

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

**Site No. 15
Pebotuwa, Ratnapura District - Package 1
August 2018**

Prepared For:

**Sri Lanka Landslide Mitigation Project
Asia Infrastructure Investment Bank
(AIIB)**

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Abbreviations

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
DFC	Department of Forest Conservation
DS	Divisional Secretary
DWLC	Department of Wild Life Conservation
EH & S	Environmental Health & Social
E&SU of PMU	Environmental & Social Unit of Project Management Unit
ESMF	Environmental and Social Management Framework
SSE&SMP	Site Specific Environmental and Social Management Plan
ESMP	Environmental Social Management Plan
GN	Grama Niladhari
GOSL	Government of Sri Lanka
GSMB	Geological & Mines Bureau
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 Pebotuwa 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 regulation and procedures to be followed during project implementation specific to the site

2. Location details and site description

Site reference: Site No.15 Package 1 – Ratnapura District, Pebotuwa.

Site Details

- i. The proposed mitigation site falls under Pebotuwa GN division of the Nivithigala DS division, Ratnapura District, Sabaragamuwa Province.
- ii. Both upslope and down slope of the road section between culvert No.26/9 and 26/10 of Ratnapura – Agalawatte road (Uda Pebotuwa elbow junction) has been affected by a landslide.
- iii. The nearest town to the site is Kalawana. About 15 km from this location
- iv. GPS reference of the site is 6.530951°N, 80.449738° E.Ref. Google image of the location Fig.1.
- v. The land ownerships are road reservation of RDA and lands belonging to several private parties.



Fig 1: Google image of the location: The red balloon / brownish patch indicates the location of the slide and debris flow path, Ref. drone image for detail-Annexure I

3. Landslide hazard incident details

On 26.05.2017, a precipitation of >300 mm had triggered the movement of the slope. The main cause of the slope movement is non engineered road development, high seepage and runoff through the section of road. The heavy precipitation on the date had caused heavy seepage to create a weak zone in this section to trigger a landside and debris flow crossing the road while damaging both road and the structures in the down slope. Total area affected by the landslide is approximately $30,000\text{m}^2$.

The incident has made one house in the downslope damaged beyond renovation. The flowing debris had completely scavenged the section of the road at this location and depositing masses of soils and rock fragments on the road and down slope. This had caused complete obstruction to traffic fleet for several days. The road has creeped towards down slope creating a long tension crack parallel to the road. As the communities were vigilant on the extreme rain and slope movement there were no casualties due to the incident. Refer Fig 2: Images of the moving slope area.



Fig 2a: The exposed surface of failed slope on the upslope



Fig 2b: Damaged road and Tension cracks on the road (the dark color band)



