REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No. 175
Yangalmodara Railway Crossing
Kurunegala District

March 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

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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
PRDA	Provincial Road Development Authority
RHS	Right Hand Side
LHS	Left Hand Side
SLR	Sri Lanka Railways

1. Introduction

1.1 Project overview

The Government of Sri Lanka intends obtaining a loan from the Asian Infrastructure Investment Bank (AIIB) for mitigating/rectifying unstable slopes in high risk areas especially in 11 districts of 06 provinces of the country. 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 a 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 Yangalmodara Railway Crossing, (Site No. 175) 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 landslide mitigation design team, the PMU and the contractor in the implementation of Environmental and Social Management component of the project. The SSE & SMP is published in NBRO website 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 175, Kurunegala District, Yangalmodara Railway Crossing (Site No. 175)

2.2 Location details

The proposed mitigation site falls under Yatigaloluwa GN division of Alawwa DS division, Kurunegala District, North Western Province.

GPS references of the site – 7.31816°N and 80.27870°E

Nearest town and accessibility to the site – The Yangalmodara railway crossing is located approximately 1 km from Walakumbura railway station (the 33rd station on the Main Line) toward Polgahawela station

(the 34th station), which is 3 km away. The railway crosses the A6 Ambepussa-Kurunegala-Trincomalee road, which provides the easiest access to the site. The Yangalmodara site is about 5 km from the nearest town, Alawwa.

2.3 Topography and land ownership

The proposed mitigation site is located upslope to the Yangalmodara railway crossing. The elevation of the area is 241 ft. The extent of site proposed to be mitigated is about 660 m^2. The railway line reservation land is owned by Sri Lanka Railway Department and adjacent upslope land is privately owned while the road is under the jurisdiction of RDA.

Refer figure 1; Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure.

Figure 1: Google image of the proposed landslide mitigation site, the surrounding evironmental features and service infrastructure.

2.4 Meteorology of the area (Polgahawela)

Annual average rainfall – 164.31 millimeters
Annual average temperature – 30.2ºC
(Source: https://weatherandclimate.com/sri-lanka/north-western/polgahawela)

2.5 Demographic feature of the area

According to Grama Niladhari Mr. I.P.N. Kelum Kumara, the Yatigaloluwa Grama Niladhari Division comprises approximately 340 families, with a population of 1,414, including 706 males and 708 females.

3. Landslide hazard incident details

3.1 Account of incident

The first occurrence of the landslide dates back to May 13, 2021, during the COVID-19 pandemic. According to Aluthdivulwewe Indrananda Himi, who resides at the upslope Paarileiya Wana Arana (Forest

Hermitage/Temple), both the road and railway were covered by fallen debris. Additionally, a tree collapsed onto a jeep, causing damage to the vehicle.

During the rainy season, the instability of the slope poses a significant risk to commuters and railway transportation, particularly along the A6 Ambepussa-Kurunegala-Trincomalee road and the railway lines. Furthermore, the Paarileiya Wana Arana, located upslope, remains vulnerable to potential landslides. Refer Fig 2: cross sections, land use, risk elements and the photographs of special features of the location.

3.2 Effects and consequences of landslide

During periods of intense rainfall, the unstable slope and falling debris pose a significant risk to the railway line, railway signal system, passengers, station commuters, and the temple located upslope. Moreover, the landslide has damaged the staircase leading to the temple, further impacting accessibility and safety.

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

No any remedial measures have been taken to reduce the potential risk of the area.

3.4 Evacuations

No any evacuation for this site.

