

**Site Specific Environmental and Social Management Plan  
(SSE & SMP)**

**Site No.25  
RHS of Veyanagoda-Ruwanwella Road  
(23+100 , 23+210)  
Kegalle District - Package 4  
October 2018**

**Prepared for:**

**Sri Lanka Landslide Mitigation Project  
Asia Infrastructure Investment Bank  
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## **Abbreviations**

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
DFC	Department of Forest Conservation
DS	Divisional Secretary
DWLC	Department of Wild Life Conservation
ES	Environmental & Social
E&SU of PMU	Environmental & Social Unit of Project Management Unit
ESMF	Environmental and Social Management Framework
ESMP	Environmental Social Management Plan
SSE & SMP	Site Specific Environmental and Social Management Plan
GN	Grama Niladhari
GOSL	Government of Sri Lanka
GSMB	Geological & Mines Bureau
IUCN	International Union for Conservation Nature
NBRO	National Building Research Organization.
RDA	Road Development Authority

## 1. Introduction

The Government of Sri Lanka intends obtaining a loan from the Asian Infrastructure Investment Bank (AIIB) for mitigating/rectifying unstable slopes in high risk areas especially in 11 districts of 06 provinces of the country. The project requires to be implemented in accordance with environmental and social safeguards and mandates of the AIIB and that of Sri Lanka. Considering the nature of project actions and its implementation, an environmental and social management framework has been (ESMF) 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 RHS of Veyangoda-Ruwanwella Road (23+100, 23+210) landslide mitigation site.** The plan has been prepared by an in-depth environmental and social assessment to

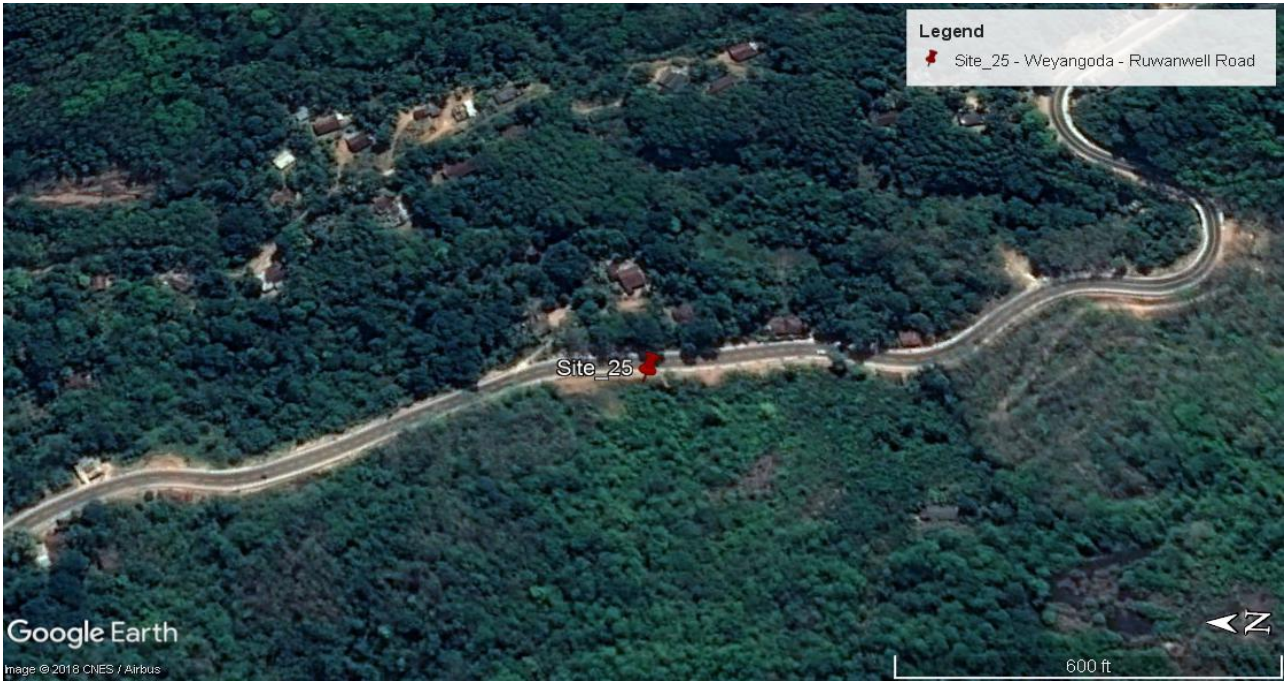
- i. Identify sensitive environmental and social elements in the project influence area
- ii. Identify significant environmental and social impacts due to project actions
- iii. Propose mitigation measures
- iv. Decide appropriate environmental and social monitoring requirements specific to this project
- v. Study relevant environmental regulation and procedures to be followed during project implementation specific to the site

## 2. Location details and site description

Site reference: Site No. 25, package-4, Kegalle District, RHS of Veyangoda-Ruwanwella Road (23+100, 23+210)

Site Details

- i. The site falls administratively under Thumbaliyadda (GN Division) of Ruwanwella Divisional Secretariat Division (DS Division), Kegalle District of Sabaragamuwa Province. The slope instability occur in between section 23+100 and 23+210 of right hand side of Veyangoda - Ruwanwella (B 445) road at Gonagaldeniya area.
- ii. The nearest town to the site is Ruwanwella, about 8.5 km from the site.
- iii. GPS reference of the location is 7.060212 N, 80.202799 E Ref. Map of the location Fig 1.
- iv. The land ownership is private lands and Road Development Authority.



