REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No.183
Unstable slope area at Dorana Ella Information Center - Sinharaja Forest Entrance

Rathnapura District

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Prepared for:

ASIAN INFRASTRUCTURE INVESTMENT BANK

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Abbreviations

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

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 Landslide Vulnerability by Mitigation Measures Project (RLVMMP). The project requires to be implemented in accordance with environmental and social safeguards and mandates of the AIIB and that of Sri Lanka. Considering the nature of project actions and its implementation, an Environmental and Social Management Framework (ESMF) has been prepared as required by the AIIB environmental and social safeguard policy.

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

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

This is the site specific environmental and social management plan for **Dorana Ella Information Center - Sinharaja Forest Entrance** site mitigated under the RLVMMP. 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 183, Ratnapura District, for **Unstable slope in Dorana Ella Information Center - Sinharaja Forest Entrance**

2.2 Location details

The proposed mitigation site falls under Kudawa GN division of the Kalawana DS division, Ratnapura District, Sabaragamuwa Province.

GPS references of the site– 6.435842 °N and 80.419402 °E

Nearest town and accessibility to the site– Kalawana

Kalawana town is about 35 km from the site. The site can be accessed by taking the Kalawana-Rakwana B181 road and then turning right at the Wedddagala Junction onto the Weddagala-Kudawa road. The Dorana Ella Information Center is approximately 7 km from this point, located at the end of the Weddagala-Kudawa road. (Ref. fig. 1)

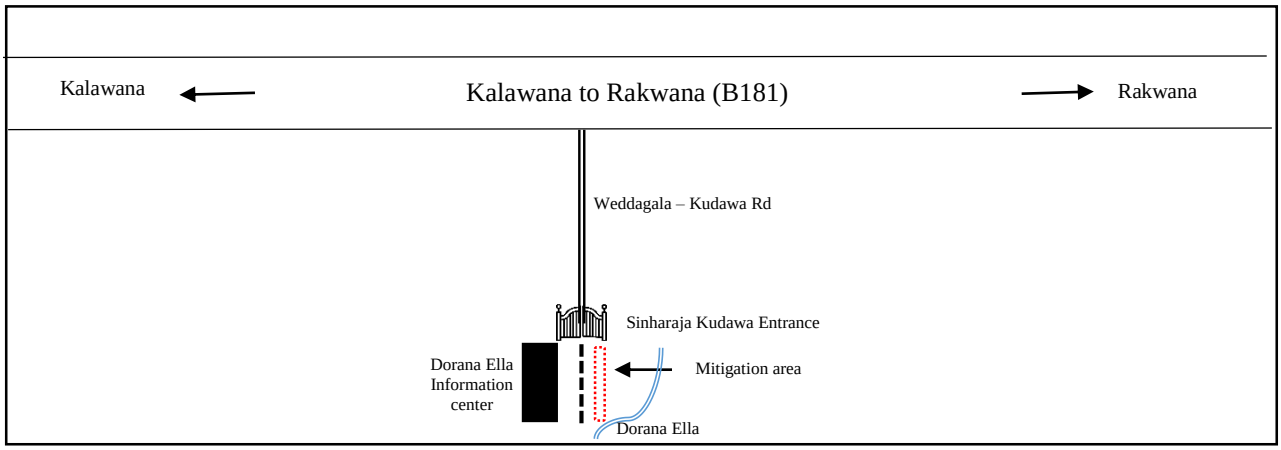

Figure 1:Road map showing the accessibility to the site

2.3 Topography and land ownership

The proposed mitigation site is located in Dorana Ella Information Center premises - Sinharaja Forest Entrance, in the Kalawana area of the Ratnapura District. The unstable and subsidized slope section is located in between the Information Center and "*Dorana Ella*" river reservation area. The elevation range of the area is nearly 200 - 1150m. The extent of site proposed to be mitigated is about 657 m^2. The land ownership of the Dorana Ella Information Center is Department of Forest Conservation in Sri Lanka. A river called "*Dorana Ella*" is flowing from the boundary of the Information Center premises.
Refer figure 2, 3; Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure.

