REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No. 176
Landslide Mitigation site at Thismalpola Railway Station

Kegalle District

April 2025

Prepared for:

ASIAN INFRASTRUCTURE INVESTMENT BANK

Prepared by:

National Building Research Organisation
99/1, Jawatta Rd | Colombo 05
Tel: 011-2588946, 011-2503431, 0112-2500354

Table of Content

List of Annexes

List of Figures

List of Tables

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 **Landslide mitigation site at Thismalpola Railway Station** rock fall 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. 176, Kegalle District, for **Landslide mitigation site at Thismalpola Railway Station**

2.2 Location details

The proposed mitigation site falls under Thismalpola GN division of Rambukkana DS division, Kegalle District, Sabaragamuwa Province.

GPS references of the site– 7.321409°N and 80.342122°E

Nearest town and accessibility to the site –

Polgahawela town is about 8.5 km from the site. (*Ref. fig. 1*)

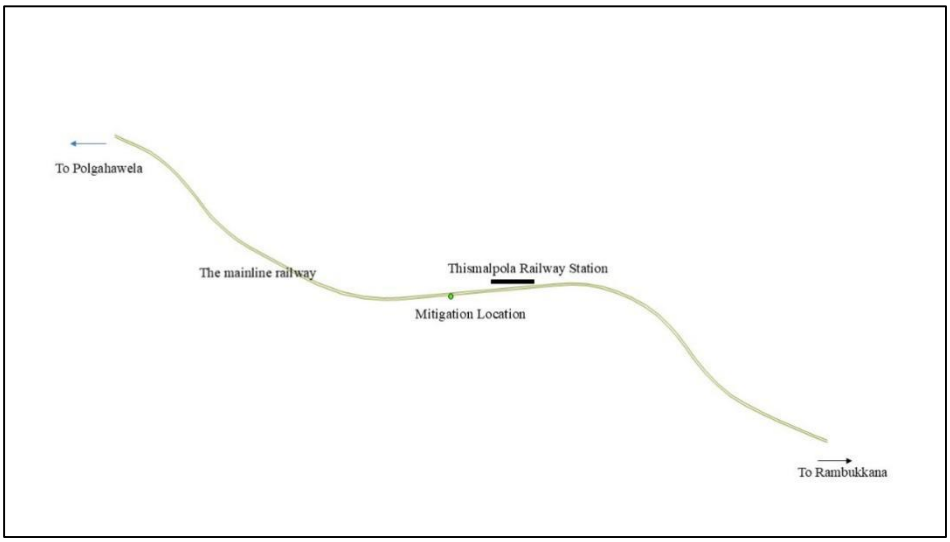

Figure 1: Road map showing the accessibility to the site

2.3 Topography and land ownership

The site proposed to be mitigated is located at CH 48 ½ in Main Railway Line in Sri Lanka. The altitude of the area is 118 m (387 feet) (Source: https://mapcarta.com/14798430) . The extent of site proposed to be mitigated is about 500 m^2.

The railway line reservation land and paddy lands within the mitigation area is owned by Sri Lanka Railway Department and currently the paddy lands re rented to the farmers to cultivate. Maha oya is located at the southern direction to Thismalpola Railway Station. Refer figure 2; Google 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

2.4 Meteorology of the area

Annual average rainfall – 164.31mm
Annual temperature – 27.09ºC - 32.11ºC
(Source: https://weatherandclimate.com)

3. Landslide hazard incident details

3.1 Account of incident

According to the residents and the officers of the Railway Station, a slope failure has been happened near the railway line during a heavy rainy day. The soil mass fall and ground subsidence incidents were happened at the right hand side (RHS) of the railway track heading towards Polgahawela. When the slope failures happened, the railway track has blocked and closed for few hours or days until remove them. (*Refer to Fig 3: cross sections, land use and of the location).*

3.2 Effects and consequences of landslide

The damaged railway line section had made high risks for railway commuters as this is the only access railway road to the Kandy, Badulla, Matale, Jaffna, Baticloa, Thrincomalee districts in main railway line of Sri Lanka. The failed soil mass and rock boulders had blocked the railway line and the workers of the Department of Sri Lanka Railway have removed them immediately.