Fig 2c: Disturbed vegetation in the down slope



Fig 2d: The damaged house of the down slope

Fig 2: Images of the moving slope

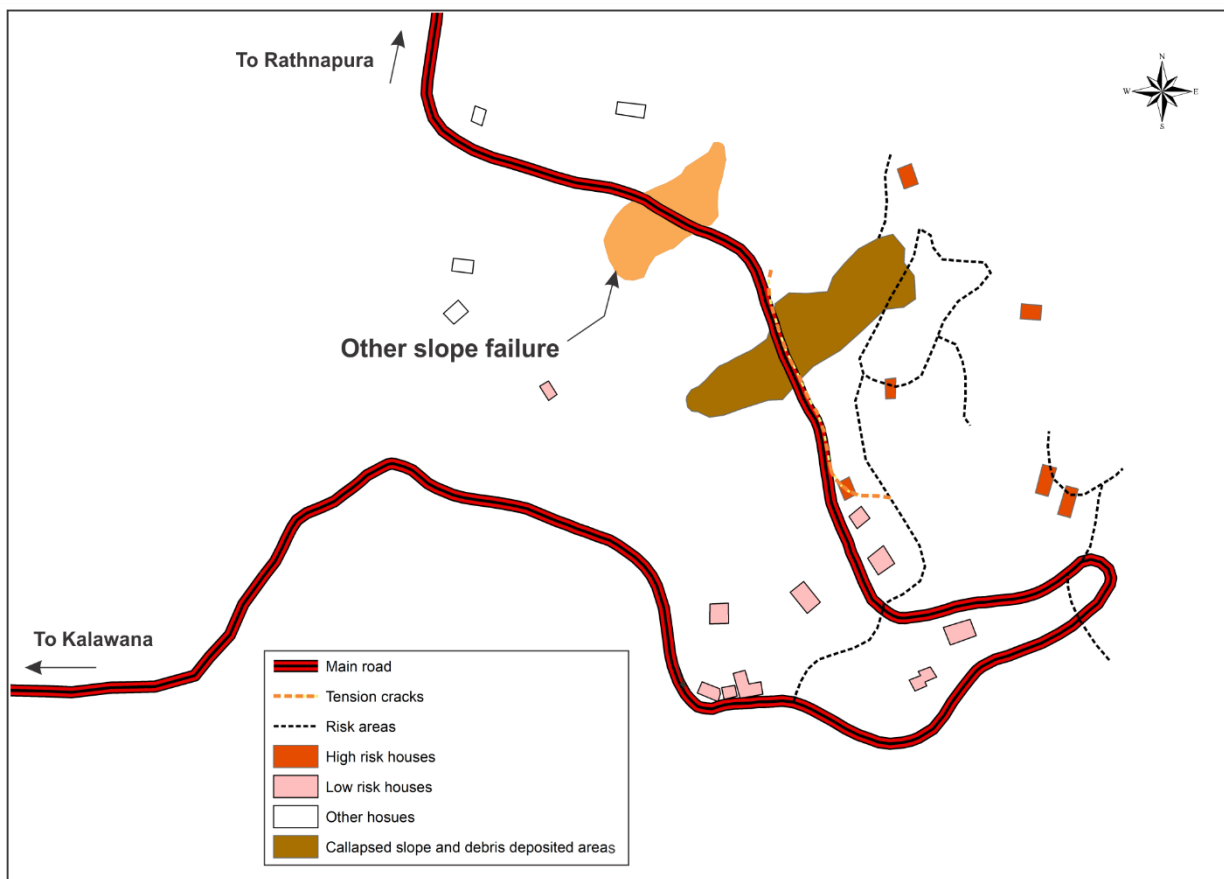


Fig 3: Diagrammatic interpretation of affected slope area and buildings due to ground movement

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

According to NBRO district office this slope was on gradual creeping since 2016. The occupants were alerted by NBRO on the risk as evacuation on a critical situation. Ms Damayanthi had already evacuated the houses which later damaged by the critical collapse. RDA had cleared the debris on the road opening the road for traffic. But, the debris deposited on down slope still remain creeping conditions favourable for further movement. No measures were taken to improve the drainage or to remove overlying debris deposits. After critical event on 26.05.2017, NBRO had inspected the site and demarcated the risk zone.

Evacuations: households of 3 houses have already evacuated considering high risk (Ref. NBRO/LRRMD/RT/L1/17/31/34458) name of the households are; Mrs. DM Amarasinghe, Mr R G Thomas, and Mr R D G Rajapakshe.

Medium to low risk households: House owned by Mr S D Thilakarane has been considered as medium risk while following houses are considered low risk Mrs T W Chithrakanthi, Mr DM Ariyaratne, Mrs DM Sriyalatha

Life risk management measurers: The NBRO team has demarcated the houses at high risk and advised the occupants to respond to NBRO rainfall early warning system, and awareness on stage response on preparedness and evacuation alerts were given to them. This mechanism is currently operational by the Gram Niladhari in the division via Division Secretary.

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

At present the failed slope on the upslope is exposed with impinging weak soils and rock fragments. The house at downslope is damaged beyond repair and the occupants have evacuated the house. The three houses located left side of Rathnapura- Kalawana Road demarcated as high risk will be unsafe to occupy.

According to landslide experts of NBRO District office Ratnapura, the up slope area of the slide is at high risk of future collapse, whereas down slope is under slow progressive creep. As there is no remediation to improve the drainage up till now, aggravation to movement may be possible during subsequent rainy periods.

This may pose risks on the life of commuters and the people living in the area. As this is the connectivity road between Kalawana and Ratnapura, and Nivithigala the obstruction to traffic fleet may pose a significant impact on life line facilities, services and related economic activities and the transactions among Kalawana and Ratnapura and Nivithigala towns. Further subsidence may result sizable damage to the road and cost of remediation would be high. About 200m to Ratnapura, there is another failed slope.