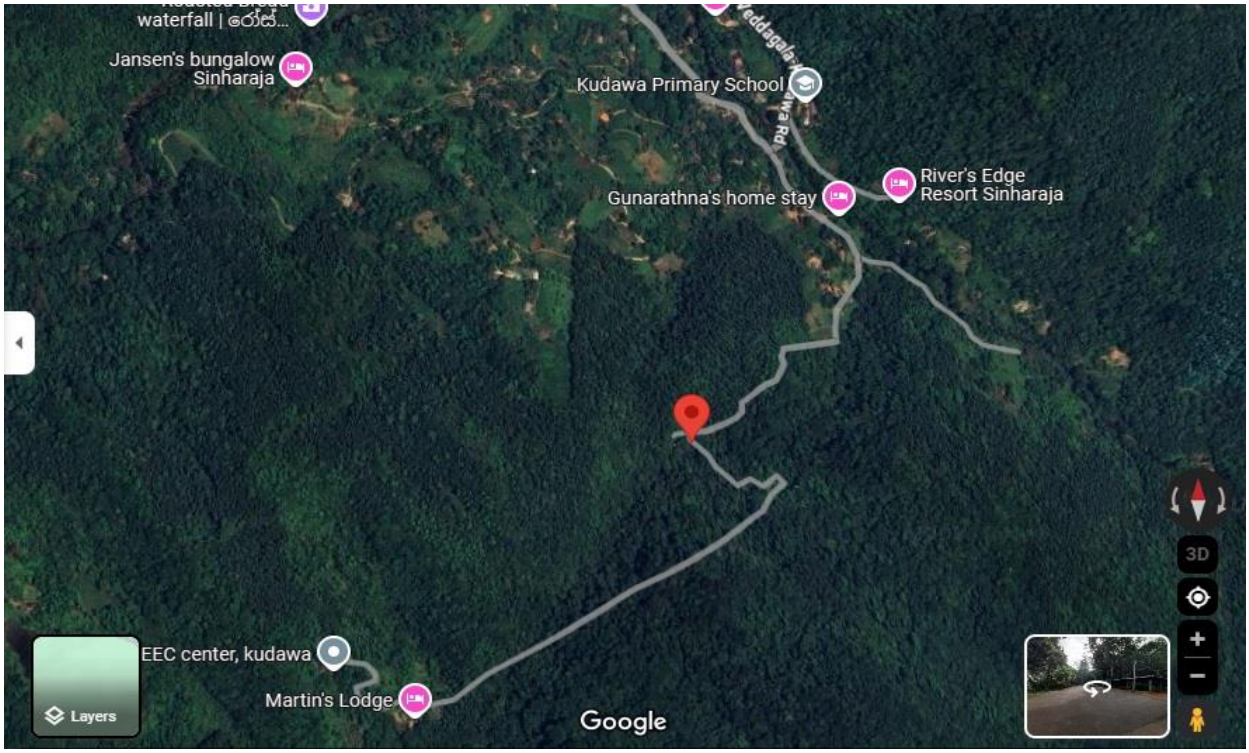

Figure 2: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure

2.4 Meteorology of the area

Annual Rainfall Range – 3614mm – 5006mm
Average temperature range – 19°C – 34 °C
(Source: weatherandclimate.com)

3. Landslide hazard incident details

3.1 Account of incident

Ground instability and the ground subsidence have been emerged in between the two-story building of the information center and the *Dorana ella* river reservation area with the heavy rain fall. The area is highly potential for slope failure and ground subsidence.
Slope failure *Refer Fig 3: cross sections, land use, risk elements and the photographs of special features of the location.*

3.2 Effects and consequences of landslide

No any causalities or physical damages to the buildings were reported.

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 any evacuations have been undertaken due to the potential risk.

