TERMS OF REFERENCE

CONSULTANCY SERVICES FOR THE DESIGN AND SUPERVISION OF RECONSTRUCTION OF BALTHAZAR BRIDGE IN GRENADA

1 Background

The World Bank' has provided USD 15M financing for the Grenada Resilience Improvement Project (GRIP), and the Government of Grenada intends to provide a portion of these funds for a replacement flood-resilient Balthazar bridge up to about 50 m long over the Great River in the parish of St Andrews on the island. This will help align Grenada's development with three of the UN's Sustainable Development Goals [1], namely: Goal # 9 *building resilient infrastructure*, Goal # 13 *combatting an impact* (flood risk to public safety) *of climate change*, and Goal # 8 *promoting sustainable economic growth* (via enhanced roads).

Grenada is the southernmost of the Windward islands, themselves located near the southern tip of the Caribbean archipelago. It is geolocated at latitude 12.2^{o} N, longitude 61.6^{o} W, about 85 miles north of Venezuela (on the South American mainland), also north of Trinidad-&-Tobago, and is 135 square miles in area including Carriacou and Petit Martinique, with a population of about 112,000. Grenada was granted independence from the UK in 1974, with English being by far the dominant language. It is a volcanic island with a mountainous interior, from which multiple rivers flow into the Atlantic Ocean and the Caribbean sea on its eastern and western coasts respectively.

Grenada experiences a tropical climate which is becoming more severe due to climate change. Category 3 hurricane Ivan (2004), of 135 mph winds, led to US $900 million in losses (twice Grenada's GDP) [2]. There have been multiple floods from heavy rains since. As in many of the small island developing states (SIDS) across the region, these events make Grenada vulnerable to landslides which affect housing, and they compromise the integrity & safety of road bridges. The Government of Grenada's (GoG's) Ministry of Infrastructure and Physical Development (MOIPD) has stated an urgent need to improve the climate resilience of the country's transport infrastructure.

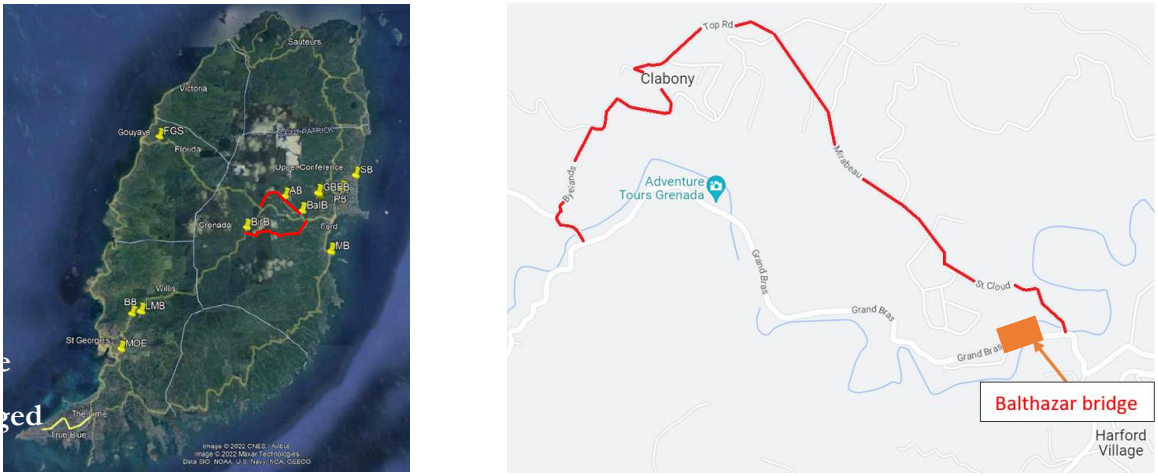
An ongoing challenge is that key bridges on Grenada's 1,127 km road network suffer flood-induced foundation scour, log impacts and (for low-lying bridges) overtopping. Scour and impact affect structural integrity and reduce the post-hazard resilience of communities and the national economy, while overtopping has road-use safety implications. The risks are exacerbated by the growing frequency and intensity of tropical storms, hurricanes and rainfall from climate change.

The World Bank's 2019-2023 Canada Caribbean Resilience Facility (CCRF) project [3] used in-service bridges across the island (Fig. 1(a)), as Case Studies [4], to build GoG civil engineers' capacity in assessing the flood resilience and wider integrity of Grenada's road bridges.

The new World Bank-funded, USD 15M Grenada Resilience Improvement Project (GRIP) builds on and strongly extends the success of the CCRF project by enabling the redesign / reconstruction of the currently low-lying Balthazar bridge (BalB). This 40 m long bridge, located in the parish of St Andrews (Figs 1(a), (b)), lies along the base of a dip in the road where it crosses the Great River as a reinforced concrete slab structure supported on low stone walls, giving an appearance of multiple culverts, Fig. 2(a). The riverbed is a source of stones (note stone piles on the bridge, Fig. 2(a)) for toilet soakaways on the island. Due to its low-lying nature and to stones/debris trapped in the culverts, BalB is a flow obstacle during floods up to five times a year, thus it suffers severe overtopping and breaching of the banks up to 20 m along the road from the bridge, Fig. 2(b). This renders the bridge and approach roads unmotorable during floods, with consequences as follows:

- Motorists have been forced into a time-consuming detour along a 4 km stretch of road in need of maintenance, shown red in Fig. 1(b) as the St Cloud-Mirabeau-Top Road-Byelands route.
- Infrequently, motorists have attempted crossing the overtopped bridge, which once tragically resulted in vehicle and occupants being swept downstream [5], raising an issue of public safety.
- The severe floods have strong safety implications for the nearby community slightly uphill of the river, including one isolated home (right side of road, Fig. 2(a)) within 30 m of the riverbank.
- Post-flood clearing of logs, stones and mud from the bridge is often a joint effort between the GoG and local residents over extended periods [5, 6]. The delays adversely affect road network resilience, along with resumption of connectivity between communities and economic activity.

GRIP will change that status quo by taking BalB up to higher levels of public safety and flood resilience. Note that Birch Grove bridge (BirB, Fig. 1(a)), which crosses a tributary of the Great river upstream of BalB, was built (2004) for more freeboard and shows none of the above problems.



(a) BalB on Map of Grenada (CCRF [4]) (b) Local Map Showing River

Fig. 1 – Location of Balthazar Bridge (BalB)

(a) Normal Water (b) Under Flooding

NB - Approach Road Identical in Both Above Images

Fig. 2 – Balthazar Bridge Views

2 Objectives

These Terms of Reference (TOR) define the design and supervision of construction requirements for delivering a replacement Balthazar bridge which eliminates the public safety and structural integrity problems of the current bridge. The project overall will be the responsibility of the GoG's MOIPD. The objectives outlined below treat the bridge, river, nearby land, and community as a *system* affected by floods. Alongside the points outlined below, cost will be a main consideration.

- The reconstructed BalB will be a double lane bridge of minimum 7 m wide deck and 1 m wide raised sidewalks, parapets and accommodation for utility runs as needed. The span will be a function of hydrological and hydraulic studies. The deck will be usable during floods. Its height will be determined from relative costs considering 1:10 to 1:1000-year flood events.
- For approval by the GoG, a structural design standard should be proposed which defines a bridge design life exceeding 100 years and is based on a limit state approach. This may be the most up-to-date Eurocode with British National Annex, or GoG approved equivalent.
- Also for approval by the GoG, the Consultant shall propose unfactored vertical and horizontal loads, and factored combinations of these loads including dead, live and fatigue loads along with effects of parapet collision, geotechnical, flood, hurricane and seismic conditions. Where needed, load calcs can draw on other standards (e.g. DMRB BA59/94 for log impact loads during floods, SEAOC for seismicity, etc), while ensuring a consistent safety factor framework.
- In addition to stability, strength, serviceability and durability, the structure and its components shall be designed for redundancy, so that overall failure doesn't occur if a key element is lost.