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

The project influence area will include the mitigation site area and the area beyond project site that has a likelihood of being significantly impacted (influenced area: The boundary of influence is identified as 100 m). Within this area there is no natural forests cover, wild life reservations or highly environmentally sensitive habitats. The vegetation resemble lowland Rainforest vegetation and trees cultivated at home gardens. But the natural vegetation is almost replaced and disturbed by tea plantations, home gardens, and other un-managed land uses. The road reservation area immediately to either side of the road is with degraded slopes with disturbed vegetation at initial succession. *Refer figure 2a and 2b to observe degraded lands in either side of the road with several slope failures.*

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

- i. Road traffic and commuters of the road and pedestrians
- ii. Occupants of the houses at both side of the road
- iii. Current services economic activities of the area specially tea cultivation and transportation
- iv. Community water supply lines crossing the damaged section of the upper slope -supplying water to several houses.

7. Description of the works envisaged under the project

The proposed mitigation works will be largely concentrated on already failed upslope area as well as the downslope area. The type of mitigation works will be i) slope reshaping and removal of impeding weak soils to achieve more stable slope geometry, ii) removal of deposited debris from earlier failures, iii) improvement to the drainage, which includes improvement to both surface and subsurface drainage. The surface drain system will include crown drains in the crest area, berm drains and cascade drains in both upslope and down slope. These drains will be on both upslope and down slope area and may include a system of horizontal drains and vertical wells, iv) Mainly soil nailing, retaining structures together with reinforcement structures will also be used in the stabilization mainly on the upslope area. v) Surface erosion control measures will be applied mostly in the upslope section and some parts of the down slope.

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

8.1 Positive impacts

The mitigation work will ensure uninterrupted traffic flow and road connectivity throughout and will increase the safety of commuters. Also, above mentioned tea industry, cash crops, economic activities and other life line activities of people in Kalawana and Nivithigala areas will be benefitted largely by this mitigation. The risk of medium risk houses will be safer. Quick remediation may secure the cost of road rehabilitation from future damage to road.

This road is one of the connectivity road between Ratnapura and Weddagala, a route for famous Sinharaja Heritage site also a route with exceptional scenic beauty for current and future ecotourism, a transportation path for tea industry and several of indirect development and economic activities. The mitigation work will ensure uninterrupted traffic flow and road connectivity throughout and will increase the safety of

commuters during rainy season. Further, above mentioned industry, economic activities and other cultural and tourism activities are benefitted largely by this.

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

The mitigation works will be concentrated both on upslope and down slope of the road. The area used for mitigation in the upslope is a boundary of a tea cultivation. Since this area is a small plot of already degraded land, there will be no impact to the land owner with regard to loosing access to the land or loss to valuable uses. In contrary, remediation works in the upslope will increase stability of the boundary and protect the land from future failures.

However, the land in the downslope is currently abandoned by the owner as it is categorized as high risk. NBRO has advised the land owner not to develop the land as it could aggravate the risk of failure. Accordingly, the land is considered as no-development high risk zone preventing any future development works. Therefore, even without the project the land owner has already lost the value of the land. But, access to land is allowed for extraction of valuable products.

With the mitigation works the owner will lose the free access to site during the construction phase due to safety reasons. After completion of mitigation works also the owner may not be able to develop the land, erect structures etc as it might disturb the ground conditions. However, after mitigation the land owner will be able to extract the products in existing land uses if any.

As the land is already considered high risk and no development zone it will not be acquired under the project or no compensation will be paid under this project. However, the already damaged house may require to be removed to facilitate mitigation works. The house may contain valuable recoverable building materials. If reusable building materials are not recovered owner may lose valuable pieces of building materials.

8.2.2 Ecological, biological impacts, and fauna and flora

The impacts on terrestrial ecosystems are minimum because i) many project actions will be taking place on already failed or disturbed slopes. ii) Both up slope and down slope lands have already disturbed vegetation iii) There are no annual crops within the project area. iv) There are no forested/ areas within the project influence area with high biodiversity, or sensitive ecosystems, v) habitat fragmentation is minimal. vi) None of the trees found in the site are endemic, threatened and identified in the red list of IUCN. During the project implementation there will be requirement of cutting/ uprooting trees. In such cases necessary approval is required. Valuable timber species may be removed from the system unintentionally if proper supervision is not done by the Environmental and Safety Officer with relevant knowledge on these species.

8.2.3 Impact on the drainage pattern of the area

Disruption of existing surface and sub-surface drainage pattern in the area is envisaged with the project implementation. These impacts are minimal as there are no natural streams or water extraction points located in the project influence area.

8.2.4 Erosional impacts and stream bed alterations

The mitigation works in this site will focus largely on the drainage improvement. Therefore, during rainy season heavy flow of water is expected to be generated to enter the natural stream either through a culvert or directly to the streams through step drains etc. As there are no streams close by the impact. Aquatic ecosystems are less significant.