*Fig 1: Google image of the proposed landslide mitigation site, Ref. Annex 1. Drone image for details*

### **3. Landslide hazard incident details**

A precipitation of over 300 mm had triggered a slope instability on 26/05/2017 in a long road stretch as a result of a non-engineered slope excavation for the road expansion in Veyangoda - Ruwanwella road. Soils/debris had extended towards the road obstructing completely its passage for commuters. This long unstable slope cut is collapsing time to time with the recurring heavy precipitations.

#### **The damages occurred due to incident**

The failed debris (soil and rocks) mass had extended only up to the road, had not moved down the slope. There are houses in the down slope and they were not affected by the failure. There were no reported casualties as well.



*Fig 2a: Upslope of the road and slope failure*



*Fig 2b: Downslope of the road*





Fig 2c: Water line runs at the toe area



Fig 2d: Risk houses at the toe area

Fig 2: Images of project area

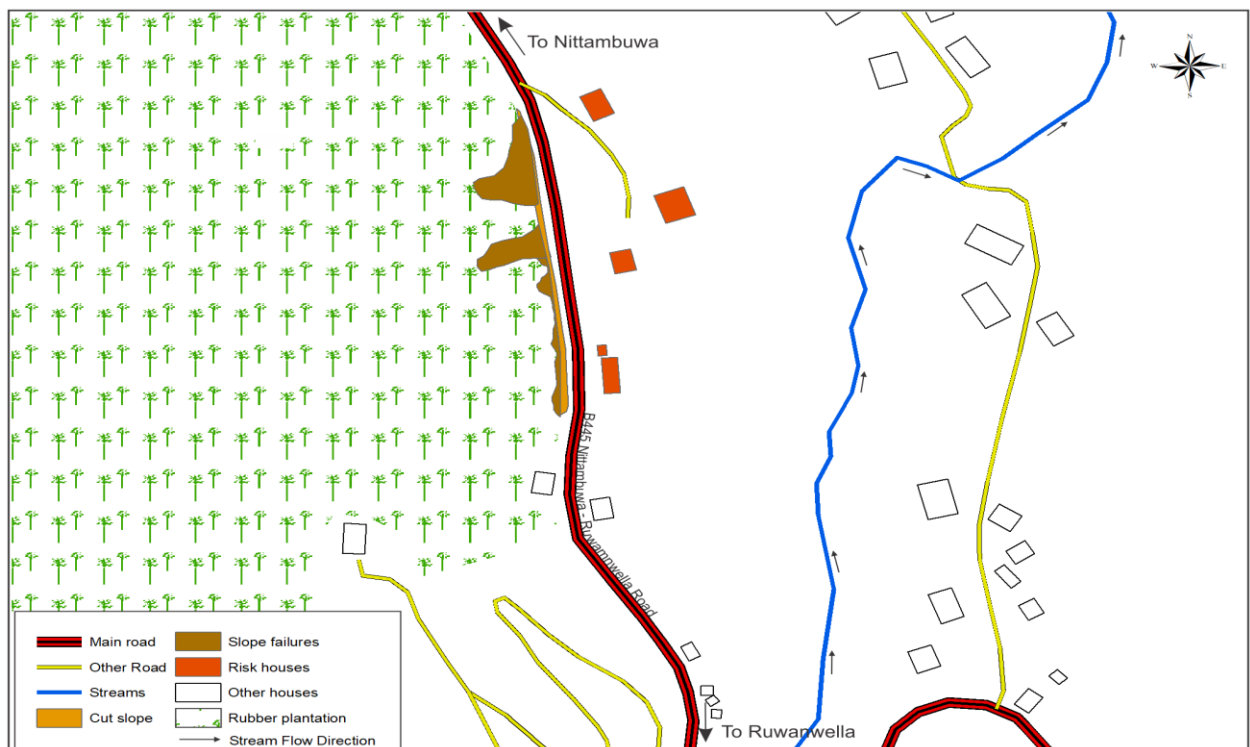


Fig 3: Diagrammatic interpretation of affected slope area and the houses currently at risk

#### 4. Description of any remedial measures already undertaken to reduce the potential risk

NBRO inspected site after the incident and a report was issued (NBRO/LRRMD/KG/RWP/L117/31/30080)

##### Evacuations

The NBRO report has informed the occupants of the houses categorised as high risk to evacuate the houses if following signs in the slope appear, and informed GN officer, Officer of National Disaster Relief Services Centre to be vigilant on the bellow mentioned signs

- Muddy colour in springs
- New tension cracks appearing or widening in upslope area
- Tilting of trees at upslope area

None of the households have evacuated permanently the houses, but are very much vigilant on the appearance of early warning signs during heavy precipitation events.

## **5. Description of the area of the landslide, areas adjacent to the landslide and current level of risk**

The area is a sloping landscape. The upslope above the affected location is a steep slope section with in a rubber plantation while down slope is relatively gentle to flat lands. There are home gardens with scattered houses in the down slope area. A road from Veyangoda to Ruwanwella travers across these landscapes.