3.5 Resettlement (progress)

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

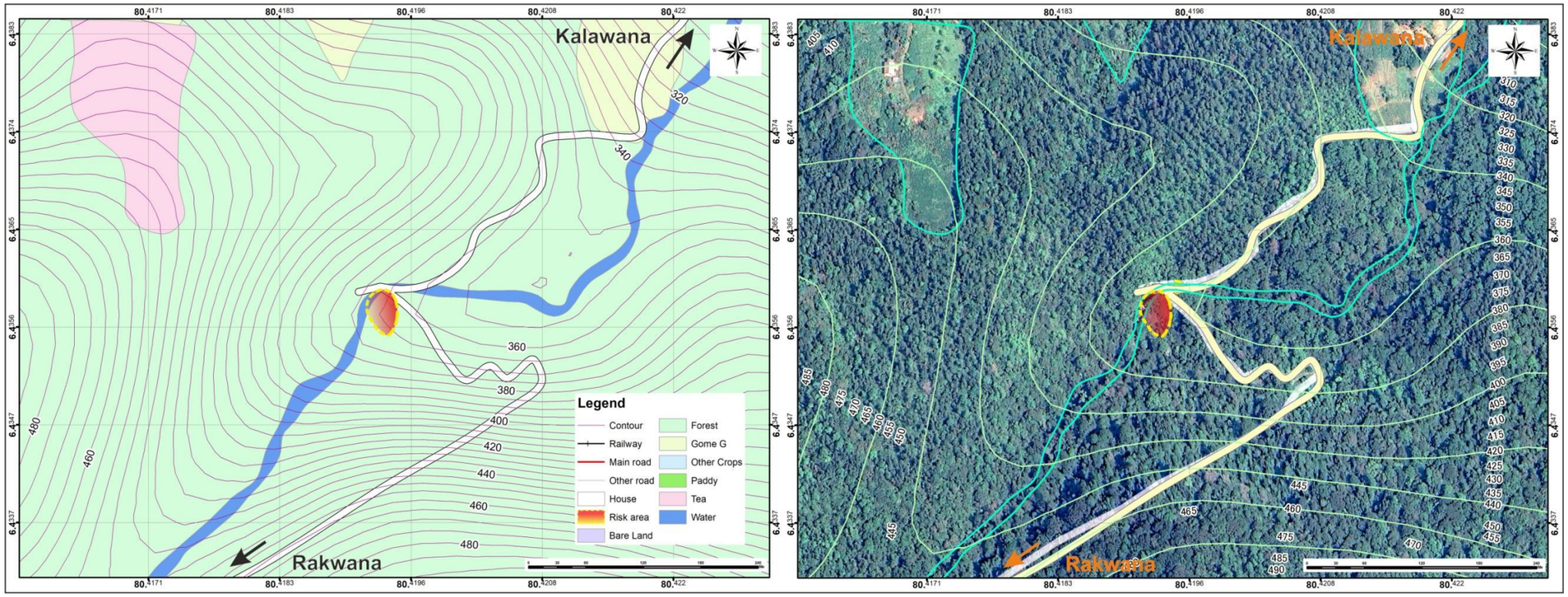

Figure 4: Google image, cross sections, land use, risk elements and the photographs of special features of the location

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 unstable slope section

The *Dorana Ella* information center is situated along the access route from the Kudawa ticket counter to Wathurawa within the Sinharaja Forest Reserve, a UNESCO World Heritage Site in southwestern Sri Lanka. This area is renowned for its rich biodiversity and is a popular destination for nature enthusiasts. The access road from the Kudawa entrance, passing through Dorana Ella to Wathurawa, has been the focus of rehabilitation efforts due to erosion and degradation caused by heavy rains and usage.

It is a government-run information-providing center located near the entrance of the Sinharaja Forest Entrance in Sri Lanka. The main purpose of this information center is to provide valuable information and the building also facilitates a conference hall for school and university students, researchers, wildlife enthusiasts, the general public, and tourists who wish to gain knowledge of the Sinharaja forest.

The two-story building of the premises includes the information center, a conference hall, a cafeteria, a dining hall, a sick room, washrooms, and a staff room. At present, the information center employs approximately 20 staff members who contribute to its day-to-day operations and overall functioning. Instead of providing information and conference hall facilities, other services like dining, sanitary, and resting of sick persons are provided. The environment is surrounded by lush rainforest, making it a prime location for education, biodiversity experiments, bird-watching, photography, and nature walks.

A natural river called "*Dorana Ella*" with crystal clear water is flowing at the boundary of the unstable area.

4.2 Areas adjacent to the unstable slope

The environment near the unstable area is a serene and pristine rainforest setting, forming part of the entrance of the Sinharaja Forest Reserve, a UNESCO World Heritage Site. Surrounded by lush greenery and towering tropical trees, the area is teeming with biodiversity. The air is cool and damp, often filled with birdsong, the hum of insects, and the gentle rustle of leaves in the breeze. Crystal-clear streams meander through the forest floor, while vines, ferns, and orchids flourish in the shaded understory. Early mornings are misty and tranquil, offering an ethereal atmosphere ideal for birdwatching and nature walks. With its rich ecological surroundings and peaceful ambiance, the area around the forest entrance and the information centre provides a true immersion into one of Sri Lanka's most important natural habitats. A bridge is located across the river near adjacent to the unstable slope *Refer Fig 4: Google image, cross sections, land use, risk elements and the photographs of special features of the location*

4.3 Current level of risk

The entrance and the surrounding area of Dorana Ella information center, while offering remarkable information, facilities and access to the Sinharaja Forest Reserve, also presents certain geological and environmental risks that visitors should be aware of particularly related to slope instability and ground subsidence. The area contributes to a moderate to high risk of landslides, slope failures and ground subsidence especially during the monsoon seasons (May–September and October–January). The saturated ground can become unstable, leading to small -scale soil slips or more significant slope failures in certain areas. Additionally, ground subsidence the gradual sinking or sudden collapse of the

earth surface can occur in waterlogged zones or where human activity (like footpaths and minor construction) weakens the soil structure.

