall be reinstated immediately following completion of work.

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Restoration of temporarily disturbed edge areas shall utilize native vegetation to prevent fragmentation and reduce the risk of secondary encroachment. Success shall be verified where no clearing has occurred beyond approved limits and at least seventy percent vegetation re-establishment is achieved within one rainy season. Any unauthorized clearing or wildlife disturbance shall trigger immediate corrective instruction by the Supervising Consultant and notification to the PIU for contractual enforcement where required.

Borrow Pit Rehabilitation

Borrow pit rehabilitation applies to all approved extraction sites used during construction. Rehabilitation shall commence immediately following completion of material extraction at each site. Excavated areas shall be regarded as stable slopes, construction debris removed, and topsoil replaced where available. Revegetation shall utilize native species appropriate to local conditions, and invasive species (Operational Invasive Species Management Plan is enclosed as Annex-7) shall be controlled where detected.

Borrow pits shall not remain as unstable excavations or uncontrolled depressions unless specifically designed and documented as engineered drainage features within the approved works design. Rehabilitation shall be considered complete when slopes remain stable following the first rainy season, and a minimum of seventy percent vegetative cover has been achieved. Sites failing to meet this standard shall undergo additional stabilization and revegetation prior to final acceptance.

All restoration measures form mandatory obligations under the Contractor's BOQ and the Construction Environmental and Social Management Plan (CESMP). Compliance shall be verified by the Supervising Consultant and overseen by the PIU. Final demobilization shall not be approved until restoration criteria are met and formally certified.

5.5 Public Awareness and Community Biodiversity Education

Pangolins were not recorded during the field surveys; however, their potential occurrence in the wider landscape is recognized through secondary biodiversity information. Community awareness activities will therefore address pangolins and primates as precautionary wildlife protection measures, without implying their confirmed presence within the Project area.

5.6 Implementation and Financial Framework

Implementation of biodiversity mitigation, restoration, monitoring, and reporting measures is structured to ensure clear accountability between execution, supervision, oversight, and regulatory review.

Physical mitigation and restoration measures shall be implemented by the Contractor as part of construction works and incorporated into the C-ESMP. The Supervising Consultant shall verify compliance, certify implementation against defined performance indicators, issue corrective instructions where required, and document performance through regular inspections. The PIU shall exercise contractual oversight, enforce corrective measures where necessary, and authorize use of

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contingency allocations in accordance with Table 6-1. Regulatory supervision shall apply in accordance with national environmental procedures and permit conditions.

Table 1: Implementation Responsibilities

Activity	Implementer	Supervising Entity	Funding Source
Sediment control at river and stream crossings	Contractor	Supervising Consultant	Works Contract (BOQ Environmental Line Items)
Riparian and wetland restoration	Contractor	Supervising Consultant	Works Contract (BOQ Environmental Line Items)
Forest-edge stabilization	Contractor	Supervising Consultant	Works Contract (BOQ Environmental Line Items)
Borrow pit rehabilitation	Contractor	Supervising Consultant	Works Contract (BOQ Environmental Line Items)
Invasive species control	Contractor	Supervising Consultant	Works Contract (BOQ Environmental Line Items)
Biodiversity induction and refresher training	Contractor / PIU	Supervising Consultant	Project Environmental Budget
Wildlife monitoring and inspections	Supervising Consultant	PIU	Supervision Contract
Half-Yearly biodiversity monitoring	Supervising Consultant	PIU	Supervision Contract
Environmental reporting	Supervising Consultant	PIU	Supervision Contract
Regulatory oversight	PIU	EPA	Applicable Regulatory Framework

Cost allocations are derived from the number of ecological nodes identified along the corridor, the engineering footprint associated with crossings, slopes, and borrow areas, and the monitoring frequency required according to ecological sensitivity classification.

Eight perennial stream crossings were used as the costing basis for sediment control, stabilization, and inspection activities, consistent with the approved drainage schedule. Estimated disturbance width per crossing informed linear quantities applied for sediment control and localized stabilization measures. Slope stabilization quantities are derived from the approved earthworks schedule, with approximately four hectares of engineered slope disturbance used to calculate revegetation and erosion control requirements. Borrow pit rehabilitation assumes four active extraction areas with an estimated combined disturbed footprint of approximately four hectares.

