



REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No.111
Badulla-Soranathota-Dalukkotuwa-Kiriwehera Road (UVA CRIP)
Badulla District

March 2022

Prepared for:



**ASIAN INFRASTRUCTURE
INVESTMENT BANK**

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Abbreviations

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
CEB	Ceylon Electricity Board
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
ESMP	Environmental and Social Management Plan
GN	Grama Niladhari
GOSL	Government of Sri Lanka
GSMB	Geological Surveys & Mines Bureau
LHS	Left Hand Side
NBRO	National Building Research Organization
NWSDB	National Water Supply & Drainage Board
RDA	Road Development Authority
RHS	Right Hand Side
SSE & SMP	Site Specific Environmental and Social Management Plan

1. Introduction

1.1 Project overview

The Government of Sri Lanka has obtained 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 **Badulla-Soranathota-Dalukkotuwa-Kiriwehera Road (UVA CRIP)**, 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 intend to be used by landslide mitigation design team, the PMU and the contractor in the implementation of ESMP 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 (SS- ESMAP) prior to commencing works.

2. Description of the project and site descriptions

2.1 Name of the project

Rectification of Site No.111, Soranathota site, Badulla-Soranathota-Dalukkotuwa-Kiriwehera Road-UVA CRIP, Soranathota, Badulla District.

2.2 Location details

The proposed mitigation site falls under Soranathota GN division of Soranathota Pradeshiya Sabha in Badulla District of Uva Province.

GPS references of the site – 7.032838°N and 81.042630°E

Elevation – The elevation of the site is around 2342ft AMSL (713.8m)

Nearest town to the site – Badulla town is the nearest town to the mitigation site and it is located around 8 km away from the site.

Accessibility to the location

The distance to the mitigation site from Colombo fort is 240 km via Colombo-Batticaloa (A4) Road. The site can be accessed via Mahiyanganaya Road (B36) through Kandaketiya - Soranathota Road from Badulla town. When travel around 8 km from the Badulla town along Mahiyanganaya Road and turning to Kandaketiya - Soranathota Road towards Kandaketiya, the mitigation site can be observed in the left side.

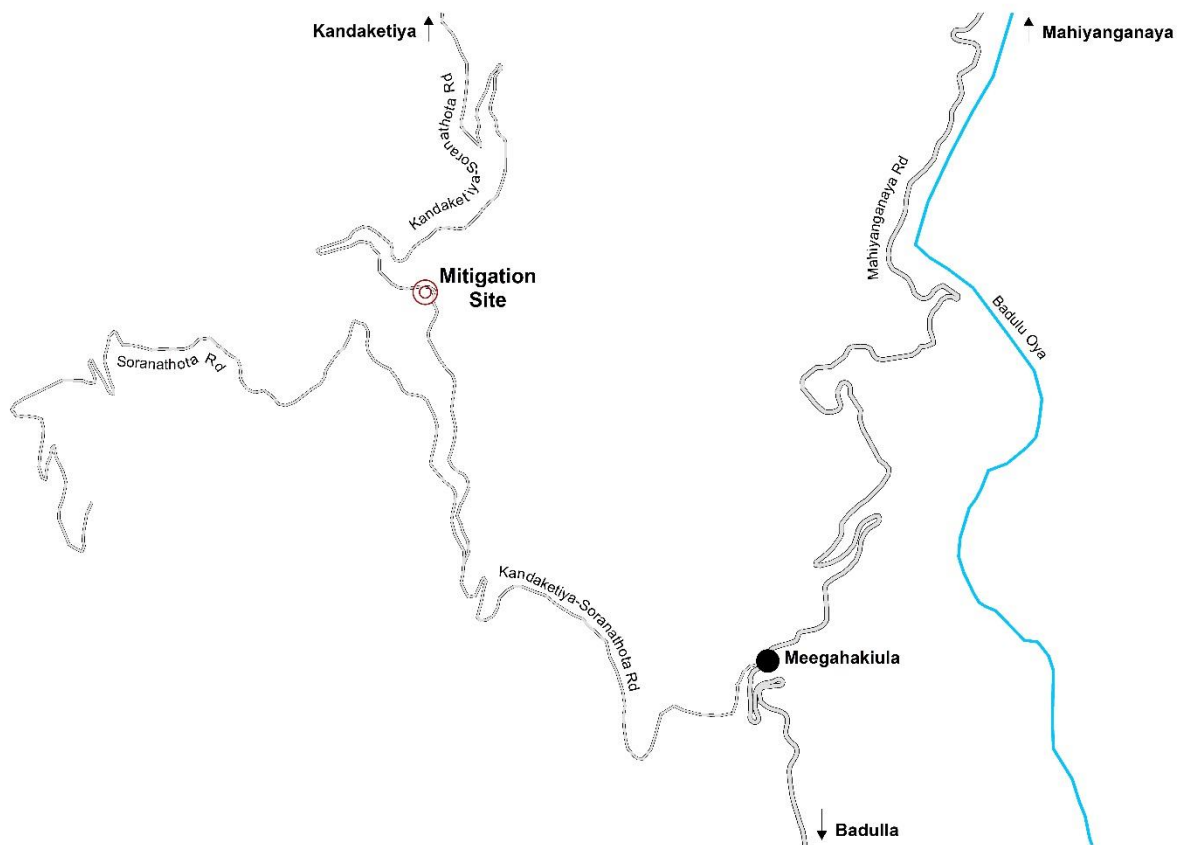


Figure 1: Accessibility to the location (not in a scale)

2.3 Topography and land ownership

The proposed mitigation site is located on the right side of the Peradeniya-Badulla-Chenkaladi Road (A5) towards Badulla. The general topography of the site is characterized by vertical cut slopes trending towards the downslope from Kandaketiya - Soranathota Road to Soranathota Road. The slope of the mitigation location is about 35 – 40 degrees towards the Soranathota road.

The extent of the land area in the mitigation site is about 70,000m². The land ownership is divided among privet ownership (A.M Punchibanda, A.M Punchibandara) and Road Development Authority (Road Reservation). (Ref. Fig 2 for Google image of the proposed landslide mitigation site and surrounding features and service infrastructure.)

