REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No. 166
Ground Subsidence & Unstable Slope near culvert No. 151/11 of Peradeniya - Badulla - Chenkaladi Hwy (A5)

Badulla District

November 2024

Prepared for:

AIIB ASIAN INFRASTRUCTURE INVESTMENT BANK

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Abbreviations

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
DFC	Department of Forest Conservation
DS	Divisional Secretary
DWLC	Department of Wild Life Conservation
EH & S	Environmental Health & Social
E&SU of PMU	Environmental & Social Unit of Project Management Unit
ESMF	Environmental and Social Management Framework
SSE&SMP	Site Specific Environmental and Social Management Plan
ESMP	Environmental and Social Management Plan
GN	Grama Niladhari
GOSL	Government of Sri Lanka
GSMB	Geological Surveys & Mines Bureau
NBRO	National Building Research Organisation
PRDA	Provincial Road Development Authority
RHS	Right Hand Side
LHS	Left Hand Side

1. Introduction

1.1 Project overview

The Government of Sri Lanka has received a loan from the Asian Infrastructure Investment Bank (AIIB) for mitigating/rectifying unstable slopes in high-risk areas especially in 13 districts of 06 provinces of the country under the Reduction of Landslide Vulnerability by Mitigation Measures Project (RLVMMP). The project requires to be implemented in accordance with environmental and social safeguards and mandates of the AIIB and that of Sri Lanka. Considering the nature of project actions and its implementation, an Environmental and Social Management Framework (ESMF) has been prepared as required by the AIIB environmental and social safeguard policy.

The purpose of the Environmental and Social Management Framework (ESMF) is to provide a guide for the application of AIIB safeguards and national environmental and social mandates during the implementation of project actions. The project implementing agency (NBRO) is expected to ensure implementation of environmental and social management plans prepared under the ESMF during all phases of project implementation so that the impacts on the environment and community are minimal.

During the scoping exercise, it was revealed that the environmental & social setting and health & safety conditions are more site specific, and require to be addressed specific to site conditions. Therefore, the ESMF has recommended site specific environmental and social assessments followed by Site Specific Environmental and Social Management Plans (SSE&SMP) for each site. The SSE&SMP gives planning, design, construction and operation phase environmental, social, and health & safety management measures to be considered in the project Implementation.

This is the site-specific environmental and social management plan for **Ground subsidence & unstable slope near culvert No. 151/11 of Peradeniya - Badulla - Chenkaladi Hwy (A5)** landslide mitigation site. This plan has been prepared by an in-depth environmental and social assessment to:

i. Identify sensitive environmental and social elements in the project influence area
ii. Identify significant environmental and social impacts due to project actions
iii. Propose mitigation measures
iv. Decide appropriate environmental and social monitoring requirements specific to this project
v. Study relevant environmental regulations and procedures to be followed during project implementation specific to the site

1.2 Intended users

The document provides an in-depth insight into site-specific environmental and social issues associated with the proposed project and the mitigation measures and intends to be used by the landslide mitigation design team, the PMU and the contractor in the implementation of the Environmental and Social Management component of the project. The SSE&SMP is published in on the project website (https://rlvmmp.lk/) and can be viewed by wide range of interested parties (public, stakeholder organizations) can be utilized by the contractors for the project and will form the basis of site-specific management plans that will be prepared by the contractors as part of their Site Specific Environmental and Social Management Action Plans (SSE-SMAP) prior to commencing works.

2. Description of the project

2.1 Name of the project

Rectification of Site No. 166, Badulla District, for **Ground subsidence & unstable slope near culvert No. 151/11 of Peradeniya - Badulla - Chenkaladi Hwy (A5) between Passara town and Lunugala**

2.2 Location details

The proposed mitigation site falls under Maduwatta GN division of Lunugala DS division, Badulla District, Uva Province.
GPS references of the site– 6.9732875°N and 81.19027499°E

Nearest town and accessibility to the site – Passara

Passara town is about 10 km from the site. The site can be accessed via Peradeniya - Badulla - Chenkaladi Hwy (A5). (*Ref. fig. 1*)

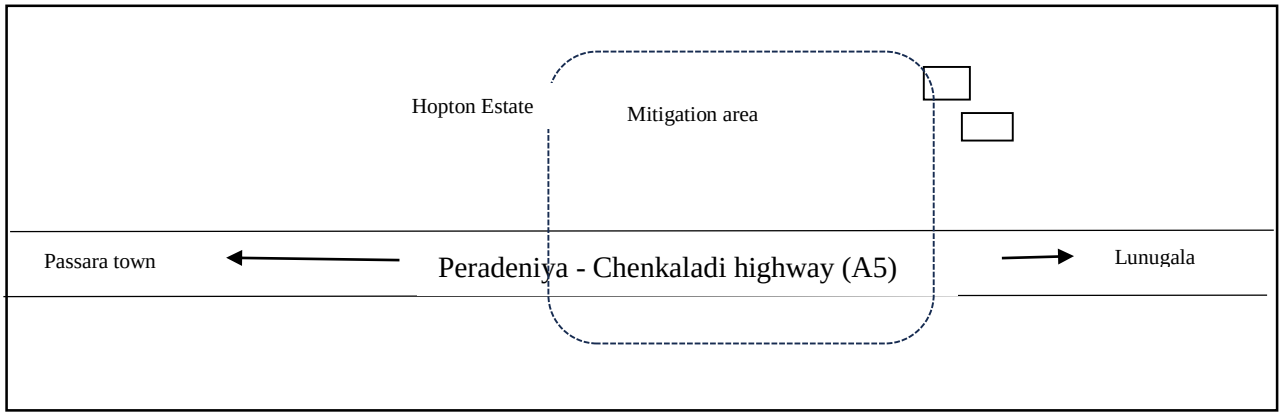

Figure 1:Road map showing the accessibility to the site

2.3 Topography and land ownership

The proposed mitigation site is located within a tea plantation land and road reservation area. The elevation of the area is 750 m. The extent of site proposed to be mitigated is about 3132m^2. The unstable area is located in a sloppy terrain where the natural slope has been cut for the road construction. The land ownership of the plantation land is Hopton Estate and the road reservation is owned by Road Development Authority. A natural stream called "Miloya" is flowing the at the downslope to the road.
Refer figure 2, 3; Google and drone images of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure.

Figure 2: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure

Figure 3: Drone image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure

2.4 Meteorology of the area

Annual average rainfall – 400.3 mm
Annual average temperature – 24.12 ºC
(Source: Website of Divisional Secretariat –Lunugala)

3. Landslide hazard incident details

3.1 Account of incident

According to Mrs. M.F.F. Fazna, Grama Niladhari of Maduwatta division, ground subsidence with instability developed in 2021 in the upslope section near culvert No. 151/11 with the heavy rainfall, and the road was kept closed for about 4 days of the period due to the risk. Tensional cracks emerged on the road near culvert No. 151/11. During the incident, the damaged road obstructed the traffic fleet, and community services (schools, community centers, health care, religious places etc.).