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Monitoring costs are scaled according to ecological sensitivity. The Timbo River crossing, classified as High Sensitivity, requires more frequent inspection during active works. Moderate Sensitivity nodes require periodic monitoring. Post-construction monitoring is budgeted for one year to confirm stabilization and revegetation success.

A contingency allocation representing approximately 2.65 percent of total biodiversity management cost has been included within Table 6-1 to address unforeseen corrective actions triggered by monitoring findings or extreme weather events. Use of contingency funds shall require documented justification and PIU approval.

5.7 Budget Summary

Table 2: Biodiversity Budget Summary by Ecological Component

Ecological Component	Subtotal (USD)
Timbo River Crossing	35,700
Other Perennial Stream Crossings	40,800
Wetland Depressions	27,600
Forest-Edge Segment	25,600
Borrow Pits and Slopes	48,400
Capacity Building and Awareness	11,300
Post-Construction Monitoring & Contingency	20,974
Total Biodiversity Management Budget	**210,374**

The total Biodiversity Management Budget amounts to **USD 210,374.** Allocations are proportionate to ecological sensitivity classification, engineering disturbance footprint, and required monitoring frequency at each identified ecological node. All cost items are location-specific and quantity-based, derived from the approved drainage schedule, earthworks footprint, identified sensitive nodes, and defined monitoring requirements. The budget does not include undefined lump-sum allocations. Each activity is measurable, traceable to a specific ecological component, and linked to defined implementation responsibilities under Section 6.

The contingency allocation included within the monitoring and post-construction subtotal represents approximately 2.65 percent of the total biodiversity management cost and is reserved strictly for corrective measures triggered by monitoring findings.

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6. Conclusion and Recommendations

The biodiversity assessment confirms that the 250-meter Direct Area of Influence (AoI) is predominantly a modified landscape shaped by long-term agricultural activity, settlement expansion, infrastructure presence, and secondary vegetation. Ecological sensitivity within the corridor is localized rather than continuous and is concentrated at defined nodes, particularly the Timbo River crossing (TR-01), the identified perennial stream crossings (SC-01–SC-08), seasonal wetland depressions (WD-01–WD-06), and the forest-edge segment between Big Joe Town and Garpu Town (FE-01). No extensive intact natural habitat blocks occur within Direct AoI.[10]

Screening undertaken in accordance with AfDB Operational Safeguard 3 and the World Bank ESS6 indicates that the project area does not meet the criteria for critical habitat. The corridor does not intersect legally protected areas, and no confirmed populations of species meeting critical habitat thresholds were recorded within the Direct AoI during the ESIA baseline survey or the February 12–20, 2026, field verification. While suitable habitat conditions exist at the Timbo River crossing for certain freshwater and reptile species, including the Slender-snouted Crocodile (*Mecistops cataphractus*), the species was not recorded during field surveys or community consultations. Its inclusion in this report remains precautionary and habitat-based and does not alter the screening conclusion that critical habitat is not triggered.

Anticipated biodiversity impacts are site-specific and primarily construction related. These impacts are manageable through the application of the mitigation hierarchy of avoidance, minimization, restoration, and monitoring. Residual impacts are expected to be localized and reversible where mitigation and monitoring measures are implemented as defined in Section 5. In this context, biodiversity offsets are not required.

This Biodiversity Action Plan adopts a node-based management approach. Mitigation measures, monitoring frequency, performance indicators, restoration thresholds, implementation responsibilities, and associated costs are directly linked to identified ecological sensitivity