No any accidents, causalities were recorded due to the slope failure incidents.

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

No any remedial measures already undertaken to reduce the potential risk

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.

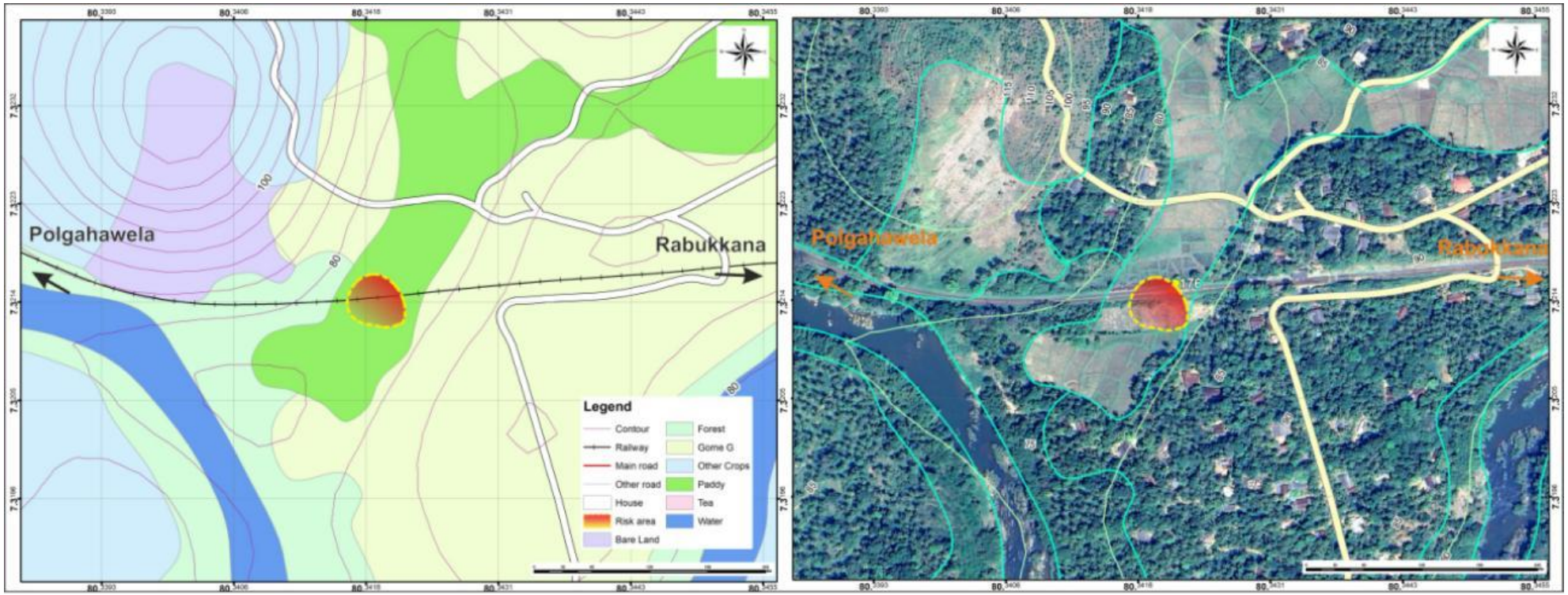

Figure 4: Cross sections, land use and risk elements of the location

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

4.1 Area of the landslide

Thismalpola railway station is 35th railway station on Sri Lanka's main line between Panaleeya and Yatagama railway stations. It is a small stop and located approximately 78.954 kilometers from the Colombo Fort railway station, it stands at an elevation of 83 meters above sea level. The station is positioned near the town of Polgahawela and the village of Godawela in the Sabaragamuwa Province. Despite its modest size, Thismalpola serves as a stop for several trains traveling between Colombo Fort and Rambukkana, as well as those connecting Kandy and Polgahawela. Given its limited facilities and services, Thismalpola Railway Station primarily caters to local travelers commuting to nearby towns and cities. It serves the local community by providing access to the country's rail network.
Paddy fields are located the both side of the railway line near to Thismalpola railway station and the unstable area is located in between the railway track and paddy field. The vegetation of the unstable area is bushes and scrubs.