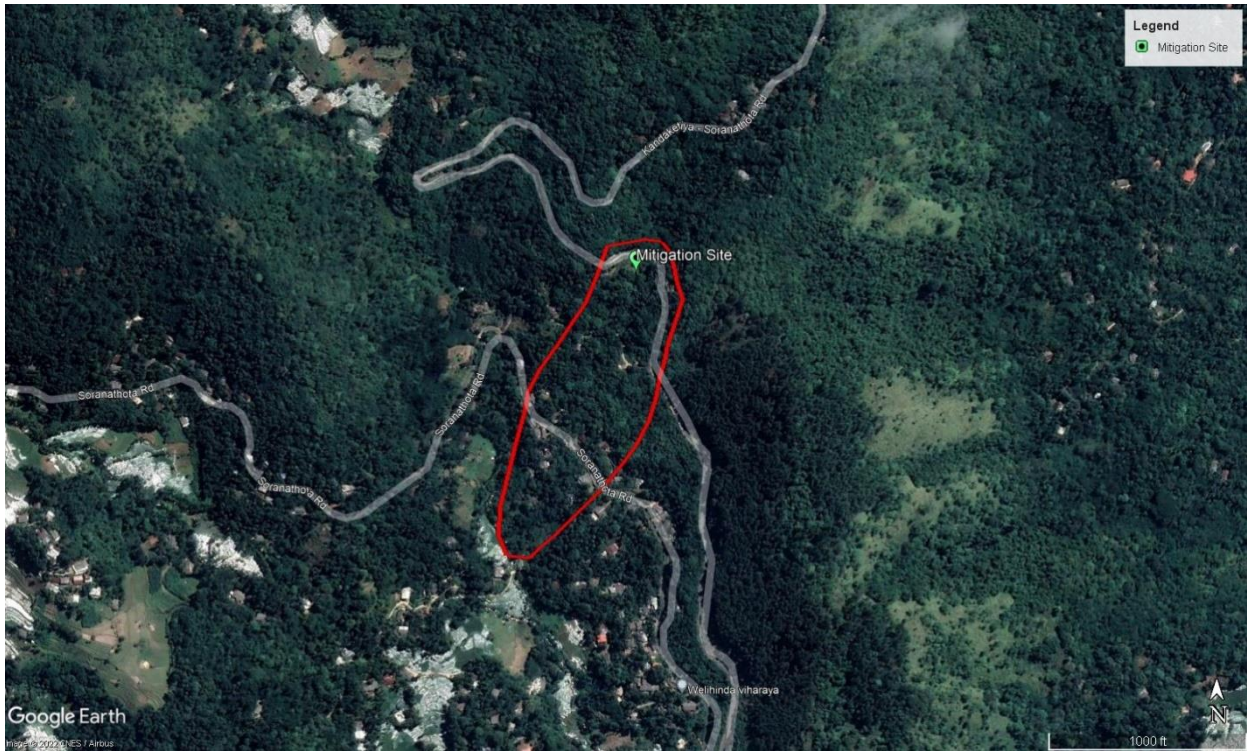


Figure 2: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure.

2.4 Meteorology of the area

The mitigation site lies on 713.8m above sea level. The climate here is tropical rainforest. It has a significant amount of rainfall during the year. This is true even for the driest month. The average annual temperature in this area (Soranthota) is 25 °C | 77°F. Rainfall here is about 6000mm | 236 inch per year. (Source: www.worldweatheronline.com).

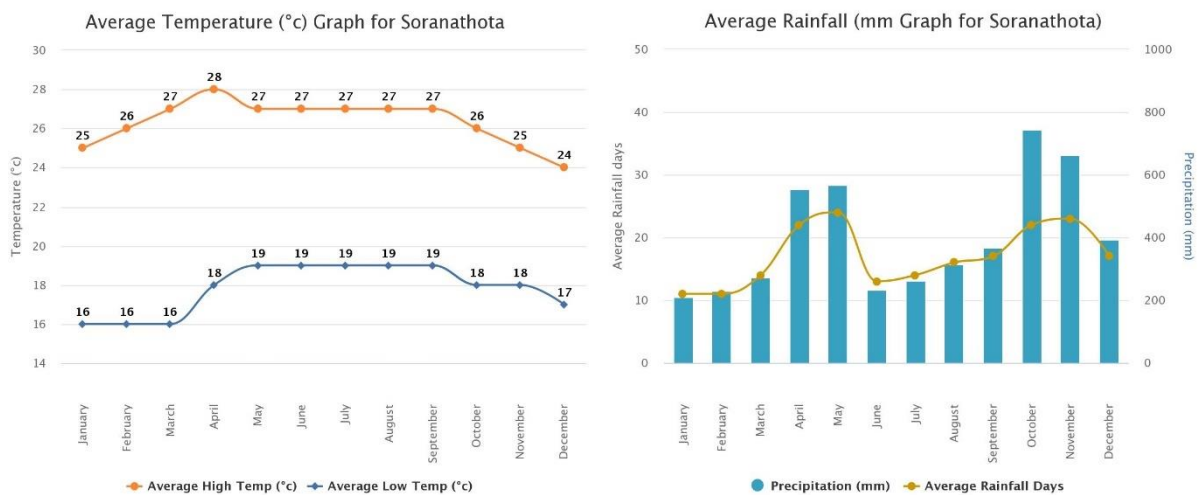


Figure 3: Average monthly Temperature and Precipitation of Soranthota

3. Landslide hazard incident details

3.1 Account of incident

Currently a slopy soil can be observed in this valley. According to Mrs. W.M.C Pushpalatha, secretary of disaster management committee of Soranathota, in 2014 a landslide incident has occurred in this area. Due to that, the house of Mr. K.R.M.D.K Kithulwaththa was fully damaged. Further, it affected the home gardens and pepper cultivation of the surrounding community. At the same time, there are possibilities for landslide in this area with the continuous rainfalls.

Further, Badulla district office of NBRO has conduct an inspection and identified 27 households in the downslope are at high level of risk with the future landslide incident. Those are,

L.M Dharmarathna	R.M Udaya Priyantha	M.M Udaya Kumara
R.M Jayasundara	R.M Karunarathna	R.M Sudukuma
J.M Premalatha	R.M Premadasa	R.M Tikiri Banda
R.M Jayasekare	R.M Rathnayake	M.M Wimalawathi
M.M Nilantha	S.M Nimal Dissanayake	Sunil Chandra
Ajith Udowita	S.M Sudu Banda	Subodini
M.M Padmasiri	R.M Piyasena	A.M Dammika Aththanayake – Already resettled
M.M Wimalasena	R.M Rohitha	S.M Gunapala – Already resettled
M.M Jayathissa	R.M Sudu Banda	K.R.M.D.K Kithulwaththa – Already resettled

Refer Fig 4: Location of totally damaged house and high-risk houses due to potential landslide

In 2004, Kandaketiya - Soranathota Road was constructed. The removed soil from the road construction has accumulated to this site. Also Mr. K.R.M.D.K Kithulwaththa has dig six wells in his house premises. As per the Mrs. W.M.C Pushpalatha's statement, these 2 are the major reasons behind the landslide of this area.



