



REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No.100

**Soragune – Ranwanguhawa Road (Haldummulla)
Badulla District**

February 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
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 received 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 & 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 **Soragune – Ranwan Guhawa road (Haldummulla)** 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.100, Soragune – Ranwan Guhawa road (Haldummulla) landslide mitigation site, Badulla District

2.2 Location details

The proposed mitigation site falls under Harankawa GN division of Haldummulla DS division in Badulla District of Sabaragamuwa Province.

GPS references of the site – 6.7507767°N and 80.8768499°E

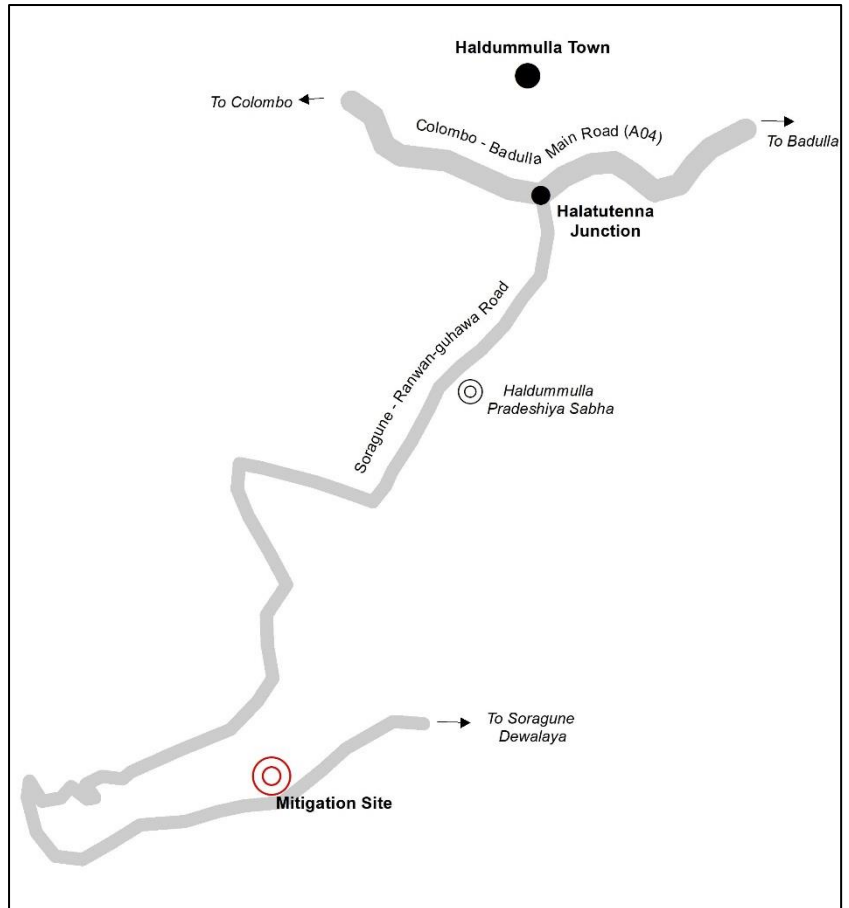
Elevation – 2860ft AMSL (870m)

Nearest town to the site –Haldummulla town can be recognized as the nearest administrative and commercial town, which has located about 2.5 km from the site.

Accessibility to the location

This mitigation site is located within the Haldummulla Pradeshiya Sabha area. When travel around 190 km from the Colombo via Colombo- Badulla major road (A-04) can be found the Haldummulla Town. The mitigation site can be found when traveling around 2.5km from the Haldummulla town (Halatutenna Junction) via Soragune - Ranwanguhawa road.

Figure 1: Accessibility to the location (Not in a Scale)



2.3 Topography and Land Ownership

The general topography of the site is characterized by varying slopes of 20 to 60 degrees from the upper part of the landslide area with the average cross-sectional length of 400m towards the road and houses. The major portion of the area has steep slope more than 40 degrees and observed around 15ft vertical cut slope near the road which created when construct the road. Different sized boulders were scattered unevenly across the mountainside, and the sudden soil movements caused by landslide caused larger sized boulders to move to the lower part of the slope. Currently, the sedimented parts of those boulders can be observed closer to the road area.

The extent of the land area of the mitigation site is about 3500 square meters. The site is in a hilly terrain where the natural slope has been disturbed for cultivation, construction of road and make space for house construction.

As per the Grama Niladhari of Harankawa GN division, land ownership of this area is belongs to privet and upper part of the area has some government lands under the Land Development Ordinance.