[10] The project corridor is predominantly composed of modified agro-mosaic habitats, with localized ecological features that may qualify as NH based on their ecological characteristics, native biodiversity and functional value. These features include the Timbo River riparian corridor (TR-01), stream crossings and drainage channels (SC-01–SC-08), water-dependent habitats (WD-01–WD-06), and the Big Joe–Garpu forest-edge feature (FE-01), subject to confirmation through baseline evidence and field verification against World Bank ESS6 criteria.
Progressive restoration, rehabilitation, and native vegetation establishment will be undertaken to maintain or reinstate the biodiversity values and ecological functions of these features. The BAP specifies a minimum vegetation survival threshold of ≥80% at the high-sensitivity Timbo River riparian node (TR-01) and ≥70% at moderate-sensitivity nodes (SC, WD and FE), as well as rehabilitated borrow and slope areas.
Monitoring will evaluate vegetation survival and cover, native species composition, invasive alien species, erosion control, and recovery of relevant ecological functions, with corrective measures implemented where performance targets are not met. These measures are intended to address residual impacts and support achievement of NNL of biodiversity values for affected NH, where applicable under ESS6. NNL will be assessed against the pre-impact baseline and the extent, condition and ecological functions of affected habitats; vegetation survival thresholds alone will not demonstrate NNL. Biodiversity offsets will be considered only as a last resort, where significant residual adverse impacts remain after avoidance, minimization and restoration measures have been fully applied and where appropriate and feasible in accordance with ESS6.

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locations and corresponding engineering disturbance footprints. Budget allocations are quantity-derived, location-specific, and traceable to defined ecological components and approved works quantities.

Implementation responsibilities are clearly delineated. The Contractor is responsible for the execution of physical mitigation and restoration measures under the C-ESMP and Works Contract environmental line items. The Supervising Consultant is responsible for compliance verification, monitoring, and certification against defined performance indicators. The PIU provides contractual oversight, enforcement authority, and approval of contingency use where corrective measures are required. Regulatory supervision shall apply in accordance with national environmental procedures and permit conditions.

Engineering references, drainage schedules, ecological node descriptions, monitoring indicators, restoration thresholds, and cost derivations are documented within this report and supporting project documentation to ensure technical traceability and audit readiness.

Subject to effective implementation, supervision, and adaptive management consistent with the monitoring framework defined in Section 6, anticipated biodiversity impacts are limited in spatial extent, manageable in magnitude, and consistent with the requirements of AfDB Operational Safeguard 3 and Liberia's environmental regulatory framework.

The Contractor shall prepare a site-specific C-ESMP considering the World Bank ESS6 to validate and, where necessary, update the existing ecological baseline for all construction areas, ancillary facilities and associated impact pathways extending beyond the 250-meter DAoI, as appropriate. The assessment shall prioritize ecologically sensitive receptors, including the Timbo River crossing, perennial watercourses, seasonal wetland depressions and the forest-edge habitat between Big Joe Town and Garpu Town. Field investigations shall document habitat condition and species occurrence, refine the identification of recorded primates where feasible, and evaluate the potential presence of the Slender-snouted Crocodile (Mecistops cataphractus) through targeted habitat assessment, reliable secondary information and consultation with the competent Liberian wildlife authorities.

The C-ESMP shall also evaluate direct, indirect and cumulative biodiversity impacts, determine the applicability of ESS6 requirements for MH, NH and CH and define appropriate avoidance, minimization, restoration and monitoring measures. [11]

[11] The BAP already establishes the ecological baseline, habitat classification, critical habitat screening, assessment of direct, indirect and cumulative impacts and the associated mitigation, restoration and monitoring requirements. C-ESMP will translate these requirements into site-specific method statements, restoration plans and monitoring programmes for construction areas and ancillary facilities. Targeted pre-construction verification, including the survey for Mecistops cataphractus at TR-01, will be completed before the commencement of relevant in-stream works. Any discrepancies, newly identified biodiversity features or potential critical habitat values will be reported to the CSC, PIU and relevant regulatory authorities for further assessment and appropriate action.

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Identified information gaps shall be addressed before commencement of activities that could affect the relevant receptors. The resulting mitigation commitments, monitoring indicators and corrective-action procedures shall be incorporated into the C-ESMP.

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7. Annexes

Annex 1: Drainage-Linked Biodiversity Monitoring and Management Matrix

ID	Chainage	Crossing Name	Identified Ecological Feature	Specific Risk During Construction	Location-Specific Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Responsible Party	Estimated Cost (USD)	Cost Basis
DR-01	0+000–1+200	Buchanan Coastal Outfall	Coastal discharge / modified mangrove fringe	Sediment plume into the tidal zone	Install silt curtains and staged excavation	Visible turbidity plume	Weekly (rainy season)	Contractor (CESMP)	6,500	Silt curtain supply + supervision
DR-03	~11+850	Yarpah Tributary	Riparian vegetation strip	Vegetation removal beyond ROW	Mark 15 m no-clear buffer beyond works footprint	Buffer demarcation intact	Bi-weekly	Contractor / PIU	3,000	Demarcation + signage
DR-04	~18+400	Big Joe Tributary	Agricultural runoff interface	Increased sediment load	Install temporary sediment traps upstream	Sediment trap functioning	Weekly	Contractor	4,500	2 sediment traps + maintenance
DR-06	~30+950	Seasonal Channel	Wet season flow expansion zone	Scour and embankment erosion	Install gabion toe protection	No active bank erosion	Monthly	Contractor	18,000	60m gabion structure