A large curve-shaped tensional crack was developed at the upslope tea estate. The area has a high potential for slope failure. (*Refer to Fig 3: cross sections, land use and of the location).*

3.2 Effects and consequences of landslide

A part of the road was damaged due to the ground subsidence and tensional cracks formation. Currently, due to the road instability, only one lane is in operation causing difficulty in traffic movement.

3.3 Description of any remedial measures already undertaken to reduce the potential risk

According to the request of the Lunugala Divisional Secretary, a preliminary field study was conducted by the Scientists of the National Building Research Organization on 09.01.2024. Accordingly, considering the risk situation and the emergency at the place, recommendations for emergency response were issued on 15.02.2024 through NBRO report Ref. NBRO/LRRMD-BDL/BDU/LUNUGA/LI/24/0071/BD/LGD/L1/2024/00014. The preliminary inspection report has

recommended several short-term and long-term mitigatory measures. In the upslope area, two high-risk houses were identified.

3.4 Evacuations

No, evacuations have been undertaken to reduce the potential risk.

3.5 Resettlement (progress)

No resettlement or relocation is proposed for this site.

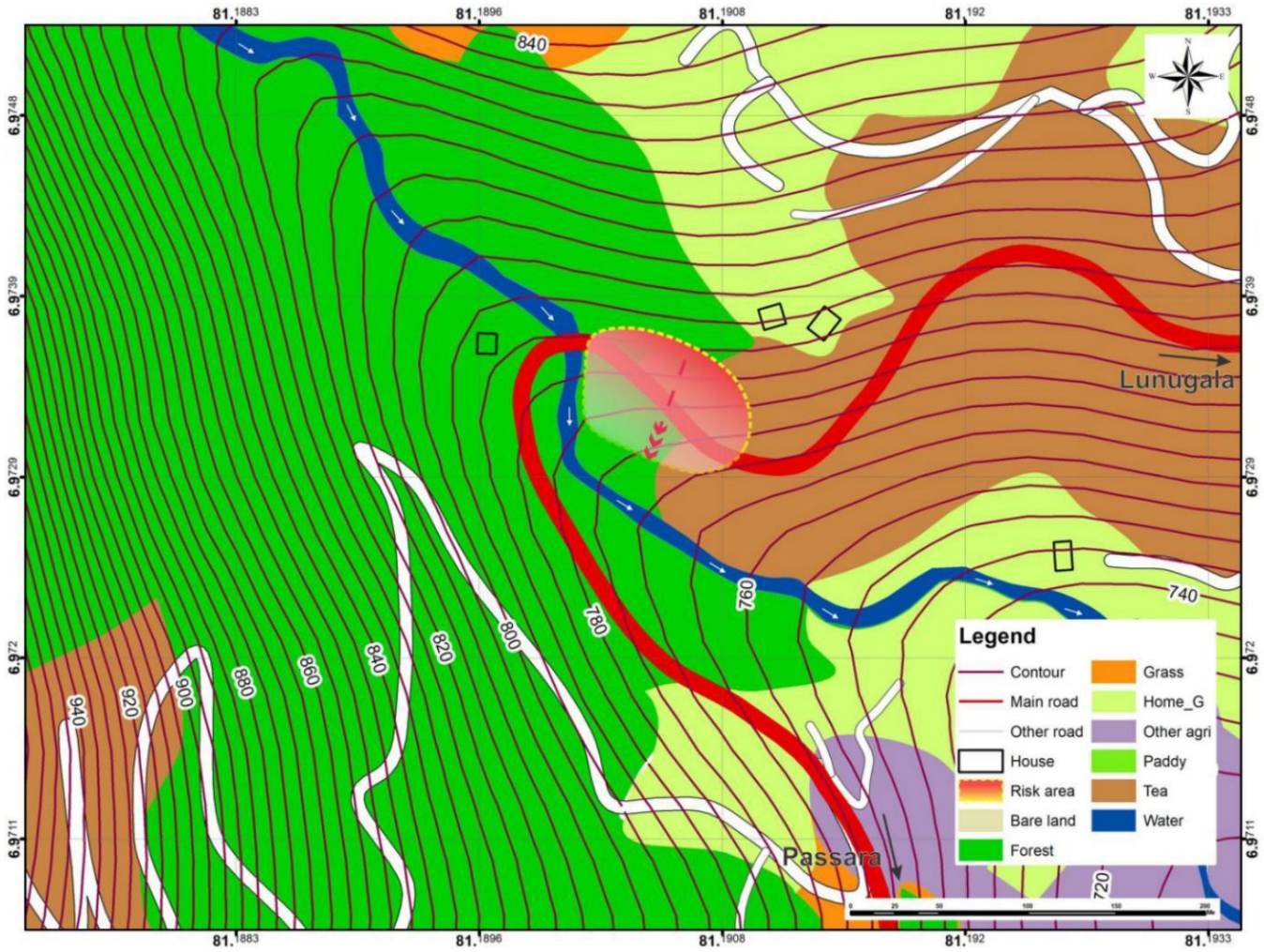

Figure 4: Google image, cross sections, land use and risk elements of the location

4. Description of the area of the landslide/slope failure and areas adjacent to the landslide and current level of risk

4.1 Area of the landslide

The ground subsidence and slope instability area is located in an area where the slope had been cut to provide space to build the road near culvert No. 151/11 of Passara Lunugala Road. The upslope and down slope area are dominated by the tea plantation owned by the Hopton Estate. Grevillea robusta (Common name: Silver oak, Sinhala name: Sabukku) plants are grown occasionally in the tea plantation for shading. Miloya stream flows at the downslope area of the main road. The affected road; Passara - Lunugala is the only main access road to the Lunugala and Passara areas which provides the facilities and services to the people. Community water supply lines are running through the unstable area.

4.2 Areas adjacent to the landslide

The surrounding area of the unstable slope section contains mostly tea plantations. Two high-risk and 5 medium-risk houses are located in the upslope area adjacent to the unstable slope. There are tea-cultivated lands in the downslope area owned by the Hopton Estate.

The surrounding area of the unstable slope section contains mostly tea plantations and the area is mountainous with steep slopes. The down slope area is not congested with settlements and few houses are located in the upslope area adjacent to the slope failure and the stream flowing at the downslope. Community water supply lines are running through the unstable area.

4.3 Current level of risk

This ground subsidence and tensional cracks will be activated again with the upcoming rains and the road will be blocked. During the rainy season, it poses a high risk to commuters and vehicle transportation on the road due to the potential risk of slope failure. The unstable slope section of the tea plantation imposes a high risk on the workers of the tea estate.

If the site is not rectified to prevent future failures, the slope failure with soil masses will disturb all functions of vehicle transportation between Bibila and Passara. The commuters, pedestrians, pilgrims, tourists, workers of the neighboring tea plantations, and their livelihood activities would be at risk due to this unstable slope section. Also, the tea plucking activities and the collecting tea leaves would be difficult and risk due the unstable slope. The obstruction of accessibility may pose a significant impact on lifeline facilities, services, and related economic activities including transactions.