Figure 4: Location of totally damaged house and high-risk houses due to potential landslide

3.2 Effects and consequences of landslide

During intense rainy periods, there is potential to occur a landslide creating risk on the lives of the community live in downslope, 24 houses in downslope (3 have already resettled), their home garden & pepper cultivation, and electricity supply line of CEB. Even though the mitigation measures were implemented on the both side of the Kandaketiya - Soranathota Road, there are possibilities of dislodge soil mass through the unstable slope tends to fall imposing risk to the vehicle, pedestrians and the commuters using Kandaketiya - Soranathota Road.

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

Currently several structural remedial measures such as horizontal drains, soil nailing and netting have been used reduce the potential risk of cutting failure in the upper part of this slope. But, the landslide threat for this area has initiated in downslope of the road.

Community-based early warnings have been given to the community living in downslope to provide necessary information related to the landslides. Currently, there is a community-based disaster management committee. A manual rain gauge station has been implemented for them. By looking at its readings during rainy days, disaster management committee take necessary actions for evacuations according to the given guide lines. Further, cultural center in the Welihinda Viharaya has been assigned as evacuation center. Other than that there is no any structural measurers has been taken in this site to reduce the potential risk.

3.4 Evacuations

With the current level of risk, the people living in downslope is asked to evacuate. As above-mentioned, they are temporary evacuating during rainy season according to the give guide lines. But project-based evacuation is not needed for this site.

3.5 Resettlement (progress)

There are 27 high risk households in the downslope of this site who has recommended to resettle in safer areas. Currently, three of them (A.M Dammika Aththanayake, S.M Gunapala and K.R.M.D.K Kithulwaththa) are already resettled with the resettlement program. Further, two of them (Sunil Chandra and Subodini) are currently constructing new houses in Pussallakanda but not resettled yet. Rest of them are not willing to resettle because they don't have any other lands and their main income source (pepper cultivation) is located in this area. However, there is no requirement of project based resettlement for this site.

Landslide Mitigation Site No - 111 - Badulla- Soranathota - Dalukkotuwa- Kiriwehera Road-UVA CRIP (Ch: 3+050km) (RLVMMP)

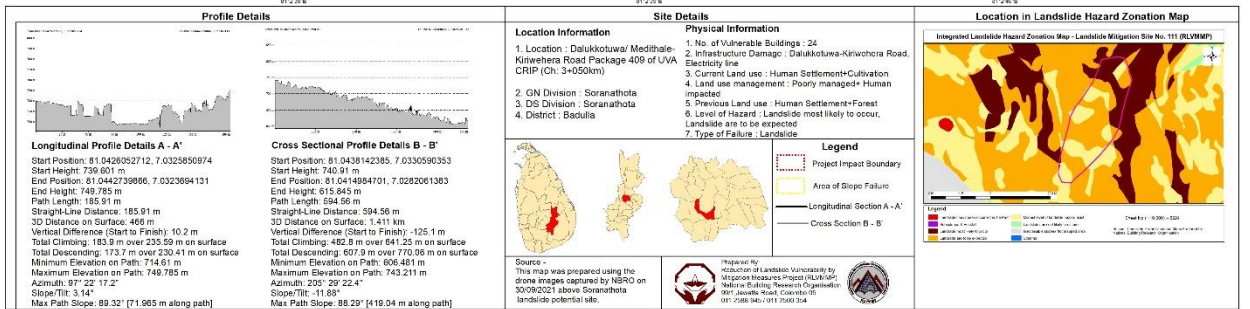
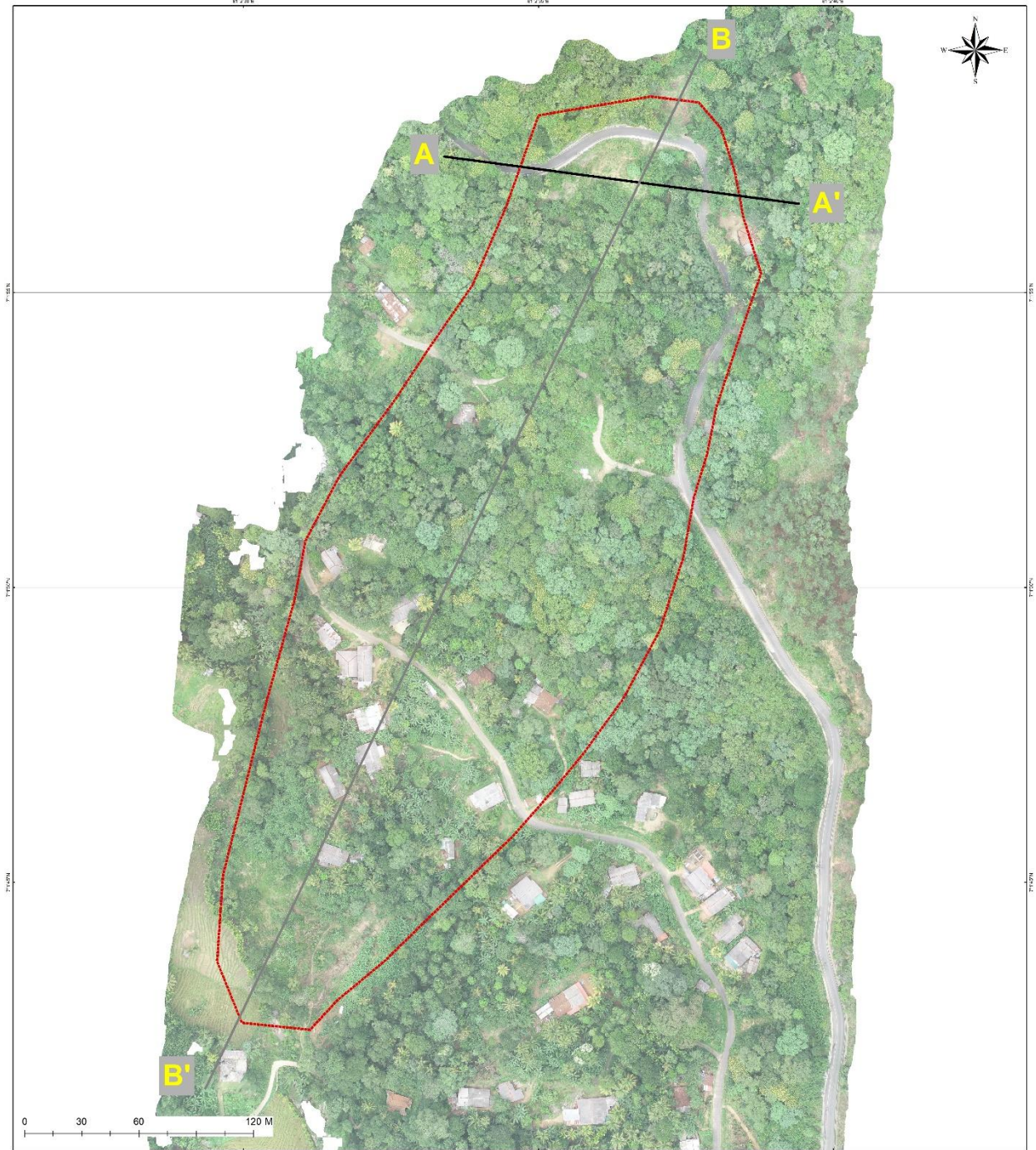