The home gardens in the down slope have a well grown tree cover with minimum two canopy layers. A marshlands, and rubber plots etc are found further towards down slope area. A natural stream flows parallel to the road in the down slope area.

About 150m stretch along upslope cut in the road is under risk of future collapse. The section has partially collapsed times to time during recurring heavy precipitations exposing unstable debris masses, rock fragments etc. Several impinging loose weathered soil and fractured pieces of rocks are posing high risk on the commuters along this road section. Therefore, there is a high risk of slope instability at heavy precipitation events.

The houses belong to Mr A A C Abesinghe will be at high risk while houses of Mr A A Milton Abesinghe, Mr A A Amarasekara, Mr M A M P Karunaratne are at medium risk, and Mr M A Karunaratne, Mr D P P Karunaratnes' houses are at moderate risk.

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

The area is largely rubber and home gardens. Just upslope of unstable slope section is an abandoned rubber plot, disturbed and under succession by healthy understory vegetation cover. Trees grown in home gardens such as jak, "kitul, Kenda and understory vegetation such as grasses and small shrubs etc are found the area just above the failed section.

There are no forested areas, wildlife reservations, environmentally sensitive habitats found within the study area. No ecologically significant terrestrial habitats found. There is a natural stream flowing about 500m downslope parallel to the road, but no streamlets from the failed slope section directly feeding this stream.

The environmental and social elements that may be at risk due to project implementation area:

- i. The road activities and the commuters, will be affected
- ii. Occupants in houses of downslope area will be affected
- iii. The pipe lines laid across the failed slope which are currently providing water ( domestic, incl. drinking) to houses will be affected

## **7. Description of the works envisaged under the project**

The proposed mitigation works will be largely concentrated on slope reshaping, removal of weak and loose slope sections, improvement to the drainage and slope reinforcement. Permanent structures to convey the runoff and seepage water through proper drainage management, such as directing runoff to a surface drains system and reducing the water table in the unstable seepage area by insertion of horizontal drain systems etc may be considered in drainage improvement. Also, soil, nailing, rock bolting and retaining walls together with surface erosion control measures will be considered in the mitigation design.

## **8. Identification of social and environmental impacts and risks related to the works**

### **8.1 Positive impacts**

The mitigation will make currently unstable slope at the road side stable, securing safety of commuters and pedestrians. Further, mitigation will be beneficial to the occupants' at high risk, medium risk and moderate risk houses.

## **8.2 Negative impacts**

The mitigation works are generally confined to an area which is already disturbed by a slope failure. Therefore, negative impacts are much localized and also limited mostly to construction period.

### **8.2.1 Loosing access to land and future development activities**

Most of the mitigation works will be carried out in RDA road reservation and in private owned rubber lands. As a result the owner will lose future development opportunity of their property. However, these rubber lands have already become unusable, with disturbed vegetation and hence may not be useful for any productive purposes under current state, hence their development opportunity has been already lost. As these lands have been categorized as high risk they will not be allowed for future development.

A water lines currently used by few houses as a source of water for drinking washing cleaning and etc. will require to be removed during project implementation.

### **8.2.2 Ecological, biological impacts, and fauna and flora**

There is a narrow strip of mixed vegetation on the crest of the failed slope that may require to be removed for mitigation works. However, the impacts on this terrestrial ecosystems are localized as many project actions will be taking place on already failed or disturbed slopes.

### **8.2.3 Impact on the drainage pattern of the area**

The slope mitigation will encounter improvement to drainage. This will result water table draw down and there is a risk of drying up of currently active springs. As there are no water uses in the upslope area there will be no impact on the water uses. There will be high flows in the drainage network during rainy season. The impacts however, are largely confined to this section of the slope.

### **8.2.4 Erosional impacts and stream bed alterations**

The section of slope under mitigation will be subjected to erosion during the rainy season as a large section of bear slope surfaces will be exposed during slope excavations, land clearing etc. As a larger slope area is excavated the runoff with high sediments load will be generated. Hence slope erosion impact are significant at this location.

There is natural stream which runs about 500m from this location. As there are no active streamlets directly feeding the stream from this area potential stream bed erosion not likely to occur.

### **8.2.5 Water pollution impacts from construction activities**

Sedimentation to existing watercourses and siltation in the downstream channels can be expected during the process of landscaping/reshaping of slopes. Improper disposal of oils and other harmful substances/contaminants from machineries, leakages from temporary storage tanks, solid waste and wastewater disposal/dumping from workers' sites could occur causing adverse impacts on water quality of the streams. Intentional and careless disposal of construction waste may result addition or mixing of construction materials (cements/other grout materials used for soil strengthening) with surface water to cause temporary water quality degradation and accumulation of unwanted substances in the downstream. There are no water streams nearby hence the effect on bank erosion, stream bed scouring river bed scouring will not be highly significant.

### **8.2.6 Open defecation and waterborne infections spread during construction phase**

There is a possibility of open defecation by the workforce and spread of water borne infections

### **8.2.7 Impacts on the water uses**

The mitigation will have a risk of drying out of springs and water sources in the upslope area. There are no direct water uses on springs in the upslope area. The intake point of the water line crossing the affected slope section is located outside the project influence area.

