REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No. 162
Failed Slope between culvert no. 149/8 and 149/9 of Peradeniya - Badulla - Chenkaladi Hwy (A5)

Badulla District

November 2024

Prepared for:

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 Organization
RDA	Provincial Road Development Authority
NWSDB	National Water Supply & Drainage Board
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 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 minimum.

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 **Failed slope between culvert No. 149/8 and 149/9 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.162, Badulla District, for **Failed slope between culvert No. 149/8 and 149/9 of Peradeniya - Badulla - Chenkaladi Hwy (A5) between Passara town and Lunugala town.**

2.2 Location details

Upper slope of the proposed mitigation site (LHS of the road) falls under Passara GN division of Passara DS division and down slope of the mitigation site (RHS) falls under Meedumpitiya GN division of Lunugala DS division, Badulla District, Uva Province.

GPS references of the site - 6.9615696°N and 81.193296 °E

Nearest town and accessibility to the site – Passara town

Passara town is about 8.3 km from the site. The site can be accessed via Peradeniya - Badulla - Chenkaladi Hwy (A5). *(Ref. Fig. 1)*

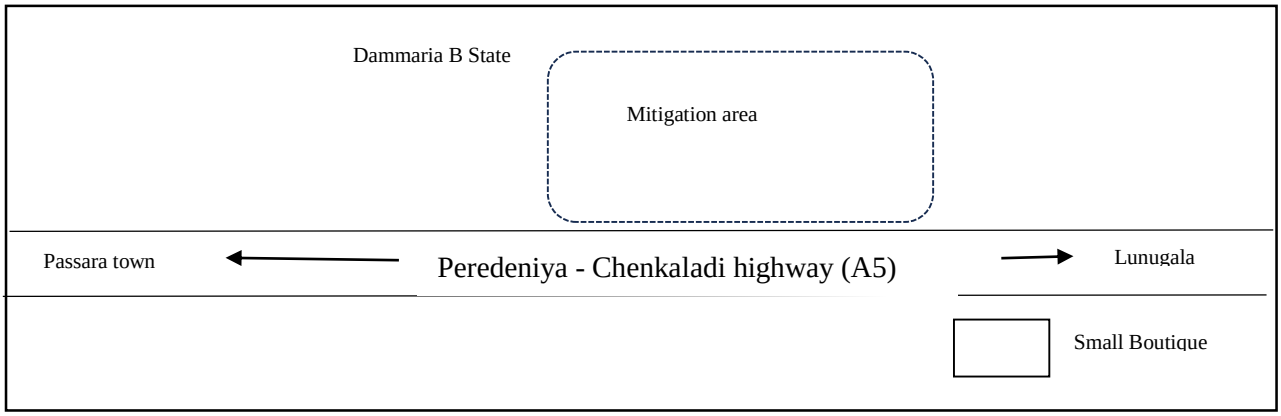


Figure 1:Road map showing the accessibility to the site

2.3 Topography and land ownership

The proposed mitigation site is located in between culvert No. 149/8 and 149/9 Left Hand Side (LHS) of the Passara - Lunugala Road (A5). The failed slope section is located in a sloppy terrain where the natural slope has been cut for the road construction. The slope failure has been emerged left hand side of the up-slope of the road including the road section and the reservation area. The elevation of the area is 749 m. The extent of site proposed to be mitigated is about 12,060 m^2. The land of the up-slope of proposed mitigation area is owned by Dammeria B Estate, Hapugasthenna Browns Plantation. The road and the road reservation is owned by Road Development Authority, executive engineer office, Badulla.
(Refer figure 2, 3; Drone and google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure).

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

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

2.4 Meteorology of the area

Annual average rainfall - 400.3mm
Annual average temperature - 24.12ºC
(Source: https://weatherandclimate.com/sri-lanka/uva/lunugala)

3. Landslide hazard incident details

3.1 Account of incident

According to the information of the villagers a ground instability had been developed at the up-slope of LHS between culvert No. 149/8 and 149/9 at Passara - Lunugala Road, eight or nine years ago, with the high rainfall, ground uplift and a ground water discharge from the unstable slope has been occurred at section of the road adjacent to the slope failure. The area is highly potential for cutting failure and slope failures along the road. *Refer Fig 3: cross sections, land use, risk elements and the photographs of special features of the location.*

3.2 Effects and consequences of landslide

The failed soil mass accumulation rests on the road section, entirely blocking access to Bibila area and the vehicle transportation.