- River training works & riverbed protection will be provided over distances upstream and downstream of the bridge that ensure the bed & channel embankment do not undergo changes in geometry from scour & siltation, which may otherwise affect the bridge and its elements.
- A recent flood submerged an approach road to the current BalB, Fig. 2(b). Thus, the up/downstream bed & embankment protection schemes must ensure that the structural integrity and use of the new bridge and approach roads remain during & after 1:10 to 1:1000 year floods.
- The bridge's aesthetics should be in harmony with its surroundings.
- The consultant is free to propose different construction forms for the replacement bridge. Modular, prefabricated (e.g. prestressed concrete, steel-concrete composite, etc.) construction, which is robust and gives a replacement bridge that is not structurally compromised by floods, may be useful as it can accelerate and improve safety of siteworks. To inform the proposed construction forms, the road network and nearby land should be inspected at the feasibility phase to establish delivery routes and staging areas for transport, storage and assembly of materials and components. Related activities to be carefully considered include potential land acquisition for the staging area and / or for the reconstructed bridge and approach roads, relocation of (possibly tapping into) public utilities like electricity poles and lines, along with ensuring the integrity and continued mechanical support of service pipes along the BalB during and after construction.
- The Consultant may consider a bridge layout which minimizes supports in the river, so as to reduce risks of log impacts and undermining / tilting of supports from flooding. Note that nearby bridges in the northeast of Grenada show variable integrity of the supports owing to flood action. The original Seamoon bridge (underneath the Bailey bridge), location SB in Fig. 1(a), exhibits severe undermining and tilting of a mid-river support, see Fig. 3(a) [4]. Conversely Birch Grove Bridge (location BirB in Fig. 1(a)), built in 2004, has supports in good condition at mid-river and the banks, the latter protected by stone walls, Fig. 3(b). However, stagnant moisture has led to undesirable flora near the bearings, Fig. 3(c), which is avoidable by slightly sloping the bearing plinths. It is recommended, during the feasibility study phase of this project, to view these & other examples of variable bridge details across the island of Grenada.
- The Consultant should consider possible re-use of materials from the existing concrete and stone bridge, in the new construction. Also, use of stones from the riverbed up to at least 100 m up and downstream of the bridge, to help construct the above-described embankment protection walls.
- The Consultant will consider the river hydrology and hydraulics that govern the horizontal and vertical clearances, scour, wing walls and embankment protection and aggressive tropical environment including the long-term (e.g. material degradation) effects of climate change.
- These uses of hydrological and hydraulic modelling to inform freeboard, log impact speeds, etc due to floods will be based on digital elevation models to be provided by the GoG and the World Bank, along with river / rain gauge data for flood flow estimation purposes. The hydraulic model around Balthazar bridge will use river bathymetry with up/downstream boundary conditions sufficiently distant from the bridge. The gauge data will be provided free of charge to the project by the GoG, with assistance from a World Bank-appointed expert to maximise data integrity.

- Rerouting traffic during the anticipated 18-month construction period should be considered. This may be via the two bypasses shown in red in Fig. 1(a), about 10 km length, (the upper route is that shown in Fig 1(b) as used by motorists when the current BalB is overtopped), or it may be a temporary bridge built across the river at the reconstruction bridge site. The first option, if chosen, will be the GoG's responsibility and the bypasses will first need refurbishment, thus influencing the BalB reconstruction schedule. The latter option, if selected, will be at cost to the GRIP budget and care must be taken to ensure that the temporary bridge is not at risk of being washed away or becoming unmotorable by floods, nor should the temporary bridge supports adversely affect river flow during floods to interfere with the replacement bridge construction.

(a) Seamoon Bridge (SB on Fig. 1(a)): Tilted Support

(b) Birch Grove Bridge (BirB on Fig. 1(a)) : Mid-River Support and River Wall Work Well

(c) Birch Grove Bridge: Moisture Retention and Plant Growth at Bearing Plinth

Fig. 3 – Variable Flood-Induced Integrity of Supports for Nearby Bridges

3 Scope of Work

The outputs from this work will include complete structural design calculations, engineering drawings, specifications, quantity & cost estimates, Environmental and Social Impact Assessment (ESIA) & Environmental and Social Management Plan (ESMP) including stakeholder consultations, with attention to risk analyses & mitigations, all for GoG approval. These outputs will underpin International Competitive Bidding and supervision of construction of the works.

The different stages of works, defined in detail in subsequent sections, are presented in Fig. 4.

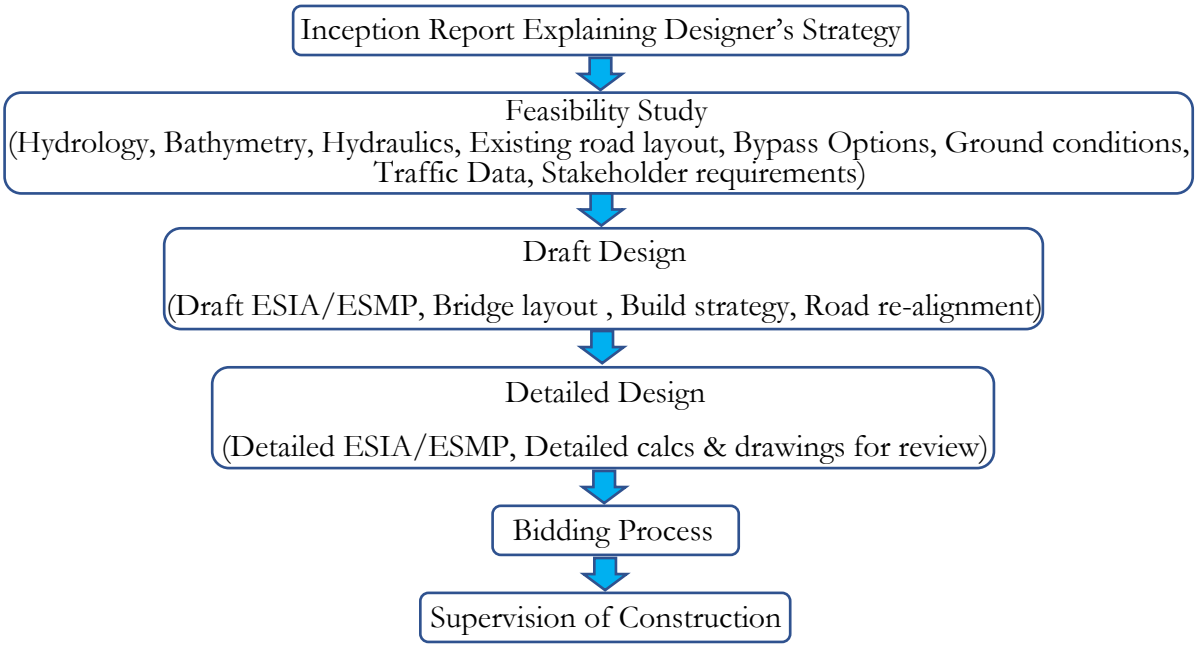


Fig. 4 – Work Stages

Any activity not defined above, but nonetheless needed to accomplish the objectives, is included in the Scope of Works. Moreover, throughout the Consultancy, as guided by the Client (GoG), any relevant data or wider information set or projects either under execution or in the pipeline should be actively tapped for maximum constructive impact on this Balthazar bridge reconstruction project. Examples of such data and information are as follows:

- Hydrological data accumulated via telemetry from river level sensors previously installed along the Balthazar bridge's river catchment network, with potential for additional sensors to be installed within this GRIP project. Engagement with GoG-approved experts will be essential to access these data and ensure their scientifically admissible use (river maps, pertinent safety factors, etc.) in developing the hydrological/hydraulic models to inform bridge design.
- Visits to Balthazar bridge during flood events, which occur multiple times each year.
- Attendance at bridges of other construction forms, ages, and river layouts in the region, as discussed in Section 2 and seen in Fig. 3. A previous World Bank CCRF report [4] on bridges across Grenada may be consulted. This will inform ideas on a flood resilient strategy for the to-be reconstructed BalB, on use of local materials e.g., stone to build river bank protection, etc.
- Road network layout, integrity of bridges, etc. between key sources (ports, quarries, etc) of materials / components and the bridge site. This will impact deliveries to site, and so may influence the bridge form. Also nearby land acquisition for staging areas and for the to-be reconstructed road, along with relocation or tapping into of utilities like electricity cables.
- Identification of capabilities, materials and equipment both available on the island and to be imported, to help inform the final design solution.