If the site is not rectified to prevent future ground subsidence, the slope failure with soil masses would disturb all functions of the information center. Officers of the Department of Forest, tourists, bird watchers, researchers, naturalists and their research or recreation activities would be at risk due to this unstable section. These improvements aim to enhance accessibility while preserving the surrounding ecosystem.

5. Description of the works envisaged under the project

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

- Earthworks including excavation and removal of soil mass
- Drainage management using surface and subsurface drainage network
- Further, in order to restore and retain the natural aesthetic outlook of this location, the protection works will essentially include nature-based surface protection solutions like turfing and planting.

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

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

i. Surrounding area in between the information center and the river
ii. Two story building complex
iii. Entrance of the Sinharaja Forest
iv. Officers of the Department of Forest, students, tourists, bird watchers, researchers, naturalists, general public and their study or recreation activities
v. "*Dorana Ella*" river and the bridge
vi. Boundary of the Sinharaja rain forest
vii. Current services and tourism activities of Kudawa Circuit Bungalow

(Ref. Fig.6 Sensitive elements that may be affected by the project actions)

Figure 6a: Information center building

Figure 6b: Entrance of the Sinharaja Forest

Figure 6c: Unstable area close to the vehicle parking facility

Figure 6d: Students and public who come to the information center

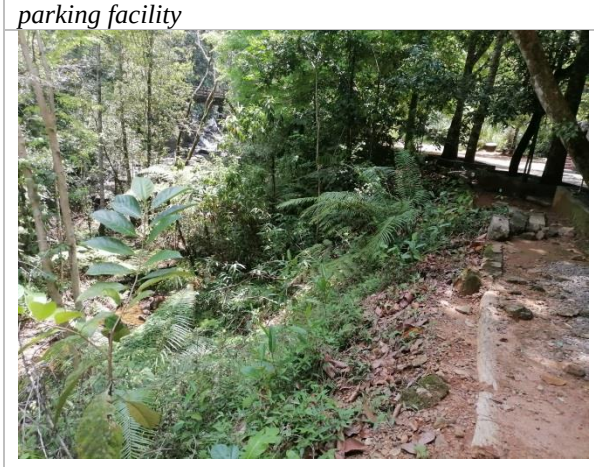

Figure 6e: Unstable downslope areaand the bridge across Dorana Ella river

Figure 6f: "Dorana Ella" river

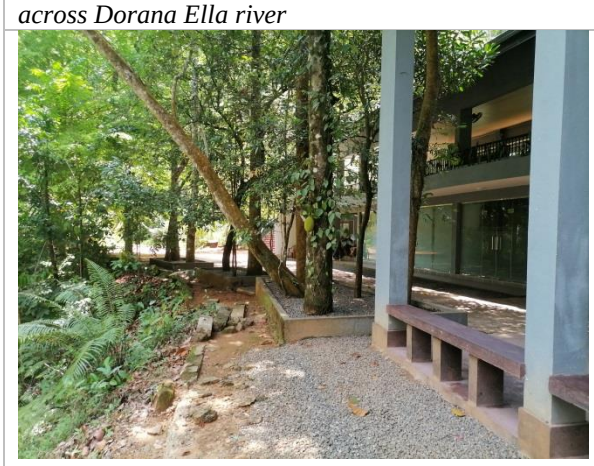

Figure 6g: Recreation compound at the information center

Figure 6h: Uprooted trees in the slope

Figure 6: 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 unstable slopes, slope failures or ground subsidence will be prevented to an acceptable level for the information

center premises located Sinharaja Forest entrance. Safer and more reliable destination encourages more visitors and students.

- Forest Officers who are working here will be highly benefitted from this mitigation. They will Improved their occupational safety and mitigation reduces risks during patrols, especially during heavy rain, improving occupational safety. The operational efficiency will be improved and less disruption to duties such as conservation work, patrolling, and fire control.

- Enhanced accessibility for the unstable area for employees, students, tourists, researchers and other general public

- The government infrastructure and institution will be protected by safeguarding offices, building, and sanitary facilities from slope failure damage.

- Improved visitor or students experience by well-maintained paths and scenic points increase enjoyment and accessibility.

- River bank and the bridge of the "*Dorana Ella*" river will benefitted by bank erosion ,debris depositions or ground instability.