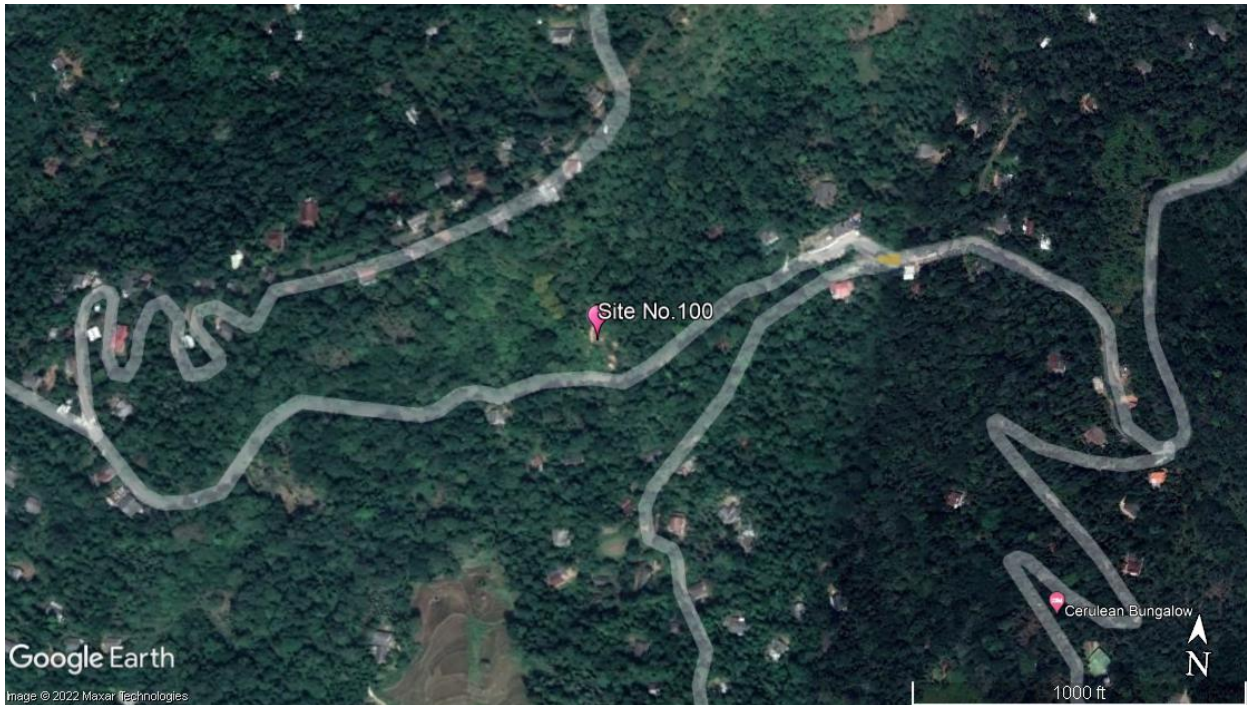


Figure 2: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure.

2.4 Meteorology of the area

Considering the physical features of the area, the majority of the area has an altitude of 305m – 914m (1000 – 3000ft). The annual rainfall of the area is between 2000mm -2500mm and the mean temperature of the area is between 20°C– 26°C.

(Source: Pradeshiya Sabha, Haldummulla

http://haldummulla.ps.gov.lk/index.php?option=com_content&view=article&id=1%3A2012-10-25-01-42-40&lang=en)

3. Landslide hazard incident details

3.1 Account of incident

A massive landslide of this area is reported in November 2019 and total affected area from the landslide is around 1000 m². The main cause of the landslide is poor drainage system on the top of the gradient. Since there was no proper mechanism to clear the cut off drainage line at the top, the water unsurprisingly flows directly through the slant vertically. During the site visit, the sedimented parts of the erosion (boulders and soil sediments) were visible on the surface closer to the Soragune – Ranwan-guhawa road. Tension crack also have been appeared on the road. The damages cause to the road as the result of slope failure was temporarily rectified.

This landslide completely damaged one house located on flow path and another three houses at the down slope were identified as High Risk to the Landslide.

- H.R.A. Ranjith Abepala – house is totally damaged from Landslide
- H.M. Chandrasiri – Identified as High Risk to the Landslide
- P.M. Sunitha – Identified as High Risk to the Landslide
- P.M. Bandupala – Identified as High Risk to the Landslide

This area falls under the “Landslide are to be expected” category of Landslide Hazard Zonation Maps prepared by NBRO.