The key works to be conducted by the site contractor are shown in Fig. 5 below.

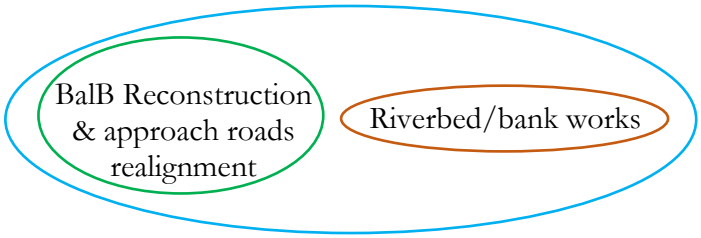


Fig. 5 – Construction Activities

3.1 Feasibility Study

3.1.1 Zone Characterization and Information Collection

A comprehensive survey of the BalB zone will be carried out as follows:

- Access and analyze available data/information, topographic, cadastral, land use, hydrological, meteorological, geological, aerial imagery and hazard events, so as to characterise the zone around the Balthazar bridge. Also access or provide data on relevant river bathymetry.
- Carry out geotechnical investigations inclusive but not limited to the use of test pit/boreholes at a maximum spacing of 10 m across the river and up to 100 m away on both sides of the river, and to minimum test pit/borehole depths below subgrade levels that will be informed by soil conditions, likely foundation loads and types.
- From site visits, establish whether, during the BalB reconstruction, traffic will be rerouted via the bypasses shown in red on Fig. 1(a) and discussed in Section 1, or via a temporary bridge at the BalB site. If the bypasses are chosen, then the Consultant should also make recommendations on any refurbishment required of the bypasses for this use. Implementation of such refurbishment will be the responsibility of the GoG, while any temporary site bridge will draw on the GRIP budget. Also, the effect of a temporary site bridge on any flood flows (and the flood-integrity of the temporary bridge itself) during the anticipated 18-month reconstruction process will need careful consideration.
- The Consultant shall also make recommendations on any required changes to the horizontal and vertical alignments of the approach roads, for approval by the GoG.
- Determine, by observation, existing lorry traffic volumes and loads on the road, locally, and combine this with code lorry load models to inform design of live loads on the bridge.
- Define principal hydrological attributes within the surrounding river network, using river level gauge databases populated by telemetry (to be accessed via the GoG), so as to later improve confidence in flood modelling pertinent to the bridge.
- Mapping critical infrastructure and key land uses and economic activities (disaggregated by sex, age, disability and usage, where possible) along the corridor;
- Carrying out a detailed topographical survey of the local road corridor using GPS, total stations, levels, etc. for use in the design of upgrades to the horizontal and vertical layouts of the approach roads and the computation of quantities for cost estimates.

3.1.2 Environmental and Social Impact Assessment (ESIA)

- Conduct an ESIA of the proposed works, which should involve broad stakeholder consultation as per above, disaggregated by sex, age, and disability. The ESIA should be compliant with GoG national regulations and the World Bank's Environmental and Health Safety (EHS) guidelines for the sector. Based on the ESIA, an Environmental and Social Management Plan (ESMP) should be developed.

Environmental and Social Management Plan

Preparation of an Environmental and Social Management Plan (ESMP) including recommended mitigation measures, analysis of alternatives, design management, monitoring and recommended

measures to facilitate social benefits, a stakeholder engagement plan and grievance mechanisms responsive to vulnerable groups' needs.

Detailed guidance on the ESIA and ESMP is presented in Annex 1.

Social and Gender Impacts

- Producing a sex-disaggregated demographic profile of communities within the zone affected by the bridge reconstruction including socio-economic, poverty and vulnerability status, individual and community characteristics including disability status, age, employment, unemployment, and underemployment status, single-heads of household m/f, (household characteristics), crime, gender based violence, educational attainment, housing and health issues.
- Identification of key employers and livelihood activities in the communities with clear identification of opportunities to reduce poverty and promote equitable, inclusive employment through the implementation and operational phases of the project and attention paid to identifying workers' health and safety risks to road-side vending with recommendations to maximise benefits derived from livelihood activities, disaggregated by sex, age and disability.
- Identification of short course skills training needs to enable females, males and people with disabilities from affected communities to actively participate in associated employment opportunities with a particular focus on training for females in non-traditional trades.
- Clear identification of any potential adverse social impacts of the project, disaggregated by sex, age, and disability.
- Identification of risks and vulnerabilities during implementation and operation in the following areas including inter alia: housing; economic activities; employment opportunities; livelihoods; labour force participation; shelter management; natural hazards; security and violence (including gender-based); education; health; transportation; traffic impacts; cultural and archaeological heritage; wildlife habitat; and water, sanitation, and drainage.
- Investigating gender-specific risks and vulnerabilities and gender-specific coping mechanisms, including those linked to projected climate change, traffic impacts and project employment or indirect project-related livelihood opportunities.
- Identification and analysis of both qualitative and quantitative socio-economic benefits.
- Prioritise community risks and vulnerabilities and community priorities for potential investments. Include women and men equally in public consultations as well as stakeholders representing the various groups including youth, elderly, children and persons with disabilities.

Stakeholder Consultations

The Consultant shall carry out stakeholder consultations in accordance with the World Bank's Environmental and Social Standard 10 – Stakeholder Engagement and Information Disclosure, to guarantee inclusiveness in order to address the needs of the community members. This includes:

- Identifying key stakeholders and describing the role/influence they may have on the project civil works.
- Gathering stakeholders' perspectives, concerns, perceived current needs and priorities, as well as their input to and feedback on proposed designs and implementation, disaggregated by sex, age, and disability.
- Conducting consultative and informative meetings with ministerial departments and agencies including those responsible for infrastructure, transport, tourism and disaster risk management, and any other relevant parties, to present the results of the Consultancy and discuss any ongoing issues/ questions related to the works. This includes meetings as specified in Annex 1, with at least one meeting to close off each design stage (i.e. feasibility study, draft design, detailed design and bidding process) and regular meetings during the construction stage (e.g., every 6 months as necessary).
- Conducting consultative and participatory stakeholder meetings periodically at appropriate points of the consultancy. This includes meetings as specified in Annex 1, and at least one meeting to close off each design stage (i.e. feasibility study, draft design, detailed design and bidding process) and regular meetings during the construction stage (e.g., every 6 months). These are to take place together with the Client and all relevant stakeholders, including community leaders, community groups including women and youth groups and residents.
- These meetings should inform on progress with planning at key stages and to seek feedback. To that end, consultations should be undertaken with these entities regarding their perspectives, concerns, perceived current needs and priorities, as well as their input to and feedback on proposed designs and implementation, disaggregated by sex, age, and disability.
- Priority should be given to the local community's needs / views on historic flood occurrences and effects, flood protection, impact of reconstruction including on recreational use of the river, changes to the nearby road layout, employment opportunities during construction, etc.
- Conducting separate meetings for women, girls, boys and men in the communities, as necessary, and their representatives at the community and national levels.

3.1.3 Climate Vulnerability Assessment and Hydrological Modelling

Identify and evaluate the potential effects of climate change on flooding of the bridge, nearby road, and community. Propose resilience measures for the reconstruction to address the identified vulnerabilities. The Consultant should undertake quantitative analysis that includes the following:

- Use of a digital elevation model (from GoG/WB), along with river gauge data and rain gauge data (GoG, with support from a WB-appointed expert to maximise data quality) to develop a hydrological model for flood flow estimation purposes. Also develop a hydraulic model around Balthazar bridge, using river bathymetry (channel section dimensions) with upstream and downstream boundary conditions located at appropriate distances away from the bridge. The Consultant will thus define hydraulic and hydrologic variables for the new bridge, river bed /

bank protection, nearby road and drainage designs, based on expected climate conditions over the new bridge's design life (exceeding 100 years) as stipulated by the intended bridge structural design standard. Climate variables could include precipitation changes (and for design purposes maximum 24-hour daily precipitation could be used as the basis for assessing the risk of floods from surface runoff); the incidence of hurricanes and tropical storms. For the new bridge, scenarios assuming various bridge support layouts within or outside of the river will be required. A spectrum from 1:10 to 1:1000-year flood events are recommended, otherwise the consultant will be expected to provide advice on the appropriate recurrence intervals for meteorological events impacting the proposed design of the infrastructure.