### **8.2.8 Solid waste disposal issues**

Haphazard disposal of solid waste can pollute water and soil, and leave various environmental impacts if proper disposal mechanism is not in place during the construction period. The effect is significant unless a proper solid waste disposal mechanism is used during the construction period.

### **8.2.9 Air pollution impacts**

Construction activities that contribute to air pollution include: land clearing, operation of diesel engines, excavations, burning, and transportation disposal of construction materials, construction waste and working with toxic material (blasting chemicals). During construction, it generates high levels of dust typically from concrete, cement, wood, stone, and silica. Further, air pollution may have an impact on the pedestrian/ commuters on the road. There are houses opposite side of the road. The occupants will be affected by air pollution such as from dust and fumes.

### **8.2.10 Noise pollution, vibration, blasting, impacts during construction, potential damage to buildings, infrastructure**

Blasting may be used to remove several impinging rock fragments. Forced excavation to remove hard weathered rocks, drilling for horizontal drains and rock bolting etc. may produce high noise and ground vibration.

The commuters on the road and the occupants of risk houses will be exposed to high noise during heavy noise generating activities, such as operating loading and unloading of materials, movement of machinery in addition to above mentioned construction works.

### **8.2.11 Relations between workers and the people living in the vicinity of the site and possibility of disputes**

There may be disputes with the workers of construction site and the villagers.

### **8.2.12 Work camps and lay-down sites requirement**

The solid waste and sewerage removal in the camp if not properly arranged will be a nuisance to the surrounding community.

### **8.2.13 Road traffic and risks of public accessing the site during construction**

The mitigation site is a long stretch of slope along the road etc several machinery and activities with high hazard risk such as drilling, boring and excavation will be operating simultaneously. Only skilled workforce will be safe working in this environment. If unauthorized persons accesses the site there may be a risk of being subjected to accidents by the heavy machinery.

### **8.2.14 Explosive hazards and hazardous materials**

Explosives may be used if the rock blasting is envisaged. This may pose risk due to unsafe use. As these operations are to be done on unstable slopes the risk of improper use of explosive and accidents from rock fragment are highly significant.

### **8.2.15 Safety to the public from construction activities; High risk for commuters**

During construction phase the road will be obstructed by the frequently moving machinery, loaders, trucks etc. As most of the mitigation works are to be carried out in limited space on slopes the heavy machinery, the trucks and loaders etc. can obstruct the commuter /pedestrian passage and may pose high risk on their life. There is a risk of falling loose rocks on the road during excavations and removal of rocks posing risk on the commuters.

### **8.2.16 Workers safety during construction**

The heavy construction machinery may be used in limited work spaces. Risk of hazard from vehicle and construction machinery accidents is highly significant. Further, even now the site is unstable with high seepage, falling debris and rock fragments time to time. This risk may be increased during the slope modification phase. Moreover the worker will have to work on scaffoldings to climb on this slope. Therefore, risk on workers from a possible failures even a minor one should be considered highly significant for this site. Contractor may engage under age workers (children) for construction work, which is risky results serious accidents and injuries.

### **9. Public and Stakeholder Consultations - That have been held and/or will be held**

Mr AAC Abesinghe who is the occupants of high risk house was consulted during field visit. The occupants in risk houses have not evacuated the house. These occupants are vigilant on possible slope instability at high precipitations and will evacuate when appearance of muddy colour in springs, tension cracks and tilting of trees etc appear at upslope area.

#### **9.1 Stakeholders involved in the consultations any recommendations or agreements reached in the consultations (Ref: annexure III)**

#### **10. Significant Environmental and Social Impacts: Social or Environmental impacts or risks that will require special measures on the part of NBRO and the contractor; Indicative significant impacts**

##### **10.1 Impacts on water or wetlands (issues relating to changes or contamination of streams, rivers and other bodies of water, typically downstream from the site): Long-term impacts and potential impacts and risks during construction/remediation of the landslide site**

Since there are no waterways nearby the impact is insignificant.

##### **10.2 Erosional impacts and stream bed alterations**

The impacts on environmental flow, stream banks/ bed and aquatic ecosystems will not be significant as there are no waterways in the proximity and streambeds originate from the slope sections directly feeding the stream and down slope.

##### **10.3 Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion)**

The traffic due to full/partial road closure may obstruct the smooth flow of vehicles. This will cause nuisance to pedestrians and commuters. The stretch of the road affected by the mitigation work is about 150m. Several machinery will operate simultaneously along this stretch. The volume of material used, generation of waste, operation of construction vehicles etc will be high. During heavy rain the entire stretch will become unsafe with very high slope instability risk. Further, there is a bend close to the site. Therefore, vehicles may not immediately see the site. Hence overall impacts on road traffic, risk of accidents, slope instability risk on commuters and work force etc are considered highly significant.

##### **10.4 Impacts on downstream service provision (water supply, sewerage, electricity, etc.)**

There are water supply lines laid down crossing the failed slope. The water in the line flows under gravity and directed to houses along the road side. The water is used by people for drinking, and other domestic purposes. The mitigation works will damage the line and will cause problems for the water users.

Power lines or telecom lines will not be affected due to the project.