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 existing drainages may be expected. Increase of water through the unstable area may intensify the risk of ground subsidence of the unstable section.	**Highly Significant**
7.2.1.2 Water pollution and impacts on surface water quality During the excavations, removal of soil and debris can generate high sediment laden runoff there could be a possibility that contaminated runoff may pollute the water within the river flowing in the affected area. Improper disposal of oils and other harmful substances/contaminants from machineries, leakages from temporary storage tanks, solid waste and wastewater disposal /dumping could occur causing adverse impacts on quality of the water. However, during rainy season, the rainwater running through the disturbed area tends to pick up sediment, oil and other pollutants generated during construction can contaminate the water of the Dorana Ella river.	**Highly 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 highly significant due to a river is located close proximity to the mitigation area.	**Highly Significant**
7.2.1.4 Open defecation and waterborne infections As site is located close to stream and dense forest cover, possibility of open defecation is high. Faecal contamination of water of the river or runoff water flow will be expected	**Highly Significant**

during construction due to open defecation of the contractor's workforce as the area consists thick vegetation cover.	
7.2.1.5 Impacts on the downstream water uses The construction activities will be carried out very close to the river bank. Therefore, the river bank will be prone to erosion during land clearing and land reshaping phase. This may increase the sediment load in river which at present has clean water, and affect the users at down slope areas.	**Highly Significant**
7.2.1.6 Impacts on ground water table and ground water quality Addition or mixing of construction materials including cements, grout materials with sub-surface water flows will cause temporary water quality degradation and accumulation of unwanted substances. During the construction period, the hazardous waste from chemical substances, waste water from the construction activities and discharge of waste matter from onsite septic systems would cause adverse impacts on the ground water quality as the water of the natural stream may use by the residents. Due to the mitigatory activities carried out in the area, the ground water quality and river water quality will be impacted.	**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 natural stream that may use to fulfill the water requirement of nearby residents.	**Significant**
7.2.2 Environmental Impacts	
7.2.2.1 Noise and vibration impacts Noise and vibration are expected from construction equipment. The officers of the DoF, tourists and students will also have an effect from noise and vibration. They will be exposed to high noise during heavy noise generating activities, such as operating loading and unloading of materials, movement of machinery in addition to above mentioned construction works.	**Highly Significant**
7.2.2.2 Air pollution impacts Construction activities that contribute to air pollution include: land clearing, operation of diesel engines, demolition and burning. Operating vehicles at high speed under dry weather conditions can increase such pollution. Improper handling and transferring of materials can also generate dust. Improper storage of materials can potentially generate dust if not properly covered. During construction, it generates high levels of dust typically from concrete, cement, wood, stone, and silica. The road is used heavily for vehicles moving (buses, bicycles, lorries, trucks, tippers, three wheels). The air pollution may have significant impact on the officers of the DoF, tourists and students. The air pollution impacts from the construction are locally significant 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 site will create inconveniences to the commuters, pedestrians, shop owner, workers of the tea estate. It can block the drainages 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 no rock boulders, explosives may not be used if the rock blasting is not envisaged.	Insignificant
7.2.3 Biological /Ecological Impacts	

7.2.3.1 Effects of important wildlife habitats Access roads, drainage channels, and construction zones can divide contiguous forest areas, disrupting wildlife movement and leading to habitat fragmentation. Fragmentation can isolate populations of sensitive species, reducing gene flow and increasing the risk of local extinctions. Construction noise, vibrations, and human presence may disturb wildlife, causing stress or displacement from their habitats. Nesting birds, amphibians, and mammals like purple-faced langurs may abandon breeding areas due to disturbance.	**Highly Significant**
7.2.3.2 Effects on Fauna & Flora Clearing vegetation for mitigation structures (e.g., retaining walls, slope stabilization nets) results in the direct loss of plant life and undergrowth that many small animals, insects, and birds rely on. Epiphytic plants, mosses, and lichens — common in Sinharaja area may be destroyed in disturbed areas, impacting the microhabitats of amphibians and invertebrates. Slope stabilization often involves drainage changes, which can disrupt natural water flow in streams and swamps that support aquatic life and amphibians. Changes in hydrology can lead to drier soil conditions in some zones, affecting moisture-dependent species. Soil movement and increased human access can lead to the spread of invasive plant species, which may outcompete native flora critical to local fauna.	**Highly Significant**
7.2.4 Social and Economic Impacts	
7.2.4.1 Impacts on agriculture within the area to be remedied/ immediately to the site There are no agricultural practices within the area to be remedied.	Insignificant
7.2.4.2 Cracks in the building due to vibration impacts The unstable land is located within the information center premises and a two story buildings is located there. Vibrations can create cracks on the building. Therefore, vibration impact on the mitigation areas is significant. During the construction heavy machinery will be used and the vibration can widen the cracks and may create new ones.	**Significant**
7.2.4.3 Loosing access to land and future development activities The land where the project activities are envisaged belongs to Department of Forest. As this is government owned property, there will not be impacts to the land owners with regard to loosing access to the land (during construction) and loss to valuable use of the land. In contrary, remediation works in the land will increase the stability of the boundary and protect the land from future ground instability.	Insignificant
7.2.4.4 Impacts on livelihood/ business and income activities There will be no impacts on livelihood/ business and income activities of the area due to mitigation activities.	Insignificant
7.2.4.5 Impacts on service provision (water supply, sewage, electricity) There are no community water supply lines and electricity supply lines which are located within the unstable area to be impacted by the construction period.	Insignificant
7.2.4.6 Effect due to loss of infrastructure and safety During construction phase the access path to the bathing area will be obstructed by frequently moving machinery, loaders, trucks etc. as the access path is very narrow. Therefore, most of the heavy machinery, trucks and loaders can obstruct the access path during the construction period.	**Low Significant**
7.2.4.7 Work camps and lay-down site requirements The camps site will be selected in the neighbourhood of community. If proper camp management is not in place, it may result several labour issues, social issues with community, conflicts for shared resources with the community, nuisances, and management of waste etc. If temporary camps are built in the close proximity of the site, management of solid waste and sewage will be an issue.	**Significant**