5. Description of the works envisaged under the project

Based on preliminary investigations, NBRO has carried out detailed investigations and designed suitable rectification measures to minimize the risk posed by this unstable slope section to ensure the safety of the commuters, the continued and uninterrupted function of this main road. The proposed activities include

- Drainage improvement – surface and subsurface drainage work (Upslope and downslope area)
- Protecting the slope with soil nailing (down slope area)

6. Brief description on the surrounding environment with special reference to sensitive elements that may be affected by the project actions

The elements and services at risk during the project implementation are;

i. Passara to Lunugala road near culvert No. 151/11
ii. Commuters and pedestrians
iii. Upslope and downslope houses and residents
iv. Miloya stream flowing at the downslope

v. Tea cultivation and related activities in the area
vi. Community water supply line
vii. Current services, economic and tourism activities of the area

(Ref. Fig.5 Sensitive elements that may be affected by the project actions

Figure 5a: Upslope tea plantation

Figure 5b: Downslope area

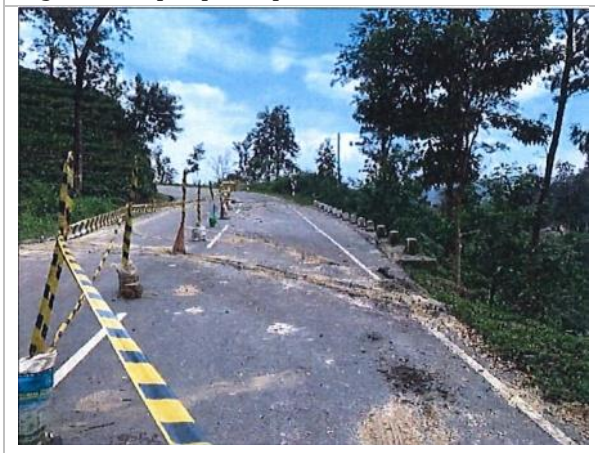

Figure 5c: Damaged road with tensional cracks

Figure 5d: Miloya stream flowing at the downslope

Figure 5e: Culvert and bridge in the road

Figure 5f: Very high risk from upslope trees to the A5 main road

Figure 5g: Two risk houses identified in the Upslope area

Figure 5h: 5 Medium risk houses identified in the Upslope area

Figure 5: Sensitive elements that may be affected by the project actions

7. Identification of social and environmental impacts and risks related to the works

7.1 Positive impacts

- The objective of this project is to ensure that further occurrence of ground subsidence to be prevented at an acceptable level The remediation may secure the cost of road rehabilitation from future ground subsidence in the area.
- The 2 lanes can be operated
- Tourism activities and other lifeline activities of people in the area will benefit largely from* this mitigation.
- Miloya stream and community water supply line will be prevented from debris depositions of future slope failures.
- Tea cultivation and harvesting activities, the income of plantation of Hopton Estate, and the workers will be benefited
- Risk houses – The 2 high-risk and 5 medium risk houses in the upslope area will be safe with the mitigation

7.2 Negative impacts

The mitigation works are generally confined to already failed land areas. Therefore, negative impacts are much localized and also limited to the construction period.

Table 1: Negative impacts and their level of significance

Impacts during the construction period	**Level of Significance**
7.2.1 Hydrological and water quality impacts	
7.2.1.1 Impacts of the drainage pattern of the area Disruption to existing surface and sub-surface drainage patterns in the area is envisaged with the project implementation. The mitigation works on this site will focus on drainage improvement. Therefore, during the rainy season heavy flow of water is expected to be generated and accumulated between the road and the slope. The water inundation of the existing drainage may be expected. An increase of water through the unstable slope may intensify the risk of slope failures of the unstable section.	**Highly Significant**

7.2.1.2 Water pollution and impacts on surface water quality During the slope excavation, the removal of debris can generate high sediment-laden runoff there could be a possibility that contaminated runoff may pollute the water within the stream flowing downslope to the affected area. Improper disposal of oils and other harmful substances/contaminants from machinery, leakages from temporary storage tanks, solid waste, and wastewater disposal/dumping could occur causing adverse impacts on the quality of the water. However, during the rainy season, the rainwater running through the disturbed slope tends to pick up sediment, oil and other pollutants generated during construction can contaminate the water of the stream.	**Highly Significant**
7.2.1.3 Erosional impacts and stream/ reservoir bed alterations The project activities will open the slope for surface erosion during the construction phase. The existing surface and sub-surface drainage pattern in the area will be disrupted during the construction phase. Therefore, the erosional impacts are highly significant due to Miloya stream is located in close proximity to the mitigation area.	**Highly Significant**
7.2.1.4 Open defecation and waterborne infections As the site is located close to a tea plantations, the possibility of open defecation is high. Faecal contamination of the stream or runoff water flow will be expected during construction due to open defecation of the contractor's workforce as the area consists of thick vegetation cover.	**Highly Significant**
7.2.1.5 Impacts on the downstream water uses The construction activities will be carried out on slopes with thick soil overburden consisting of both residual and colluvium soils. Therefore, the slope will be prone to erosion during the land clearing and land reshaping phase. This may increase the sediment load in the stream which at present has clean water, and affect the users at downslope areas.	**Highly Significant**
7.2.1.6 Impacts on groundwater table and groundwater quality Addition or mixing of construction materials including cements, grout materials with sub-surface water flows will cause temporary water quality degradation and accumulation of unwanted substances. During the construction period, the hazardous waste from chemical substances, wastewater from the construction activities and discharge of waste matter from onsite septic systems would cause adverse impacts on the groundwater quality as the water of the downstream may use by the residents. Due to the mitigatory activities carried out in the slope area, the ground water quality will be impacted or there will be a possibility for the ground water table draw down.	**Significant**
7.2.1.7 Impacts on water or wetlands Improper disposal of oils and other harmful substances/contaminants from machinery, leakages from temporary storage tanks, solid waste and wastewater disposal/dumping from workers' sites could occur causing adverse impacts on quality of the water in the stream that may use to fulfill the water requirement of down slope houses.	**Significant**
7.2.2 Environmental Impacts	
7.2.2.1 Noise and vibration impacts Noise and vibration are expected from construction equipment. The people in high risk houses, the pedestrians and commuters on roads will also have an effect from noise and vibration. The commuters on the road will be exposed to high noise during heavy noise generating activities, such as operating loading and unloading of materials, movement of machinery in addition to above mentioned construction works.	**Significant**