- Considering and factoring available historic precipitation data, climate model forecasts and scenarios assessed above, catchment surface area, topography, soil conditions, developing hydraulic and new bridge design options based on the climate change scenarios identified above, including various river flood event scenarios (1:10, 1:50, 1:100, 1:500, 1:1000-years).
- Using this analysis, identify and prioritise flood resilient bridge/river/road/land options, conducting an economic analysis of each technically feasible option, showing the costs and benefits, or a cost-effectiveness analysis if the measures are expected to deliver the same benefits. Any impacts on recreational use of the river, on use of the river bed to supply stones for construction on the island, and on the activities of the local community should be included in this assessment. The analysis should also explore opportunities provided by climate change.

3.1.4 Feasibility Study

- Develop projections for a 50-year design horizon beyond the prospective end of construction and prepare and cost (feasibility level) options for the upgrade and/or maintenance of the completed bridge and associated road and river works. Design solutions which minimize maintenance requirements/costs, without significantly increasing initial construction cost, are encouraged. The Consultant must also demonstrate how climate change risk and associated capital costs considerations alter the proposals (i.e. the specific changes in design in order to take account of climate change). Positive and negative social, environmental and institutional impacts should also be presented.

- Use the relevant model as advised by the GoG to evaluate alternative maintenance options for the bridge/river/road/land reconstruction scheme. Identify the relevant economic costs and benefits and determine the Net Present Value (NPV) for alternatives. A reasonable discount rate is required for any option to be considered feasible and the sensitivity of that rate to multi-criteria variation must be presented.

3.1.5 Draft Design

- The Consultant shall prepare a feasibility analysis for bridge designs considering site characteristics, construction requirements and road network capabilities. The Consultant shall consider the river morphology and local topography in the selection of options to optimize, to the extent practical, the span length. Any benefits of prefabricated, modular, lightweight construction may be considered including prestressed concrete, steel-concrete composite, etc construction. Among the issues associated with the construction sites is transportation access. The terrain is mountainous, the road network has numerous curves and the load capacities of the bridges en route to the construction site should be ascertained. The Consultant, considering these limitations and other considerations e.g. cost, will determine an appropriate balance between prefabricated, modular and construction site - fabricated assemblies.
- Access to the Great River must be maintained for the clearing of debris by heavy machinery.
- Additional to the basic bridge design options, the Consultant shall evaluate existing alignments and approaches to determine their suitability and assess the need for selecting alternative alignments to optimize construction designs. As part of this process, the consultant, based on this analysis, shall identify potential sites suitable for staging construction equipment and fabrication of bridge component assemblies as needed.
- At the Conclusion of this analysis, the Consultant shall prepare a report presenting their findings together with scale maps of anticipated encroachments on land outside the current ford and roadway alignments. This will be used by the client to identify potential encroachments on privately held land.
- The Consultant shall prepare draft designs, quantities and costs for GoG/MOIPD's preferred option.
- The Consultant shall update the financial and economic analyses prepared for the feasibility assessment.
- Draft ESIA and ESMP.
- For the to-be reconstructed bridge and approach roads, the Consultant shall perform a Stage 1 Road Safety Audit (RSA) in accordance with the Road Safety Audit Guidelines of the UK Design Manual for Roads and Bridges; a Draft Design Stage Audit in accordance with the Road Safety Audit Guidelines published by the US Department of Transportation Federal Highway Administration; or similar approved guidelines.

3.1.6 Monitoring & Evaluation

Developing a Monitoring and Evaluation (M&E) framework for the project, including, but not limited to, the identification of sex disaggregated indicators, the establishment of a baseline, establishment of targets, identification of suppliers of data and users of the system and stakeholder consultation. The system shall accord with the principles of Managing for Development Results.

3.1.7 Detailed Designs and Bid Documentation

- Prepare a structural design of the replacement bridge to a GoG-approved bridge design standard such as the Eurocodes in tandem with the UK National Annex, which ensures a design life exceeding 100 years. Any peripheral information required, e.g. for feeding into design against log impacts during floods, should be obtained from other relevant standards with care taken to ensure consistency in safety factors between standards. Both short-term (e.g. flood) and accelerated long-term (e.g. material degradation) effects of climate change should be considered in the design. All structural calculations (loads, load combinations, etc) and the associated drawings should be carefully documented and made available for assessment by the client (GoG).
- For any portions of the bridge approach roads and (if agreed by the GoG and WB to be within the project's scope) the bypass routes (shown red in Fig. 1(a)) to be reconstructed/repaired, a Stage 2 Road Safety Audit (RSA) should be performed in accordance with the Road Safety Audit Guidelines of the UK Design Manual for Roads and Bridges; a Detailed Design Stage Audit in accordance with the Road Safety Audit Guidelines published by the US Department of Transportation Federal Highway Administration; or similar approved guidelines. Detailed designs are expected to incorporate considerations for vulnerable road users (pedestrians, persons with disabilities, bicyclists, and motorcyclists, disaggregated by sex and age) and responsive security features along the road and at bus shelters.
- Preparing quantities and cost estimates for the works using the Civil Engineering Standard Method of Measurement (CESMM) or other approved method. The estimates should identify the incremental costs associated with climate adaption.
- Preparing proposed construction schedules, both overall and by section, to indicate the extent of disruptions through diversions, noise, light, dust etc.
- Preparing construction specifications for all the works shown on the drawings for which the contractor is responsible. The specifications shall be clear and concise with a statement setting forth the general scope of work, followed by a description of the various classes of work, under appropriate sections and headings. The quality control requirements for the contractor will be described in detail, including identifying standards or codes that are to apply.
- Preparing bidding documents in accordance with the client's (GoG's) preferred approach, to be defined but may be that of the World Bank. These documents should be adapted to reflect the requirement to select a qualified and experienced contractor in Environmental, Social, Health, and Safety (ESHS) worksite management, and to include comprehensive ESHS Specifications for worksites, specifications for HIV/AIDS and gender-based violence awareness training for the contractor's and subcontractors' personnel, and associated cost schedules. The bidding documents will incorporate the measures described in the ESMP including cost for implementing them.
- Revised ESIA and ESMP.

- Submitting the full designs including all structural calculations, plans and specifications, for approval to the client and appropriate authorities, as required incorporating recommendations.
- Attending meetings to discuss the designs and provide explanations for the purpose of furthering approvals.

The detailed design package will include the following drawings, but not limited to the:

- Topographical site plan
- River profiles and cross sections
- Existing river crossing layout and approach roads.
- Proposed bridge layout and approach roads.
- General arrangement of bridge structure (abutments, deck, wing walls)
- Cross sections (abutment, deck, wing walls)
- Embankment protection layout and cross sections
- Road cross section
- Road and bridge profile
- Temporary crossing bridge (if applicable)

3.1.8 Bidding Process

The Consultant will assist the bidding process to identify a contractor for the reconstruction works, including:

- Conducting pre-bid site meetings and site visits with the GoG and prospective bidders.
- Preparing minutes of all such meetings and providing written responses to bidders' queries.
- Providing technical advice to the GoG MOIPD during the bidding process.
- Preparing a bid evaluation report for the GoG MOIPD's nominated Evaluation Committee, in accordance with the World Bank's Procurement Regulations.
- Assisting with negotiations between the GoG MOIPD and the prospective contractor.
- Preparing the contract document which incorporates ESMP-detailed measures including costs.

3.1.9 Pre-construction and during construction services

- The Consultant should note that for the purposes of preparing a proposal for construction supervision services, both the bridge/approach road reconstruction and the river (bed and embankment) works as shown in Fig 5, apply.