Figure 5: Cross Section, Land-use, Risk Elements and the spatial features of the location

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

4.1 Surrounding area of the slope failure

When referring to the surrounding area of the slope failure, highest proportion of the land coverage can be observed as general plants and agricultural lands. Further, scattered settlements could be observed in the downslope area. There were no any important monuments located within the nearby mitigation site.

Following features and land-use pattern could be observed surrounding area of the slope failure.

- ✓ Kandaketiya - Soranathota Road runs adjacent to the site in upslope
- ✓ A minor road is running in the downslope connecting Kandaketiya - Soranathota Road and Soranathota Road
- ✓ Several residential and commercial buildings are located in the downslope
- ✓ Home gardens, paddy & pepper cultivation lands could be observed in the downslope
- ✓ The upslope and the rest of the area is covered by common tree species

4.2 Current level of risk

In 2014 a landslide incident has occurred in this area. Due to that, the house of Mr. K.R.M.D.K Kithulwaththa was fully damaged. Further, it has affected the home gardens and pepper cultivation of the surrounding community in downslope. The future landslide may occur due to recurring extreme precipitation events creating impacts on the lives of the community in downslope, 24 houses of them (3 have already resettled), their pepper cultivation, home gardens, paddy cultivation, electricity supply line of CEB, existing drainage network, Kandaketiya - Soranathota Road, Soranathota Road, minor road in downslope which connects Kandaketiya - Soranathota Road and Soranathota Road, pedestrians, commuters and vehicles using those roads.

5. Description of the works envisaged under the project

The proposed project aimed to combat further progressive failure of landslide. Therefore, preventive measures such as reshaping, soil nailing, turfing with grass blanket on back fill slope, re-vegetation of slope and surface drainage management will be implemented as the mitigation measures. Environmentally friendly mitigation measures are highly encouraged in this site as it is located in environmental pleasant area.

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

Following sensitive elements will be at risk due to project actions;

- i. Kandaketiya - Soranathota Road
- ii. Electricity supply line of CEB
- iii. Existing drainage network
- iv. Existing remedial measures which have already undertaken to reduce the potential risk such as netting, soil nailing and horizontal drains
- v. Pepper cultivation and home gardens of surrounding community
- vi. Locally established trees and their ecosystem in the mitigation site

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



Figure 6a: Kandaketiya - Soranathota Road



Figure 6b: Electricity supply line of CEB



Figure 6c: Existing drainage network at upslope of the area



Figure 6e: Existing remedial measures which have already undertaken to reduce the potential risk in upslope area such as netting, soil nailing and horizontal drains