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ID	Chainage	Crossing Name	Identified Ecological Feature	Specific Risk During Construction	Location-Specific Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Responsible Party	Estimated Cost (USD)	Cost Basis
DR-07	~38+300	Gio's Tributary	Wetland adjacency	Disturbance to wetland hydrology	Limit equipment access to the defined crossing zone	No encroachment into the wetland	Weekly	Contractor / Supervising Engineer	5,500	Access control + fencing
DR-08	~44+600	Gbediah Stream	Riparian strip	Sedimentation during culvert installation	Progressive backfilling and compaction	No exposed soil > 7 days	Weekly	Contractor	4,200	Labor + compaction control
DR-09	55+600	**Timbo River Bridge**	Major riverine ecosystem; primate corridor observed	Turbidity increase; wildlife disturbance	• In-stream works during low-flow only • Install turbidity monitoring point • No night works	Turbidity within baseline +20%	Twice weekly during works	Contractor + PIU Safeguards	22,000	Turbidity meter + monitoring + supervision

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ID	Chainage	Crossing Name	Identified Ecological Feature	Specific Risk During Construction	Location-Specific Mitigation Measure	Monitoring Indicator	Monitoring Frequency	Responsible Party	Estimated Cost (USD)	Cost Basis
					near forest edge					

Annex 2: Drainage, Biodiversity and Engineering Drawing Register

ID	Chainage (km)	Crossing Name	Structure Type	Drawing Ref.	Design Return Period	Ecological Sensitivity	Location-Specific Mitigation	Monitoring Frequency	Responsible Party	Estimated Cost (USD)
DR-01	0+000–1+200	Buchanan Coastal Outfall	Culvert System	DWG-DR-01 (Sheet 4)	1:25 Year	Low–Moderate (coastal runoff)	Install silt curtains during excavation	Weekly (rainy season)	Contractor	6,500
DR-03	11+850	Yarpah Tributary	Box Culvert	DWG-DR-01 (Sheet 8)	1:25 Year	Moderate (riparian strip)	Mark 15 m no-clear buffer beyond works	Bi-weekly	Contractor / PIU	3,000
DR-04	18+400	Big Joe Tributary	Pipe/Box Culvert	DWG-DR-01 (Sheet 11)	1:25 Year	Moderate (agricultural interface)	Temporary upstream sediment traps	Weekly	Contractor	4,500
DR-06	30+950	Seasonal Channel	Box Culvert	DWG-DR-01	1:50 Year	Moderate (wet-season expansion)	Gabion toe protection (60 m)	Monthly	Contractor	18,000

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ID	Chainage (km)	Crossing Name	Structure Type	Drawing Ref.	Design Return Period	Ecological Sensitivity	Location-Specific Mitigation	Monitoring Frequency	Responsible Party	Estimated Cost (USD)
				(Sheet 17)						
DR-07	38+300	Gio's Tributary	Box Culvert	DWG-DR-01 (Sheet 22)	1:50 Year	High (wetland adjacent)	Restrict equipment to defined footprint	Weekly	Contractor / Supervising Engineer	5,500
DR-08	44+600	Gbediah Stream	Pipe Culvert	DWG-DR-01 (Sheet 26)	1:25 Year	Moderate (riparian vegetation)	Progressive backfilling; no exposed soil >7 days	Weekly	Contractor	4,200
DR-09	55+600	**Timbo River**	Major Bridge	DWG-BR-01 (Sheets 31–36)	1:100 Year	High (major riverine ecosystem; primate corridor observed)	• In-stream works limited to low-flow season • Turbidity monitoring • No night works near forest edge	Twice weekly during works	Contractor + PIU Safeguards	22,000