Figure 3: Land use, risk elements and the special features of the location

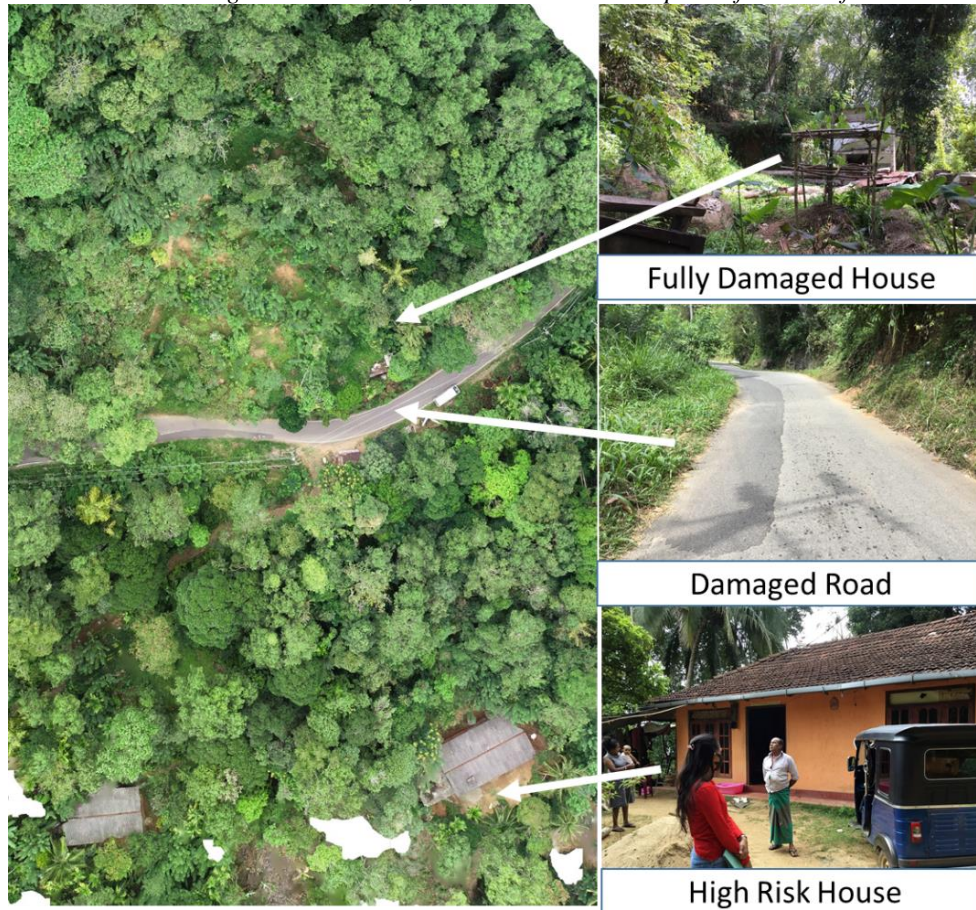
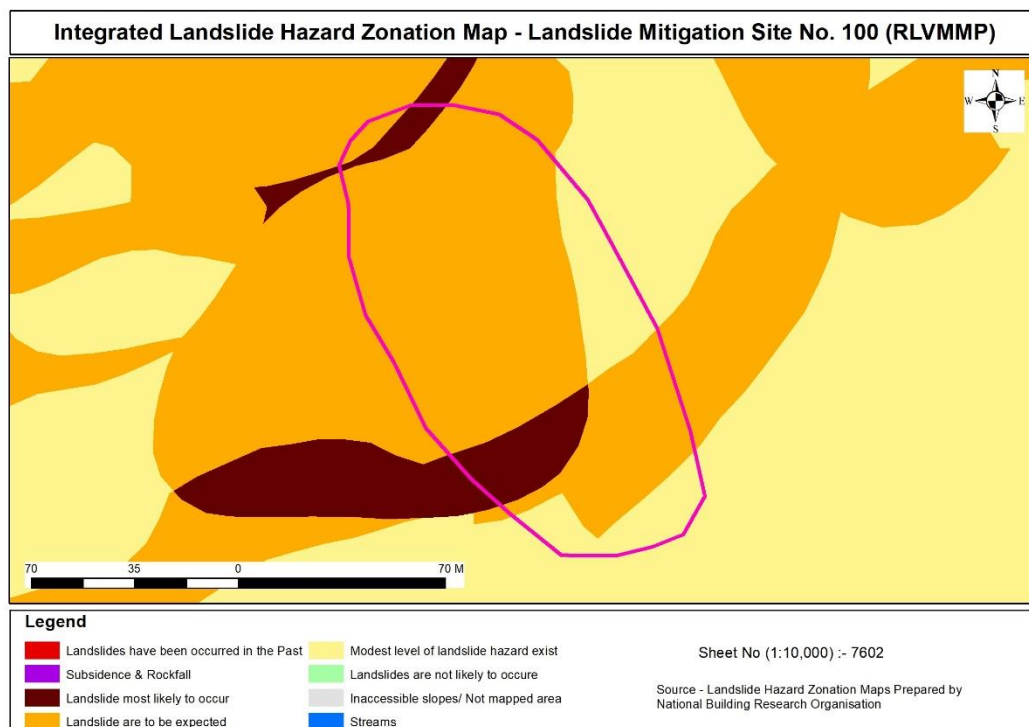


Figure 4: Landslide Hazard Zonation Map of the area



3.2 Effects and consequences of landslide

During intense rainy periods dislodged soil mass through the unstable slope tends to fall imposing risk on the houses located down slope, their cultivations, Soragune – Ranwan-guhawa road, electricity line, water line and disrupting smooth functioning of the area.

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

There are no any remedial measures have been taken to reduce the potential risk

3.4 Evacuations

Residents inhabit near the landslide location are instructed to temporarily evacuate the area during rainy days. The house owner of the damaged house has already evacuated from the site. However, no evacuation is required to execute the landslide risk reduction measures at the site.

3.5 Resettlement (progress)

04 houses have been identified including damaged house to resettle due to high risk to further activation of landslide. Two of them have received lands to construct houses, but still they are staying in the same place.

However, no resettlement requirements to execute the landslide risk reduction measures.

Landslide Mitigation Site No - 000 - Badulla- Haldummulla- Harankahawa - Soragune Ranwanguhawa Rd (2km) (RLVMMP)