7.2.4.8 Relations between workers and staff/ people living in the vicinity of the site and possibility of disputes The construction workers at this site will be from different social backgrounds and from different geographical areas often under poverty. Usually, they are with poor educational and social background. Such communities may have a wide range of social issues to cause dis-stress on the neighbouring community and the workers of the project. Although the workers who would engage in such issues will be rare, even few possibilities cannot be ignored.	**Highly Significant**
7.2.4.9 Workers safety during construction The workers may be exposed to risk from falling. Fatal injuries may occur if the slope fails. The risk of slope failure is aggravated during the rainy season. This risk is highly significant. Risk of hazard from vehicle and construction machinery accidents is highly significant at this site. Contractor may engage under age workers (children) for construction work, which is risky and can results serious accidents and injuries.	**Highly Significant**
7.2.4.10 Safety to the public from construction activities: High risk for commuters During construction phase the bungalow premises will be obstructed by the frequently moving machinery, loaders, trucks etc. As most of the mitigation works are to be carried out in limited space with the heavy machinery, the trucks and loaders etc. can obstruct the passages and may pose high risk on the people's life. Therefore, the risk on the people is highly significant.	**Highly Significant**
7.2.4.11 Impacts on transport infrastructure There is no impact on transport infrastructure due to the mitigation	Insignificant
7.2.4.12 Areas used for businesses, agriculture or other within the area to be remediated There are no any areas used for businesses or agriculture 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 any areas used for businesses or agriculture immediately adjacent to the site to be remediated.	Insignificant
7.2.4.14 Need for people to enter or cross the site Excavation machineries, loaders, trucks etc. will be used in the area used to access in to the unstable slope area. There is no special need for commuters and neighbouring community to enter the site for other purposes. Construction may use materials such as metal aggregates, steel etc. which can be injurious under improper storage and handling. However, 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	Workers	Very high
2. Transporting materials and machineries	Workers/ students/Officers of the DoF/ Tourists/ Researchers	Very high

3. Throw out disposals (litter, bottles, and food) to the construction site and nearby area	Workers / students/Officers of the DoF/ Tourists/ Researchers	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 buildings	Officers of the DoF/ students/ Tourists/ Researchers	Very high
6. Injuries due to construction works	Workers/ students/ Officers of the DoF/ Tourists/ Researchers	Very High
7. Work with electrified supply lines	Workers	High
8. Site Working – Working in poor visibility	Workers	High
9. Lone Working	Workers	High
10. Emergency evacuation	Workers/ Officers of the DoF/students/ Tourists/ Researchers	High
11. Extreme weather conditions (wind, rain etc.)	Workers	High

9. Significant Environmental and Social Impacts

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

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

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

9.2 Child labour & forced labour

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

10. Environmental Social Management Plan (ESMP)

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

10.1 Resettlement action plan

There is no project-based resettlement in this site.

10.2Evacuation of people

Project based evacuations are not required for this site.

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

This risk may not be triggered in this site.

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

This risk may not be triggered in this site.