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 on 08.01.2024 by the Scientists of the National Building Research Organisation. Accordingly, taking into account the risk situation and the emergency situation at the place, recommendations for emergency response were issued on through the NBRO report Ref. NBRO/LRRMD/BDL/LUNUGA/LI/24/0080 dated 15.02.2024. The preliminary inspection report has recommended several short-term and long-term mitigatory measures.

3.4 Evacuations

No any evacuations were processed due to the potential risk.

3.5 Resettlement (progress)

There is no requirement of project-based resettlement programme for this site.

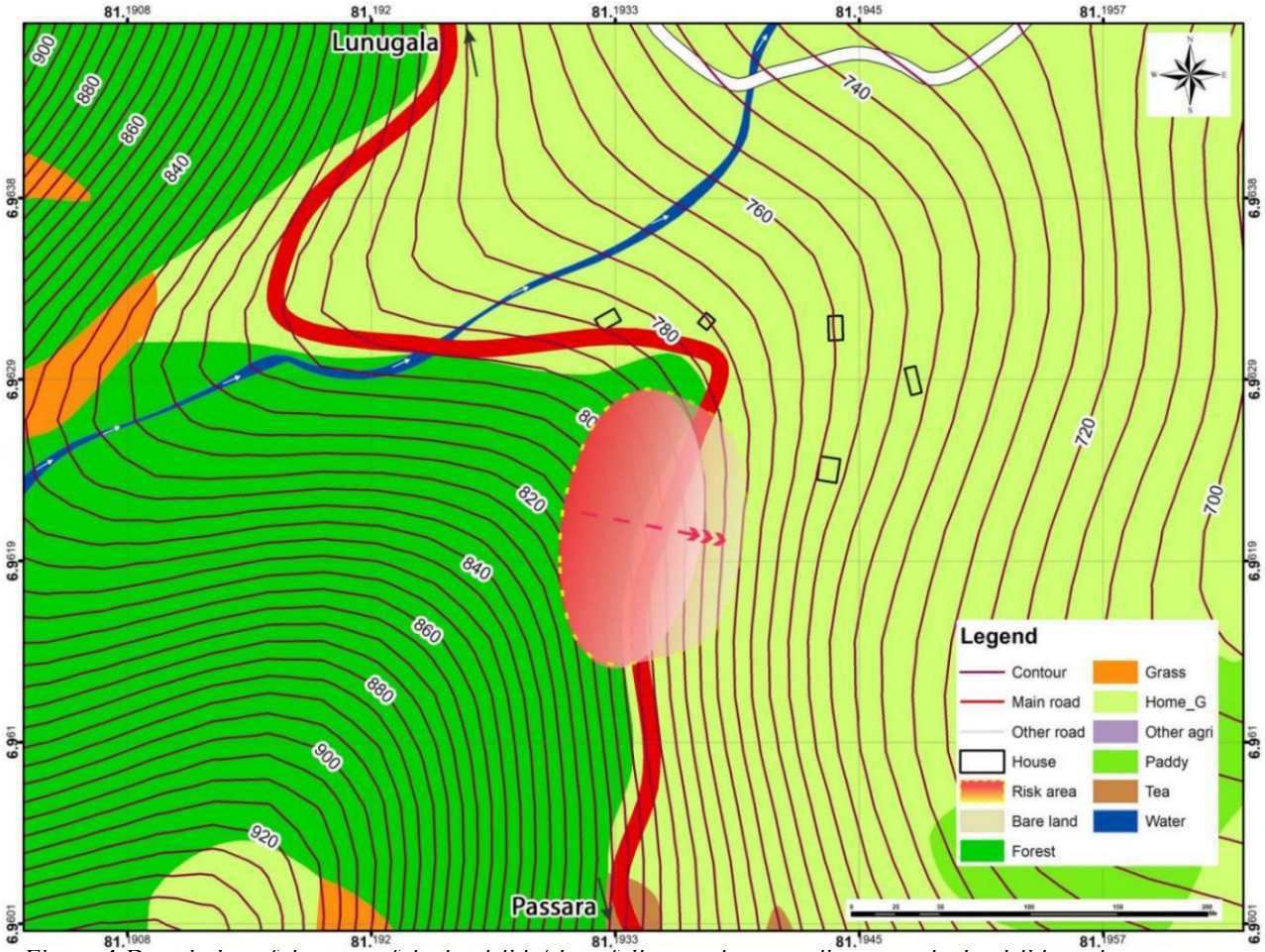


Figure 4:Description of the area of the landslide/slope failure and areas adjacent to the landslide and current level of risk