### **10.5 Households living in high-risk or medium-risk areas adjacent or near to the site (up-slope, down-slope, downstream, etc.)**

The construction poses high risk on public safety, noise and vibration impacts, and cracks in house located opposite site of the road.

### **10.6 Areas used for businesses, agriculture or other within the area to be remediated**

There are no areas used for business agriculture practices or other within the area to be remedied hence has not significant impact.

### **10.7 Areas used for businesses, agriculture or other immediately to the site**

There are no agriculture practices or other immediately adjacent to the site hence has no significant impact on agricultural uses.

### **10.8 Need for people to enter or cross the site**

There is no special need for people to enter the site for other purposes. However, unauthorised entry of people may occur due to intentional or unintentional purposes, they may be at risk due to operating machinery, and vehicles, electricity, and may be from blasting materials.

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

Many health and safety issues pertinent to this site is largely common to any landslide mitigation 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 addition, the extent of area having vertical unstable slopes under risk is much higher compared to a normal roadside landslide mitigation site. Also, number of workforce engaged in the construction activity will be higher than normal. Numerous machinery will operate simultaneously. Hence, health and safety issues at this side is considered highly significant.

### **10.10 Child labour & forced labour**

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

## **11. Clearances, no objection, consent and approvals required for the implementation of the project**

### **11.1 Project implementation**

- i. Approval from the District Secretariat  
The approvals will require to be obtained from the District secretary for the implementation of project where 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. This issues will be discussed, the recommendation at this meeting will be considered in the implementation of the ESMP
- ii. Approval from the planning committee  
The project will obtain the approval from the planning committee of the Ruwanwella Pradeshiya Sabha.

### **11.2 Approval from state land owners to implement the project in state lands of the site**

- i. The relevant agencies are RDA as part of the project actions are taking place on the road reservation. Necessary agreement will be made between NBRO and the RDA to access the land, carry out construction work, remove materials (trees, soils, rocks and boulders), erect structures, and continue with operation and maintenance works.

**11.3 Approval from Central Environmental Authority, Department of Forest, Department of Wildlife Conservation**

- i. As project site is located in environmentally sensitive areas approval from the district Central Environmental Authority is required. Refer Annexure IV for procedure.

**11.4 Other approvals**

- i. Approval from regional Geological Surveys and Mines Bureau will be obtained for transportation and disposal of earth, rocks and mineral debris.
- ii. Approval for extraction of materials - Approval from Geological & Mines Bureau (GSMB) is needed (if necessary only).
- iii. Approvals from Ruwanwella Pradeshiya Sabha will be obtained for the disposal of waste and plant litter.
- iv. Approval through the Divisional Secretary from the district office of Ministry of Defense will be obtained for the sites if requiring rock blasting.
- v. Approvals from regional office of Ceylon Electricity Board will be required for power supply for site operation.

**11.5 Consent/ no objection/ legally bound agreement from the private land ownerships**

The owner of the rubber land is Mrs. Priyanga Priyadarshanee Perera. A legally bound agreement between the land owners and the project implementing authority will be signed allowing no-objection to remove the structures, access the land, implement construction works, and engage in long-term maintenance works.

There are water supply lines crossing the proposed mitigation area. And will be affected by the construction work. This will be informed to the vulnerable parties. Arrangements will be made to re-install them safely before project implementation under the project cost.

The tentative timeline for getting approval is given in the following table.

Table 1: Tentative timeline for getting approvals

Approvals	Month 1				Month 2			
	W1	W2	W3	W4	W1	W2	W3	W4
<b>Project implementation</b>								
<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				—				
<i>Approval from state land owners Provincial Eng: Office &amp; CEA</i>								
Submission of application		—						
Respond to comments			—					
Approvals				—				
<b>Other approvals</b>								
GSMB		—						
Ministry of Defense (Depends on the requirement)			—					
Consent/ no objection from the private land ownership			—					

## 12. Environmental Social Management Plan (ESMP)

Measures to manage and or mitigate the impacts and risks, especially the impacts and risks identified in Sections 8 & 10. This will be included in the specific recommendations and requirements of the ESMP.

### 12.1 Resettlement action plan

Relocation of houses will not be triggered in this site

### 12.2 Evacuation of people

The occupants in the high risk houses may have a life threatening impact during the construction phase. As possible activation of slides during the construction phase may occur, and also as the mitigation work has a strong influence towards aggravation of slope failure risk, it is logical to consider that the risk of failure is linked with project works. The environmental and social management team has identified at least three houses directly down slope which are at high risk. It is recommended to assess possible slope failure risk on these houses during the construction phase. If such situation exists the project should consider practicality of protection barriers against debris risk or boulder falling risk. If such temporary mitigation measures are not practical, temporary evacuation of people from the houses is strongly recommended. As these households are not considered under government resettlement package it is reasonable to consider a suitable payment for them to rent out houses in the area to compensate the rental fee.

### 12.3 Procedure for removal of damaged structures, facilities infrastructure

There are no damaged structures need removal.

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

There can be cracks forming on the house on the downslope at the opposite side due to high vibration generation from various project actions mentioned above. It is imperative that necessary control measures are taken to reduce the ground vibration levels within the norms prescribed by the CEA. If project based cracks occur, it should be compensated and the contractor should bear the cost.