3.5 Resettlement (progress)

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

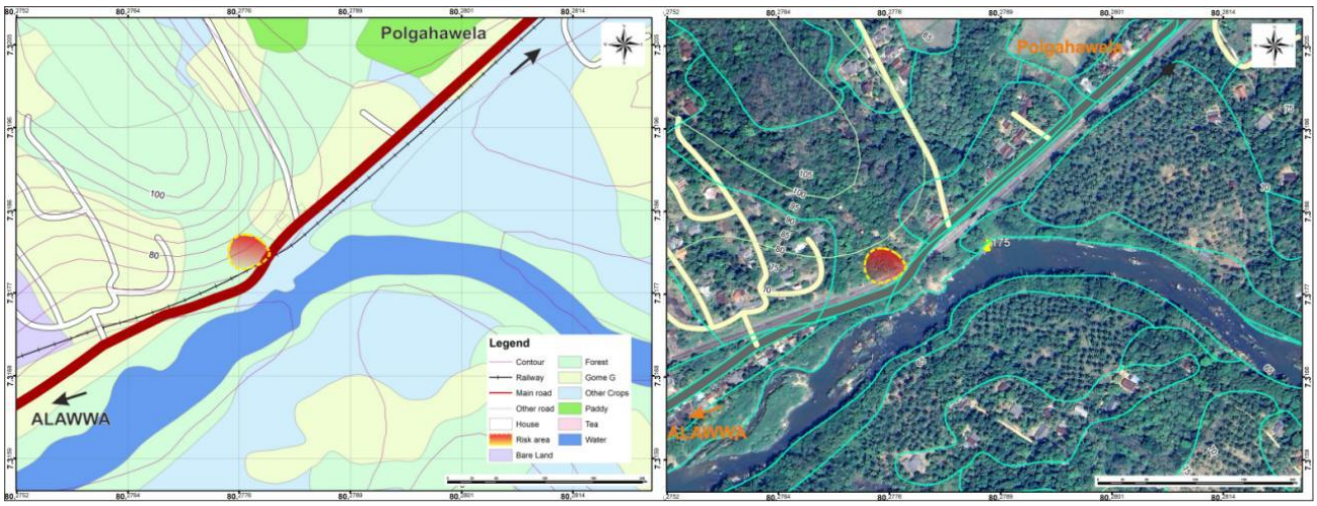

Figure 2: Cross sections, land use, risk elements and the photographs of special features of the location

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

4.1 Area of the landslide

The landslide-affected area is located on the right-hand side of the Yangalmodara railway crossing when traveling from Colombo to Polgahawela. This railway crossing holds a tragic memory for the entire country due to a devastating bus-train collision. On April 27, 2005, a Colombo-Galkiriyagama bus collided with an intercity express train traveling from Colombo to Kandy. Thirty-five people lost their lives on the spot, while more than 40 others were injured. The injured passengers were rushed to government hospitals in Kurunegala, Kegalle, and Polgahawela. This remains one of the most tragic motor accidents in Sri Lanka's history.

The railway line from Colombo Fort to Polgahawela Junction serves as a major hub, where multiple railway lines branch out. These include the Main Line, which is regarded as one of the world's most scenic train routes (Colombo to Badulla), the Northern Line connecting Anuradhapura to Jaffna, Trincomalee line and the Batticaloa Line, which extends toward the eastern region via Polonnaruwa. Similarly, the road section intersecting the railway crossing, the Ambepussa-Kurunegala-Trincomalee (A6) highway plays a crucial role in providing access from Colombo to almost all northern districts of the country.

The affected land, featuring an unstable slope, lies within the Paarileiya Wana Arana, a location that attracts many pilgrims seeking spiritual serenity amidst nature. A resident Buddhist monk permanently resides in the hermitage, practicing and sharing noble Buddhist teachings. The land use in the affected area consists of mixed vegetation, with dominant tree species including Ficus religiosa (Bo tree), Grewia tiliifolia Vahl (Damunu tree), and several cultivated banana trees.

On the opposite side of the unstable slope, the Gatekeeper's hut/cabin is located, where two rail gatekeepers are on duty in 12-hour shifts, ensuring the smooth functioning of the crossing throughout the day.

4.2 Areas adjacent to the landslide

The Mahamevnawa Buddhist Monastery in Polgahawela, the first and main temple of the Mahamevnawa temple network, is a renowned destination for Buddhist devotees from across the island. It is located 4 km from the mitigation site and can be accessed via Narammala Road, which branches off from the A6 highway approximately 50 meters from the site. Any potential disruption caused by the unstable slope could hinder accessibility for pilgrims traveling from Colombo.

The downslope area of the A6 road features the Maha Oya, offering a breathtaking view to both train passengers and road commuters.