7.2.2.2 Air pollution impacts Construction activities that contribute to air pollution include: land clearing, operation of diesel engines, demolition and burning. Operating vehicles at high speed under dry weather conditions can increase such pollution. Improper handling and transferring of materials can also generate dust. Improper storage of materials can potentially generate dust if not properly covered. During construction, it generates high levels of dust typically from concrete, cement, wood, stone, and silica. The road is used heavily for vehicles moving (buses, bicycles, lorries, trucks, tippers, three wheels). The air pollution may have significant impact on the commuters and pedestrians. The air pollution impacts from the construction are locally significant during dry periods for commuters and workers of tea plantation.	**Highly Significant**
7.2.2.3 Solid waste disposal issues Haphazard disposal of solid waste; various types of waste such as litter, food waste, construction waste will be generated and may store or dispose on site. The littering and hap hazard storage and disposal of solid waste in and around the site will create inconveniences to the commuters, pedestrians, workers of the tea plantation workers. It can block the drainage to make breeding grounds for water borne diseases. Waste can pollute the soil, and leave various environmental impacts if proper disposal mechanism is not in place during the construction period.	**Highly Significant**
7.2.2.4 Explosive hazards and hazardous materials Since the affected area has rock boulders, explosives may be used if the rock blasting is envisaged. This may pose a risk due to unsafe use. As these operations are to be done on affected slopes the risk of improper use of explosive and accidents from rock fragments are highly significant.	**Significant**
7.2.3 Biological /Ecological Impacts	
7.2.3.1 Effects of Important Wildlife Habitats There are no forested/ wild-life reservation areas within the project influence area with high biodiversity.	Insignificant
7.2.3.2 Effects on Fauna & Flora Majority of the trees found in the area are not endemic, threatened and identified in the red list of IUCN. A few tea bushes in the upslope area of Hopton Estate needed to be uprooted for drainage works and a several tea bushes at the downslope also needed to be uprooted for soil nailing and making access for material transportation.	**Highly significant**
7.2.4 Social and Economic Impacts	
7.2.4.1 Impacts on agriculture within the area to be remedied/ immediately to the site There is a tea cultivation immediately adjacent to unstable slope area. During the construction period, this land use pattern may be affected by disposal of spoil and debris or parking machinery and their oil leakages.	**Significant**
7.2.4.2 Cracks in the building due to vibration impacts The unstable land is located adjacent to a road. The road is running through the site. Vibrations can create cracks on the road too. The upslope and down slope house are located within the close proximity of the proposed mitigation site. Therefore, vibration impact on the upslope and down slope house are highly significant. During the construction heavy machinery will be used and the vibration can widen the cracks and may create new ones in the buildings.	**Significant**

7.2.4.3 Loosing access to land and future development activities The land where the project activities are envisaged belongs to Hopton Estate and the road reservation of RDA and tthe mitigation works will be concentrated on both upslope and down slope of the road. This area is a mainly tea cultivated land, there will be some impacts to the land owners with regard to loosing access to the land (during construction) and loss to valuable use of the tea cultivation. In contrary, remediation works in the upslope will increase the stability of the boundary and protect the land from future failures.	**Significant**
7.2.4.4 Impacts on livelihood/ business and income activities The tea cultivation immediately adjacent to the unstable land (both upslope and downslope of the road) would be affected during the construction period. The collecting and transportation to factories would be interrupted during construction phase. This would affect the income of the community.	**Significant**
7.2.4.5 Impacts on service provision (water supply, sewage, electricity) The community water supply lines running through the mitigation area will be impacted. There are no sewage and electricity lines to be impacted by the construction period.	**Significant**
7.2.4.6 Effect due to loss of infrastructure and safety During construction phase the main road from Passara to Lunugala road will be obstructed by frequently moving machinery, loaders, trucks etc. as the access road is very narrow. Therefore, most of the heavy machinery, trucks and loaders can obstruct the pedestrian passage and cause traffic during peak times.	**Significant**
7.2.4.7 Work camps and lay-down site requirements The camps site will be selected in the neighbourhood of community. If proper camp management is not in place, it may result several labour issues, social issues with community, conflicts for shared resources with the community, nuisances, and management of waste etc. If temporary camps are built in the close proximity of the site, management of solid waste and sewage will be an issue.	**Significant**
7.2.4.8 Relations between workers and staff/ people living in the vicinity of the site and possibility of disputes The construction workers at this site will be from different social backgrounds and from different geographical areas often under poverty. Usually, they are with poor educational and social background. Such communities may have a wide range of social issues to cause dis-stress on the neighbouring community and the workers of the project. Although the workers who would engage in such issues will be rare, even few possibilities cannot be ignored.	**Highly Significant**
7.2.4.9 Workers safety during construction The workers may be exposed to risk from falling. Fatal injuries may occur if the slope fails. The risk of slope failure is aggravated during the rainy season. This risk is highly significant. Risk of hazard from vehicle and construction machinery accidents is highly significant at this site. Contractor may engage under age workers (children) for construction work, which is risky and can results serious accidents and injuries.	**Highly Significant**
7.2.4.10 Safety to the public from construction activities: High risk for commuters During construction phase the road will be obstructed by the frequently moving machinery, loaders, trucks etc. As most of the mitigation works are to be carried out in limited space on slopes the heavy machinery, the trucks and loaders etc. can obstruct the commuter /pedestrian passage and may pose high risk on their life. There is a risk of falling loose rocks on the road during excavations and removal of rocks posing risk on the commuters. The same risk at a high level will be there for the workers of the tea estate located in upslope and down slope as they will be exposed to a longer duration to this risk during the construction phase. Therefore, the risk on them is highly significant.	**Highly Significant**

7.2.4.11 Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) The traffic due to full/partial road closure may obstruct the smooth flow of vehicles during the week days, in office hours, school times, on holy days. This will cause nuisance to pedestrians and commuters	**Significant**
7.2.4.12 Areas used for businesses, agriculture or other within the area to be remediated There is tea cultivation is done in both up and down slope area immediately adjacent to the site. For the construction activities a few tea bushes at the upslope and several tea bushes at the downslope near the culvert needed to be uprooted and this will have an impact on the income of Hopton estate. However, considering the total tea estate area the effect will be minimal.	**Less Significant**
7.2.4.13 Areas used for businesses, agriculture or other immediately adjacent to the site There is tea cultivation in the both up and down slope area immediately adjacent to the site owned by the Hopton estate. The machinery movement and material transportation would have an impact.	**significant**
7.2.4.14 Need for people to enter or cross the site Excavation machinery, loaders, trucks etc. will be used in the area used to access in to the unstable slope area. There is no special need for commuters and neighbouring community to enter the site for other purposes. Construction may use materials such as metal aggregates, steel etc. which can be injurious under improper storage and handling. However, unauthorized entry of ordinary people may occur due to intentional or unintentional purposes and they may be at risk due to operating machinery, vehicles, electricity, and may be blasting materials.	**Highly Significant**

8. Site Specific Risk Analysis

Table 2: Site specific risk analysis

Risk	Affected group	Risk level
1. Facing accidents when working close to the road (as there is a large bend close to the site)	Workers	Very high
2. Transporting materials and machinery	Workers	Very high
3. Throw out disposals (litter, bottles, and food) to the construction site from the commuters.	Workers	Very high
4. Facing accidents during constructions at night time	Workers	Very high
5. Accidents from the construction activities and materials placed close to the road	Commuters	Very high
6. Injuries due to rock particles due to explosions/ blasting	Workers Commuters	Very High
7. Rock fall from the unstable area	Workers Commuters	High
8. Work with electrified supply lines	Workers	High
9. Site Working – Working in poor visibility	Workers Commuters	High
10. Lone Working	Workers	High
11. Emergency evacuation	Workers	High

12. Extreme weather conditions (wind, rain etc.)	Workers	High

9. Significant Environmental and Social Impacts

Environmental, social impacts or risks that will require special attention on the part of NBRO.