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Annex 3 Hydraulic Design Reference

Crossing Category	Hydraulic Basis	Design Logic
Minor Culverts	IDF curves (coastal rainfall zone)	Flow capacity sized for 1:25 year storm
Medium Crossings	Catchment-based hydrology	1:50-year design flood
Timbo River Bridge	Hydraulic modelling and scour analysis	1:100-year flood event

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Annex 4: Critical Habitat Screening Table

OS3 Critical Habitat Criterion	Species / Ecological Feature Considered	Location within AoI	IUCN Status	Field Confirmation (ESIA + Feb 2026 Verification)	Critical Habitat Triggered?	Justification	Management Response Required
Presence of CR/EN species with viable population	Slender-snouted Crocodile (*Mecistops cataphractus*)	Timbo River Crossing	Critical/Endangered	Not recorded during baseline or field verification; included through precautionary literature screening based on the Liberia National Biodiversity Strategy and Action Plan (NBSAP) and regional species distribution information	No	No confirmed breeding or resident population; precautionary inclusion only	Construction-phase turbidity control and habitat protection
Presence of species of conservation concern identified through literature screening	African Pangolin species (Phataginus tricuspis, Phataginus tetradactyla,	Forest-edge habitats and secondary vegetation along the corridor (potential	VU / EN depending on species	Not recorded during ESIA baseline, February 2026 verification, or community consultations;	No	Potential habitat exists within wider landscape, but no confirmed occurrence	Worker hunting prohibition; biodiversity awareness training; wildlife

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OS3 Critical Habitat Criterion	Species / Ecological Feature Considered	Location within AoI	IUCN Status	Field Confirmation (ESIA + Feb 2026 Verification)	Critical Habitat Triggered?	Justification	Management Response Required
	Smutsia gigantea)	habitat only)		included through literature-based precautionary screening using NBSAP and regional biodiversity references		within the Direct AoI	monitoring during vegetation clearing
Restricted-range or endemic species	None identified	Entire 60.9 km corridor	N/A	No endemic species recorded	No	Corridor dominated by modified agro-mosaic landscape	Standard biodiversity management only
Significant concentrations of migratory/congregatory species	No migratory bird colonies or seasonal aggregations recorded	All crossings	N/A	No aggregation sites identified	No	No nesting colonies or congregation sites within AoI	Routine monitoring only
Unique or irreplaceable ecosystems	Primary forest blocks	None within 250 m AoI	N/A	Secondly fragments only	No	Habitat is modified and fragmented; not irreplaceable	Forest-edge stabilization measures

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OS3 Critical Habitat Criterion	Species / Ecological Feature Considered	Location within AoI	IUCN Status	Field Confirmation (ESIA + Feb 2026 Verification)	Critical Habitat Triggered?	Justification	Management Response Required
Legally protected or internationally recognized areas (e.g., KBA, National Park)	Protected Areas	None intersecting corridor	N/A	No protected area overlap	No	Project alignment does not intersect recognized conservation areas	No additional measures required
Ecological corridors critical for species survival	Primate movement observed	Timbo River & Forest-edge (Big Joe–Garpu)	Likely LC/NT species	Primate activity observed during field verification and community consultations; species-level identification not confirmed; precautionary consideration informed by regional species occurrence described in national biodiversity	No (Localized sensitivity only)	Movement is localized; not regionally critical corridor	No night work; minimize vegetation clearance

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OS3 Critical Habitat Criterion	Species / Ecological Feature Considered	Location within AoI	IUCN Status	Field Confirmation (ESIA + Feb 2026 Verification)	Critical Habitat Triggered?	Justification	Management Response Required
				literature including the NBSAP			
Wetlands supporting sensitive aquatic species	Seasonal wetlands & riparian strips	Wetland depressions & tributaries	Mixed LC amphibians	Amphibians observed; no threatened populations recorded	No	Wetlands are small, seasonal, and not regionally unique	Drainage control and hydrology protection

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Annex 5: Species Conservation Status References