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

4.3 Current level of risk

Landslides on the upslope of the railway crossing at this location pose a significant risk, primarily to the Paarileiya Wan Arana, the smooth operation of train transportation from Colombo Fort to Badulla (Main Line), Jaffna via Anuradhapura (Northern Line), Trincomalee, and Batticaloa via Polonnaruwa. Additionally, they threaten the movement of vehicles along the A6 Ambepussa-Kurunegala-Trincomalee Road.

The unstable ground section also endangers the occupants of neighboring houses, their livelihood activities, and the safety of the public. Furthermore, restricted accessibility could significantly impact essential facilities, services, and economic activities, including daily transactions and trade.

5. Description of the works envisaged under the project

The location is highly potential for landslides. The proposed project aims to ensure further progressive landslides are prevented. Therefore, preventive measures such as surface and subsurface drainage improvement, external/ internal slope rectification measures (retaining walls) will be used.

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. Paarileiya Wana Arana and its functions.
ii. Neighbouring houses and their occupants and livelihood activities.
iii. Railway and road commuters.
iv. Maha Oya located downslope
v. Current services, economic, and tourism activities
(Ref. Fig.3 Sensitive elements that may be affected by the project actions)

Figure 3a: Road and railway blocked due to the landslide

Figure 3b: Road and railway blocked due to the landslide

Figure 3c: Unstable slope

Figure 3d: Paarileiya Wana Arana

Figure 3e: Staircase access pathway to Paarileiya Wana Arana

Figure 3f: Maha Oya located downslope

Figure 3g: A6 road towards Colombo

Figure 3h: A6 road towards Kurunegala

Figure 3: 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 prevent further landslides to an acceptable level in the land section near the Yangalmodara Railway Crossing, which intersects with the A6 Ambepussa-Kurunegala-Trincomalee road. Both the railway route and the A6 main road are vital transportation corridors, connecting numerous key destinations across Sri Lanka. The A6 main road serves as the primary route linking the capital city, Colombo, to Kurunegala District, the third most populous district in Sri Lanka.

- The Main Line is a major railway line in Sri Lanka's rail network and is considered one of the most scenic train journeys in Asia. It begins at Colombo Fort and travels through Sri Lanka's hill country, reaching Badulla. This route is highly demanded by both local and international tourists, as it passes through major population centers and attractions such as Nuwara Eliya and Horton Plains. The proposed project will significantly improve railway operations by ensuring uninterrupted transportation along this route, enhancing safety for commuters, tourists, and pedestrians during the rainy season. Additionally, it will help keep the railway track open year-

round. The remediation efforts will also reduce future costs associated with railway track and road rehabilitation caused by potential landslides in the area.

- 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 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. The water inundation of the Yangalmodara railway crossing may be expected.	**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 runoff. There could be a possibility that contaminated runoff may pollute the water within the high seepage in the area. Improper disposal of oils and other harmful substances/contaminants from machinery, leakages from temporary storage tanks, solid waste and wastewater disposal/dumping could occur causing adverse impacts on quality of the water.	**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 significant.	**Significant**
7.2.1.4 Open defecation and waterborne infections As site is located within an open area, possibility of open defecation is low.	Insignificant
7.2.1.5 Impacts on the downstream water uses The construction activities will be carried out on slopes with thick soil overburden consisting of both residual and colluvium soils. Therefore, the slope will be prone to erosion during the land clearing and land reshaping phase. This may increase the sediment load in the Maha oya flowing downslope, and affect the downstream users.	**Significant**
7.2.1.6 Impacts on ground water table and ground water quality The addition or mixing of construction materials, including cement and grout, with subsurface water flows could lead to temporary water quality degradation and the accumulation of unwanted substances. During the construction period, hazardous waste from chemical substances, wastewater from construction activities, and discharge from onsite septic systems may negatively impact groundwater quality. Additionally, the mitigatory activities carried out in the slope area could affect groundwater quality, potentially resulting in a draw-down of the groundwater table.	**Significant**
7.2.1.7 Impacts on water or wetlands	**Significant**