### 12.5 Public awareness and education- needed for following areas

Special educational and awareness programs on landslide risk to both residents and workforce  
Special educational programs to Contractors workforce on Health and Safety requirement during the construction phase

### 12.6 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
<b>i. Natural resource management and resource optimized designs</b> Project specific designs should be considered to eliminate mass clearing of vegetation and minimum number of removal of tree species. Sufficient emphasis should be made to consider conservation of trees if important tree species are found	Low/Moderate
<b>ii. Habitat connectivity and animal trails</b> If large fraction of vegetation is required to be cleared in ecologically fragile habitats 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 impact are localized.	should be considered only if requirement exist for important species



<p><b>iii. Conservation of water resources</b> This involves extraction of water both surface and sub-surface. The water extracted will be in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by wild fauna as well as the neighboring communities for bathing and other domestic purposes even as drinking water.</p>	Very High
<p><b>iv. Interruption to water supplies</b> The chances of drying of water source/s affected by the mitigation work is very high due to water table draw down. (Temporary/or permanent). However there are no water extraction points in upslope project influence area.</p>	Low
<p><b>v. Aesthetically compatible design considerations</b> The designs in aesthetically sensitive environments should consider structures that blend with natural environment to keep the visual pollution to minimum. The design should consider natural stream features to this location. Inputs of landscape architect may be important for the design of suitable mitigation structures</p>	Very High
<p><b>vi. Consideration of green environmental features</b> As many of the mitigations works are carried out in ecologically sensitive habitats, It is recommended to consider green environmental designs as much as possible in the designs e.g.: use of local vegetation species for erosion control, combination of plants to sustain species diversity in the environment, avoiding inclusion of potentially invasive species use of excavated materials for construction &amp; etc.  There are large rocks in the site requiring to be removed for slope modification. These rocks will be blasted. The project may consider these as raw material for construction.</p>	High
<p><b>vii. Workers/ commuters and community safety</b> Activation of slide may occur during construction phase and may pose threat to workers and commuters. Therefore safety consideration such as berms, safety nets etc. should be considered ( temporary measurers restricted only for the construction phase)</p>	Very High
<p><b>viii. Erosion control structures</b> The project involves surface runoff management in a large extent of slope area. There is a possibility of erosive flows generation during the heavy rainy period. Hence, necessary erosion control measures such as step drains, flow speed breakers etc are recommended to consider in the design negate damage from erosive flows</p>	Very High
<p><b>ix. Low post maintenance and operation designs</b> 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 to be directed to natural streams.  The materials used for structures and should be chosen carefully so as to withstand local weather conditions with high durability. Designs should specially consider corrosion prevention techniques if steel structures are use and geotextiles if fine sediments are prone to enter sub drains.</p>	Very high

## 12.7 Mitigation of impacts during the construction phase

### 12.7.1 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 and 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.

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 3: Contractor requirement to comply with ES & HS

Reference No. as per construction contractors obligation to ESMP	Item	Relevant to the project
<b>2002. Environmental and Social Monitoring</b>		
2002.2 1)	Storage on site	Highly Relevant ( Roadside)
2002.2 2)	Noise and Vibration	Highly Relevant (commuters , pedestrians and houses)
2002.2 3)	Cracks and damages to the buildings	Highly Relevant ( houses down slope)
2002.2 4)	Disposal of waste	Relevant
2002.2 5)	Disposal of refuse	Relevant (road reservation)
2002.2 6)	Dust control	Relevant (commuters/ pedestrians/ houses)
2002.2 7)	Transport of Construction materials and waste	Relevant
2002.2 8)	Water	Relevant
2002.2 9)	Flora and Fauna	Relevant
2002.2 10)	Physical and cultural resources	Not relevant
2002.2 11)	Soil Erosion	Highly relevant (vertical slopes)
2002.2 12)	Soil Contamination	Relevant
2002.2 13)	Borrowing Earth	Relevant
2002.2 14)	Quarry Operations	Not Relevant
2002.2 15)	Maintenance vehicles and Machinery	Relevant
2002.2 16)	Disruption to public	Highly Relevant (community nearby)
2002.2 17)	Utilities and roadside amenities	Highly Relevant (road & buildings)
2002.2 18)	Visual environment enhancement	Highly Relevant (aesthetically sensitive road sections)
<b>2002-5. Environmental Monitoring</b>	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	Highly Relevant
<b>2003. Working Conditions and Community Health and Safety</b>		
2003.2	Safety organization and communication	Highly Relevant (unsafe slopes/ commuters/houses/ heavy machinery)
2003.3	Child Labor and Forced Labor	Relevant
2003.4	Safety reports and notification of accidents	Highly Relevant
2003.5	Safety Equipment and Clothing	Highly Relevant
2003.6	Safety inspections	Highly Relevant
2003.7	First Aid Facilities	Highly Relevant

2003.8	Health and safety information and training	Highly Relevant
2003.9	Plant equipment and qualified personnel	Highly Relevant
<p><b>Relevant:</b> The section is relevant to the site as a common ESMP applicable to any site</p> <p><b>Highly relevant:</b> 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><b>Possibly relevant:</b> This ESMP will be triggered if the site come across with relevant aspect during project implementation</p> <p><b>Not relevant:</b> The section may not be relevant to this site under disclosed conditions</p> <p><b>Optional:</b> require to be implement if needed only</p> <p><b>Refer site specific monitoring plan:</b> 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><b>Reference:</b> Contractors Obligation for implementation of ESMP</p>		