10.5 Public awareness and education- needed for following areas

i. Programs to inform and educate people in the vicinity and Officers of the DoF about the risks posed by unstable land section
ii. Requirement for special awareness for tourists, students , researchers and the people who coming to the area 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 instability. Also, the site is located in a very limited space in between river and buildings. The vehicle parking sites, material storage and temporary shelters etc. should not be installed in the danger zones of the ground subsidence. It is very necessary to keep safety officer during the construction period and proper communication between contractor's workforce and the other responsible officials should be maintained.	Very High
iii. Habitat connectivity and animal trails If large fractions of vegetation are required to be cleared in ecologically fragile habitats as for permanent structures or for access, or if deep drains etc. are to be made the designs should include habitat connectivity features, animal trails and vegetation strips and etc. even if the impacts are localized.	High
iv. Conservation of water resources If involves extraction of water both surface and sub-surface. The water extracted is in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by wild fauna as well as the neighboring communities for bathing and other domestic purposes .	High
v. Interruption to water supplies If the water in the mitigated slope is used as a source for individual or community water supply, the chance the water source can be affected by the mitigation work is high due to water table draw down. Also, there is a there is a natural stream located within the upslope of the site providing drinking water for the nearby community. In such instances the design should include alternative source of water for the community (temporary/or permanent).	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. 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	Very High

mitigation structures.	
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 social and cultural features The local cultures and heritages are strengthened by their close connections to the natural environment that sustains them. Therefore, the project actions should be carried out considering local culture and social aspects, providing opportunities to reinforce them during the project actions.	Low
ix. Workers/ students and public safety Due to the close proximity to the information center, 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 the officers of DoF, tourists and researchers. Therefore, design-based safety consideration such as beams, safety nets etc. should be considered.	Very high
x. Erosion control structures In drainage management, water is extracted and conveyed to nearby stream often through culverts. During rainy season the flow in these drainage structures can be significantly high and this may cause stream bed erosion. Hence the design should adequately consider flow speed breakers to reduce erosive flows entering natural streams. This should be an inclusive part of the design if there is a river 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 (information center premises)
2002.2 2)	Noise and Vibration	Highly relevant (officers of DoF, tourists and researchers)
2002.2 3)	Cracks and damages to the buildings	Relevant
2002.2 4)	Disposal of waste	Relevant
2002.2 5)	Disposal of refuse	Highly relevant (information center premises)
2002.2 6)	Dust control	Highly Relevant (officers of DoF, tourists and researchers)
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 (officers of DoF, tourists and researchers)
2002.2 17)	Utilities and roadside amenities	Highly relevant
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
2003.3	Child Labor and Forced Labor	Relevant
2003.4	Safety reports and notification of accidents	Highly relevant
2003.5	Safety Equipment and Clothing	Highly relevant
2003.6	Safety inspections	Highly relevant
2003.7	First Aid Facilities	Highly relevant
2003.8	Health and safety information and training	Highly relevant
2003.9	Plant equipment and qualified personnel	Relevant

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

10.7.2 Site Specific mitigation

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

Table 5: Site specific ES & HS mitigation measures

Mitigation item	Project implementation phase	Responsibility

i. Minimize erosional impacts during construction It is recommended that mitigation works involved with site clearance, slope reshaping, removal of debris etc. are avoided during rainy season. Therefore, it is imperative that site works in slope mitigation are carried out in the dry season and avoid such activities in the wet season as much as possible. This should be considered in project planning stage. Silt traps should be introduced to cut down sediment laden runoff.	Site preparation & construction	Construction Contractor
ii. Invasive species Should be avoided in using vegetative erosion control structures. Native plants in the forest environment should be chosen for vegetative control. The species used for vegetative control measures need approval from the Department of Wildlife Conservation & Department of Forest.	Construction	Construction Contractor
iii. Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) A good traffic control should be implemented in the construction stage near the entrance of the Sinharaja Forest. 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 fulltime watchmen is highly recommended for this site for both worker and commuter safety. iii. Safety barriers and safety nets should be installed at places of risk to protect workers and commuters from boulder falling risk Adoption of standard worker safety methods iv. Provision of personal protective equipment (PPE) such as safety boots, helmets, protective clothing goggle etc. v. Provision of trainings 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 Centres 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. 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

vi. Disposal of construction waste The contractor should pay special attention with respect to disposal of construction waste. This site is located within the Sinharaja Forest Entrance information center premises with a clam, quit and pleasing environment. Dorana Ella river is flowing from the boundary of the site and water seepages are available in the area during rainy season. Therefore, such waste if generated should store properly without getting washed off and dispose according to approved procedures by the PMU. Construction waste should not dispose along the road or into the drainages.	Site preparation & construction	Construction Contractor
vii. 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
viii. Dust and aerosol control screens Dust particles generated during the construction period can influence the officers of DoF, students, tourists and researchers. They will 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
ix. Water for construction Water for construction works should be obtained only from the approved sites.	Construction	Construction Contractor
x. 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
xi. Impact on service infrastructure Telecommunication, electricity, water lines should be relocated before construction starts as per the approval of PMU.	Construction	Construction Contractor
xii. 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
xiii. During construction good housekeeping should be maintained to minimize visual pollution	Site preparation & construction	Construction Contractor
xiv. 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
xv. Snake bites management and emergency management by accidents Proper emergency management system for snake bites (include awareness on snake bites, safety shoes while at work, first aid on a snake bite, hospitalization and admission to correct hospital where snake bite management facilities are available) should be introduced. Accidents are common in these kinds of sites. Proper emergency management unit for other accidents (first aids facilities, safety items, hospitalization facilities and transportation facilities) should be maintained for this site.	Construction	Construction Contractor