Improper disposal of oils and other harmful substances/contaminants from machinery, leakages from temporary storage tanks, solid waste, and wastewater disposal/dumping from workers' sites could occur causing adverse impacts on the quality of the water.	
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 in an open road which intersects the railway. Also, the day time noise generated from the movement of machinery and vehicles during construction phase will disturb the activities of the upslope Paarileiya Wana Arana 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, and the storage, transportation, and disposal of construction materials and waste. During construction, high levels of dust are typically generated from concrete, cement, wood, stone, and silica. Given the proximity of a temple upslope and houses near the site, the dust generated during the construction phase could have significant effects. Air pollution resulting from these activities is likely to affect both railway and road commuters as well as nearby households, particularly 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 haphazard 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 a fallen rock, the need for rock blasting will be assessed based on site conditions.	**Significant**
7.2.3 Biological /Ecological Impacts	
7.2.3.1 Effects of important wildlife habitats There are no forested/ wild-life reservation areas within the project influence area with high biodiversity.	Insignificant
7.2.3.2 Effects on Fauna & Flora Majority of the trees found in the slope 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 such cultivation immediately adjacent or the area to be remedied.	Insignificant
7.2.4.2 Cracks in the building due to vibration impacts The unstable land is located upslope of the Yangalmodara railway crossing, within the Paarileiya Wana Arana and Sri Lanka Railway reservation land. The temple's chambers housing monks, the Buddha shrine, and other infrastructure could be impacted by vibrations during construction. Moreover, the staircase leading to the temple has already been damaged due to the landslide. Additionally, the house adjacent to the temple land remains vulnerable to vibrations. The impact of vibrations on these structures is highly	**Significant**

significant, as existing cracks may widen, and new ones may form. The use of heavy machinery during construction could further compromise the stability of nearby buildings.	
7.2.4.3 Loosing access to land and future development activities Most of the construction activities will be focused on unstable slope area upslope to the Yangalmodara Railway Crossing. Hence, during the construction phase, the railway and road will be temporarily obstructed. The traffic due to full/partial road closure may obstruct the smooth flow of vehicles. This will cause nuisance to the users of the road. Additionally, there may be temporary impacts on the upslope temple's access to certain sections during construction. However, in the long run, the remediation efforts will improve the stability of buildings and safeguard the land from future failures.	**Highly significant**
7.2.4.4 Impacts on livelihood/ business and income activities There is no income generating or business activity in the proposed mitigation area.	**Significant**
7.2.4.5 Impacts on service provision (water supply, sewage, electricity) The electricity lines and a water pipeline run at a distance from the unstable slope— the electricity line is located on the opposite side of the road, while the water line runs along the edge of the Maha Oya riverbank. Although there is a PVC water tank within the unstable slope section, the resident thero has confirmed that it is no longer in use.	Insignificant
7.2.4.6 Effect due to loss of infrastructure and safety During the construction phase, the railway and A6 road at the Yangalmodara railway crossing will be obstructed due to the frequent movement of machinery, loaders, trucks, and other construction vehicles.	**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. Although the workers who would engage in such issues will be rare, even few possibilities cannot be ignored.	**Highly Significant**
7.2.4.9 Workers safety during construction The workers may be exposed to risk of facing railroad and road accidents. The constructions are carried out in a very limited space. They also may face risk of falling from the unstable slope. Fatal injuries may occur due to the ignorance of workers and overstepping the moving dimensions resulting into train accidents. The heavy construction machinery may be used in limited work spaces. Risk of hazard from vehicles and construction machineries accidents is also 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 As the site is located in a land section featuring both railway tracks and a main road, ensuring commuter safety will be highly significant. The presence of heavy machinery such as excavators, rollers, water bowsers, trucks, and lorries carrying materials and water may increase the risk of accidents.	**Highly Significant**
7.2.4.11 Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) The traffic on the Ambepussa -Kurunegala road, and railway from Walakumbura to Polgahawela station's full/partial closure may obstruct the smooth flow of vehicles and ntrains during the week days, during office hours, school times, or holidays. This will cause nuisance to pedestrians and commuters.	**Highly Significant**
7.2.4.12 Areas used for businesses, agriculture or other within the area to be remediated There are no areas used for business, specific agriculture practices or other within the area to be remediated.	Insignificant
7.2.4.13 Areas used for businesses, agriculture or other immediately adjacent to the site There are no areas used for business, specific agriculture practices or other immediately adjacent to the site.	Insignificant
7.2.4.14 Need for people to enter or cross the site Excavation machineries, loaders, trucks etc. will be used in the railway station premises where railway commuters and railway staff are moving. There is no special need for commuters and the station staff 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, unauthorised 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 in a limited space	Workers	Very high
2. Transporting materials and machineries	Workers	Very high
3. Throw out disposals (litter, bottles, and food) to the construction site from the commuters of the road and trains.	Workers	Very high
4. Facing railway, and road accidents during construction at night time	Workers	Very high
5. Accidents from the construction activities and materials placed in the limited space	Workers/ commuters	Very high
6. Water inundation in the unstable area	Workers Railway and road commuters	High
7. The wasps' attacks during the construction phase	Railway and road commuters Community nearby Workers	Low
8. Injuries due to rock particles due to explosions/ blasting	Workers Community nearby	Low