Refer Fig 2: Google image, cross sections, land use, risk elements and the photographs of special features of the landslide mitigation s

4.2 Areas adjacent to the landslide

The Thismalpola station is situated in a rural area with pleasant landscape. The station's surroundings are characterized by the natural beauty typical of Sri Lanka's rural areas. The areas adjacent to the slope failure is a village named Thismalpola. The village is bounded by Ma Oya. Thismalpola Primary School is also located near the mitigation area. The main transportation mode is railway in the villagers, staff of the school and the students.

4.3 Current level of risk

The residents who live nearly 2km buffer one of the railway station and the staff and the students of the school are come to the station on foot. Some villagers are using railway road to walk for their day to day activities such as go to the paddy fields, grocery, school, neighboring houses etc. About 300 passengers are using this station daily. Nearly 50 train journeys are operating through this station and 16 trains are stopped in this station daily.

If the site is not rectified to prevent future ground subsidence and slope failures can directly affect the rail transportation of the main line in Sri Lanka. The life of the railway commuters and the tourists would be at risk. Also, during future failures, it would discontinuous all functions of the railway transportation trough the line as this is the only access railway line to Kandy, Badulla, Nuwaraeliya, Jaffna, Batticaloa, Trincomalee areas. The obstruction of accessibility poses highly significant impact on rail transportation, life line facilities of the villagers and related economic activities including the transactions.

5. Description of the works envisaged under the project

The location is highly potential for slope failures. Therefore, preventive measures such as soil nailing, reshaping, turfing, surface and subsurface drainage management will be introduced.

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. Rail transportation
ii. Railway commuters and tourists
iii. Residents of nearby houses
iv. Paddy field and paddy cultivation
v. Transpotation mode of Thismalpola Primary School’s staff and students.

vi. Income activities of the villagers

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: Unstable slope area

Figure 5b: Opposite side of the mitigation area

Figure 5c: Paddy fields near the unstable area

Figure 5d: Thismalpola Railway Station

Figure 5e: Thismalpola Primary School

Figure 5f: Platform of the station

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 land subsidence and slope failures will be prevented to an acceptable level for the railway land section in Thismalpola railway station. The

Main Railway Line is a major railway line in the rail network of Sri Lanka and considered by many to be one of the most scenic train journeys in all of Asia. The line begins at Colombo Fort and winds through the Sri Lankan hill country to reach Kandy, Badulla, Nuwara Eliya and Mathale. The Main Line operates through major population centers and tourist destinations such as Nuwara Elliya, Hortin Plains, Hatton, Ella, and Demodara Nine arch etc .Main line pass through the tea estates, pine forests, waterfalls, bridges and tunnels.

Therefore the he proposed project will significantly enhance railway safety for commuters, tourists and pedestrians during rainy seasons. It will allow keeping the railway track open throughout the year. Quick remediation may secure the cost of railway track rehabilitation from future ground subsidence or the slope failures in the area. Transpotation and tourism activities and other life line activities of people in the area will be benefitted largely by this mitigation.

7.2 Negative impacts

The mitigation works are generally confined to already unstable slope 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 The mitigation works in this site will focus largely on the rail road. Disruption to existing surface and sub-surface drainage patterns in the area is envisaged with the project implementation. During the rainy season heavy flow of water is expected to be generated and accumulated between the paddy fields and the railway line. The water inundation of the existing drainage may be expected. An increase of water through the unstable slope may intensify the risk of rock fall of the unstable section.	**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. Improper disposal of oils and other harmful substances/contaminants from machinery, leakages from temporary storage tanks, solid waste and wastewater disposal/dumping could occurred causing adverse impacts on the quality of the water. However, during the rainy season, the rainwater running through the cannels tends to pick up sediment, oil and other pollutants generated during construction can contaminate the water. As there is a major river nearby, the water pollution impact is highly significant.	**Highly Significant**
7.2.1.4 Open defecation and waterborne infections Faecal contamination of well1s or the river will be expected 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 downslope water users The construction activities will be carried out near the railway track. Therefore the impacts on the downslope water users are insignificant.	**Insignificant**
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. Due to the mitigatory activities carried out in the area, the ground water quality or water table draw down impacts will be significant because there is natural ground water sources in that area.	**Highly Significant**