9.1 Priority Health and Safety Issues. Specific H&S concerns that require measures that go beyond the standard contractual requirements for contractors

The health and safety issues pertinent to this site is significant as the workers have to work on a unstable slope with a risk of falling. Such common E & HS issues have been discussed in the **ESMF**. Worker safety requirement in the construction site is more detailed under 2003 5: Safety equipment and clothing in the section 2003: Working conditions and community health and safety in the Bidding document.

9.2 Child labour & forced labour

Child labor & Forced labor is detailed under 2003.3 under section 2003: Working conditions and community health and safety in the Bidding document.

10. Environmental Social Management Plan (ESMP)

Measures to manage and or mitigate the impacts and risk. Especially the significant impacts and risks identified in sections 7 & 8. This section will include the specific recommendations and requirements of the ESMP for design stage, construction phase and maintenance operation phase.

10.1 Resettlement action plan

There is no project-based resettlement in this site.

10.2Evacuation of people

Project based evacuations are not required for this site.

10.3Procedure for removal of damaged structures, facilities infrastructure (consent from owners to remove the articles)

This risk may not be triggered in this site.

10.4 Requirement for compensation for loss of property /uses due to project actions

This risk may not be triggered in this site.

10.5 Public awareness and education- needed for following areas

i. Programs to inform and educate people in the vicinity and the workers of the plantation estate about the risks posed by unstable land section
ii. Requirement for special awareness for commuters and the people passing through the area using the road with potentially high-risk during construction phase and early warning.

10.6 Design based Environmental/ Social Management considerations

The site is located in an aesthetically beautiful, environmentally sensitive natural environment in the rural setup. Hence, following environmentally and socially significant design considerations are recommended.

Table 3: Design stage Environmental & Social considerations

Design feature	Recommended level of consideration for this site
i. Natural resource management and resource optimized designs Project specific designs should be considered to eliminate mass clearing of vegetation and minimum number of removals of grown tree species. Sufficient emphasis should be made to consider conservation of trees if important tree species are found.	Very High
ii. Site Planning During site planning it is necessary to be cautious on possible re-activation of landslide with rock fall. Also, the site is located in a very limited space of a slope with a road. The vehicle parking sites, material storage and temporary shelters etc. should not be installed in the danger zones of the slides. It is very necessary to keep trained flagman or safety officer during the construction period and proper communication between contractor's workforce and the other responsible officials should be maintained.	Very High
iii. Habitat connectivity and animal trails If large fractions of vegetation are required to be cleared in ecologically fragile habitats as for permanent structures or for access, or if deep drains etc. are to be made the designs should include habitat connectivity features, animal trails and vegetation strips and etc. even if the impacts are localized.	High
iv. Conservation of water resources If involves extraction of water both surface and sub-surface. The water extracted is in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by wild fauna as well as the neighboring communities for bathing and other domestic purposes .	High
v. Interruption to water supplies If the water in the mitigated slope is used as a source for individual or community water supply, the chance the water source can be affected by the mitigation work is high due to water table draw down. Also, there is a there is a stream flowing through the site providing water for the down slope area. In such instances the design should include alternative source of water for the community (temporary/or permanent).	High
vi. Aesthetically compatible design considerations The designs in aesthetically sensitive environments should consider structures that blend with natural environment to keep the visual pollution to minimum. Greening could be used in construction activities to develop the area as a tourist attraction. Service of landscape architect may be important for the design of suitable mitigation structures.	Very High for upslope area
vii. Consideration of green environmental features As many of the mitigatory works are carried out in ecologically sensitive habitats, it is recommended to consider green environmental designs as much as possible in the designs e.g.: use of local vegetation species for erosion control, combination of plants to sustain species diversity in the environment, avoiding inclusion of potentially invasive species & etc.	Very High for upslope area
viii. Conservation of social and Cultural features The local cultures and heritages are strengthened by their close connections to the natural environment that sustains them. Therefore, the project actions should be carried out considering local culture and social aspects, providing opportunities to reinforce them during the project actions.	Low

ix. Workers/ commuters and community safety Due to the close proximity to the roads people may face accidents specially the workforce during the construction phase. Unauthorized entry and ignorance may cause severe accidents around the site. Activation of slides or ground subsidence may occur during construction phase and may pose threat to workers of RDA, passengers and commuters. Therefore, design-based safety consideration such as beams, safety nets etc. should be considered.	Very high
x. Erosion control structures In drainage management, water is extracted and conveyed to nearby stream often through culverts. During rainy season the flow in these drainage structures can be significantly high and this may cause stream bed erosion. Hence the design should adequately consider flow speed breakers to reduce erosive flows entering natural streams. This should be an inclusive part of the design if there are streams and culverts in the proximity of the mitigation site.	High
xi. Low post maintenance and operation designs The mitigation should consider passive techniques such as gravity drains for drainage management. Correct pipe diameters, pore diameters and laying angles should be considered to avoid clogging of drains. Low maintenance structures and designs such as designs to withstand erosive forces, sediment trapping systems etch should be considered if drain water is expected be directed to natural streams. The materials used for structures and should be chosen carefully so as to withstand weather conditions with high durability. Designs should specially consider corrosion prevention techniques if steel structures are used.	Very High

10.7 Mitigation of impacts during the construction phase

10.7.1 Construction contractors' requirement to comply with environmental and social management during the construction phase

Measures to manage and to mitigate the environmental and social impacts are generally common to all landslide mitigation sites. Such impacts are largely attributed to activities in the construction phase. The mitigation of impacts therefore becomes an obligation of construction contractor. NBRO has prepared a comprehensive document on "***contractors' requirement to comply with Environmental and Social Health and Safety (ES & HS) management during the construction phase"*** to be included in construction contractors' bid document. The main sections are summarized below (Table 4) indicating the degree of relevancy for this site. For details ESMP for construction contractors should be referred.