## 12.8 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 mitigatory measures

Mitigation item	Project implementation phase	Responsibility
<p><b>i. Clearing the vegetation cover</b></p> <p>The contractor should be careful in clearing of vegetation cover if construction works are envisaged in the crown area to minimize slope instability risk, ecological impact and etc. Should avoid clearing of large areas, intentional and unintentional felling of trees and etc.</p>	Site preparation and construction	Construction Contractor
<p><b>ii. Minimize erosional impacts and sediment laden runoff during construction</b></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.</p> <p>As a large extent of slope area to be exposed during the mitigation the erosional impacts are high. Hence proper erosion and sediment strategies are compulsory at this site eg: avoid heavy excavations during wet season, covering erosion prone slope sections during rainy period, silt traps and etc</p>	Site preparation and construction	Construction Contractor
<p><b>iii. Invasive species</b> should be avoided in using vegetative erosion control structures. Native plants in the local environment should be chosen for vegetative control. The species used for vegetative control measures need approval from the Department of Wildlife Conservation.</p>	Construction	Construction Contractor
<p><b>iv. Disposal of construction waste and sediment laden runoff</b></p> <p>The contractor should pay special attention with respect to disposal of construction waste. Such waste if generated should store properly without getting washed off and dispose according to approved procedures by the PMU. The project should consider use of rock material for construction. If not suitable for this work, the rock material allowed to be recovered by interested parties to be used as a construction material</p>	Site preparation and construction	Construction Contractor
<p><b>v. Dust and aerosol control screens</b></p> <p>Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged</p>	Site preparation and construction	Construction Contractor
<p><b>vi. Water for construction</b></p> <p>Water for construction works should be obtained only from the approved sites</p>	Site preparation and construction	Construction Contractor

<p><b>vii. Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion)</b> Contractor should prepare a well thought traffic and road safety management plan for this site considering the slope instability risk on commuters, long extent of mitigation slope, nearby bend etc. The plan should include luminous separation tapes, road safety sign boards, flagmen during traffic times, landslide risk sign boards, full time watchmen day and night, night lamps etc.</p>	Site preparation and construction	Construction Contractor
<p><b>viii. Workers health and safety</b> 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> <ul style="list-style-type: none"> <li>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.</li> <li>ii. A good warning system and fulltime watchmen is strongly recommended for this site for both worker and commuter safety.</li> <li>iii. Safety barriers and safety nets should be installed at places of risk to protect workers, commuters and the community in the downslope from boulder/debris falling risk</li> <li>iv. A service of fulltime watchmen to be used in the site as the road consists several bends</li> <li>v. At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, should be provided.</li> </ul>	Site preparation and construction	Construction Contractor
<p><b>ix. Working hours</b> 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>	Site preparation and construction	Construction Contractor
<p><b>x. Need for people to enter or cross the site</b> Possible unauthorized access to the site should be avoided by awareness, warning signs and vigilance by the contractor’s full time watchmen.</p>	Site preparation and construction	Construction Contractor
<p><b>xi. During construction good housekeeping</b> should be maintained to minimize visual pollution</p>	Site preparation and construction	Construction Contractor
<p><b>xii. Water supply line</b> The water lines currently running crossing the failed slope need to be installed properly without being affected during the construction works. The water recipients should be consulted during project mobilization to inform about the mitigation work and requirement to shift the waterline to a safe location. As the line is conveying water under gravity the re-positioning should be done carefully not to interrupt the flow during low flow times. However, the line can be re-position across the same location when the mitigation works are completed.</p>	Site preparation and construction	Construction Contractor

**13. 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.

Table 5: Environmental and Social monitoring plan; construction phase

Monitoring requirement	Parameters	Frequency
i. Baseline monitoring	Stream water quality	Should be considered only after careful evaluation of mitigation design and drainage in the area
	Pre crack survey of the high risk houses	Once*
	Ground vibration	Once*
	Background noise measurement	Once*
	Air quality: particulate matter	Once*
ii. During construction	Stream water quality	During slope excavations, ground soil boring works ( every month) *: Should be considered after careful evaluation mitigation design and drainage in the area
	Crack survey of the high risk houses	If noticeable displacement is observed during construction**
	Ground vibration	During operation of drilling machinery, boring works, or any works that generate ground vibrations*
	Construction noise	Only during 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><b>Stream water quality</b> – Comparison with ambient water quality standards published by the CEA, 2017</p> <p><b>Pre crack survey of the high risk houses</b>-Professional report</p> <p><b>Ground vibration</b>-as per The interim standards on vibration for the Machinery, Construction activities and Vehicular movements, CEA</p> <p><b>Background noise measurement</b> –Extraordinary Gazette No.924.1, May 23,1996, CEA</p> <p><b>Air quality particulate matter</b>- The National Ambient Air Quality standards stipulated under the Extraordinary Gazette, No. 1562/22 August 15, 2008 -Central Environmental Authority of Sri Lanka.</p> <p><b>Micro habitat and ecosystem richness:</b> As per the instructions of DWC</p> <p><b>Rainfall:</b> Reports to be analysed by the ES &amp; HS unit of PMU to be vigilant on the potential risk of slope failure and to develop response mechanism</p>	