7.2.1.7 Impacts on water or wetlands Improper disposal of oils and other harmful substances/contaminants from machineries, 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 area and the paddy fields that requires quality water for the paddy cultivation.	**Significant**
7.2.2 Environmental Impacts	
7.2.2.1 Noise and vibration impacts Noise and vibration are expected from construction equipment. Noise and vibration impacts are significant as the constructions are carried out near to the railway station and a school premises. Also, the day time noise generated from the movement of machinery and vehicles during construction phase will disturb the activities of the station and the households as there are houses with occupants within the 100m influential limit of the proposed mitigation site.	**Highly Significant**
7.2.2.2 Air pollution impacts Construction activities that contribute to air pollution include: land clearing, operation of diesel engines, demolition, burning, from storage, transportation disposal of construction materials, construction waste and working with toxic materials. During construction, it generates high levels of dust typically from concrete, cement, wood, stone, and silica. As the houses are located close to the site the effects from dust generated activities during the construction phase. The air pollution from the construction activities would affect the railway commuters and nearby households during dry periods.	**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 station will create inconveniences to the railway commuters, passengers, staff of the station and the neighboring community. It can block the water seepages 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 not be used if the rock blasting is envisaged.	**Insignificant**
7.2.3 Biological /Ecological Impacts	
7.2.3.1 Effects of Important Wildlife Habitats There is not a forest reserve within the project influence area. Important wildlife habitats may not be impacted due to the construction activities such as high noise generation activities.	**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. Therefore the important Fauna & Flora species may not be impacted.	**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 Impacts on agriculture is highly significant because there are paddy lands within the area to be remedied and also immediately to the mitigation site. During the construction period, the paddy cultivation near the unstable slope will be impacted.	**Highly Significant**
7.2.4.2 Cracks in the road/houses due to vibration and blasting impacts The unstable land is located adjacent to a railway track. The railway line is running through the site. Vibrations can create cracks on the railway track. The houses, railway station and the school are located near to the proposed mitigation site. Therefore, vibration impacts on the residents and buildings are highly significant. During the construction heavy machinery and chemicals for	**Highly Significant**

blasting will be used and the vibration can widen the cracks and may create new ones in the buildings.	
7.2.4.3 Loosing access to land and future development activities The mitigation works will be concentrated on the railway reservation area. Hence there will be no significant impact to the land owners with regard to loosing access to the land or loss to valuable uses.	**Insignificant**
7.2.4.4 Impacts on livelihood/ business and income activities The paddy cultivation would be interrupted during construction phase. Hence the impact on the livelihood income activities would be locally significant.	**Significant**
7.2.4.5 Impacts on service provision (water supply, sewage, electricity) The road, electricity, water supply lines running through the mitigation area will be impacted.	**Significant**
7.2.4.6 Effect due to loss of infrastructure and safety During construction phase, the railway tracks from Panaleeya and Yatagama will be obstructed by frequently moving machinery, loaders, trucks etc.	**Significant**
7.2.4.7 Risks of public accessing the site during construction The site may have machinery with high hazard risk such as drilling, boring and excavation machines etc. Only skilled workforce will be safe working in this environment. If unauthorized persons access the site, they may be at risk of being subjected to accidents by the heavy machinery. Also, the occupants of the neighbouring houses may even enter the site without proper awareness of the site staff. Ignorance of entry of the people and careless operation of machinery can cause fatal injuries and accidents to them. The risk to the public entering to the site is therefore significant	**Highly Significant**
7.2.4.7 Work camps and lay-down site requirements The camp 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 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 railway staff of the Thismalpola station. Although the workers who would engage in such issues will be rare, even few possibilities cannot be ignored. Therefore, social and community issues at this site will be considered highly significant.	**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 rock falls. The risk of rock fall 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/tourists The Thismalpola railway station is a public place where people from different ages and backgrounds with poor knowledge on construction risk use for transportation purposes. Nearby community are walking through the mitigated area and along the and railway track to the station as they haven't access road to the station. Therefore the safety of the them will be very much specially due to some heavy locomotives such as excavators, rollers, water bowsers, trucks and lorries carrying material, water etc. on railway may pose risk of accidents as the station is frequently used by people for travelling.Therefore, the risk on them is highly significant.	**Highly Significant**