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 area of the slope failure is located in an area where the slope had been cut to provide space to build the Peradeniya - Badulla - Chenkaladi Hwy (A5) between culvert no. 149/8 and 149/9. The up slope area is dominated by trees such as Serpentine and bushes which located in Dammeria B Estate, owned by the Hapugasthenna Browns Plantation. The down slope is consists with settlements and shrub lands which belongs to LRC. A road is running to the down slope settlements and seven houses are located in the down slope. A large scale water supply line of NWSD is running through the failed slope and 11000V electricity supply line of CEB is running up the failed slope area. The affected road is the only main access road to Bibila area which provide the facilities and access to the area.

4.2 Areas adjacent to the landslide

The surrounding area of the unstable slope section contains mostly forest type vegetation and the area is mountainous with steep slopes. Some small scale grocery and tea shops are located at the opposite

side of the road (Temporary shops). The area is not congested with settlements and few houses are located at the down slope area adjacent to the slope failure. The home gardens with special commercial crop types such as cinnamon are common features in down slope settlement area.
Refer Fig 4: Description of the area of the landslide/slope failure and areas adjacent to the landslide and current level of risk

4.3 Current level of risk

This slope instability will be activated again with the upcoming rains and there will be a possibility to occur soil mass failures into the road. If a massive landslide happened, the road will be collapsed and the entire households of the down slope area will be collapsed. During rainy season it poses a high risk on the commuters and vehicle transportation in the road due to potential risk of the slope failure. The unstable slope section in the up slope area imposes a high risk on the community at down slope and small shops. Both up slope and down slope roads, commercial buildings and the houses are under the risk.

If the site is not rectified to prevent future failures, the slope failure with soil masses would disturb all functions of the vehicle transportation between Passara and Lunugala. The commuters, pedestrians, people and the owners of the shops and their livelihood activities would be at risk due to this unstable slope section. Also, during future failures, it would limit the continuous functions of the road between Passara to Bibila as this is the main access way to Bibila town, the obstruction of accessibility may pose a significant impact on life line facilities, services and related economic activities including the transactions.

5. Description of the works envisaged under the project

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

- Protecting the slope with soil nailing
- Drainage management using surface and subsurface drainage network
- Alleviate local slope failures by way of increasing the development metric solution of exposed finished surface via nature based solution.
- Further, in order to restore and retain the natural aesthetic outlook of this location, the protection works will essentially include nature-based surface protection solutions like turfing and planting.

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 between culvert No. 149/8 and 149/9
ii. Commuters and pedestrians
iii. Small shops and small business
iv. Households of the down slope
v. Water supply pipe line of NWSDB
vi. 11000V electricity line of CEB
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: Up slope failed section with unstable trees

Figure 5b:Uplift road section

Figure 5c: Up slope failed section

Figure 5d: Up slope failed section with road bend area

Figure 5e:Down slope of the area

Figure 5f:Mountainous landscape and small shops

Figure 5g: Road bend section with soil excavation and removed area by the RDA

Figure 5h: View of the upslope area toward the Bibila

Figure 5i: Abandoned shop in front of the damaged road section

Figure 5j: The small business place near the damaged road section

Figure 5k:Water line of NWSDB

Figure 5l: Electricity line of CEB

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

Chart below summaries the positive and negative impacts which are envisaged during project actions and their significance

7.1 Positive impacts

- The objective of this project is to ensure that further occurrence of slope failure/ landslide will be prevented to an acceptable level for the road section and down slope household area. The

Bibila-Passara road is the main access road to the both cities therefore the mitigation of this road will highly benefited to the road users.

- The proposed project will significantly enhance safety of the road for commuters, tourists and pedestrians during rainy season and will allow keeping the road open throughout the year. The remediation may secure the cost of road rehabilitation from future ground subsidence in the area.
- Business activities beside the road and other life line activities of people in the area will be benefited largely by this mitigation.
- Water supply line and the electricity supply line will benefited by debris depositions of slope failures.