9. Work adjacent to electrified lines, signal lines	Workers	High
10. Site Working – Working in poor visibility	Workers	High
11. Lone Working	Workers	High
12. Emergency evacuation	Workers	High
13. 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 requirements 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. The buildings may have some impacts in the form of structural damage during the project actions due to ground vibration induced by heavy machinery operation. (The scheme of compensation, in case of damage to structures due to project should be arranged, (Refer 2002.2.17) utilities and roadside amenities in contracts requirement to ESMP.

10.2 Evacuation of people

Project based evacuations are not required for this site.

10.3 Procedure 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

It may require to compensate for the losses occurred due to damaging the water supply lines due to project actions.

10.5 Public awareness and education- needed for following areas

i. Programs to inform and educate people in the vicinity about the risks posed by unstable land sections located at the railway crossing premises especially the occupants of the upslope temple and commuters using the road and railway station.
ii. Requirement for special awareness for commuters, and the people passing through the location 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 slope failures and movements of soil masses. Also, the site is located in a very limited space of a railway crossing. 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 of SLR during the construction period and proper communication between contractor's workforce, railway station and PMU must be built. The SLR buildings within the close proximity can be used as camping sites or storage houses under the permission of the Railway Department.	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 extraction of water is involving as a mitigation measure, as the extracted water is in a good quality and yield it can be considered as a source of water for upslope and downslope houses.	High
v. 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. As the tourism industry is one of the major economic growth points for the project area, 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.	High

vi. 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
vii. 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
viii. Workers/ commuters and community safety Due to the close proximity to the railway tracks people may face railroad accidents specially the workforce during the construction phase. Unauthorized entry and ignorance may cause severe accidents around the site. Activation of slides may occur during construction phase and may pose threat to workers, and commuters. Therefore, design-based safety consideration such as berms, safety nets etc. should be considered.	Very high
ix. 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
x. 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 etc. 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.	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 summarised below (Table 3) 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 contractors obligation to ESMP	Item	Relevant to the project
2002. Environmental and Social Monitoring		

2002.2 1)	Storage on site	Highly Relevant (railway tracks, Road and upslope temple)
2002.2 2)	Noise and Vibration	Highly relevant (upslope temple, nearby houses and commuters)
2002.2 3)	Cracks and damages to the buildings	Highly relevant (upslope temple and nearby houses)
2002.2 4)	Disposal of waste	Relevant (upslope temple, nearby houses and commuters)
2002.2 5)	Disposal of refuse	Highly relevant (upslope temple, nearby houses and commuters)
2002.2 6)	Dust control	Highly relevant (upslope temple, nearby houses and commuters)
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, commuters)
2002.2 17)	Utilities and roadside amenities	Highly relevant (houses)
2002.2 18)	Visual environment enhancement	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 (unsafe slope, 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. Avoid train accidents / possible emergency situations during construction Safety officers and flag men of SLR are highly recommended to each mitigation location. At least three flagmen should be kept in a site. Flag man or the safety officer has all the responsibilities of the train schedules and stop train in emergency situations. Always be alert on the signals and instructions given by the safety officers of SLR An awareness and training programme on railway safety for the construction workforce, railway station staff and users are compulsory.	Site preparation & construction	PMU Construction Contractor Railway Department
ii. 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 site is located adjacent to a railway crossing of a main road. 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 and Railway Department
iii. 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. • Prepare a special Occupational Health and Safety Management Plan prior to commencement of construction activities • A good warning system, watchman and fulltime flagman of the Railway Department is highly recommended for this site for both worker and commuter safety. • Adoption of standard worker safety methods • Provision of personal protective equipment (PPE) such as safety boots, helmets, protective clothing goggle etc. • Provision of trainings and awareness programs to employees • Conducting hazard analysis and plan/provide adequate mitigation measures for such hazards identified, prior to carrying out major construction activities • If the wasp nest is in the vicinity, it is mandatory to use Evacuation Centres for ensure of workers' safety • 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 Railway Department
iv. Transporting materials and machineries Inform and take permission from the authorized person of SLR before any material and machinery transportation through / along the railway tracks running very close to the affected area. The commuters and the workers should be informed about the material and machinery transportation schedule. The railway station	Construction	PMU Construction Contractor Railway Department