Species / Taxonomic Group	Scientific Name	Habitat within AoI	IUCN Red List Status	National Protection Status (Liberia)	Source of Status Information	Relevance to Critical Habitat Screening
Slender-snouted Crocodile	*Mecistops cataphractus*	Timbo River (habitat-based reference only; not observed)	Critical/Endangered	Not specifically listed as nationally protected species	IUCN Red List; Liberia National Biodiversity Strategy and Action Plan (NBSAP)	Habitat suitable; no confirmed population within AoI
African White-bellied Pangolin	Phataginus tricuspis	Forest-edge habitats and secondary vegetation (potential habitat only)	Vulnerable (VU)	Protected under wildlife trade regulations	IUCN Red List; NBSAP; regional biodiversity literature	Included as precautionary literature-screened species
Black-bellied Pangolin	Phataginus tetradactyla	Forest and secondary vegetation zones	Endangered (EN)	Protected under wildlife trade regulations	IUCN Red List; NBSAP	Literature-screened species potentially occurring in broader landscape
Giant Ground Pangolin	Smutsia gigantea	Forest habitats (potential regional presence)	Endangered (EN)	Protected species	IUCN Red List; NBSAP	Literature-based precautionary screening
African Tree Frog	*Afrixalus* spp.	Seasonal wetlands & depressions	Least Concern (LC)	Not nationally listed	IUCN Red List; NBSAP species	Common wetland species; no threatened

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Species / Taxonomic Group	Scientific Name	Habitat within AoI	IUCN Red List Status	National Protection Status (Liberia)	Source of Status Information	Relevance to Critical Habitat Screening
(representative amphibians)					distribution references	populations recorded
Primate species (unconfirmed taxa)	Likely regional guenon spp.	Timbo River & forest-edge segment	Least Concern (LC) or Near Threatened (NT) depending on species	Not confirmed	IUCN Red List; NBSAP; regional primate distribution literature	Localized wildlife presence; no evidence of viable endangered population
Freshwater fish (Tilapia spp., Clarias spp.)	Multiple species	Tributaries & Timbo River	Mostly LC	Not nationally listed	IUCN Red List; NBSAP aquatic biodiversity references	Common freshwater taxa; no restricted-range species recorded
Secondary forest avifauna	Multiple species	Forest-edge & agro-mosaic landscape	Mostly LC	Not nationally listed	**IUCN Red List; NBSAP ecosystem descriptions**	Typical modified habitat assemblage

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Annex 6: February 12–20, 2026 Field Verification Photo Log

A. Actual photographs taken along the corridor.

	
Wetlands with Water Hyacinth along Benson River near Buchanan City	Existing drainage structures along the Buchanan–Cestos corridor showing reinforced concrete and culvert drainage systems, some of which are partially obstructed by vegetation and sediment, potentially affecting water flow and aquatic habitat conditions

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Reinforced concrete beam bridge at km 14+200 crossing the New Cess River along the Buchanan–Cestos corridor, illustrating an existing river crossing where aquatic habitat connectivity and sediment control are key biodiversity management considerations.	Chromolaena odorata (Siam weed), an invasive plant species commonly colonizing disturbed roadside and fallow areas within the project corridor and potentially affects native vegetation regeneration during post-construction restoration.

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Community consultation meeting held in Big Joe Town with local residents and community leaders to discuss biodiversity conditions, wildlife observations, and potential environmental concerns associated with the Buchanan–Cestos road project corridor.	Community consultation meeting held in Garpu Town with local residents and community leaders to discuss environmental conditions, wildlife observations, and potential biodiversity impacts associated with the Buchanan–Cestos road corridor within the project's Area of Influence.

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B. Reference Images of Species of Conservation Concern (Not Observed During Survey)

<table>
<tr>
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<tr>
<td>Representative image of the Pygmy Hippopotamus (*Choeropsis liberiensis*), an Endangered species referenced in NBSAP and included as a precautionary species of conservation concern, though not recorded within the project's DAI during field surveys.</td>
<td>Representative image of the Diana Monkey (Cercopithecus diana), a Vulnerable primate included as a precautionary species of conservation concern, though not recorded within the project's Direct Area of Influence.</td>
</tr>
<tr>
<td>
Image shared by a community member showing Jenktin's Duiker (Cephalophus jentinki), an Endangered forest antelope referenced in this report as a species of conservation concern within Liberia's Upper Guinean forest ecosystem.</td>
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Annex-7: Invasive Alien Species (AIS) Management Plan

The Invasive Alien Species (IAS) Management Plan establishes operational procedures for preventing the introduction, establishment, and spread of invasive alien species during construction, rehabilitation, and operation of the Buchanan–Cestos City Junction Road Corridor. The plan applies to the road alignment, road verges, drainage channels, river crossings, wetlands, forest edges, borrow pits, quarries, construction camps, material storage areas, and other associated facilities.