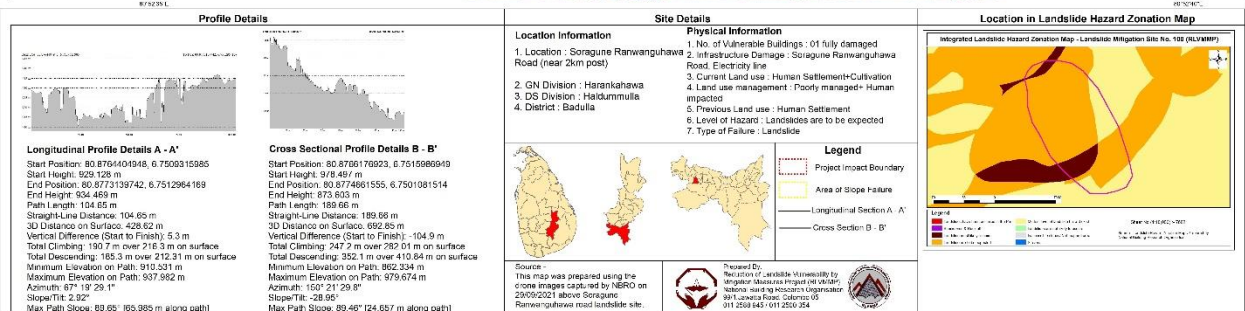
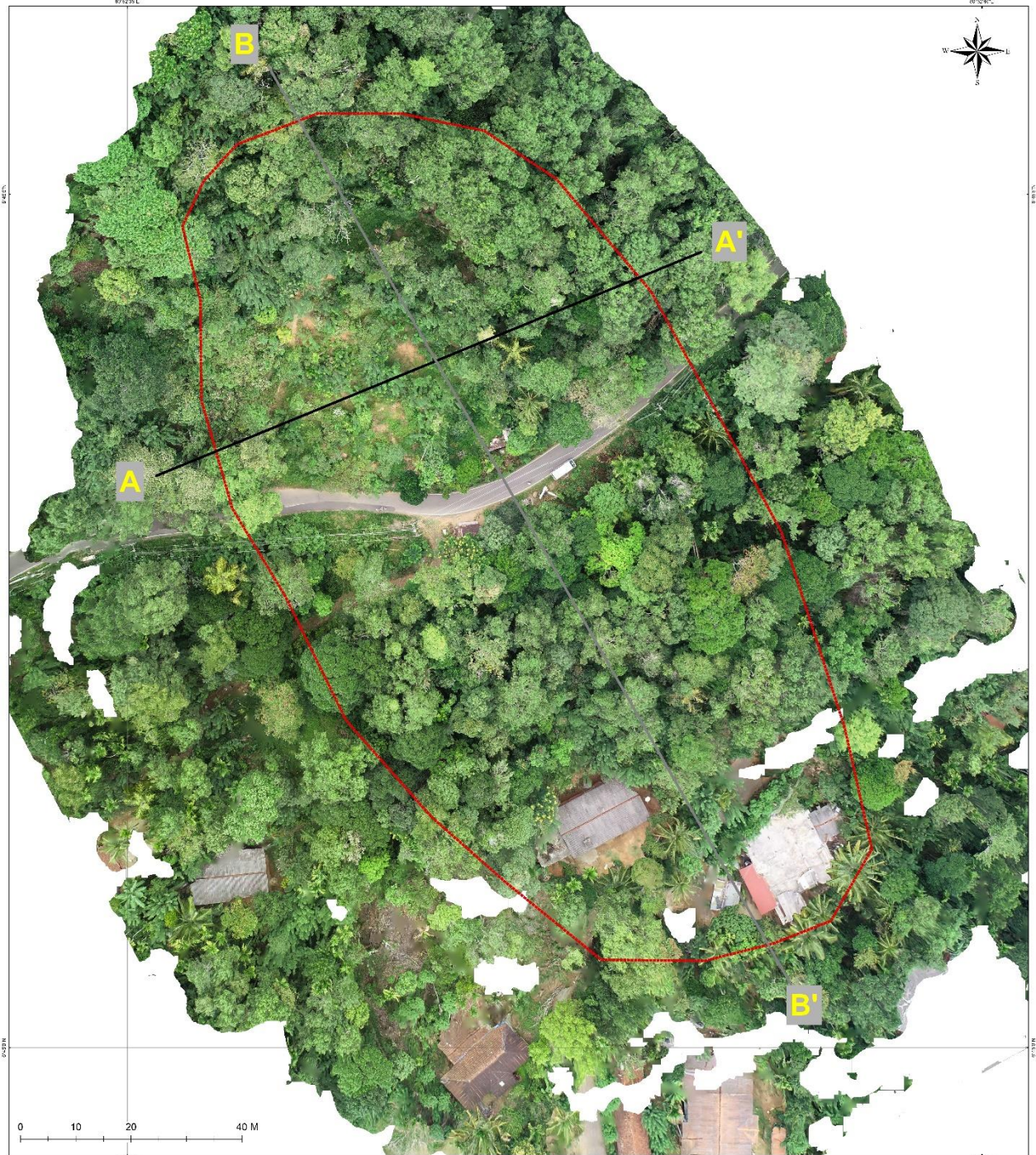


Figure 5: Cross Section, Land-use, Risk Elements and the spatial features of the location

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

Since the project site is located in remote area, scattered rural settlements and its characteristics can be observed. When considering about the surrounding area of the site, scattered settlement, home gardens and areas with dense trees could be observed within 500m radius from the site. It is not observed any commercial or administrative area in close proximity.

There are 04 houses located closer to the mitigation site and all of these houses were identified as high risk to the landslide. Well grown trees such as Jack fruit, Areca nut, Mango, Kithul, Dawla and Sapu are grown at the site and home gardens. Further, variety of spices are grown in the home gardens like pepper and cinnamon. These plants are the primary or secondary income source of these families inhabit in the area.

The Soragune – Ranwan-guhawa road runs through the site and medium size fallen rock boulder from landslide incident is observed alongside the road. The villagers stated that the special ‘Perahera’ event of Soragune Dewalaya is held during the month of September and therefore, high traffic congestion is occurring along the road. In other months, there is no much traffic congestion.