Table 4: Contractor requirement to comply with ES & HS

Reference No. as per construction contractor's obligation to ESMP	Item	Relevant to the project
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Highly Relevant (road reservation)
2002.2 2)	Noise and Vibration	Highly relevant (commuters, pedestrians)
2002.2 3)	Cracks and damages to the buildings	Relevant
2002.2 4)	Disposal of waste	Relevant
2002.2 5)	Disposal of refuse	Highly relevant (road reservation)
2002.2 6)	Dust control	Highly Relevant (commuters, pedestrians)
2002.2 7)	Transport of Construction materials and waste	Relevant
2002.2 8)	Water	Relevant
2002.2 9)	Flora and Fauna	Relevant
2002.2 10)	Physical and cultural resources	Not relevant
2002.2 11)	Soil Erosion	Relevant
2002.2 12)	Soil Contamination	Relevant

2002.2 13)	Borrowing Earth	Relevant
2002.2 14)	Quarry Operations	Not relevant
2002.2 15)	Maintenance vehicles and Machinery	Relevant
2002.2 16)	Disruption to public	Highly relevant (community nearby)
2002.2 17)	Utilities and roadside amenities	Highly relevant (road)
2002.2 18)	Visual environment enhancement	Highly relevant (Aesthetically sensitive road section)
2002-5. Environmental Monitoring	Baseline surveys (air, water, noise, vibration, crack surveys)	Refer site specific monitoring plan
	Surveys during construction (air, water, noise, vibration, crack surveys)	Refer site specific monitoring plan
	Surveys during operation phase	Refer site specific monitoring plan
	Reporting and maintenance of records	Relevant
2003. Working Conditions and Community Health and Safety		
2003.2	Safety organization and communication	Highly relevant (unsafe slope, commuters, heavy machinery)
2003.3	Child Labor and Forced Labor	Relevant
2003.4	Safety reports and notification of accidents	Highly relevant
2003.5	Safety Equipment and Clothing	Highly relevant
2003.6	Safety inspections	Highly relevant
2003.7	First Aid Facilities	Highly relevant
2003.8	Health and safety information and training	Highly relevant
2003.9	Plant equipment and qualified personnel	Relevant

Relevant: *The section is relevant to the site as a common ESMP applicable to any site*
Highly relevant: *The contractor should pay special emphasis in the preparation of environmental method statements to ensure that the relevant ESMP is implemented specific to the site*
Possibly relevant: *This ESMP will be triggered if the site come across with relevant aspect during project implementation*
Not relevant: *The section may not be relevant to this site under disclosed conditions*
Optional: *require to be implement if needed only*
Refer site specific monitoring plan*: Contractor is obliged to carry out monitoring as specified in the site specific monitoring plan*
Reference: Contractors Obligation for implementation of ESMP

10.7.2 Site Specific mitigation

Given below are the site-specific mitigation measures that the project is expected to implement during the construction period.

Table 5: Site specific ES & HS mitigation measures

Mitigation item	Project implementation phase	Responsibility
i. Minimize erosional impacts during construction It is recommended that mitigation works involved with site clearance, slope reshaping, removal of debris etc. are avoided during rainy season. Therefore, it is imperative that site works in upslope mitigation are carried out in the dry season and avoid such activities on upslope area in the wet season as much as possible. This should be considered in project planning stage. Silt traps should be introduced to cut down sediment laden runoff.	Site preparation & construction	Construction Contractor
ii. Invasive species Should be avoided in using vegetative erosion control structures. Native plants in the local environment should be chosen for vegetative control. The species used for vegetative control measures need approval from the Department of Wildlife Conservation & Department of Forest.	Construction	Construction Contractor

iii. Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) A good traffic control should be implemented in the construction stage. As there is a bend on the road adjacent to the site proper road safety measures should be included with warning signs and permanent trained watchmen, luminous sign boards indicating slope instability risk and road obstruction signs, night lamps etc. are strongly recommended at this site.	Construction	Construction Contractor and
iv. Priority Health and Safety Issues As the workers in the site have to work in high risk conditions, it is imperative to implement recommendations given in section 2003 of contractors' obligation on ESMP under "working conditions and community health and safety". These recommendations should be followed carefully in a proper organization and safety monitoring system. i. Prepare a special Occupational Health and Safety Management Plan prior to commencement of construction activities ii. A good warning system and full time watchmen is highly recommended for this site for both worker and commuter safety. iii. Safety barriers and safety nets should be installed at places of risk to protect workers and commuters from boulder falling risk Adoption of standard worker safety methods iv. Provision of personal protective equipment (PPE) such as safety boots, helmets, protective clothing goggle etc. v. Provision of training and awareness programs to employees vi. Conducting hazard analysis and plan/provide adequate mitigation measures for such hazards identified, prior to carrying out major construction activities vii. If the wasp nest is in the vicinity, it is mandatory to use Evacuation Centers for ensure of workers' safety viii. Additionally, work should be discontinued for sufficient time period during rainy period as working on unstable land will be highly risky in the rainy season	Construction	PMU Construction Contractor
ix. Throw out disposals (litter, bottles, and food) to the construction site from the commuters. Put up the safety sign boards prior to the construction site indicating people at work. The commuters should be aware about the construction activities through notices erected before reaching the proposed mitigation site.	Site preparation & construction	Construction Contractor
x. Injuries due to rock particles due to explosions/ blasting Minimize all blasting activities during peak times and making awareness announcements through the blasting period. Establish an emergency accidents preparedness plan for their injuries due to rock particles due to explosions/ blasting.	Construction	Construction Contractor
xi. Minimize erosional impacts during construction It is recommended that mitigation works involved with site clearance, slope reshaping, removal of debris etc. are avoided during rainy season. Therefore, it is imperative that site works in slope mitigation are carried out in the dry season and avoid such activities on slope area in the wet season as much as possible. This should be considered in project planning stage. Silt traps should be introduced to cut down sediment laden runoff.	Site preparation & construction	Construction Contractor

xii. Disposal of construction waste The contractor should pay special attention with respect to disposal of construction waste. This site is located close to a main road in a rural landscape with a pleasing environment. Also, this main road is used by many tourists. Stream is flowing through the site and water seepages are available in the area during rainy season. Therefore, such waste if generated should store properly without getting washed off and dispose according to approved procedures by the PMU. Construction waste should not dispose along the road or into the drainages.	Site preparation & construction	Construction Contractor
xiii. Impact on down slope water users Stream is flowing at the downslope of the unstable slope. The construction activities may pollute the water flowing. It would have a significant impact on the down slope water users.	Site preparation & construction	Construction Contractor
xiv. Onsite sanitary facilities for the workers The contractor should prepare temporary sanitary facilities for the workforce within the site, to mitigate open defecation of the workers.	Site preparation & construction	Construction Contractor
xv. Dust and aerosol control screens Dust particles generated during the construction period can influence the commuters and tourists. The commuters traveling in the Bibila Passara main road specially tourists could be affected from generated dust particles. Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged.	Site preparation & construction	Construction Contractor
xvi. Water for construction Water for construction works should be obtained only from the approved sites.	Construction	Construction Contractor
xvii. Working hours The construction activities should be restricted to day time only. Working after 6.p.m. is not recommended for any reason due to safety issues.	Construction	Construction Contractor
xviii. Impact on service infrastructure Telecommunication, electricity, water lines should be relocated before construction starts as per the approval of PMU.	Construction	Construction Contractor
xix. Need for people to enter or cross the site Possible unauthorized access to the site should be avoided by awareness, warning signs and vigilance by the contractor's full-time watchmen.	Construction	Construction Contractor
xx. During construction good housekeeping should be maintained to minimize visual pollution	Site preparation & construction	Construction Contractor
xxi. Worker's code of conduct Possible disputes between the labor force and the commuters and tourists should be prevented by maintaining the agreed code of conduct by the contractor. Possible disputes between workforce and commuters should be avoided especially when using shared resources such as common bathing and washing places etc.	Construction	Construction Contractor