- For all approach roadworks, perform a Stage 3 Road Safety Audit (RSA) in accordance with the Road Safety Audit Guidelines of the UK Design Manual for Roads and Bridges; a Pre-Opening Stage Audit in accordance with the Road Safety Audit Guidelines published by the

US Department of Transportation Federal Highway Administration; or similar approved guidelines.

- Advise the contractor on the interpretation of the engineering drawings and technical specifications and issue supplementary details and instruction during the construction period, as required.
- Review the contractor's workplan including construction schedule and comment on the procedures, methods, and sequence of the work.
- Consider and advise on alternative methods, equipment and materials proposed by the contractor.
- Advise on the validity of charges for additions or deletions to the contract and advise on the issue of change orders.
- Process contractor's progress and final requisitions and issue progress certificates for the client's acceptance.
- Maintain records related to the contracts.
- Arrange and record monthly site meetings.
- Prepare monthly progress reports, based on the Contractor's monthly progress reports, make comments, and recommend any appropriate action as required.
- Provide technical advice to the client and recommend appropriate actions if needed during construction phase on planning and scheduling, budgeting, estimating, and cost and quality control.
- Provide full-time resident staff services during construction.
- Ensure that the contractor is carrying out the work in accordance with the contract documents and communicate with the contractor and the client regarding deficiencies in the work and other matters of direct interest or concern. Where necessary, check contractor's line, levels, grade and the results of laboratory testing.
- Arrange for all necessary laboratory testing required in the completed works and carry out technical inspection of materials if they are consistent with the approved technical specifications.
- Investigate and report on all unusual circumstances that may arise during construction.
- Carry out final inspection at the handover of the works as part of the acceptance program of the client.
- Collect, or obtain from the Contractor, field information required to prepare the draft final "as-built" drawings.
- Prepare a Works Completion Report at handover, to include a maintenance manual, the draft final drawings and associated full set of structural design calculations for the "as-built" bridge.

Specifically, as part of its obligations for the ESIA, the Consultant must ensure that the Contractor delivers its ES obligations under its contract. This includes, but is not limited to the following:

- Reviewing the Contractor's Environment and Social Management Plan (C-ESMP), including all updates and revisions at frequencies specified in the Contractor's contract (normally not less than once every 6 months);
- Reviewing all other applicable contractor's documents related to ES aspects including the health and safety manual, security management plan and SEA prevention and response action plan;
- Reviewing and consider the ES risks and impacts of any design change proposals and advise if there are implications for compliance with ESIA, ESMP, consent/permits and other relevant project requirements;
- Undertaking, as required, audits, supervisions and/or inspections of any sites where the Contractor is undertaking activities under its contract, to verify the Contractor's compliance with ES requirements (including relevant requirements on SEA/SH).
- Undertaking audits and inspections of Contractor's accident logs, community liaison records, monitoring findings and other ES related documentation, as necessary, to confirm the Contractor's compliance with ES requirements (including relevant requirements on SEA/SH).
- Determining remedial action/s and their timeframe for implementation in the event of a noncompliance with the Contractor's ES obligations.
- Ensuring appropriate representation at relevant meetings including site meetings, and progress meetings to discuss and agree appropriate actions to ensure compliance with ES obligations.
- Ensuring that the Contractor's actual reporting (content and timeliness) is in accordance with the Contractor's contractual obligations.
- Reviewing and critiquing, in a timely manner, the Contractor's ES documentation (including regular reports and incident reports) regarding the accuracy and efficacy of the documentation.
- Undertaking liaison, from time to time and as necessary, with project stakeholders to identify and discuss any actual or potential ES issues.
- Establishing and maintaining a grievance redress mechanism including types of grievances to be recorded and how to protect confidentiality e.g. of those reporting allegations of SEA and/or SH.

3.1.10 Post-Construction Services

Following handover of the Works:

- Carry out site inspections and identify deficiencies during the contract defects liability period, monitor the rectification of deficiencies and prepare final acceptance documentation at the expiry of the defect liability period.
- Prepare a Contract Completion Report.

3.2 Implementation Arrangements

MOIPD will appoint a Project Coordinator (PC), who will facilitate the work of the Consultants and make available all studies, reports, and data relevant to the completion of the exercise and will act as the liaison between the consultants and GoG officials and stakeholders and as quality assurer.

The PC will provide quality assurance of the consultant's work which includes quality reviews and due diligence, where required, and recommendations for adjustment or correction if deemed necessary. The Consultant will facilitate quality assurance and allow for sufficient time in their planning to permit reviews.

The Consultant will prepare a comprehensive quality plan for the consultancy for review and comment by PC. The quality plan will include, but not be limited to, quality control details on document preparation ensuring an effective and traceable system is in place that requires all critical components to go through an internal quality review and sign off process prior to release and that this control documentation is made available upon request. It is to include sufficient reasonable time for the PC to also review where the PC deems necessary.

3.3 Qualifications and Experience

The Consultant should be multidisciplinary and must meet the criteria as detailed in the REOI. This includes the following:

- The Consultant should have proven experience in analysing and modelling bridge construction, considering extreme events such as floodings.
- The Consultant should have demonstrable experience with the design and supervision of bridge construction works in the Caribbean region and/or with comparable Small Island Developing States under threat of extreme weather events (tropical cyclones, flooding).
- The Consultant should have demonstrable experience carrying out ESIA and setting up ESMP's in accordance with World Bank procedures.
- The Consultant should not have any pending litigation and non-performing contracts during the last 5 years.
- The Consultant should have excellent written and oral communication skills in English.

It is the Consultant's responsibility to ensure that the team has an appropriate mix of key and non-key experts required to satisfy the full requirements of the TOR. As a guide only, it is considered that the consulting team is likely to need to include the following key experts. In addition to the experience described below, professional qualifications such as chartered engineer (MICE) status from the UK are desirable, though not essential.

Key Expert 1: Bridge Engineer and Team Leader - with preferably 15 years' experience of carrying out feasibility studies, detailed design and preparation of procurement documents for, along with supervision of construction of bridges preferably against natural hazards (floods, earthquakes, etc). Demonstrable experience of using Eurocodes or other GoG-approved bridge design standard and / or leading design of replacement bridges exceeding 40 m total length will be an asset. The candidate would preferably have a minimum of a Master's degree in structural/civil engineering.

The Team Leader must have satisfactorily performed the function of Team Leader on at least 3 similar projects within the past 8 years.

Key Expert 2: Highway Engineer - with preferably minimum 10 years' experience of carrying out viability studies, detailed design, conducting road safety audits, and in the preparation of procurement documents for both new road and road repair projects. The candidate would preferably have a minimum of a bachelor's degree in civil/highway engineering.

Key Expert 3: Geotechnical Engineer - with preferably minimum 10 years' experience in the investigation of, and the design of structures in areas vulnerable to floods, landslides, the design of retaining walls, river-bed and river-wall scour protection, and related work. The candidate would preferably have a master's degree in civil / geotechnical engineering.

Key Expert 4: Hydrologist / river engineer / civil engineer with preferably minimum 6 years' experience of hydraulic river modelling and of carrying out hydrological modelling of normal and flooded river networks with clear channels or channels obstructed by large objects such as low-lying bridges. Demonstrable experience of having combined computer modelling with river level gauge data to understand the behaviour of river networks would be an advantage. The candidate would have a minimum of a Bachelor's degree.

Key Expert 5: Transport Economist - with preferably minimum 7 years' experience of carrying out the financial and economic analysis and evaluation of new road development and road repair project proposals. The candidate would preferably have a Master's Degree in Economics, Civil Engineering or related discipline. Experience with HDM-IV and other economic decision tools is considered essential. This may be integrated into Key Expert 2 or may be separate.