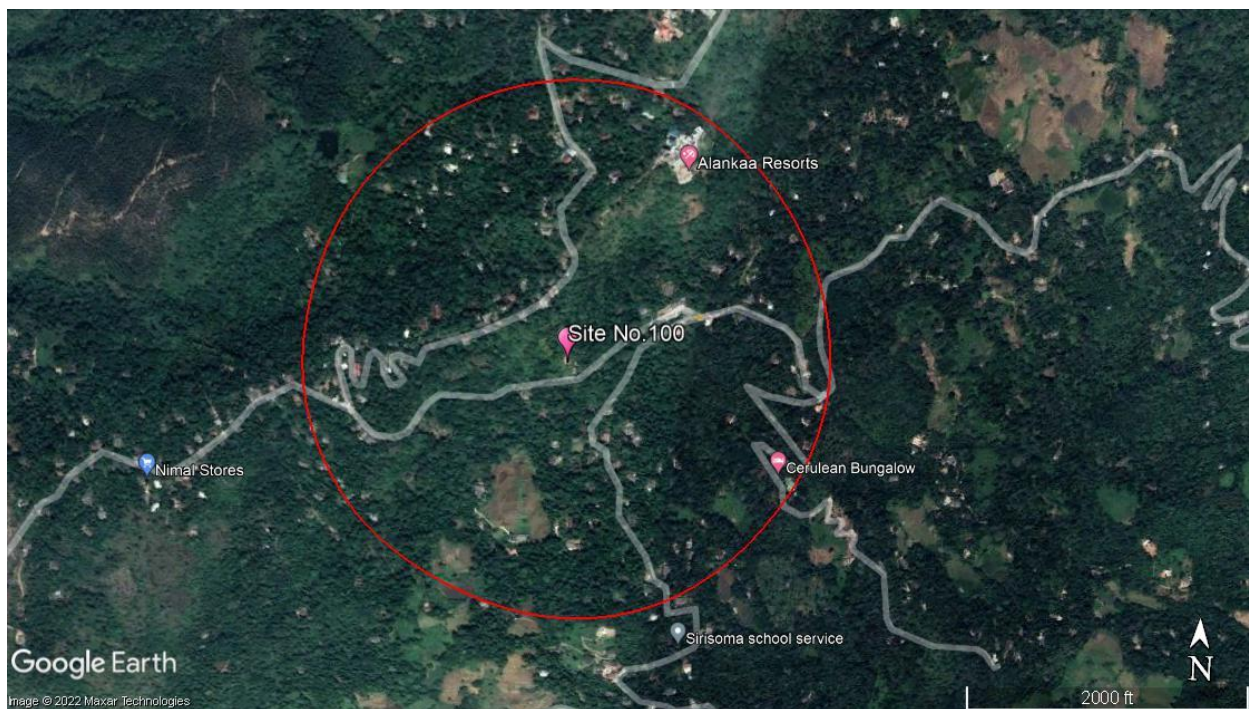


Figure 6: Land-use of the surrounding area within 500m buffer zone

4.2 Current level of risk

There are about 04 families reside at the down slope of the landslide location. This has to be rectified to prevent further reactivation of the landslide. Possible soil mass or debris flow will directly impact the traffic movements along the Soragune – Ranwan-guhawa Road. Passengers who use the road may face the danger of injury or loss of life. Further, life and property of occupants in the downslope area and their source of livelihood are also exposed to the landslide threat.

5. Description of the works envisaged under the project

The proposed project aimed to combat further progressive landslide of this area. The proposed mitigation works will be largely concentrated on unstable land area. Measures expect to undertake are;

- Lowering the water table of the slope by introducing subsurface drains
- Improve the surface drainage system by constructing proper drainage system within whole area
- Soil nailing, reshaping and turfing

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;

- Passengers and vehicles travel along the Soragune – Ranwan-guhawa Road
- Houses at risk of slope failure and the occupants of those houses.
- Home gardens consist of valuable trees in upper slope and downslope area.
- Electricity line and water line runs through the mitigation site.
- Current services and economic activities of the area.



Figure 7a: Soragune – Ranwan-guhawa Road



Figure 7b: Houses at risk of slope failure



Figure 7c: Home gardens consist of valuable trees



Figure 7d: Water line

Figure 7: 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.