In accordance with ESS6, the plan adopts a precautionary and prevention-first approach, recognizing that road construction and operation may facilitate the spread of invasive species through earthworks, movement of contaminated soil, construction machinery, imported materials, roadside vegetation disturbance, and altered drainage patterns. Particular attention shall be given to sensitive ecological receptors, including the Timbo River and other watercourses, wetlands, forest-edge habitats, and areas supporting native biodiversity.

The objectives are to:

- Prevent the introduction and spread of IAS through project activities and associated facilities.
- Identify, map, and monitor existing and emerging IAS populations within the project area of influence.
- Protect native vegetation, aquatic habitats, riparian ecosystems, and biodiversity-sensitive areas.
- Establish practical control, containment, and eradication procedures appropriate to the species and site conditions.
- Define institutional responsibilities, monitoring indicators, reporting procedures, and corrective actions.
- Ensure that disturbed areas are rehabilitated using suitable native species and that restoration does not introduce or promote invasive species.

IAS Risk Assessment and Management

The following risk categories shall guide implementation. Risk classifications shall be reviewed when new infestations are identified, construction activities change, or monitoring indicates increased risk. The classification of a site as low risk shall not exempt it from preventive measures.

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Risk category	Project locations or activities	Required management response
High	Timbo River and other sensitive watercourses, wetlands, forest edges, and confirmed IAS infestations near sensitive habitats	Avoid disturbance where feasible; undertake pre-clearance surveys, establish exclusion zones, implement strict equipment and soil biosecurity, and conduct frequent inspections.
Moderate	Road verges, drainage outlets, embankments, disturbed agricultural margins, and rehabilitation areas	Undertake routine IAS inspections, manage soil movement, remove infestations using approved methods, and establish suitable native vegetation.
Low	Previously disturbed areas with no confirmed IAS infestation and limited ecological sensitivity	Apply preventive biosecurity, routine surveillance, and appropriate vegetation management.

Prevention Measures

Prevention shall be the primary management approach because established IAS populations may be difficult, costly, or impossible to eradicate.

1. Machinery and Equipment Hygiene

- Inspect earthmoving machinery, excavators, bulldozers, graders, trucks, and vegetation-clearing equipment before mobilization and when moving between infested and un-infested sites.
- Remove adhering soil, plant fragments, seeds, and other biological material before equipment enters sensitive or un-infested areas.
- Establish designated cleaning locations away from rivers, wetlands, drainage channels, and other sensitive habitats.
- Collect and manage, wash water and removed soil to prevent the transfer of viable seeds or plant fragments into the environment.
- Maintain equipment-cleaning records identifying the machinery, cleaning date, source location, and destination work area.

2. Soil and Construction Materials

- Inspect top-soil, fill, borrow material, aggregates, and imported landscaping materials for visible invasive vegetation and potential contamination.
- Obtain materials from approved sources and require suppliers to disclose known IAS risks where relevant.
- Segregate topsoil from confirmed infested areas and prevent its uncontrolled reuse in un-infested or sensitive locations.
- Avoid transferring contaminated soil between work fronts, river crossings, wetlands, and forest-edge habitats.
- Store soil and construction materials in designated areas with appropriate runoff and sediment controls.

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- Where contaminated material cannot be safely reused, it shall be contained, transported, treated, or disposed of at an approved location using methods appropriate to the identified species and applicable requirements.

3. Vegetation Clearance and Movement Controls

- Conduct pre-clearance inspections to identify IAS infestations and establish suitable exclusion zones.
- Minimize unnecessary vegetation removal and soil disturbance, particularly adjacent to watercourses and native vegetation.
- Avoid moving cut vegetation, roots, seed-bearing material, or contaminated soil into unaffected areas.
- Clean vegetation-cutting equipment before moving between infested and un-infested work areas.
- Prioritize work in un-infested areas before entering infested areas, where the construction sequence permits.