Figure 6f: Pepper cultivation and home gardens of surrounding community



Figure 6g: Locally established trees and eco system in the mitigation site

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

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

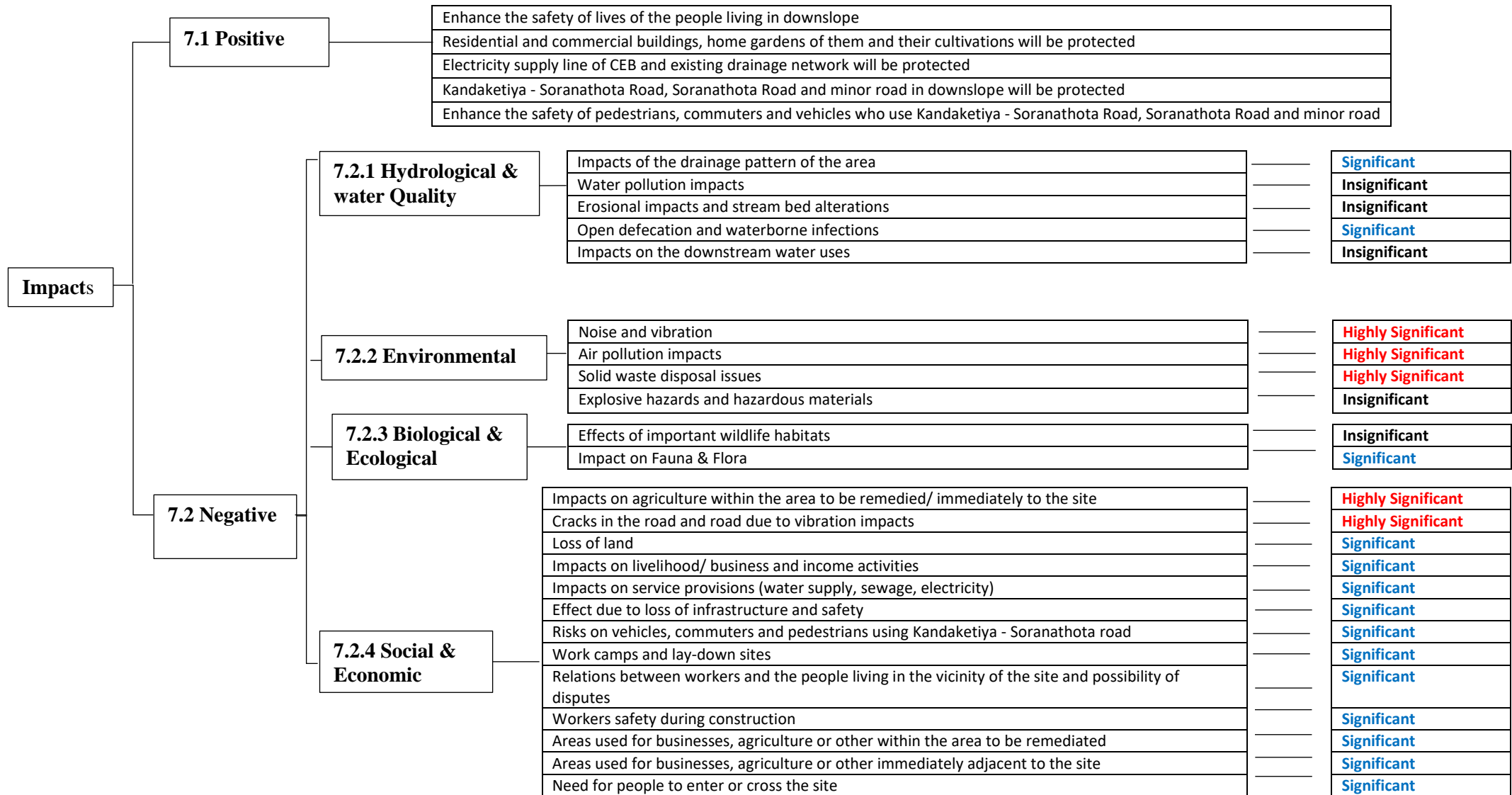


Figure 7: Summary of the impacts which are envisaged during project

7.1 Positive impacts

- The objective of this project is to ensure that further landslides in this area are prevented to an acceptable level.
- This mitigation project will enhance the safety of lives of the people who are living in downslope. Further, residential and commercial buildings, home gardens of them and their cultivations will be protected.
- Additionally, Kandaketiya - Soranathota Road, Soranathota Road and minor road in downslope will be protected. Moreover, it will enhance the safety of pedestrians, commuters and vehicles who use Kandaketiya - Soranathota Road, Soranathota Road and minor road.
- Further, electricity supply line of CEB and existing drainage network will be protected by this mitigation project.
- Prevent frequent evacuation during rainy season and reduce continuous expenditure to government to provide relief and compensation
- Minimize the soil degradation and siltation from future landslides and slope failures
- Prevent the interruption to day today activities of the occupants, travelers and tourists of this area
- Enhance the safety of commuters, passengers
- Prevent adverse social and economic impact of the resettlement to the community
- Protection of cultivations and the income of the families against slope failure devastation

7.2 Negative impacts

The mitigation works are generally confined to an area which is already unstable and highly potential for slope failures. 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	
<p>7.2.1.1 Impacts of the drainage pattern of the premises</p> <p>There is a well-established drainage system in upper part of this location including concrete paved drains and culverts. But, there is no proper drainage pattern in downslope of the road. Disruption of existing surface and sub-surface drainage pattern in the area is envisaged due to the reshaping of the unstable slopes, removal of soils etc. Further, mitigation works in this site will focus largely on the drainage improvement. Due to diversions, cut-off drains and increased sub-surface drainage, the premises will have increased flows at higher velocities in rainy periods. Also, while excavations and land clearings during the construction will cause continuous runoff of the surface water with mud downward the slope in rainy days. At the same time there is high possibilities of</p>	Significant

blocking or broking the existing drainage system and could be led to the negative impacts of the pattern.	
7.2.1.2 Water pollution impacts There are no water streams close to the mitigation site	Insignificant
7.2.1.3 Erosional and siltation impacts and stream bed alterations There are no water streams close to the mitigation site	Insignificant
7.2.1.4 Open defecation and waterborne infections Currently, the surrounding area of the site is not much dense with human settlements. Further, the area is covered by common tree species. Therefore, an isolation character can be observed in several areas closer to site and it will increase open defecation. Since, there were no any waterbodies near to the mitigation site, the waterborne infections are insignificant.	Significant
7.2.1.5 Impacts on the downstream water uses There are no water streams close to the mitigation site	Insignificant
7.2.2 Environmental Impacts	
7.2.2.1 Noise and vibration impacts Construction noise are expected from machinery in site preparation and landscaping. Impact is significant as the construction is carried out in the proximity of residential area, and Kandaketiya - Soranathota Road. The noise generated from the machinery will disturb the residents, pedestrians and commuters. If heavy machinery is operated, the vibration can affect the residential building, drains, water supply line and the road. As a result, structural deformations such as cracks, damages and collapse may happen.	Highly Significant
7.2.2.2 Air pollution impacts Potential impacts on the air quality will be due to the fugitive dust and the exhaust gases generated in and around the construction site due to vehicular movement and site clearance, storage and handling of construction materials such as sand, cement, etc. As Kandaketiya - Soranathota Road is in the close proximity to the mitigation location, the effect is significant to pedestrians and commuters if heavy air polluting activities are carried out. Further, residential buildings are located in downslope to the mitigation site, the effect is highly significant to general public who are living in the area including children and vulnerable groups if heavy air polluting activities are carried out.	Highly Significant
7.2.2.3 Solid waste disposal issues Poor management of solid waste such as litter, food waste, construction waste during the construction phase may lead to create inconveniences to people, can block the drains to make breeding grounds for water borne refection vectors and pathogens peril. Waste can pollute the soil, and leave various environmental impacts if proper disposal mechanism is not in place during the construction period. Further, this may lead to create inconveniences to people living in the area.	Highly Significant
7.2.2.4 Explosive hazards and hazardous materials Since the affected area has no rock boulders, explosives may not be used and the rock blasting is not envisaged.	Insignificant

7.2.3 Biological /Ecological Impacts	
7.2.3.1 Effects of important wildlife habitats There are no forested/ wild-life reservation areas within the project influence area with high biodiversity, or habitat fragmentation.	Insignificant
7.2.3.2 Impacts on Fauna & Flora Locally established vegetation cover and eco-system referring to it can be observed in this area. Therefore, it may be affected by the project activities during construction phase.	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 Currently, the downslope of the mitigation area is covered by pepper cultivation of the native community. Therefore, it may be affected by the project activities during construction phase. According to the observations, home gardens and pepper cultivation can be observed within this area. Pepper and home gardens are the main livelihood of the downslope communities. Therefore, the project activities create significant impacts on them when construction activities are carried out near this location.	Highly Significant
7.2.4.2 Cracks in the road due to vibration impacts There are several buildings located in the proximity of the mitigation, specifically the 24 houses have already been identified as high-risk houses. Further, Kandaketiya - Soranathota road & Soranathota roas, and its drains are going parallel to the site. During the construction heavy machinery will be used and the vibration can cause cracks in these buildings.	Highly Significant
7.2.4.3 Loss of land The mitigation lands are privately owned. Loss of land is significant because they may lose their land ownership and cultivation. But at the same time, the rest of the lands will be protected by this mitigation.	Significant
7.2.4.4 Loosing access to land and future development The mitigation works will be concentrated on privet lands which has cultivated pepper. During the construction period, there will be impacts to the land owners with regard to loosing access to the land or loss to valuable uses. In contrary, remediation works in the upslope will increase the stability of the boundary and protect the land from future failures.	Significant
7.2.4.5 Impacts on livelihood/ business and income activities The main income source of this community is pepper cultivation and paddy cultivation. Since the project activities may affect to the pepper cultivated lands, it may impact on income activities of them.	Significant
7.2.4.6 Impacts on service provision (water supply, sewage, electricity) The construction works, moving machinery will certainly damage to the electricity supply line of CEB and existing drainage network in upper slope area.	Significant