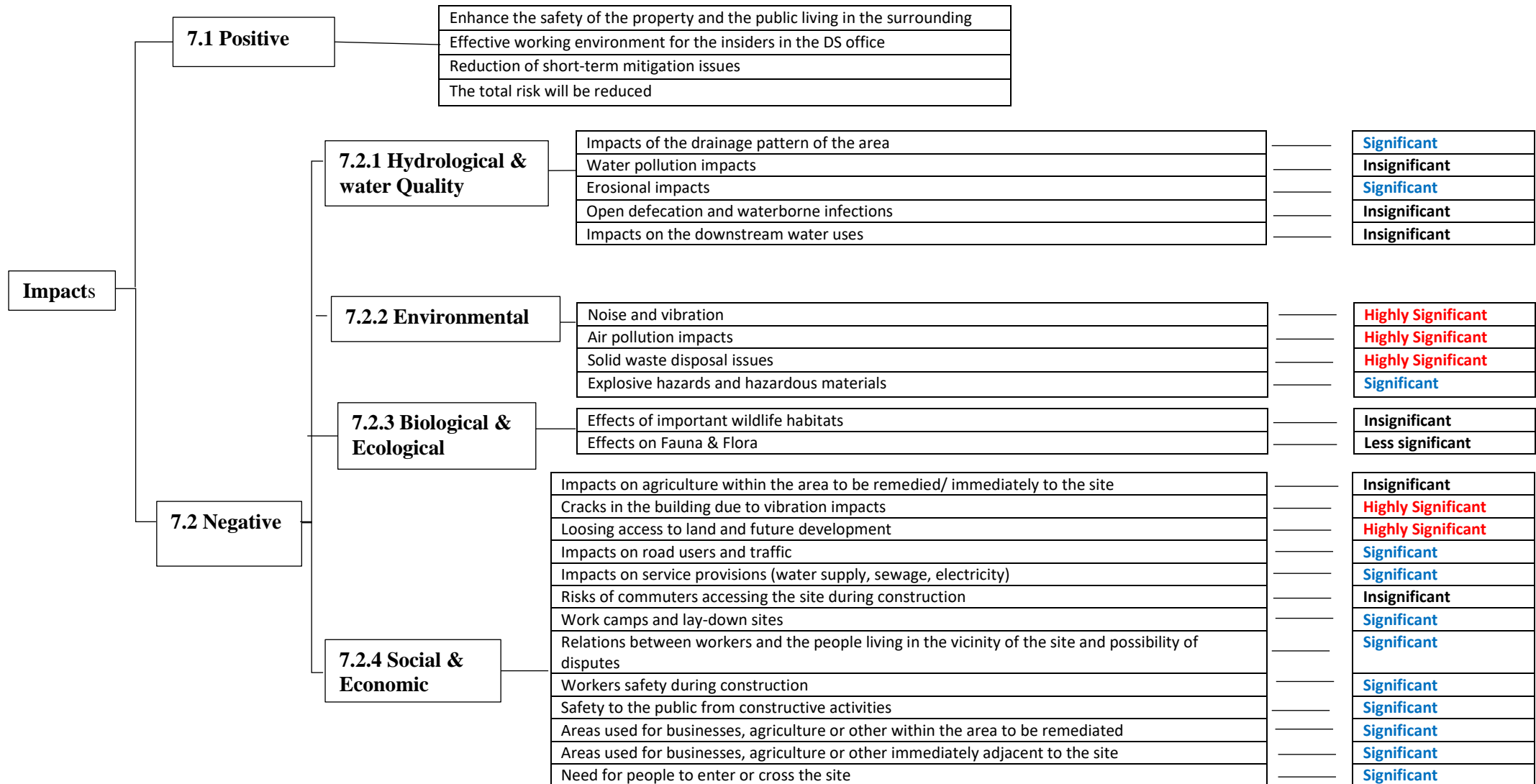


Figure 6: Summary of the impacts which are envisaged during project

7.1 Positive impacts

- The project will reduce further landslide threat at the upslope section in Soragune - Ranwanguhawa Road. Therefore, the proposed project will significantly enhance safety for commuters and pedestrians during rainy seasons. It will allow to keep the road open throughout the year.
- If the mitigation measures are implemented to the site, it will support to enhance the safety of the home gardens located in the up-slope and down-slope areas. The family which is partly depending on the income taken from the home garden will be safeguarded.
- Prevent frequency evacuation during rainy season and reduce continuous expenditure of the government to provide relief and compensation.
- Implementation of the mitigation measure will ensure to minimize the soil degradation and siltation from future landslide and slope failures.
- Prevent the disruption of road and other infrastructure in emergency situations during the rainy season and so convenient to provide continuous relief and services to other areas.
- Prevent the cost of resettlement of high risk families and solution for land scarcity. Further, this will prevent the adverse social and economic impacts of resettlement.
- Reduction of short-term mitigation issues is one of major economic benefit adding after the completion of this mitigation.

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	
7.2.1.1 Impacts of the drainage pattern of the premises There is no proper drainage pattern in the area. But a cut-off drain could be observed at the upper part of the slope. Disruption of the existing surface and sub-surface drainage pattern in the area is envisaged due to the reshaping of the unstable slopes, removal of soils, and diversions of existing drainage and surface runoff flow paths. The 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.	Significant
7.2.1.2 Water pollution impacts There are no water streams close to the mitigation site	Insignificant
7.2.1.3 Erosional impacts Landslide has been already occurred in this location and soil mass on the upslope has flowed to the soragune - Ranwanguhawa road. Therefore, during rainy season, and during	Significant

the construction period, these soil masses may be disturbed and eroded. When natural water paths are deviated due to construction activities, erosion would be high.	
7.2.1.4 Open defecation and waterborne infections As the site is located within a residential area, possibility of open defecation is low	Insignificant
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 is expected from machinery during site preparation and landscaping. Impact is significant as the construction is carried out in the proximity of the residential area where a population who are highly vulnerable to heavy noise like infants and disables are living. If heavy machinery is operated, the vibration can affect the residential buildings located closer to the site. Some cracks can be observed in the building on the down slope of the mitigation site. Therefore, structural deformations such as expansion of cracks and collapse of walls etc. can be take place. Therefore, crack survey should be done before and after the mitigation work.	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 residential buildings are located in the close proximity to the mitigation site, the effect is highly significant to general public who are living in the area including children and disables 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, and construction waste during the construction phase may lead to create inconveniences to people living in the area. Waste can pollute the soil, and leave various environmental and social 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 some rock boulders, explosives may be used if the rock blasting is envisaged. This may pose risk on people in the area, commuters and pedestrians due to unsafe use.	Significant
7.2.3 Biological /Ecological Impacts	
7.2.3.1 Effects of important wildlife habitats There are no forested/ wild-life reservation areas within the project influence area with high biodiversity, or habitat fragmentation.	Insignificant
7.2.3.2 Impact on Vegetation Majority of the trees found in the area are not endemic, threatened and identified in the red list of IUCN. Some common tree species were observed during the site visit like Kudu (Dawula), Sapu, Jack, Mango, Kithul and Bo tree etc. During the project implementation there will be requirements of cutting/ uprooting trees, some of may be regulated under Falling of Trees (Control) Act. Hence, the removal of them may require approval from the relevant authorities. Valuable timber species may be removed from the system unintentionally/intentionally if proper supervision is not done by the Environmental and Safety Officer with relevant knowledge on these species.	Less Significant

7.2.4 Social and Economic Impacts	
<p>7.2.4.1 Impacts on agriculture within the area to be remedied/ immediately to the site</p> <p>It could be observed Pepper and Cinnamon cultivation within the mitigation area owned by Mr. Ranjith Ambepola. Dominant trees such as Sapu, Jack fruit, Mango, Kithul are grown at down slope of the location. Construction will lead to removal of these vegetation and will have impact on income earning of the owner of the cultivation.</p>	Insignificant
<p>7.2.4.2 Cracks in the building due to vibration impacts</p> <p>There are several residential buildings located in the proximity of the mitigation site. During the construction heavy machinery will be used and the vibration can cause cracks in these buildings and it can affect the stability of the nearby buildings immediate to the slope as well.</p>	Highly Significant
<p>7.2.4.3 Loosing access to land and future development</p> <p>The mitigation works will be concentrated on land owned by Mr. Ranjith Ambepola and he has cultivated Cinnamon about ¼ acres of land. During the construction period, there will be impacts to the land owner with regard to loosing access to the land or loss to valuable uses.</p> <p>In contrary, remediation works in the upslope will increase the stability of the boundary and protect the land from future failures.</p>	Highly Significant
<p>7.2.4.4 Impact on road users and traffic</p> <p>Most of the construction activities will be focused on unstable slope area adjacent to Soragune - Ranwanguhawa road. Hence, during construction phase, this road will be temporary obstructed and it would be impacted to road users. The impact is affecting only at the construction phase. The traffic due to full/partial road closure may obstruct the smooth flow of vehicles during the week days, school times, (in morning, day time and evening). This will cause nuisance to pedestrians and commuters. Further, This effect will be severe during the "Perahera" season in September as heavy traffic can be observed during the Perahera season.</p>	Highly Significant
<p>7.2.4.5 Impacts on service provision (water supply, sewage, electricity)</p> <p>Utility pole on the edge of the road (starting point of the down slope) will be damaged. The water line also runs through the mitigation site. During the construction works and when moving machinery, water lines can be disturbed and damaged.</p>	Significant
<p>7.2.4.7 Risks of people accessing the site during construction</p> <p>Excavation machineries, loaders, trucks etc. will be used in this premises where people, vehicle and pedestrian 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. Since the site is located near to main access road and a residential area, the commuters moving around the area. Ignorance of entry of people and careless operation of machinery can cause fatal injuries and accidents to them.</p>	Significant
<p>7.2.4.8 Work camps and lay-down site requirements</p> <p>The camp site will be selected in the close proximity to the mitigation site. If proper camp management is not in place, it may result several labour issues, social issues with community and the officers, due to 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. In order to provide water and other facilities required for workers from the premises, permission must be obtained from relevant parties.</p>	Significant