#### 14. Grievance redress mechanism for this site

The consultants ES officer is responsible for establishing the grievance redress mechanism for this site **with special consideration occupant of houses of the risk areas**, (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 6: Proposed scheme of information disclosure

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

Table 7: Level of information gathered through consulting institutions

<b>Date</b>	<b>Institution</b>	<b>Person contacted for information</b>
16/10/ 2018 @ 10.30 hrs	Road Development Authority – Ruwanwella	Mr.H K RAWickramanayake Executive Engineer Ruwanwella
03/10/2018 @ 13.00 hrs	Forest Department	Mr K G Sepala District Forest Officer
03/10/2018 @ 14.00 hrs	Central Environmental Authority	Mr.SU D Ghankeerthi Senior Environmental Officer – District office Kegalle Director –CEA
03/10/2018 @ 14.00 hrs	Land Reforms Commission	Mr. D. Sendanayaka Director, LRC, Kegalle

**Annexure I: Drone image of the project area**



**Annexure II: Images of the site condition and the consultation**



*Fig a: Consultation with high risk house owner , Mr. Abesignhe*



*Fig b: The risk home located downslope*



*Fig c: Stones felt down with the slope failure*



*Fig d: The medium risk home located upslope*

**Annexure III: Report on the Stakeholder Consultation: Kegalle District**

Date: 13/09/2018 and 03.10/2018		
Institution	Name and designation of the contact officer	Concerns raised
Road Development Authority Ruwanwella	Mr. H K RA Wickramanayake – Executive Engineer – Provincial Engineer Office	<ul style="list-style-type: none"> <li>✓ This area is under the jurisdiction of RDA – Ruwanwella</li> <li>✓ The Executive Engineer Office has no objection and states the mitigation is very much needed.</li> <li>✓ Other concerns raised                             <ul style="list-style-type: none"> <li>• The design to be accepted by the RDA: The project implementing agency should submit detailed design report to RDA with a formal request on nature of approvals required. PMU should prepare above documents and should submit the documents to RDA regional office</li> <li>• A proper handing over of the project is required after the mitigation</li> <li>• Engineer Office will do the maintenance after mitigation</li> </ul> </li> </ul>



Forest Department	Mr K G Sepala District Forest Officer	The mitigation of this site not cover/concerns under this institution
Department of Wildlife & Conservation (DWLC)	No Wild Life Office Found in the district	
Land Reforms Commission (LRC)	Mr D Sendanayake Director LRC Kegalle District	The mitigation of this site not cover/concerns under this institution
Central Environmental Authority	Mr.SU D Ghankeerthi Senior Environmental Officer – District office Kegalle	<ul style="list-style-type: none"> <li>✓ Under the Soil conservation Act 772/22 of 1996. of National Resource Management Centre, Kegalle District has been gazetted a sensitive area except some areas</li> <li>✓ Under this gazette any development is not allowed irrespective of the magnitude of the project.</li> <li>✓ In a disaster this is not needed.</li> <li>✓ The Basic Information Questionnaire (BIQ) is needed to fill for the project and submit the application</li> <li>✓ This Environmental assessment may be required to see their difference after mitigation</li> <li>✓ The CEA will grant approval with recommendations.</li> </ul>

#### **Annexure IV: Proposed procedure for obtaining approvals from environmental agencies**

##### **Proposed approval procedure for Environmental Clearance form District Central Environmental Authority**

- i. In the project preparation phase, the ES & H&S unit of PMU study the Site specific ESMPs and should submit the project proposal to district office of CEA with details of the Aerial extent that would be influenced by the project actions with spatial reference to sections of site specific ESMP relevant to the project.
- ii. A basic information questioner (BIQ) should be completed and submitted along with the above details
- iii. CEA may call for project briefing and further information on ESMP that should be provided by the PMU
- iv. Approval will be granted subjected to site specific conditions that should be adhered by the project

#### **Annexure V: Study team**

<b>Name</b>	<b>Designation</b>	<b>Position in the study</b>
TDSV Dias	Director/ ESSD/NBRO	Team leader
SAMS Dissanayake	Senior Scientist/ESSD/NBRO	Senior Environmental Scientist
Prabath Liyanaarachchi	Scientist/ ESSD/NBRO	Environmental scientists
H Kusalasiri	Technical Officer/ESSD/NBRO	GIS/Demographic data /survey support
Dilhani Jayalath	Officer in charge / Kegalle district office	Geologist
D.I.U Jayawardhane	Scientist/ LRRMD/NBRO	Geologist

## **Annexure VI: List of references**

1. NBRO site investigation report on landslide disaster at Gonagaldeniya area of Ruwanwella- Veyangoda road (NBRO/LRRMD/KG/RWP/L117/31/30080)
2. Contractor's obligations for Generic Environmental and Social Management Plan- Sri Lanka Landslide Mitigation Project-AIIB
3. Environmental and Social Management Framework-Sri Lanka Landslide Mitigation Project \_AIIB
4. Resettlement Planning Framework- Sri Lanka Landslide Mitigation Project \_AIIB