xxii. Snake bites, toxic insect bite management and emergency management by accidents Proper emergency management system for snake bites and toxic insect bite (include awareness on snake bites, safety shoes while at work, first aid on a snake bite, hospitalization and admission to correct hospital where snake bite management facilities are available) should be introduced. Accidents are common in these kinds of sites. Proper emergency management unit for other accidents (first aids facilities, safety items, hospitalization facilities and transportation facilities) should be maintained for this site.	Construction	Construction Contractor
xxiii. Resettlement action plan There are occupied 2 houses identified as high risk and needing resettlement. If the resettlement is not implemented, a scheme of compensation, in case of damage to structures due to the project should be arranged.	Construction	E & SU of PMU
xxiv.Evacuation Project-based evacuations are required for this site for impacted houses considering the designs and construction methods. A suitable evacuation plan is to be implemented with consultation the Divisional Secretary, Chairman, Pradeshiya Sabha to reduce the impact of people during construction. A scheme of compensation, to cover the rental (monthly payment for tenants during their stay in rental houses) and any other expenses during evacuation due to project should be arranged.	Construction	E & SU of PMU

10.7.3 Monitoring requirements specific to the site

Following monitoring plan is strongly emphasized during the construction phase specific to this site. In addition to this, monitoring procedure indicated in the contractors' obligation to ESMP should also be implemented by construction contractor. The contractor is expected to indicate in the bid the ESMP procedure to be implemented along with relevant proofs of his competency. The cost for ESMP will require to be indicated as a separate pay item. The environmental and social management method statement is expected to be submitted by the selected construction contractor and to be approved by the PMU unit.

Table 6: Environmental and Social monitoring plan; construction phase

Monitoring requirement	**Parameters**	**Frequency**
i. Baseline monitoring	Water quality (Stream)	Once*
	Pre-construction crack survey of the houses in the immediate area	Once*
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality (Stream)	If noticeable water quality impairment due to sediment laden runoff
	Crack survey for the risk buildings	If noticeable displacement is observed during construction **
	Ground vibration	During operation of drilling machinery, boring works, or any works that generate ground vibrations*
	Construction noise	Once a month during heavy noise generation times *
	Air quality particulate matter	Once a month *

iii. Vehicular Emission	All machinery/vehicles operational should have the emission control test certificate as applicable - should be checked by the site ES officer of the consultant
iv. Monitoring agency	* A competent independent monitoring agency with registration of Central Environmental Authority for all parameters except crack surveys **Crack surveys should be conducted by competent agency acceptable to PMU
v. Reporting requirements	**Stream water quality** – Comparison with National Environmental (ambient water quality) regulations, no.01 of 2019 **Pre-construction crack survey of the high-risk buildings**-Professional report **Ground vibration**-as per the interim standards on vibration for the Machinery, Construction activities and Vehicular movements, CEA **Background noise measurement** –Extraordinary Gazette No.924.1, May 23,1996, CEA **Air quality particulate matter-** The National Ambient Air Quality standards stipulated under the Extraordinary Gazette, No. 1562/22 August 15, 2008 -Central Environmental Authority of Sri Lanka.

11. Labour management

Sound worker-management relationships, treating workers in the project fairly and providing safe and healthy working conditions is required. Responsibility is lies with the PMU and the construction contractor.

The Objectives are;

- To promote safety and health at work.
- To promote the fair treatment, nondiscrimination and equal opportunity of project workers.
- To protect project workers, including vulnerable workers such as women, persons with disabilities, children and migrant workers, contracted workers, community workers and primary supply workers, as appropriate.
- To prevent the use of all forms of forced labor and child labor.
- To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national laws.
- To provide project workers with accessible means to raise workplace concerns.

12. Preventive measures for COVID-19 that was issued by Sri Lankan national health authority (this is applicable if Notification on Covid -19 epidemic/ endemic is issued by Health Authorities Sri Lanka)

COVID-19, the novel corona virus infection has not been totally eradicated in the world. Therefore, to prevent/ control of the spread of infection also to prevent panic situations in the event of detecting a suspected case, all contractors are required to develop a COVID-19 Preparedness plan and need implementing in the site as per the "Health and Safety Guidelines for Sri Lankan Construction Sites to be adopted during COVID 19 outbreak" Guidelines given by Construction Industry Development Authority CIDA 29th April 2020.

13. Public and Stakeholder Consultations -the public consultations that have been and/or will be held

13.1 Public Consultations

Mr, S.Prasad and Mr. Bathmanadan Payraj the owners of the risk houses, were consulted during the field visit and made them aware of the mitigation project and the funding mechanism. Both stated that the mitigation works are appreciable and expressed their willingness to the project.

13.2 Stakeholders involved in the consultations any recommendations or agreements reached in the consultations (Refer Annexure II)

Mrs Padmashanthi, plantation family welfare officer of Hopton Estate was informed about the project works. She stated that the mitigation works are appreciable and expressed their willingness to the project.

08. Clearances, no objection, consent and approvals required for the implementation of the project

Table 7: Clearances, no objection, consent and approvals

Requirement / Approval / Institution	Relevance to the project
14.1 Project implementation	
Approval from the District Secretariat	The approvals will be required and the proposals need to be presented at the District Coordinating Committee, to which chief minister and stakeholder agencies in the district will also participate. The Officer of PMU will present the project, disclose the project details and various concerns including environmental and social issues will be discussed at this meeting. The issues arrived will be addressed in the ESMP, the decisions and recommendations taken up at this meeting will be considered in the ESMP.
Approval from the planning committee	The approval from the planning committee of the Lunugala Pradeshiya Sabha.
14.2 Approval from the state lands owners relevant to the project	
Central Environmental Authority	Consent from District Central Environmental Authority is required as Badulla District is under the sensitive area under Soil Conservation Act 25 of 1951.
Department of Forest Department of Wildlife Conservation	As there is no forest reservations and wildlife habitats; Department of Forest and Department of Wildlife Conservation approvals are not needed
Geological Surveys and Mines Bureau	Approval will be obtained for extraction of materials, transportation and disposal of earth, rocks and mineral debris. (If necessary, only).
Lunugala Divisional Secretariat	Approvals from Lunugala Divisional Secretariat will be obtained for the disposal of waste and plant litter.
Ceylon Electricity Board	Approvals from regional office of Ceylon Electricity Board will be required for power supply for site operation.
National Plant Quarantine Service	Approval from Additional Director National Plant Quarantine Service Katunayake for Director General of Agriculture under the Plant Protect Act No. 35 of 1999 Plant or seed if needed for bio–Project Managed slope mitigation shall be imported into Sri Lanka under the authority and in accordance with the conditions, of a plant importation permit issued.
14.3 Consent/ no objection/ legally bound agreement from the private land ownerships	
Land owner (RDA & Hopton Estate)	Signing a legally bound agreement between the land owner and the project implementing authority allowing no-objection to remove the structures, access the land, implement construction works, and engage in long-term maintenance works

The tentative timeline for getting approval is given in the table 8.