7.2.4.11 Impacts on transport infrastructure (especially temporary loss of road, risks of traffic congestion) Machinery and material transportation will interrupt the railway transportation in between Panaleeya and Yatagama railway stations. Further, material & machinery transportation to the proposed mitigatory site may affect to the railway transportation because there is no any access road to the site.	**Significant**
7.2.4.12 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, tourists or other neighbouring community to enter the site for other purposes. 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/ tourists	Very high
3. Throw out disposals (litter, bottles, and food) to the construction site from the commuters.	Workers/tourists/ commuters	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	Workers/tourists/ Commuters	Very high
6. Injuries due to rock particles due to explosions/ blasting	Workers/tourists/ /Commuters	Very High
7. Rock fall from the unstable area	Workers/tourists/ Commuters	High
8. Work with electrified supply lines	Workers	High
9. Site Working – Working in poor visibility	Workers	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 an unstable slope with a risk of rock 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 nearby residents, students of the school about the risks posed by unstable rock land section.
ii. Requirement for special awareness for tourists, 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 slope failures. Also, the site is located in a very limited space in between railway track and the paddy field. The vehicle parking sites, material storage and temporary shelters etc. should not be installed in the danger zones of the rock falls. 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 .	Very 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.	Very 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
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
viii. Conservation of environmental, 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.	Very high
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, tourists, passengers and commuters. Therefore, design-based safety consideration such as beams, safety nets etc. should be considered.	Very high
x. Erosion control structures During rainy season the flow of 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 (railway reservation)
2002.2 2)	Noise and Vibration	Highly relevant (commuters, tourists)
2002.2 3)	Cracks and damages to the buildings	Relevant
2002.2 4)	Disposal of waste	Relevant (commuters, tourists)
2002.2 5)	Disposal of refuse	Highly relevant (railway reservation)
2002.2 6)	Dust control	Highly Relevant (commuters, tourists)
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	Relevant
2002.2 11)	Soil Erosion	Relevant
2002.2 12)	Soil Contamination	Relevant
2002.2 13)	Borrowing Earth	Relevant
2002.2 14)	Quarry Operations	Relevant
2002.2 15)	Maintenance vehicles and Machinery	Relevant
2002.2 16)	Disruption to public	Highly relevant (community, tourists nearby)
2002.2 17)	Utilities and roadside amenities	Highly relevant (road)
2002.2 18)	Visual environment enhancement	Highly relevant
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 (commuters, tourists, 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 soilmass etc. are avoided during rainy season. Therefore, it is imperative that site works in 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.	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 railway traffic control should be implemented in the construction stage. As there is a railway track 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 watchman is highly recommended for this site for workers, tourists, businessmen 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
v. 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
vi. Minimize erosional impacts during construction It is recommended that mitigation works involved with site clearance, slope reshaping, removal of rock boulders 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.	Site preparation & construction	Construction Contractor
vii. Disposal of construction waste The contractor should pay special attention with respect to disposal of construction waste. This site is located in a rural landscape with a pleasing environment adjacent to a forest reservation. Seasonal recharging stream through the area are flowing in the downslope area. 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 railway track sides.	Site preparation & construction	Construction Contractor
viii. 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