<p>7.2.4.7 Effect due to loss of infrastructure and safety</p> <p>Most of the construction activities will be conducted adjacent to Kandaketiya - Soranathota Road. Hence, during construction phase, Kandaketiya - Soranathota Road which is connecting Meegahakiula and Kandaketiya will be temporary obstructed. Loosing access impact is affect only for the construction phase. The traffic due to full/partial road closure may obstruct the smooth flow of vehicles. This will cause nuisance to pedestrians and commuters.</p>	<p>Significant</p>
<p>7.2.4.8 Risks on vehicles, commuters and pedestrians using Kandaketiya-Soranathota Road</p> <p>Excavation machineries, loaders, trucks etc. will be used in the Kandaketiya-Soranathota Road where pedestrians and commuters are moving. Site may use high voltage power for operation of certain machinery. Construction may use materials such as metal aggregates, steel etc. which can be injurious under improper storage and handling. Ignorance of entry of people and careless operation of machinery can cause fatal injuries and accidents to them.</p>	<p>Significant</p>
<p>7.2.4.9 Work camps and lay-down site requirements</p> <p>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.</p>	<p>Significant</p>
<p>7.2.4.10 Relations between workers, residents, commuters and pedestrians and possibility of disputes</p> <p>Construction workers at this site will 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 neighboring community.</p> <p>Although the workers who would engage in such issues will be rare, even few possibilities cannot be ignored. Therefore, social and community issues at this site will be considered highly significant.</p> <p>Further, the site is located adjacent to Kandaketiya-Soranathota Road, there will be disputes with pedestrians and commuters with workers due to full/partial road closure during construction period.</p>	<p>Significant</p>
<p>7.2.4.11 Workers safety during construction</p> <p>The workers may be exposed to risk from falling. Fatal injuries may happen if the landslide occur. The heavy construction machinery may be used in limited work spaces. Risk of hazard from vehicles and construction machineries accidents are 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. Since, site is located adjacent to Kandaketiya-Soranathota Road, there is a possibility of road accidents also.</p>	<p>Significant</p>
<p>7.2.4.12 Areas used for businesses, agriculture or other within the area to be remediated</p> <p>Pepper cultivation of the surrounding community is located within the area to be remediated. Further, locally established vegetation cover could be observed in the mitigation site.</p>	<p>Significant</p>

<p>7.2.4.13 Areas used for businesses, agriculture or other immediately adjacent to the site</p> <p>Pepper cultivation of the surrounding community is located adjacent to the area to be remediated. Further, locally established vegetation cover could be observed adjacent to the site.</p>	<p>Significant</p>
<p>7.2.4.14 Need for people to enter or cross the site</p> <p>Since, the mitigation lands are privately owned and their crops are located adjacent to the site they may enter to this site. Therefore, they may be at risk due to operating machinery, vehicles, electricity, and may be blasting materials.</p>	<p>Significant</p>

8. Significant Environmental and Social Impacts

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

8.1 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 almost vertical unstable slope with a risk of slope collapse. The health and safety issues of workers safety is highly significant at this site. 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.

8.2 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.

9. 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.

9.1 Resettlement action plan

There is no project-based resettlement in this site.

9.2 Evacuation of people

Project based evacuations are not required for this site. But, the area in the downslope should be named as a “No Entry Zone” for the construction period because farmers of the pepper cultivation may have impacts due to construction activities.

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

This risk may not be triggered in this site.

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

It may require to compensate for the acquired land of M.M Kumarasinghe and others referring to the requirement. Additionally, it may require to compensate or rectify if any damages happen to the

properties of them (residential community). Further, it may require to compensate or rectify if any damages happen to the properties of RDA (*Kandaketiya - Soranathota Road, Soranathota Road and drainage network*) and CEB (*electricity supply lines*) during the constructions. Since the site is adjacent to Kandaketiya - Soranathota Road, it may require to compensate if any damages happen to vehicles, pedestrians and commuters on the road. Further, it may require to compensate or rectify if any damages happen to the existing remedial measures which have already undertaken to reduce the potential risk.

9.5 Public awareness and education- needed for following areas

- i. Programs to inform and educate about the risks posed by landslide.
- ii. Requirement for special awareness to commuters and pedestrians who are passing the site via Kandaketiya - Soranathota Road and Soranathota Road.
- iii. Requirement for special awareness to the farmers of the pepper cultivation lands

9.6 Design based Environmental/ Social Management considerations

Following environmental and social design considerations are recommended for this depending on its environmental and social relevance.

Table 2: Design stage Environmental & Social considerations

Design feature	Recommended level of consideration for this site
<p>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.</p>	Moderate
<p>ii. Site Planning During site planning it is necessary to be cautious on possible re-activation of landslide and movements of soil masses. Hence vehicle parking sites, material storage and temporary shelters etc. should not be installed in the danger zones of the slides. The site is located in a very limited space parallel to Kandaketiya - Soranathota Road. It is very necessary to keep trained flagman or safety officer during the construction period and proper communication between contractor’s workforce and PMU must be built.</p>	Very High
<p>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.</p>	Moderate
<p>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 houses in the surrounding area.</p>	High
<p>v. Interruption to electricity supply lines and drainage Electricity supply to the downslope and drains of the Kandaketiya - Soranathota Road may be interrupted due to the project.</p>	Very High

<p>vi. Aesthetically compatible design considerations The designs in aesthetically sensitive environment should consider structures that blend with natural environment to keep the visual pollution to minimum. Service of landscape architect may be important for the design of suitable mitigation structures.</p>	High
<p>vii. Consideration of green environmental features As many of the mitigatory works are carried out in well maintained premises, 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.</p>	High
<p>viii. Workers and community safety Activation of slide may occur during construction phase and may pose threat to workers, pedestrians, commuters and the surrounding community. Therefore, design-based safety consideration such as berms, safety nets, safety fencing etc. should be considered specific to safety of community.</p>	Very High
<p>ix. Erosion control structures During rainy season the flow in the drainage structures can be significantly high. During rainy season the heavy flow of surface runoff can be expected through the unstable slopes. This water should be conveyed to nearby storm water drains. Hence the design should adequately consider flow speed breakers to reduce erosive flows of slopes.</p>	High
<p>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 et. 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.</p>	High