10.7.3 Monitoring requirements specific to the site

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

Table 6: Environmental and Social monitoring plan; construction phase

Monitoring requirement	**Parameter**	**Frequency**
i. Baseline monitoring	Water quality (River)	Once*
	Pre-construction crack survey (Building)	Once*
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality (River)	If noticeable water quality impairment due to sediment laden runoff
	Crack survey for the risk buildings	If noticeable displacement is observed during construction **
	Ground vibration	During operation of drilling machinery, boring works, or any works that generate ground vibrations*
	Construction noise	Once a month during heavy noise generation times *
	Air quality particulate matter	Once a month *
iii. Vehicular Emission	All machinery/vehicles operational should have the emission control test certificate as applicable - should be checked by the site ES officer of the consultant	
iv. Monitoring agency	* A competent independent monitoring agency with registration of Central Environmental Authority for all parameters except crack surveys **Crack surveys should be conducted by competent agency acceptable to PMU	
v. Reporting requirements	**Stream water quality** – Comparison with National Environmental (ambient water quality) regulations, no.01 of 2019 **Pre-construction crack survey of the high-risk buildings**-Professional report **Ground vibration**-as per the interim standards on vibration for the Machinery, Construction activities and Vehicular movements, CEA **Background noise measurement** –Extraordinary Gazette No.924.1, May 23,1996, CEA **Air quality particulate matter**- The National Ambient Air Quality standards stipulated under the Extraordinary Gazette, No. 1562/22 August 15, 2008 -Central Environmental Authority of Sri Lanka.	

11. Labour management

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

The objectives are;

- To promote safety and health at work.
- To promote the fair treatment, nondiscrimination and equal opportunity of project workers.
- To protect project workers, including vulnerable workers such as women, persons with disabilities, children and migrant workers, contracted workers, community workers and primary supply workers, as appropriate.
- To prevent the use of all forms of forced labor and child labor.

- To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national laws.
- To provide project workers with accessible means to raise workplace concerns.

12. Preventive measures for COVID-19 that was issued by Sri Lankan national health authority

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

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

13.1 Public Consultations

Mr. S.D Namal, Forester of Sinharaja forest and Mr. E.G. Suresh Wasantha, Field Officer of the Department of Forest was informed about the project works and got the clearances for the project.

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

Mr. S.D. Nimal, Forest Officer of the Kudawa Entrance of Department of Forest conservation was informed about the project works and got the clearances for the project.

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

Table 7: Clearances, no objection, consent and approvals

Requirement / Approval / Institution	Relevance to the project
14.1 Project implementation	
Approval from the District Secretariat	The approvals will be required and the proposals need to be presented at the District Coordinating Committee, to which chief minister and stakeholder agencies in the district will also participate. The Officer of PMU will present the project, disclose the project details and various concerns including environmental and social issues will be discussed at this meeting. The issues arrived will be addressed in the ESMP, the decisions and recommendations taken up at this meeting will be considered in the ESMP.
Approval from the planning committee	The approval from the planning committee of the Kalawana 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 Rathnapura 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, ttransportation and disposal of earth, rocks and mineral debris. (If necessary, only).
Kalawana Divisional Secretariat	Approvals from Kalawana 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 Forest)	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 7.

Table 8: Tentative timeline for getting approvals

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

15. Grievance redress mechanism for this site

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

16. Information disclosure

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

Table 9: Proposed scheme of information disclosure

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

Table 10: Level of information gathered through consulting institutions

Date	Institution	Person contacted for information
15/03/2025	Dorana Ella Information Center Sinharaja Forest Entrance Department of Forest Conservation	Mr. S.D. Nimal, Forest Officer Department of Forest Conservation
15/03/2025	Kudawa 198B Kalawana Divisional secretariat office	Ms. H. M Roshani Grama Niladhari Kudawa 198B

Annexure I: Images of the site condition and the consultation

	
Consultation with Mr. S.D Nimal (Kudawa Entrance) Forester, Sinharaja Forest	*Consultation with Ms. H.M Roshini, Grama Niladhari, Kudawa 198B Division*

Annexure II: Report on the Stakeholder Consultation: Ratnapura 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, Ratnapura 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.

Annexure III: 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	Data collection and report preparation

Annexure IV : 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