Key Expert 6: Environmental and Climate Risk Assessment Specialist – with preferably minimum 10 years' work experience in carrying out environmental impact assessments and the development of Environmental Management Plans for bridge and roads projects, and in the area of climate change impacts and adaptation, including familiarity with analysing climate data and preparing gender-aware vulnerability assessments. The candidate should possess good communication (oral and written), interpersonal and teamwork skills. The candidate would preferably have a master's

degree in Environmental Sciences, Environmental Engineering, Environmental Management or related discipline, and experience in disaster risk mitigation;

Key Expert 7: Social and Gender Impact Specialist - with preferably minimum 8 years' experience of carrying out social and gender impact assessments of bridge / transport infrastructure projects. The Social and Gender Impact Specialist would preferably have a Master's Degree in Social Sciences, Gender Studies or related discipline, experience in gender analysis, experience utilising differential participatory approaches to perform social and gender analysis including the establishment of a project baseline indicator framework, and experience in preparing associated social impact assessments in accordance with the policy, guidelines and requirements of major IFIs.

Key Expert 8: Resident Engineer – with preferably minimum 10 years' experience in providing construction supervision services. The candidate would have a minimum of a Bachelor's degree.

It is envisaged that inputs would be required from non-key experts that will include, among others, a Monitoring and Evaluation specialist, civil/structural engineers, surveyors, and CAD technicians.

4. Reporting Arrangements/Outputs

The Consultants will be required to submit seven printed copies of each report, three copies to GoG/MOIPD, three copies to the World Bank (WB) and one copy for an independent assessor, respectively. The reports shall also be submitted in PDF as complete documents to GoG/MOIPD and WB. Reports and data shall further be provided electronically in their original form (e.g. Microsoft Word, Excel, AutoCAD, etc.) to GoG/MOIPD. The timeframe for providing feedback on reports may vary, with a ***minimum*** of 2 weeks per report.

Name/Type of Report	**Content**	**Time of Submission**
Inception Report	The Consultant shall prepare a report to include (without being limited to) the following: • Initial findings including any feedback on these Terms of Reference (TOR) • Consultant's detailed organization, mobilization, work schedule and methodology including approach to fulfil the assignment	Within 1 month of contract signing

	requirements as per the ESIA detailed in these TOR. • An entire programme of services including the implementation strategy and highlighting use of resources including personnel, equipment, etc. • A proposed outline for the final report • Design standards & criteria to be employed	
Site Characterization and Data Collection Report	The site characterization and data collection report can be submitted in stages as sub-reports to fast-track comments and reviews. • Bridge and bypass routes sites visit report. • River bathymetry, hydrological analyses • Bridge approach / bypass roads safety audits • Bridge approach / bypass roads inventories • Condition and structural adequacy assessments of existing bridges, culverts, and other structures with respect to transporting materials / components for new bridge construction. • Detailed topographical survey. • Detailed geological study. • Baseline social, environmental (including climatic and hazard) conditions report. • Baseline financial (including key rates), economic, institutional conditions report	Within 10 weeks of contract signature
•Draft ESIA report •Draft ESMP report •Draft Climate Vulnerability Assessment Report	The Draft ESIA report includes the findings of the ESIA, including the Social and Gender Analysis. The draft ESMP to cover the design/preparation phase, construction, and operational phases. The Climate Vulnerability Assessment to include the site characterization, climate change scenarios, hydrology / hydraulic modelling, and gender-aware vulnerability analysis.	Within 10 weeks of contract signature, to be contained within the site characterisation and data collection reports
Draft Feasibility Study Report	The Draft Feasibility Study Report presenting the engineering, social, environmental, institutional, financial, and economic analysis of the new bridge and approach + bypass road	Within 18 weeks of contract signature

	options, and recommendations for further consideration based on economic viability.	
Final Feasibility Study Report	The Final Feasibility Study Report presenting the engineering, social, environmental, institutional, financial, and economic analysis of upgrading options, and recommendations for further consideration based on economic viability. This submission should incorporate and address all of the comments received from the Draft Feasibility Study Report.	Within 2 weeks of receiving comments from MOIPD on Draft Feasibility Study Report
• Revised ESIA report • Revised ESMP report • Revised Climate Vulnerability Assessment Report	The revised ESIA to include updated findings of the ESIA, including the Social and Gender Analysis. The revised ESMP to cover updates to the design/preparation phase, construction, and operational phases. The revised Climate Vulnerability Assessment Report to include more relevant detail on the site characterisation, climate change scenarios, hydrological/hydraulic modelling, and gender-aware vulnerability analysis.	To be submitted with Final Feasibility Study Report
Draft Design Report	The Draft Design Report having received MOIPD's preferred option, submit the draft design, cost, quantity estimates and M&E framework. The report shall demonstrate how the recommendations of the ESIA have been integrated into the project design, revised cost estimates, bidding document (specifications, bills of quantities, conditions of contract, etc.) and M&E framework.	Within 20 weeks of contract signature
• Final ESIA report • Final ESMP report • Final Climate Vulnerability Assessment Report	The final ESIA report should incorporate the conclusive findings of the ESIA, including the Social & Gender Analysis. The final ESMP report to comprehensively cover the design/preparation phase, construction, and operational phases. The final Climate Vulnerability Assessment Report to holistically cover site characterisation, climate change scenarios, hydrological modelling, and gender-aware vulnerability analysis	Within 20 weeks of contract signature, to be submitted with the Draft Design Report

Draft Final Design Report and Draft Bidding Documents	The Consultant shall prepare a report which shall include (without being limited to) the following: • Detailed bridge / riverbed protection / river wall protection / approach road realignment / bypass roads upgrade designs, cost estimates and implementation schedule • Bidding Documents • All topographic survey data including coordinates of permanent control points tied into the national survey grid. • Environmental Impacts Assessment and mitigation measures	Within 4 months of submission of Final Draft Design Report
Final Design Report and Bidding Documents	The Consultant shall present the Final Design Report and Bidding Documents.	Within 1 month of receipt of comments from MOIPD on the Draft Final Design Report and Bidding Documents.
Prequalification Documents	Relevant documents for advertising and prequalification of contractors shall be presented.	Within 1 month of the start of the assignment.
Bidding Process	The consultant will assist the Client in carrying out the bidding process, including issuance of any addenda to the procurement documents, preparing responses to requests for clarifications from bidders, preparing and carrying out the pre-bidding conference and site visit, as well as the minutes of the pre-bidding conference.	During the bidding process
Bid Evaluation Report	The consultant will assist the Client in the evaluation process and prepare a detailed Bid Evaluation Report on the bids received, based on results of evaluation and evaluators recommendations for a selection of a works contractor.	Within 7 days after completion of evaluation by Evaluation Committee

4.1 Construction Supervision Stage:

Name/Type of Report	Content	Time of Submission
Contract Management Plan	The Consultant shall prepare a contract management plan that details all processes needed to manage the contract with the contractor during the works. This includes, but is not limited to, progress monitoring procedures, construction and contract meetings, quality and risk management, financial management and any other activity needed for effective contract management. Contract Management module in STEP to be used.	Prior to commencement of construction.
Construction Progress Reports	The Construction Progress Reports is a Monthly Progress Report in the approved form, briefly and concisely describing all construction activities and progress for the previous month, and report on environmental monitoring during construction and contractors' compliance with the ESMP. Problems encountered, and/or problems anticipated, shall be clearly stated, together with steps taken or recommendations for their correction/mitigation. These reports shall also list the Contractors' equipment and work force. It will also indicate the work to be performed during the coming month, expenditure record, and current estimates of final cost and completion date	No later than 2 weeks after the end of each month of the implementation period.
Certificate of Practical Completion	The Certificate of Practical Completion: At the end of the construction period provide a Certificate of Practical Completion which certifies the practical completion of all the works described in the Contract Documents. This certificate should be signed by the members of an inspection team consisting of representatives of GOG/MOIPD, the Consultant and the Contractor.	At the conclusion of the construction
Works Completion Report	Kindly provide MOIPD with a Works Completion Report, which shall include electronic and full-size sets of (Al size) 'as-built' reproducible plans and all associated structural design calculations on stable-	Within one month of the issue of the Certificate of

	base material showing final details of the Works as completed, along with all data, records, field books, warranties, properly indexed and catalogued. It shall include the monitoring programme to be implemented by the consultant during the defects liability period, including an updated ESMP for the operational phase of the works.	Practical Completion
Contract Completion Report	The Contract Completion Report, summarizing the construction activities, contract changes, claims, or disputes or any other substantive matters having an effect on the amount, cost, and progress of the work. Also include Maintenance Plans for all Civil Works constructed and Equipment delivered and installed as well as the final ESMP to cover the operational phase.	Within 1.5 months of the issuance of the Completion Certificate

Comments on the Reports should be anticipated within two months of receipt and the Consultants will adjust the ongoing work according to the comments received. The Consultants will revise the draft reports within one month of receipt and in accordance with the comments received. All data input files should also be provided.