platform or the railway trucks must not be damage due to the material and machineries transportation.		
v. Impacts on railway transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) A good traffic control should be implemented in the construction stage. As there is a rail crossing close to the site proper safety measures should be included with warning signs and permanent trained watchmen, flagman, luminous sign boards indicating slope instability risk and rail road obstruction signs, night lamps etc. are strongly recommended at this site. All the safety sign boards must be used under the supervision of SLR and according to the railway transportation. Any deformities in the railway tracks due to construction activities should be monitored day and night by the watchman placed in the proposed mitigation site.	Construction	Construction Contractor and Railway Department
vi. Throw out disposals (litter, bottles, and food) to the construction site from the commuters of trains. Put up the safety sign boards prior to the construction site indicating people at work. The train commuters should be aware about the construction activities through railway announcements from previous railway station before reaching the proposed mitigation site.	Site preparation & construction	Railway Department
vii. Injuries due to rock particles due to explosions/ blasting Inform and take permission from the authorized person of SLR before blasting. Stop all blasting activities during train transport times and making awareness announcements through the nearby railway station. Establish an emergency accidents preparedness plan for the injuries due to rock particles due to explosions/ blasting.	Construction	Construction Contractor Railway Department
viii. Inundation of the railway tracks During the construction, the water inundation of the railway tracks and the road will be expected. To mitigate this impact, contractor should construct temporary surface and sub surface drainage network directing excess water to nearby stream or canal before start of the construction.	Site preparation & construction	Construction Contractor
ix. 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
x. 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 relevant authorities.	Construction	Construction Contractor

xi. Noise and vibration control The noise and vibration generating activities may disturb the smooth flow of activities of the nearby houses including the Paarileiya Vana Arana and the both road and railway commuters taking Yangalmodara railway crossing. Vibration generating activities should be done within the prescribed limits to avoid damage to structures. Suitable compensation should be made if damage cracks due to construction work occur in the houses and infrastructure.	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 within a public place in a rural landscape with a pleasing environment. 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 tracks.	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, tourists and staff of the station. The upslope Paarileiya Wana Arana temple and nearby houses with occupants 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 and electricity for construction Water for construction should be obtained only from approved places. If the Contractor intends to use electricity from the main electricity line, they should be informed and the required permission should be taken.	Construction	Construction Contractor
xvi. Working hours, working in extreme weather conditions and working in poor visibility The construction activities can be carried out at both day and night time. Working after 6.p.m. could be done after with the consent from Station Master due to safety issues.	Construction	Construction Contractor Railway Department
xvii. Impact on service infrastructure Telecommunication, electricity, water lines should be relocated before construction starts on per the approval of PMU.	Construction	Construction Contractor
xviii. During construction good housekeeping should be maintained to minimize visual pollution	Site preparation & construction	Construction Contractor
xix. Workers code of conduct Possible disputes between the labor force and the villagers, staff of the station, commuters and tourists should be prevented by maintaining the agreed code of conduct by the contractor. Possible disputes between workforce and villagers should be avoided especially when using shared resources such as common bathing and washing places etc.	Construction	Construction Contractor

xx. 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.		