Table 8: Tentative timeline for getting approvals

Approvals	Month 1				Month 2			
	W1	W2	W3	W4	W1	W2	W3	W4
Project implementation ***Approval from the District Secretariat*** Submission of application Project briefing Respond to comments Approvals								
Approval from planning committee Submission of application Project briefing Respond to comments Approvals								
Approval from state land owners RDA Submission of application Respond to comments Approvals								
Other approvals GSMB Ministry of Defense (Depends on the requirement)								
Consent/ no objection from the land ownership (Hopton Estate)								

09. Grievance redress mechanism for this site

The PMU ES officer is responsible for establishing the grievance redress mechanism for this site for impact communities. *(Reference: Environmental and Social Management Framework for recommended procedure for establishment of grievance redress mechanism).*

10. Information disclosure

It is the responsibility of the PMU to disclose the ES information to following agencies and organizations by indicated modes as a minimum as given in the following table.

Table 9: Proposed scheme of information disclosure

Information	Proposed agencies	Mode of information disclosure
i. Project plan (site details, design, implementation arrangements)	District CEA, District Secretariat, Divisional secretary, RDA, Other district levels Agencies, NBRO district office, AIIB	Meetings, District coordination committee, submission of relevant report to sign agreements, approvals and consents.
ii. Environmental and Social Management plan	District CEA, AIIB,	Meetings, District Coordination Committee, submission of relevant report to sign agreements, approvals and consents
iii. Monitoring reports (baseline and during construction)	District CEA, AIIB and relevant parties as appropriate	Progress meetings, special meetings, submission of relevant reports
iv. Site inspections for environmental conformance workers health and safety	District CEA, RDA, Divisional secretary, Police, State Land Owners, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate	Written and verbal communications, submission of relevant reports
v. Decisions taken and progress review meetings pertinent to ES matters	District CEA, RDA, Divisional secretary, Police, State Land Owners, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate	Meetings, submission of relevant reports

vi. Grievance redress mechanism	Relevant parties, AIIB	Meetings, written and verbal communications

Table 10: Level of information gathered through consulting institutions

Date	**Institution**	**Person contacted for information**
15/06/2024	Hopton Estate	Mrs Padmashanthi Plantation family welfare officer Hopton Estate
12/11/2024	Grama Niladhari – Maduwatta GN division	Mrs. M.F.F Fazna 070-5510493
12/11/2024	RDA office Badulla	Mr. S.S. Hennayaka Executive engineer 077-5531097

Annexure I: Images of the site condition and the consultation

Consultation with Mrs Padmashanthi, Plantation family welfare officer - Hopton Estate

Consultation with Mr, S. Prasad,owner of a risk house

Consultation with Mrs. M.F.F Fazna, Grama Niladhari – Maduwatta GN division

Consultation with Mr. S.S. Hennayaka, Executive engineer, RDA office Badulla

Annexure II: Report on the Stakeholder Consultation: Badulla District

Institution	Name and designation of the contact officer	Concerns raised
Central Environmental Authority	Provincial Director, Central Environmental Authority Central Province.	✓ Under the Soil Conservation Act 25 of 1951 of National Resource Management Centre, Badulla District has been gazetted as a sensitive area. ✓ Under this gazette any development is not allowed irrespective of the magnitude of the project. ✓ In a disaster this is not needed. ✓ Landslide mitigation projects are not considered projects prescribed in the Gazette. ✓ The Basic Information Questionnaire (BIQ) is needed to fill for the project and submit the application ✓ As the proposed project (mitigation) intends to reduce the risk from landslide for an emergency action CEA approval is not needed considering the priority of the project. ✓ Before project commence a request indicating the mitigation sites need. ✓ If the project is carried out in a sensitive area, even not within a prescribed project, consideration of sensitive area will govern the process.

Road Development Authority	Chief Engineer	✓ This area is under the jurisdiction of Badulla District RDA office ✓ The RDA has no objection and states the mitigation is very much needed. ✓ Other concerns raised • A proper handing over of the project is required after the mitigation • RDA will do the maintenance after mitigation • It is emphasized that during the construction the contractor should use Personal Protective Equipment • At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, flagmen and for the night work, lights and illumination should be provided. ✓ It is also stated that Construction waste/ excavated materials should not be a nuisance to public/commuters

Annexure III: Proposed procedure for obtaining approvals from state land owners and environmental agencies.

1. **Proposed procedure by RDA for approval for implementation of landslide mitigation projects in RDA reservation areas**
   i. The design to be accepted by the RDA: The project implementing agency should submit detailed design report to RDA with a formal request on nature of approvals required. PMU should prepare above documents and should submit the documents to RDA regional office.
   ii. RDA regional office will evaluate the proposal and may call for project briefing. The PMU should provide necessary briefing as appropriate
   iii. On the approval by RDA an agreement will be signed between RDA and Project implementing agency to access the site, erect structures, and implement mitigation works.
   iv. A condition that would include is
      - A proper handing over of the project is required after the mitigation
      - RDA will do the maintenance after mitigation
      - It is emphasized that during the construction the contractor should use Personal Protective Equipment
      - At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, flagmen and for the night work, lights and illumination should be provided.
      - Construction waste/ excavated materials should not be a nuisance to public/commuters

Annexure IV: Study team

Name	**Designation**	**Position in the study**
SAMS Dissanayake	Senior Scientist/ESSD/NBRO	Senior Environmental Scientist
Prabath Liyanaarachchi	Scientist/ ESSD/NBRO	Environmental scientist, GIS/ Demographic data collection /survey, Report preparation
Asanka Sanjaya	Field Assistant	Assistant - data collection for the SSESMP
Ranil Jayawardhana	Field Assistant	Assistant - data collection for the SSESMP

Annexure: List of references

1. Contractor's obligations for Generic Environmental and Social Management Plan- Sri Lanka Landslide Mitigation Project-AIIB

2. Environmental and Social Management Framework-Sri Lanka Landslide Mitigation Project - AIIB
3. Resettlement Planning Framework- Sri Lanka Landslide Mitigation Project -AIIB
4. Felling Trees (Control) Act by Ministry of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries and Aquatic Resources Development
5. Census and Statistical Report (2012), Department of Census and Statistics