Each deliverable produced by the Consultant must contain a visibility statement acknowledging that technical assistance has been provided by the World Bank and the World Bank logo must be utilised.

5. Duration of the Project

The duration of the Feasibility and Design Services is estimated to be 11-man months (not inclusive of comments, approvals timelines) from the signature of the Contract. The duration of the construction supervision phase is 18 months, inclusive of a 3-month procurement period and exclusive of a 12-month defects liability period.

6 Selection Method

A consulting firm will be selected following the Quality and Cost-Based Selection (QCBS) procedures specified in the World Bank Procurement Regulations. Two contracts are expected to be negotiated and signed with the winning consultant: a lump-sum contract for the preparation,

design and bidding phases of the assignment, and a time-based contract for the supervision phase of the assignment.

REFERENCES

[1] THE 17 GOALS | Sustainable Development (un.org) https://sdgs.un.org/goals
[2] World Bank Report. Dec 2009. Hurricane Ivan Emergency Recovery Project. 40 pp.
[3] Canada Gov/GFDRR/World Bank. 2019. *Canada Caribbean Resilience Facility, Key Facts and Figures*. https://www.gfdrr.org/en/publication/canada-caribbean-resilience-facility-crf
[4] Sebastian W. June 2022. *Climate-Resilient Asset Management Training in Grenada*. Report submitted to the World Bank, Canada Caribbean Resilience Facility Project.
[5] Personal communication, MOIPD engineer.
[6] Personal communication, resident local to Balthazar bridge.

Annex 1: Detailed ESIA and ESMP Scope

Needs and Justification for Environmental and Social Impact Assessment

The aim of the ESIA study is to assess the environmental and social impacts associated with the reconstruction of Balthazar Bridge. The ESIA will propose practical and effective mitigation measures to prevent or reduce any potential negative implications of the construction and operation of the planned works. In addition, an environmental and social management plan will be developed to ensure best environmental and social performance. For the project area, the ESIA will be based on the following:

- Environmental and social impacts associated with the project are assessed and examined at the earliest planning stage possible.
- Environmental and social impacts to be investigated and examined include factors that impact public health and safety as well as the natural environment, such as: air, quality water, soil, waste, accidents, ecosystems, and biota. Social concerns include: involuntary resettlement of the population, cultural heritage, landscape, gender, communicable diseases, etc. Traffic impacts should also be assessed.

- In addition to the direct and immediate impacts, derivative, secondary and cumulative impacts will also be examined and investigated to a reasonable extent.
- Alternative proposals and/or minimization measures to prevent or reduce adverse impacts are examined to choose a better project option in terms of environmental and social considerations. In examination of measures, priority is to be given to the prevention of environmental impact including from the bridge design, and when this is not possible, minimization and reduction of impact must be considered next. The findings of this examination should be incorporated in the plan.
- Examination of the environmental and social considerations will include analysis of environmental costs and benefits in quantitative terms, as much as possible, while taking into consideration economic, financial, institutional, social, and technical aspects.
- Appropriate follow-up environmental and social management and monitoring plans will be prepared as part of the ESIA. Estimated costs of implementing such plans and financial resources to cover such costs will be determined.

The ESIA will ensure that the project components will be in compliance with relevant national, laws and ordinances as well as the World Bank ESF.

Tasks

The following tasks are expected to take place to prepare the ESIA for the proposed project:

- Conduct meetings with relevant government agencies to understand and familiarize with draft studies, plans, and designs and other activities related to the project;
- Conduct site visits for the purpose of site reconnaissance and establishing baseline and collecting data from local concerned authorities;
- Review all relevant laws and regulations relevant to the planned activities;
- Describe the environmental and social settings for the areas where planned activities will take place;
- Assess the potential positive and negative environmental and social impacts associated with the planned activities;
- Prepare a comprehensive Environmental and Social Management Plan (ESMP)

- Perform effective and efficient public consultation process at two stages: during scoping phase and once the Draft ESIA is prepared. A proper communication plan should be prepared and specific actions to be taken to ensure good representation and good attendance of affected communities and stakeholders in the planned Public consultation events

Approach

The Consultancy will try to the extent possible to identify and compile the readily available technical data and information that would allow preparing the Environmental and Social Impact Assessment with the least uncertainties. Appropriate and justified engineering/scientifically based assumptions should be made to address any information or data gaps.

In preparing the Environmental and Social Impact Assessment the Consultant will ensure compliance with:

- Current environmental and social regulations and standards in Grenada
- The World Bank ESF and other World Bank procedures and guidelines on conducting environmental impact assessment.
- The World Bank Group's Environmental, Health and Safety Guidelines (EHSGs)

Environmental and Social Impact Assessment Methodology

The Consultant is expected to prepare and submit their own detailed work methodology and approach to fulfil the assignment requirements given the risks covered under this TOR as part of the Inception Report.

The following will be the minimum requirements of the proposed methodology

(1) Gain an understanding and study project objectives and familiarize with project locations

- Obtain necessary documents including maps, site plans, photographs, diagrams, and any visual and graphic aids.
- Familiarize with project, including project purpose; location; components and phases; workforce and equipment; associated activities; schedule; and cost.
- Gather information about the various stages of the project execution (pre-, during, and post).

- Detail the elements of the project, highlighting the areas to be reserved for activities and characterizing the surrounding areas in terms of residential areas, industrial areas, protected areas, historical sites, etc.

(2) Review relevant legislative and regulatory considerations.

- Review national and international legislations and regulations relevant to the project, including also required governmental permits and authorizations required.
- Compare national regulations and the World Bank ESSs and identify gaps between them

(3) Conduct the First Public Consultation (Scoping Session)

A community consultation will be initiated as early as possible. The Consultant will consult with the stakeholders twice. The first public consultation will be conducted after the identification of relevant impacts to discuss and agree on the scope of the ESIA.

The Consultant in coordination with relevant authorities will arrange and conduct scoping sessions which should be attended by the relevant authorities and stakeholders. The aim of these scoping sessions is to:

- Explain and reach a common understanding of the potential impacts and sensitivities of the surrounding environment, and similarities and differences between the present project and other similar projects implemented in Grenada.
- Identify, early in the process, any environmental and social aspects, which the stakeholders raise, which may not have been included in the scope of work
- Provide a basis for reviewing the issues that will be considered in the ESIA

(4) Analysis of Alternatives

The environmental and social assessment should also include an analysis of alternatives that would examine different alternatives with the objectives of minimizing environmental, health, safety and social impacts of the project. The analysis would focus on the following:

- Summarizing and referencing the alternatives in a manner consistent with national and international guidance
- Analyzing the benefits and impacts expected from the project and other technical and economic alternatives including the "Do-Nothing" alternative
- Evaluating the social and environmental analysis of each alternative

- Proposing preferred alternatives by comparing alternatives, and justifying the rationale for preferring the proposed alternatives

(5) Data Collection and Review

General information about the project site and surrounding areas will be provided in map form, including:

- project area maps at appropriate scales to illustrate general siting of project related development sites and surrounding areas likely to be environmentally and socially affected
- topographic contours, as available, as well as locations of roads, communities, and other relevant sites within the project location.
- maps to illustrate existing land use, including industrial, residential, commercial and institutional development, agricultural as relevant to the project activities, etc

Specific data will be complied on the characteristics of the project area in terms of its sensitivity to adverse and beneficial environmental impacts. Historical and secondary source data will be collected, when possible, and validated with field observations. The Consultant will conduct the necessary baseline surveys to collect data on the following points:

- Physical Environmental Data:
    - Geology (e.g. stratigraphy and structure, seismic history if any of the areas)
    - Topography
    - Climate
    - Ambient air quality
    - Water quality
    - Ambient noise (note contribution from major sources if any)
    - Significant sources of pollution in the area and prospect for their mitigation
    - Existing traffic patterns, users of the beach/coastal area and waters etc.
- Biological Environmental Data
    - Flora and fauna, including rare or endangered species in the project area
    - Aquatic ecosystem including benthic species and habitat.
    - Sensitive habitats both terrestrial and aquatic
- Socio-Economic Data
    - Culturally Valuable Sites

- Geography, administrative districts, etc.
- Basic Demographic characteristics (population, age structure, birth rate, death rate, rate of natural increase, handicapped, etc.)
- Living Conditions (household size and density, access to electricity, source of potable water, sanitation, etc)
- Human Development Profile (education, work status, economic wellbeing, etc.)