7.2 Negative impacts

The mitigation works are generally confined to already failed land area. Therefore, negative impacts are much localized and also limited to 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 pattern in the area is envisaged with the project implementation. The mitigation works in this site will focus on the drainage improvement. Therefore, during rainy season heavy flow of water is expected to be generated and would be accumulated between the road and the slope. The water inundation of the existing drainages may be expected. 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, removal of debris can generate high sediment laden run-off there could be a possibility that contaminated run-off may pollute the water within the stream flowing down slope to the affected area. Improper disposal of oils and other harmful substances/contaminants from machinery, leakages from temporary storage tanks, solid waste and waste water disposal/dumping could occur causing adverse impacts on quality of the water. However, during 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. But there is no water stream or source nearby the mitigation site, the impacts may be not significant.	**Low Significant**
7.2.1.3 Erosional impacts and stream 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 construction phase. Therefore, the erosional impacts are low significant due to stream is not located close proximity to the mitigation area.	**Low Significant**
7.2.1.4 Open defecation and water-borne infections As site is located close to high dense shrub area in both side of the road, possibility of open defecation is high. Faecal contamination of water of the stream or run-off water flow will not be expected but during construction due to open defecation of the contractor's workforce as the area consists thick vegetation cover.	**Low 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 land clearing and land reshaping phase. This may increase the sediment load in streams. As there is no water stream nearby, the effects of the water users at down slope areas has no effect.	**Low Significant**

7.2.1.6 Impacts on ground water table and ground water 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, waste water from the construction activities and discharge of waste matter from on-site septic systems would cause adverse impacts on the ground water quality. Due to the mitigatory activities carried out in the slope area, the ground water quality will be impacted or there will be a low possibility for the ground water table draw down.	**Low 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 waste water disposal/dumping from workers' sites could not occur causing adverse impacts on quality of the water because there are no streams nearby.	**Low Significant**
7.2.2 Environmental Impacts	
7.2.2.1 Noise and vibration impacts Noise and vibration are expected from construction equipment. The pedestrians and commuters on roads will also have an effect from noise and vibration. The people of the down slope households 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.	**Highly 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 Bibila - Passara road is used heavily for vehicles moving (buses, bicycles, lorries, trucks, tippers, three wheels). The air pollution may have significant impact on the community nearby, 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 community, commuters and pedestrians. 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 not rock boulders, explosives may be used if the rock blasting is envisaged. This may pose 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.	Insignificant
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

8. Site Specific Risk Analysis

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.	Insignificant
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 are no any agricultural lands within the unstable slope area. During the construction period, land use pattern may not be affected by disposal of spoil and debris or parking machinery and their oil leakages.	Insignificant
7.2.4.2 Cracks in the road and houses due to vibration impacts The Bibila - Passara Road is running through the site and already it has cracked and uplifted. Vibrations can create cracks on the road further. The down slope houses of the community also prone to cracks due to construction works. Therefore, vibration impact on the down slope house are significant.	**Significant**
7.2.4.3 Loosing access to land and future development activities The land where the project activities are envisaged belongs to up slope estate land and the road reservation of RDA. The mitigation works will be concentrated on the failed side of the road. This area is a not congested with houses and shops, there will be no impacts to the land owner with regard to loosing access to the land (during construction) and loss to valuable use of the home gardens. In contrary, remediation works in the down slope will increase the stability of the boundary and protect the land from future failures.	Insignificant
7.2.4.4 Impacts on livelihood/ business and income activities The small grocery and tea shop immediately adjacent to the unstable road section would be affected during the construction period. The transportation would be interrupted during construction phase. This would affect the livelihood of the community.	**Significant**
7.2.4.5 Impacts on service provision (water supply, sewage, electricity) The water supply pipe lines and electricity lines are under the risk to be impacted by the construction period.	**Highly Significant**
7.2.4.6 Effect due to loss of infrastructure and safety During construction phase the main road from Bibila - Passara road and concrete road to the down-slope area 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.	**Highly 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**

Table 2: Site specific risk analysis

Risk	Affected group	Risk level

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. The same risk at a high level will be there for the households community located in 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. 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 No any areas used for businesses, agriculture or other within the area to be remediated. Therefore the impacts are insignificant.	**Insignificant**
7.2.4.13 Areas used for businesses, agriculture or other immediately adjacent to the site Some small business are located within the area to be remediated. The vendors and the customers are directly affected during the constructing period, Therefore, the risk on them is highly significant in the immediately adjacent to the site. All of them may have some interruption during construction period.	**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**

1. Facing accidents when working close to the road	Workers	Very high
2. Transporting materials and machinery	Workers, Community nearby	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, Community nearby	Very High