ix. Dust and aerosol control screens Dust particles generated during the construction period can influence the nearby residents, commuters and tourists of the trains. The commuters traveling 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
x. Water for construction Water for construction works should be obtained only from the approved sites.	Construction	Construction Contractor
xi. Traffic management and safety Traffic management system should be in place day and night. A good traffic management plan should be prepared with the concurrence of Sri Lanka Railway Department as this is a railway track situated within the railway reservation. Proper rail road safety measures should be included with warning signs and permanent trained watchmen, luminous sign boards indicating instability risk and road obstruction signs, night lamps etc. are strongly recommended at this site. Flagman of the Railway Department is responsible signaling the in and out trains through the stations according to the requirements of the construction activities. And should be approved by the PMU.	Construction	Construction Contractor
xii. 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
xiii. Impact on service infrastructure Telecommunication, electricity, water lines should be relocated before construction starts as per the approval of PMU.	Construction	Construction Contractor
xiv. 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
xv. During construction good housekeeping should be maintained to minimize visual pollution	Site preparation & construction	Construction Contractor
xvi. 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
xvii. 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

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	Once*
	Pre-construction crack survey of the houses	-
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality	Once*
	Crack survey	-
	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.

11. 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.

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

13.1 Public Consultations

Consultations with the residents nearby during the field visit. 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)

Consultation with Mr. Tharaka Wimalaweera, The sub station master of the Thimalpola Railway Station.

Mr. H.M.K.W. Bandara, Deputy Chief Engineer (Project), Mr. E.M.S.P.K. Deegala, Deputy Chief Engineer (Track) and Mr. D.W.N.Amarasena, Superintend Engineer (Design) of Way and Works Railway Department were consulted during the group discussion about the project activities of the railway sites. They discussed about the procedures to be followed during construction phase and how to carry them without disturbing the railway transportation.

13. 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 Rambukkana 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 Kegalle 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).
Rambukkana Divisional Secretariat	Approvals from Ella 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 (Department of Railway)	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								

14. 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).*

15. 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

Annexure I: Images of the site condition and the consultation

Consultation with Mr. Tharaka Wimalaweera, The sub station master of the Thimalpola Railway Station

Annexure II: Report on the Stakeholder Consultation: Kegalle District

Institution	Name and designation of the contact officer	Concerns raised
Central Environmental Authority	Provincial Director, Central Environmental Authority Sabaragamuwa Province.	✓ Under the Soil Conservation Act 25 of 1951 of National Resource Management Centre, Kegalle 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.
Way and Works Railway Department	Mr. H.M.K.W. Bandara, Deputy Chief Engineer (Project) Mr. E.M.S.P.K. Deegala, Deputy Chief Engineer (Track) Mr. D.W.N.Amarasena, Superintend Engineer (Design)	✓ This area is under the jurisdiction of the Department of Sri Lanka Railway. ✓ The SLR has no objection and states the mitigation is very much needed. ✓ Detailed work plan and time schedules must be provided to the SLR by contractor before starting construction activities and keep good relationship between contractor, PMU and SLR. ✓ Other concerns raised • A safety officer or flag man of SLR is provided to each mitigation location by SLR. • At least three flagmen should be kept in a site. • Safety structures and sign boards will be provided by SLR. • Flag man or the safety officer has all the responsibilities of the train schedules and stop train in emergency situations. • Workers must be followed his advices and guidance for safety issues. • Material transportation for locations which haven't other road access will be done according to the requests of the contractor • All the cost including railway material transportation, wages of the flagman and other resources from SLR should be bear by the construction contractor.

		• A proper handing over of the project is required after the mitigation. • SLR will do the maintenance after mitigation. • It is emphasised that during the construction the contractor should use Personal Protective Equipment • At all times, the contractor shall provide safe and convenient passage for train transportation, traffic safety measures, barricades, flagmen and for the night work, lights and illumination should be provided. • The contractor should use temporary toilet facilities ✓ 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
Thilina Dissanayake	Project Assistant	Demographic data collection /survey, Report preparation
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