<p>7.2.4.9 Relations between workers and the staff / people living in the vicinity of the site and possibility of disputes</p> <p>There may be disputes with the workers of construction site and the villagers, as people are living nearby. As there are 4 houses adjacent to the mitigation location, the level of disputes is compatibility low.</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>	Significant
<p>7.2.4.10 Workers safety during construction</p> <p>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. The heavy construction machinery may be used in limited work spaces. Risk of hazard from vehicle and construction machinery road 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.</p>	Significant
<p>7.2.4.11 Areas used for businesses, agriculture or other within the area to be remediated</p> <p>The project influence area consists with cinnamon cultivation hence it has an impact due to the project activities.</p>	Significant
<p>7.2.4.12 Areas used for businesses, agriculture or other immediately adjacent to the site</p> <p>The down slope area adjacent to the site has home gardens with paper and cinnamon. Hence there is an impact on these home gardens due to the project.</p>	Significant
<p>7.2.4.13 Need for people to enter or cross the site</p> <p>The land owner needs to enter this area for the cultivation. As the construction process involves heavy machinery, and vehicles, electricity, and may be blasting materials the entry by unauthorised personnel if occur may have very high risk.</p>	Significant

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 and closer to a road with frequently travelling vehicles up and down. 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

04 houses have been identified including damaged house to resettle due to high risk to further activation of landslide. Two of them have received lands to construct houses, but still they are staying in the same place. However, no project based resettlement is required to execute the landslide risk reduction measures.

9.2 Evacuation of people

During the construction period of the project, it may require to evacuate the high-risk house of Mr. Ranjith Ambepala located in the down slope. Currently, he is in the process of resettling to a safer location. So, if the mitigation work starts before his resettlement, the evacuation is needed. Rather than that, the other 3 high-risk houses where located within a considerable distance from the mitigation point also need to go through evacuation process if needed.

However the mitigation area should be named as a “No Entry Zone” for the construction period.

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

The consent from the owner (Mr. Ranjith Ambepola) is required to remove the damaged house from the location before implementing the mitigatory measures. Excluding that house, no any other damaged structure is located in this site.

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

It may require to compensate/ rectify if any damages happen to the houses located nearby and any element of the road (culvert/road) during construction activities.

9.5 Public awareness and education- needed for following areas

Programs to inform and educate about the risks posed by landslide.

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
i. Natural resource management and resource optimized designs Project specific designs should be considered to eliminate mass clearing of vegetation and minimum number of removals of grown tree species. Sufficient emphasis should be made to consider conservation of trees if important tree species are found.	High
ii. Site Planning During site planning it is necessary to be cautious on possible re-activation of slope failures and movements of soil masses. Therefore, vehicle parking sites, material storage and temporary shelters etc. should not be installed in the danger zones of the slides.	High
iii. Habitat connectivity and animal trails If large fractions of vegetation are required to be cleared in ecologically fragile habitats as for permanent structures or for access, or if deep drains etc. are to be made the designs should include habitat connectivity features, animal trails and vegetation strips and etc. even if the impacts are localized.	Low

<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 usage such as gardening and sanitary activities. Special attention to the quality of the water should be given as a septic tank is located close to the proposed mitigatory site.</p>	Low
<p>v. Interruption to water supply lines Water lines supplying water to the downslope runs through the unstable slope.</p>	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. This is important due to site is located rural, low dense environment.</p>	High for upslope area
<p>vii. Consideration of green environmental features As many of the mitigation 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 for upslope area
<p>viii. Workers and community safety Activation of landslide may occur during construction phase and may pose threat to workers, and the 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 etc should be considered if drain water is expected be directed to natural streams. The materials used for structures and should be chosen carefully so as to withstand weather conditions with high durability. Designs should specially consider corrosion prevention techniques if steel structures are used.</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 contractor's obligation to ESMP	Item	Relevant to the project
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Highly Relevant (Road, Houses)
2002.2 2)	Noise and Vibration	Highly Relevant (Road, Houses)
2002.2 3)	Cracks and damages to the buildings	Highly Relevant (Road, Houses)
2002.2 4)	Disposal of waste	Highly Relevant (Road, Houses)
2002.2 5)	Disposal of refuse	Highly Relevant (Road, Houses)
2002.2 6)	Dust control	Highly Relevant
2002.2 7)	Transport of Construction materials and waste	Relevant
2002.2 8)	Water	Relevant
2002.2 9)	Flora and Fauna	Low 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	Relevant
2002.2 14)	Quarry Operations	Relevant
2002.2 15)	Maintenance vehicles and Machinery (pollution)	Relevant
2002.2 16)	Disruption to public	Highly Relevant
2002.2 17)	Utilities and roadside amenities	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 is 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. Planning project activities inside the sites</p> <p>As contractor has to operate mitigation actions within the road-side premises, he should carefully prepare a plan for management of construction activities inside the premises. 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. These activities should not be carried out in a danger zone for any reason.</p>	Site preparation & construction	Construction Contractor
<p>iii. No Entry Zone</p> <p>The PMU should make a detailed assessment on possible risk of slope destabilization in the site during 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>iv. Traffic Management and Safety</p> <p>A good traffic control should be implemented in the construction stage. As there is a bend on the road adjacent to the site, proper road safety measures should be included with warning signs and permanent trained watchmen, luminous sign boards indicating slope instability risk and road obstruction signs, night lamps etc. are strongly recommended for this site.</p> <p>As per the villagers, there is a special “Perahera” event of Soragune Dewalaya in the month of September. During the Perahera season this road has high traffic congestion. Therefore, the contractor should pay special attention to traffic management during this period or carry out minimal construction work that does not affect traffic congestion.</p>	Construction	Construction Contractor