9.7 Mitigation of impacts during the construction phase

9.7.1 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 3: 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
2002.2 2)	Noise and Vibration	Relevant
2002.2 3)	Cracks and damages to the road	Highly Relevant
2002.2 4)	Disposal of waste	Highly Relevant
2002.2 5)	Disposal of refuse	Highly Relevant
2002.2 6)	Dust control	Highly Relevant
2002.2 7)	Transport of Construction materials and waste	Relevant
2002.2 8)	Water	Relevance
2002.2 9)	Flora and Fauna	Relevance
2002.2 10)	Physical and cultural resources	Low Relevance
2002.2 11)	Soil Erosion	Highly Relevant
2002.2 12)	Soil Contamination	Relevant
2002.2 13)	Borrowing Earth	Not Relevant
2002.2 14)	Quarry Operations	Low Relevance
2002.2 15)	Maintenance vehicles and Machinery (pollution)	Relevant
2002.2 16)	Disruption to public	Relevant
2002.2 17)	Utilities and roadside amenities	Highly Relevant
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
2003.3	Child labor and forced labor	Highly 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	Highly Relevant
<p>Relevant: The section is relevant to the site as a common ESMP applicable to any site</p> <p>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</p> <p>Possibly relevant: This ESMP will be triggered if the site come across with relevant aspect during project implementation</p> <p>Not relevant: The section may not be relevant to this site under disclosed conditions</p> <p>Optional: require to be implement if needed only</p> <p>Refer site specific monitoring plan: Contractor is obliged to carry out monitoring as specified in the site-specific monitoring plan in addition to monitoring requirement indicated in contractors ESMP</p> <p>Reference: Contractors Obligation for implementation of ESMP</p>		

9.7.2 Site Specific mitigation

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

Table 4: Site specific ES & HS mitigation measures

Mitigation item	Project implementation phase	Responsibility
<p>i. Minimize erosional impacts during construction</p> <p>It is recommended that mitigation works involved with site clearance, slope reshaping, removal of debris etc. are avoided during rainy season. Therefore, it is imperative that site works in upslope mitigation are carried out in the dry season and avoid such activities on upslope area in the wet season as much as possible. This should be considered in project planning stage. Silt traps should be introduced to cut down sediment laden runoff.</p>	Site preparation & construction	Construction Contractor
<p>ii. Traffic management and safety</p> <p>Traffic management system should be in place day and night. A good traffic management plan should be prepared with the concurrence of RDA as this site is located adjacent to the Kandaketiya - Soranathota Road. Proper road safety measures should be included with warning signs and permanent trained safety officer, luminous sign boards indicating instability risk and road obstruction signs, night lamps etc. are strongly recommended at this site.</p>	Construction	Construction Contractor and RDA
<p>iii. Planning project activities inside the sites</p> <p>As contractor has to operate mitigation actions adjacent to the Kandaketiya - Soranathota Road, he should carefully prepare a plan for management of construction activities. This should include careful selection of material storage as vehicle parking, mixing of concrete, cleaning activities etc. which considering the safety and optimization of space.</p>	Site preparation & construction	Construction Contractor
<p>iv. No Entry Zone</p> <p>The PMU should make a detailed assessment of the risk of site destabilization during the construction phase. "No entry zone" may require to be declared.</p> <p>Also mitigate the risk of accidents from moving vehicles operational machinery construction activities, electrical leakages etc. should be given high priority in the health and safety management plan. Sign boards indicating slope instability risk are strongly recommended at this site.</p>	Construction	E & S Unit of PMU contractor
<p>v. Machinery and material transportation</p> <p>The Kandaketiya - Soranathota Road and Soranathota Road will require to use for machinery, materials and vehicle transportation during construction phase. Therefore, extreme care should be taken as possible accidents and damages to the road are high. If damages</p>	Construction	E & S Unit of PMU Contractor

happen to the road or elements of the road should be rectified after the project.		
<p>vi. Invasive species</p> <p>Should be avoided in using vegetative erosion control structures. Native plants in the local environment should be chosen for vegetative control.</p>	Construction	Construction Contractor
<p>vii. Noise and vibration control</p> <p>The noise and vibration generating activities may disturb for the activities of residents nearby and users of the Kandaketiya - Soranathota Road. Vibration generating activities should be done within the prescribed limits to avoid damage to structures. Cracks in the road, existing remedial measures which have already undertaken to minimize potential risk and drainage lines should be monitored before, during and after completion of the project. Suitable compensation should be made if cracks from the damages or cracks enlarge due to construction work.</p>	Construction	Construction Contractor
<p>viii. Disposal of construction waste</p> <p>The contractor should pay special attention with respect to disposal of construction waste. 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 access road, drains and to the downslope because pepper cultivation and locally establish vegetation cover is in downslope.</p>	Site preparation & construction	Construction Contractor
<p>ix. Dust and aerosol control screens</p> <p>The construction activities would be carried out closer to the dust particles generated during the construction period can influence the residents of the area, workers and users of the Kandaketiya - Soranathota Road. Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged.</p>	Site preparation & construction	Construction Contractor
<p>x. Water for construction</p> <p>Water for construction should be obtained only from approved places. If the Contractor intends to use water from the downslope community, they should be informed and the required permission should be taken.</p>	Construction	Construction Contractor
<p>xi. Electricity for Construction</p> <p>Electricity for construction should be obtained only from approved places. If the Contractor intends to use electricity from CEB grid, they should be informed and the required permission should be taken.</p>	Construction	Construction Contractor

<p>xii. Priority Health and Safety Issues</p> <p>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.</p> <ol style="list-style-type: none"> i. Additionally, work should be discontinued for sufficient time period during rainy period as working on this site will be highly risky in the rainy season. ii. A good warning system and fulltime watchmen is highly recommended for this site for both worker, commuter's and pedestrian's safety. iii. Safety barriers and safety nets should be installed at places of risk to protect workers and community from boulder falling risk. iv. Proper emergency management unit for other accidents (first aids facilities, safety items, hospitalization facilities and transportation facilities) should be maintained for this site. 	Construction	E & S Unit of PMU contractor
<p>xiii. Safety structures/sign boards</p> <p>During construction phase adequate safe fencing should be established to prevent potential falling risk of workers from upslope areas. Warning sign boards indicating slope instability risk should be placed at the unstable slope area. As the risk is high during the rainy season where there is no construction work it is mandatory that safety signs boards are displayed even during the no project period as well.</p>	Construction	E & S Unit of PMU contractor
<p>xiv. Interruption to electricity supply lines and drains</p> <p>Necessary arrangements should be taken to provide alternative electricity supply in case of an interruption to electricity supply. Further, necessary arrangements should be taken to provide alternative drainage system in case of an interruption to existing drainage network.</p>	Construction	Construction Contractor
<p>xv. Use of sanitary facilities of contractor's workforce</p> <p>Separate sanitary facilities should be arranged for the workforce.</p>	Construction	Construction Contractor
<p>xvi. Working hours</p> <p>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.</p>	Construction	Construction Contractor
<p>xvii. Need for people to enter or cross the site</p> <p>Possible unauthorized access to the site should be avoided by awareness, warning signs and vigilance by the contractor's full-time watchmen.</p>	Construction	Construction Contractor
<p>xviii. During construction good housekeeping should be maintained to minimize visual pollution</p>	Site preparation & construction	Construction Contractor