Site-Specific Management Measures

Sensitive receptor or location	Principal IAS risk	Required management measures	Monitoring indicator
TR-01 — Timbo River	Spread of aquatic or riparian IAS through contaminated machinery, soil, runoff, and disturbed riverbanks	Undertake pre-work inspections; prevent contaminated runoff; clean equipment away from the river; maintain riparian vegetation; inspect disturbed banks and bridge approaches.	Number and extent of IAS infestations; evidence of IAS spread; riparian vegetation recovery; compliance with equipment-cleaning procedures.
Other rivers and streams	Transport of seeds or plant fragments through watercourses and drainage systems	Maintain vegetated buffers where feasible; prevent disposal of plant waste into water; inspect upstream and downstream disturbance areas.	IAS occurrence at crossings and drainage outlets; number of uncontrolled plant-waste or soil releases.
Wetlands and flood-prone areas	Establishment and spread of moisture-tolerant invasive plants following disturbance	Minimize access; avoid unnecessary drainage alteration; clean machinery; remove identified infestations using habitat-appropriate methods.	IAS coverage, infestation boundaries, and condition of wetland vegetation.
Forest edges and native vegetation	IAS colonization following canopy removal, soil disturbance, and increased light exposure	Minimize clearing; establish demarcated limits; promptly stabilize disturbed edges and restore native vegetation.	New IAS occurrences; disturbed area rehabilitated; native vegetation establishment.
Borrow pits, quarries, and spoil areas	Spread through exposed soil, contaminated materials, and abandoned disturbed ground	Inspect materials; manage topsoil separately; control IAS before rehabilitation; restore sites using suitable native vegetation.	IAS occurrence before and after rehabilitation; proportion of restored area meeting agreed vegetation criteria.
Road verges and drainage channels	Repeated colonization through maintenance machinery, runoff, and transported seeds	Establish routine inspection and targeted removal; clean maintenance equipment; prevent uncontrolled spread through mowing and drainage clearance.	IAS infestation extent; number of newly affected maintenance sections; proportion of identified infestations treated.

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Monitoring and Reporting Programme

The Contractor's E&S staff supported by a qualified ecologist, shall implement routine monitoring and maintain an IAS register. The Supervising Consultant shall verify the monitoring results, assess compliance, and require corrective actions where necessary.

Monitoring activity	Frequency	Performance indicator	Responsibility
Baseline IAS survey and mapping	Before vegetation clearance and major earthworks	Survey coverage completed; infestations mapped and categorized by risk	Contractor's ecologist; verified by Supervising Consultant
Machinery and equipment inspection	Before mobilization and movement from infested to un-infested areas	100% of applicable equipment inspections recorded; no uncontrolled transfer of contaminated material	Contractor
Inspection of soil and construction materials	At source approval and upon delivery, as appropriate to risk	Materials from approved sources; contamination incidents documented and managed	Contractor and material suppliers
Inspection of sensitive receptors	At least monthly during active works; more frequently at high-risk locations and after significant disturbance or runoff events	Changes in IAS presence and extent recorded; new infestations investigated promptly	Contractor's ecologist
IAS treatment verification	Following each treatment, at a species-appropriate interval	Treatment effectiveness recorded; regrowth and new seedlings identified and addressed	Contractor; verified by Supervising Consultant
Restoration and revegetation monitoring	Approximately six months after planting and at the end of the first rainy season, with additional monitoring as needed	Applicable vegetation survival or cover thresholds achieved; native vegetation establishment and IAS status documented	Contractor and Supervising Consultant
Operational roadside and drainage inspections	At least quarterly during the first two years of operation, with additional inspections during the wet season or following major disturbance	IAS hotspots recorded; drainage-related spread and reinfestation assessed; corrective actions tracked	Road operator or designated maintenance authority
Annual IAS management review	Annually during the initial operational monitoring period	Trends in infestation extent, control effectiveness, and restoration performance assessed	Road operator, with environmental oversight

Monitoring frequency shall be adjusted according to infestation severity, seasonal conditions, the rate of spread, and the sensitivity of affected habitats. Where IAS are detected near the Timbo River, wetlands, or other high-sensitivity receptors, inspections and follow-up treatment shall be intensified as necessary.

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