<p>v. Damages to the transport network and other utilities during construction, material and machinery transportation</p> <p>The asphalt paved access road within the project area will require to use for machinery and materials transportation during construction phase. The electricity and water lines are also runs through the site. Therefore, extreme care should be taken as there are possibilities of accidents and damages to the road and other utilities are high. If any damage happened to the road or any utility element during the construction, or during machinery and material transport, should be rectified during or after the project.</p>	Construction	E & S Unit of PMU Contractor
<p>vi. Noise and vibration control</p> <p>There are 04 houses located closer to the mitigation site including high risk buildings. The noise and vibration generating activities may disturb the smooth flow of activities of the residence. Vibration generating activities should be done within the prescribed limits to avoid damage to structures. Cracks in the houses 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>vii. 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. Waste should not be disposed along the road for any reason.</p>	Site preparation & construction	Construction Contractor
<p>viii. Dust and aerosol control screens</p> <p>The dust particles generated during the construction period can influence the people who are living nearby and commuters. Highly vulnerable people to dust and aerosol could be observed in these houses like children and disables. Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged.</p>	Site preparation & construction	Construction Contractor
<p>ix. Water for construction</p> <p>Water for construction should be obtained only from approved places. If the Contractor intends to use water and electricity from the nearby houses or main electricity line, they should be informed and the required permission should be taken.</p>	Construction	Construction Contractor
<p>x. 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 unstable slopes 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 and public'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>xi. 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>xii. Interruption to water lines</p> <p>Necessary arrangements should be taken to provide alternative water supply in case of an interruption to water supply. The water users should be consulted during project mobilization to inform the requirement to shift the water lines to a safe location if water lines are running through the project site.</p>	Construction	Construction Contractor
<p>xiii. Use of sanitary facilities of contractor's workforce</p> <p>Separate sanitary facilities should be arranged for the workforce.</p>	Construction	Construction Contractor
<p>xiv. Working hours</p> <p>Construction activities are best done during the day time due to safety issues.</p>	Construction	Construction Contractor
<p>xv. 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>xvi. During construction good housekeeping should be maintained to minimize visual pollution</p>	Site preparation & construction	Construction Contractor
<p>xvii. Workers code of conduct</p> <p>Possible disputes between the labor force and the community should be prevented by maintaining the agreed code of conduct by the contractor.</p>	Construction	Construction Contractor

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 administrative buildings	Once*
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality	-
	Crack survey for the administrative buildings	Once*

	Ground vibration	During operation of drilling machinery, boring works, or any works that generate ground vibrations*
	Construction noise	Once a month during heavy noise generation times *
	Air quality particulate matter	Once a month *
iii. Vehicular Emission	All machinery/vehicles operational should have the emission control test certificate as applicable - should be checked by the site ES officer of the consultant	
iv. Monitoring agency	* A competent independent monitoring agency with registration of Central Environmental Authority for all parameters except crack surveys **Crack surveys should be conducted by competent agency acceptable to PMU	
v. Reporting requirements	Stream water quality – Comparison with ambient water quality standards published by the CEA, 2017 Pre-crack survey of the 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.	

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

The occupants living closer to the mitigation site were consulted during the field visit. Those houses have their private ownership. People living surrounding the mitigation site stated that they were aware of landslide mitigation project and the funding mechanism. There are four houses at downslope of the site identified as high risk to the landslide threat and informed to resettle. As per them, they were not being able to find the suitable lands to resettle due to land scarcity. And their livelihood and source of income are in the same place. Therefore, the occupants expressed their willingness to the project and to give full support to the project.

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 of National Resource Management Centre, 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.

As the Soragune – Ranwanguhawa road is comes under Pradeshiya Sabha reservation area, consent from Haldummilla PS is very important.

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. LABOR 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
13.1 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 Haldummulla Pradeshiya Sabha
13.2 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
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).
Haldummulla Pradeshiya Sabha	Approvals from Rathnapura Municipal Council will be obtained for the disposal of waste and plant litter.
Ceylon Electricity Board	Approvals from the regional office of Ceylon Electricity Board will be required to obtain the electricity to the site.
13.3 Consent/ no objection/ legally bound agreement from the private land ownerships	

Land owner (Privet owners and Haldummulla DS)	Signing a legally bound agreement between the land owners (H.R.A. Ranjith Ambepala & Haldummulla DS) 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
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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 GSMB CEB		—	—	—				
Consent/ no objection from the land ownership (H.R.A. Ranjith Ambepala & Haldummulla DS)	—	—						

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	District CEA, Divisional secretary, District Office NBRO, AIIB and relevant parties as appropriate	Written and verbal communications, submission of relevant reports

conformance workers health and safety		
v. Decisions taken and progress review meetings pertinent to ES matters	District CEA, Divisional secretary, 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

Annexure I: Images of the site condition and the consultation



Public Consultation



Public Consultation



High Risk houses located downslope



Damaged house from landslide incident