7. Rock fall from the unstable area	Workers Commuters, Community nearby	High
8. Work with electrified supply lines	Workers, Community nearby	High
9. Site Working – Working in poor visibility	Workers Commuters	High
10. Lone Working	Workers	High
11. Emergency evacuation	Workers, Community nearby	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 an 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 shop owners about the risks posed by unstable land section

ii. Requirement for special awareness for nearby community, 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.	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.	Low
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 .	Moderate
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. 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. Service of landscape architect may be important for the design of suitable mitigation structures.	High
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.	High

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 the site, 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 downslope 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 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. Also, this main road is used by many people.	Site preparation & construction	Construction Contractor
xiii. 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
xiv. Dust and aerosol control screens Dust particles generated during the construction period can influence the commuters. The commuters traveling in the Bibila Passara main road 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
xv. Water for construction Water for construction works should be obtained only from the approved sites.	Construction	Construction Contractor
xvi. 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
xvii. Impact on service infrastructure Telecommunication, electricity, water lines should be relocated before construction starts as per the approval of PMU.	Construction	Construction Contractor
xviii. 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
xix. During construction good housekeeping should be maintained to minimize visual pollution	Site preparation & construction	Construction Contractor
xx. 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

xxi. Snake bites management and emergency management by accidents Proper emergency management system for snake bites (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

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	-
	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 (common tank)	If noticeable water quality impairment due to construction activities
	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

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, K.K.G. Siripala, the owner of "Chandrika" grocery and the tea shop were visited during the field visit and their owners made them aware of the mitigation project and the funding mechanism. They 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)

Mr.Shammi Upenrda, senior manager, Dammeria group, Passara, was informed about the project works and got the clearances for the project. He further stated that after the mitigation works done to reduce this damage, no any trade or unauthorized construction or any outside person should be allowed to enter the LHS of the road (land belong to the Dammeria B state and RDA reservation). He emphasized that this will prevent unnecessary problems that may arise in the future.

Mr. D. M. Wasantha Kumara, the Disaster relief officer and Mr.H.T. Amaradasa, Grama Niladhari – 88/B, Passara North division of the Passara Divisional Secretariat was informed about the project works.

Mr. S.S. Hennayaka, Executive engineer, RDA office Badulla was informed about the project works.

14. 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.
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 & Dammeria B Estate, Hapugasthenna Browns Plantation)	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 time-line for getting approval is given in the table 7.

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								

15. 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).*

16. 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

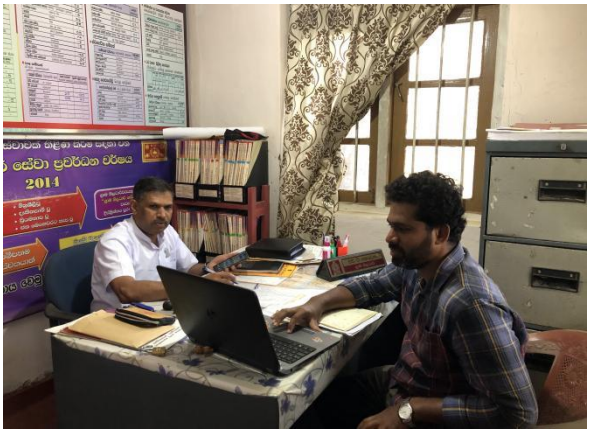
Date	Institution	Person contacted for information
23.06.2024 (Through the phone)	Divisional Secretariat Office - Passara	Mr. D.M. Wasantha Kumara Disaster Relief Officer

12.11.2024	Grama Niladhari – 88/B, Passara North division	Mr. H.T.Amaradasa
12.11.2024	Executive engineer, RDA office Badulla	Mr. Hennayaka Engineer
13.11.2024	Dammeria B State	Mr.Shammi Upenrda, senior manager, Dammeria group, Passara

Annexure I: Images of the site condition and the consultation

Consultation with Mr. K.K.G. Siripala, the grocery owner

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



Mr.H.T. Amaradasa, Grama Niladhari – 88/B, Passara North division of the Passara Divisional Secretariat

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. Final list of total sites under group no 01 (Phase II – 120 landslide mitigation sites for Reduction of Landslide Vulnerability by Mitigation Measures Project (RLVMMP) – AIIB
6. Census and Statistical Report (2012), Department of Census and Statistics