<p>xix. Worker’s code of conduct</p> <p>Possible disputes between the labor force and the commuters and pedestrians should be prevented by maintaining the agreed code of conduct by the contractor.</p>	Construction	Construction Contractor
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9.7.3 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 5: Environmental and Social monitoring plan; construction phase

Monitoring requirement	Parameters	Frequency
i. Baseline monitoring	Water quality	-
	Pre crack survey for the Kandaketiya - Soranathota Road, existing remedial measures which have already undertaken to minimize potential risk and drainage lines	Once*
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality	-
	Crack survey for the Kandaketiya - Soranathota Road, existing remedial measures which have already undertaken to minimize potential risk and drainage lines	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	<p>Stream water quality – Comparison with ambient water quality standards published by the CEA, 2017</p> <p>Pre crack survey of the buildings -Professional report</p> <p>Ground vibration-as per the interim standards on vibration for the Machinery, Construction activities and Vehicular movements, CEA</p> <p>Background noise measurement –Extraordinary Gazette No.924.1, May 23,1996, CEA</p> <p>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.</p>	

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

10.1 Public Consultation

Mrs. W.M.C Pushpalatha, the resident and the Secretary, Disaster Management Committee of Soranathota GN division has been consulted during the site visit. As per her statement, landslide incident has recorded in 2014. House of Mr. K.R.M.D.K Kithulwaththa has fully damaged and several houses have partially damaged. Further, it has impacted to their pepper cultivation also. According to her, there were 27 households who have identified as high-risk community. But with the resettlement program, three of them have resettled named A.M Dammika Aththanayake, S.M Gunapala and K.R.M.D.K Kithulwaththa. Further, two of them named Sunil Chandra and Subodini are currently building new houses in Pussallakanda but not resettled yet (27/03/2022). The rest of the high-risk community is not willing to resettle because of they don't have any other lands and their main income source (pepper cultivation) is located in this area. Pepper cultivation is spread approximately for 25 acres. During the visit, the awareness of the mitigation project has been given and she has expressed the willingness towards the project since their houses and livelihood would be safe from the project.

10.2 Stakeholders/ Institutional Consultation

As the mitigation site is comes under RDA reservation area, consent from RDA is very important. As per the Chief Executive Engineer of Badulla Region, Eng.S.S.Senanayake, RDA has no objection and states the mitigation is very much needed. Along with that a proper handing over of the project is required after mitigation, and RDA will do the maintenance after mitigation. It is emphasized that during the construction the contractor should use Personal Protective Equipment. At all times, the contractor shall provide safe and convenient passage for vehicle, pedestrians and traffic safety measures, barricades, flagmen and for the night work, light and illumination should be provided. It is also stated that construction waste/ excavated materials should not be a nuisance to public/ commuters.

The RDA Provincial Director of the Uva Province state that the mitigation location and the detailed design should be sent to the RDA for the approval before implementing as this site comes under RDA reservation area.

The CEB electricity line is going through the site and if the electricity supply needs to take from this grid proper approval need to be taken. In order to get the approval, an application form has to be sent to the regional office mentioning the requirement.

The Assistant Director Mr. Sadath from Central Environmental Authority was consulted regarding the site and according to him, this project is not fallen under the prescribed project. But, under the Soil Conservation Act 772/22 of 1996, Badulla District is an environmentally sensitive area. Therefore, the Basic Information Questionnaire (BIQ) is needed to fill for the project and submit the application. Further, he said the mitigation work is aimed at soil conservation and there was no issue of approval.

11. Preventive Measures for Covid-19 That Was Issued By Sri Lankan National Health Authority

COVID-19, the novel coronavirus infection has not been totally eradicated in the world. Therefore, to prevent/ control of the spread of infection also to prevent panic situations in the event of detecting a suspected case, all contractors are required to develop a COVID-19 Preparedness plan and need implementing in the site as per the "Health and Safety Guidelines for Sri Lankan Construction Sites to

be adopted during COVID 19 outbreak” Guidelines given by Construction Industry Development Authority CIDA 29th April 2020.

12. 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.

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

Table 6: Clearances, no objection, consent and approvals

Requirement / Approval / Institution	Relevance to the project
10.1 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 Soranathota Pradeshiya Sabha
10.2 Approval from the state lands owners relevant to the project	
Central Environmental Authority	Consent from District Central Environmental Authority is required as Badulla District is under the sensitive area under Soil Conservation Act 25 of 1951
Department of Forest Department of Wildlife Conservation	As there are no forest reservations and wildlife habitats; Department of Forest and Department of Wildlife Conservation approvals are not needed
Irrigation Department	As there are no river, stream or other water resource; Irrigation Department 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).

Soranathota Pradeshiya Sabha	Approvals from Soranathota Pradeshiya 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.
Road Development Authority, Sri Lanka	Approvals from regional office of RDA will be required since the site is adjacent to Kandaketiya - Soranathota Road for traffic management
10.3 Consent/ no objection/ legally bound agreement from the private land ownerships	
Land owner (M.M Kumarasinghe)	Signing a legally bound agreement between the land owners 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 7: Tentative timeline for getting approvals

Approvals	Month 1				Month 2			
	W1	W2	W3	W4	W1	W2	W3	W4
Project implementation <i>Approval from the District Secretariat</i> Submission of application Project briefing Respond to comments Approvals	—	—	—	—	—	—	—	—
<i>Approval from planning committee</i> Submission of application Project briefing Respond to comments Approvals		—	—	—	—	—	—	—
Other approvals RDA CEB GSMB		—	—	—				
Consent/ no objection from the land ownership (Privet ownership)	—	—						

14. Grievance redress mechanism for this site

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

15. Information disclosure

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

Table 8: 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, 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, Divisional secretary, 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, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate	Meetings, submission of relevant reports
vi. Grievance redress mechanism	Relevant parties and AIIB	Meetings, written and verbal communications

Annexure I: Images of the site condition and the consultation



Mitigation area



Kandaketiya - Soranathota Road



Already mitigated area in upslope of the location



Consultation with occupants