After gathering of data, the environmental and social issues will be assessed in terms of the environmental and social risks and benefits associated with the project.

(6)Analysis - Environmental and Social Assessment

The Consultant will assess the potential impacts of the project during project activities. The Consultant will perform the below tasks to identify and concisely present the significant environmental and social impacts:

- Explain and justify the methods used to predict potential impacts of the project on the environment, and on interactions among the project components.
- Nominate and classify issues that are potentially important in the assessment of impacts and for decision-making in relation to the project.
- Identify potential project impacts by conducting an impact analysis on the physical, biological, land-use and socio-economic environments, and the interactions among them including - erosion and sedimentation; impacts to aquatic ecosystem and habitats, impacts to terrestrial habitats; noise; traffic; community health and safety, any livelihood impacts, general public safety issues (employment opportunities; livelihoods; labour force participation) etc .
- Evaluate the impact significance of the project components and activities on the environment and society
- Establish the criteria on which the assessment of the impacts will be based on
- Develop a matrix as a means to present assessment of the impacts graphically, and specify and discuss positive or negative impacts, direct or indirect impacts, reversible or irreversible impacts, short-term and long-term, and cumulative avoidable impacts on the environment and society

(7) Develop an Environmental and Social Management Plan

After the evaluation of impacts, the Consultant will establish strategies to reduce or eliminate potentially negative outcomes. This includes avoiding negative impacts where possible, and employing mitigation measures for those that are unavoidable. Issues related to the project location, equipment, and surveys conducted previously will be categorized according to how critical the impact is. These strategies will be formulated in an Environmental and Social Management Plan (ESMP) This process entails:

- Detailing the management measures, roles, and responsibilities for implementation, supervision, and cost
- Indicating parameters to be monitored, their location, frequency of monitoring, roles and responsibilities and cost
- Assessing the ability of the implementing agencies to implement the proposed environmental management and monitoring plan
- Developing the institutional arrangement and capacity building programs necessary to ensure successful implementation

(8) Conduct the Second Public Consultation Meetings to Involve the Stakeholders of the Project in the ESIA

- Select appropriate venue for public consultation meeting.
- Manage logistics of the meetings, including participants and thorough documentation of the event.
- In addition to making a public announcement, invite stakeholders of the project, and potential interested
- Invited stakeholders should have balanced representation of women, NGOs, local community groups, youth and other vulnerable groups (e.g. handicapped, elders….etc.)
- Provide attendees with a summary of the project, and briefing on the impacts and analyses developed in non-technical local language.
- Document stakeholders' concerns and issues raised. The Consultant will document all the consultations including the issues raised and actions planned/taken and justifications for no action wherever relevant.
- Assess the public's perception of and reaction to the proposed project.
- Document how the public engagement was used in the identification of the issues, and how it affected the project.

The final version of the ESIA report will incorporate the comments raised in the second public consultation meeting. The final report will discuss how the public concerns that are raised during different stages of consultations have been considered and addressed in the project.

Proposed Annotated Table of Contents of ESIA

Executive Summary – Non-Technical Summary

An executive summary will be prepared to be used as a stand-alone document in a manner that can be accessible to non-technical readers.

Chapter 1 – Introduction and Project Description

The section will include the following:

- Statement for the project need and objectives it is intended to meet.
- A description of the project including technical design pre-, during, and post project activities using maps at appropriate scale when necessary.
- Summary of the general scope of ESIA

Chapter 2 – Policy, Legal and Administrative Framework `

This section will provide an overview of the pertinent regulations and existing codes of practice and standards. The section will include the following:

- Relevant national environmental policy, legal and administrative issues
- Regional development planning
- Permits required to proceed with project activities.
- International and national environmental standards and guidelines
- Gaps analysis between relevant national regulations and the WB ESSs

Chapter 3 – Description of the Environment and Social Context

This section will assemble and evaluate data on the relevant environmental and social characteristics of the project areas. It will include information on any changes anticipated before the project commences, including **physical**, **biological,** and **socio-cultural** environments. The presented data will be relevant and commensurate with the project. Information of the existing physical, biological, land-use and socio-economic environment will be included.

Chapter 4 – Environmental and Social Impact Assessment

A description of the positive and negative environmental impacts will be mentioned in this section during project activities. This section will also discuss the positive and negative social impacts that

the project might have on communities in general and on various sub-groups (women and men, the poor, youth) in particular.

Chapter 5 – Analysis of Alternatives

This section will describe alternatives that were examined in the course of developing the proposed project and identify other alternatives, which would achieve the same objectives. The concept of alternatives extends to siting, design, technology selection, construction techniques and phasing, and operation and maintenance procedures. It will compare alternatives in terms of potential environmental and social impacts and suitability under local conditions.

Chapter 6 – Mitigation of Environmental and Social Impacts

Identifies mitigation measures and significant residual negative impacts that cannot be mitigated and to the extent possible assess the acceptability of those residual negative impacts.
Appendices as needed.

Proposed Annotated Table of Contents of ESMP

Based on the impacts identified in the ESIA, the ESMP should describe the mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social risks and impacts. The ESMP should also include the measures and actions needed to implement these measures.
The ESMP should encompass the following:

1. Objectives of the ESMP
2. Project Description

This summarizes the project and provides maps of sufficient detail, showing the project site and the area that may be affected by the project's direct and indirect impacts.

3. Mitigation Measures

This should identify and summarize all anticipated adverse environmental and social impacts and describe with technical details each mitigation measure, including the type of impact to which it

relates and the conditions under which it is required (e.g., continuously or in the event of contingencies), together with design drawings and calculations, equipment descriptions, and operating procedures, as appropriate. It should also estimate any potential environmental and social impacts of these measures.

4. Public Consultation and Stakeholder Engagement

This section should provide:

- A summary of consultations undertaken during subproject preparation
- A description of how the stakeholder engagement will take place during subproject implementation.
- How the GRM is implemented in the local context i.e. how the Project GRM will be promoted

5. Monitoring Plan

This should identify the monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed in the ESIA and the mitigation measures described. This is meant to provide (a) a specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; and (b) monitoring and reporting procedures to (i) ensure early detection of conditions that necessitate particular mitigation measures, and (ii) furnish information on the progress and results of mitigation.

6. Capacity Development and Trainings

This should provide a specific description of institutional arrangements, identifying which party is responsible for carrying out the mitigation and monitoring measures (e.g., for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training).

7. Implementation Schedule and Cost Estimates

For all three aspects (mitigation, monitoring, and capacity development), the ESMP should include (a) an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and (b) the capital

and recurrent cost estimates and sources of funds for implementing the ESMP. These figures are also integrated into the total project cost tables.

8. Integration of ESMP with Project

The individual mitigation and monitoring measures and actions and the institutional responsibilities relating to each, and the costs of these should be integrated into the project's overall planning, design, budget, and implementation.

9. Legal requirements and bidding/contract documents

The ESMP should be incorporated in all legal documents to enforce compliance by all contractors participating in the project. The ESMP should be summarized and incorporated in the bidding and contract documents.

Annexes

Any site-specific plan required.

The ESMP will be presented in a tabular format as follows:

A. Mitigation

Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility of mitigation	Responsibility of direct supervision	Estimated Cost
Construction Phase					
Operational Phase					

B. Monitoring

Project Activity	Impact	Monitoring indicators	Responsibility	Frequency/ Duration	Location	Methods	Estimated Cost
Construction phase							
Operational Phase							