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	**Parameter**	**Frequency**
i. Baseline monitoring	Water quality (wells)	Once*
	Pre crack survey for the railway station	Once*
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality	During rainy season if noticeable change in the appearance of water
	Crack survey for the risk houses	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 ambient water quality standards published by the CEA, 2017 **Pre crack survey of the railway station** -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. Public and Stakeholder Consultations - the public consultations that have been and/or will be held

11.1 Public Consultations

Ven. Aluthdivulwewe Indrananda Himi, the residing thero of Paarileiya Wana Arana Temple, was consulted and informed about the landslide early warning alerts, the mitigation project, and the funding mechanism. The thero acknowledged the importance of the mitigation works and expressed full support and cooperation for the project. Similarly, the gatekeeper of the Yangalmodara railway crossing, Mr. M.M. Bandara was also consulted and made aware of the potential threat and the proposed project.

11.2 Stakeholders involved in the consultations any recommendations or agreements reached in the consultations

Mr. Aruna Adhikari, the supervising manager (Fixed Road - Polgahawela) of Sri Lanka Railways, Mr. J.M.W.K. Hunukumbura, the chief engineer of RDA Kurunegala, Ms. P.D.S.K. Gunapala, Divisional Secretary of the Alawwa DS Division, and Mr. I.P.N. Kelum Kumara, the Grama Niladhari of the Yatigaloluwa GN Division, were informed about the project works. They acknowledged the necessity of the mitigation and expressed their full support for the project.

12. 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
11.1 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 Alawwa Pradheshiya Sabha.
11.2 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 are 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 for extraction of materials, transportation and disposal of earth, rocks and mineral debris. (If necessary, only).
Alawwa Pradheshiya Sabha	Approvals from Alawwa Pradheshiya Sabha 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.
11.3 Consent/ no objection/ legally bound agreement from the private land ownerships	
Land owner (Sri Lanka Railway Department, RDA, and Paarileiya Wana Arana temple)	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 Sri Lanka Railway Department and 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								

13. 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).*

14. 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, Railway station master, Other district level 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, Railway station master, 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, Divisional secretary, Police, Railway station master, 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, Divisional secretary, Police, Railway station master, 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
03/04/2025	Sri Lanka Railways	Mr. Aruna Adhikari, Supervising manager (Fixed Road – Polgahawela)
03/04/2025	Road Development Authority	Mr. J.M.W.K. Hunukumbura, Chief engineer - RDA Kurunegala
02/04/2024	Divisional Secretary, Alawwa	Ms. P.D.S.K. Gunapala Divisional Secretariat
02/04/2024	Divisional Secretary, Alawwa	Mr. I.P.N. Kelum Kumara Grama Niladhari - Yatigaloluwa

Annexure I: Images of the site condition and the consultation

Consultation with Ven. Aluthdivulwewe Indrananda Himi, of Paarileiya Wana Arana Temple.

Consultation with the gatekeeper, Mr. M.M. Bandara.

Consultation with Mr. A.K.S. Athukorala, the household next to the temple land.

Annexure II: Report on the Stakeholder Consultation: Kurunegala District

Institution	Name and designation of the contact officer	Concerns raised
Central Environmental Authority	Mr. D.M.K Dissanayake, Provincial Director, Central Environmental Authority North western Province.	✓ 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. E.M.S.P.K. Deegala, Chief Engineer Mr. Sandun Lokuarachchi, Superintend Engineer (Central)	✓ 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 • The service infrastructure should be relocated under the supervision of SLR. ✓ 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 SLR for approval for implementation of landslide mitigation projects in SLR reservation areas**
   i. The design to be accepted by the SLR: The project implementing agency should submit detailed design report to SLR with a formal request on nature of approvals required. PMU should prepare above documents and should submit the documents to Way and Works of Railway Department.
   ii. Way and Works Railway Department will evaluate the proposal and may call for project briefing. The PMU should provide necessary briefing as appropriate
   iii. On the approval by SLR an agreement will be signed between SLR and Project implementing agency to access the site, erect structures, and implement mitigation works.

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
Thilina Dissanayake	Project Assistant/ESSD/NBRO	Demographic data /survey support

Annexure V: 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