8.2.5 Water pollution impacts from construction activities

Since there is no stream close to the site, the impact on water pollution is minimal. However, during rainy season fines, sediments, soil particles can contaminate storm water and may direct to waterways further downstream.

8.2.6 Open defecation and waterborne infections spread during construction phase

Faecal contamination of down slope water stream can be expected during construction due to open defecation by contractor's labour force.

8.2.7 Impacts on the downstream water uses:

Since there are no water courses nearby impact is insignificant. There is a water supply line crossing the failed scarp of the upslope. This line will be removed for the construction of structures. The water uses will face interruption to their supply.

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 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, demolition, burning, from storage, transportation disposal of construction materials, construction waste and working with toxic materials. During construction, it generates high levels of dust typically from concrete, cement, wood, stone, and silica. The air pollution impacts from the construction is locally significant during dry periods for commuters and households.

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

Noise and vibration is expected from construction equipment. Noise impact is significant as there are houses with occupants closes to the site, within 100m from the site. Hence the project will have impacts on neighbouring community. The pedestrians and commuters on roads will also have an effect from noise and vibration pollution. Further, vibration can affect the stability of buildings during construction and cracks may occur in the buildings.

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 as the people are living nearby.

8.2.12 Work camps and lay-down sites requirement

The solid waste, sewage removal in worker camps if not properly designed will be a nuisance to the surrounding community.

8.2.13 Risks of public accessing the site during construction

The site may have machinery with high hazard risk such as drilling, boring and excavation machines etc. Only skilled workforce will be safe working in this environment. If unauthorized persons access 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. May pose risk on unsafe use. These operations are to be done on unstable slopes. The risk of improper use of explosive and accidents from rock fragments are significant.

Safety to the public from construction activities. During construction phase the road will be obstructed by 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 pedestrian passage and may pose high risk on their lives.

8.2.15 Road traffic and workers safety during construction

The workers may be exposed to risk from falling. Fatal injuries may occur if the slope fails. The risk of slope failure is aggravated during the rainy season. This risk is highly significant. The heavy construction machinery may be used in limited work spaces. Risk of hazard from vehicle and construction machinery accidents is highly significant at this site. Contractor may engage under age workers (children) for construction work, which is risky and can result in serious accidents and injuries.

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

One family (Mr DM Ariyaratna) in the low risk houses were consulted for the project. According to them the package of 1.6 M is a very small amount and shifting to another place would affect their carrier, schooling and other livelihood activities. Hence, they expressed their disagreement. Further, they told that currently they are living with their relatives, which is a temporary arrangement, the house they have built is a new construction with a high investment and therefore the house cannot be just abandoned. Further, they informed that during rainy period none of the families identified as high risk stay inside the houses. The occupants expressed their willingness to the project and full support to the project during the construction phase. They also wanted to know whether they could continue living in the same houses after the mitigation. However, the occupants of already evacuated house (Mrs D M Amarasinghe) in the down slope could not be met. Her willingness to the project or consent to use the land for construction work could not be revealed during the consultation.

9.1 Stakeholders involved in the consultations any recommendations or agreements reached in the consultations (Refer 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:

Washout of fines, sedimentation laden runoff can be expected during the removal and debris soil produced 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 surface quality of the streams.

10.2 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 during the week days, in office hours, school times, (in morning, day time and evening). This will cause nuisance to pedestrians and commuters.

10.3 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, air pollution and vibration impacts, and crack in buildings

10.4 Areas used for businesses, agriculture or other within the area to be remediated

There are no businesses, specific agriculture practices and etc. In the project influence area, hence has no impact. However, the site is located Ratnapura – Nivithigala road, which is used heavily for tea leaves transportation, and therefore has a medium impact at one-way closure.

10.5 Areas used for businesses, agriculture or other immediately adjacent to the site

There are no areas used for business, specific agriculture practices or other immediately adjacent to the site hence has no impact.

10.6 Need for people to enter or cross the site

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.

10.7 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. 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.

10.8 Child labor & forced labor

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

10.9 Interruption to water supply

Interruption to water supply will occur as the water line crossing the failed slope is needed to be removed for mitigation.

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 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.

- ii. Approval from the planning committee

The project will obtain the approval from the planning committee of the Ratnapura Urban council

11.2 Approval from the state lands owners to implement the project in the specified site

The relevant agencies is Road Development Authority as part of the project actions are taking place on the road reservations. 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. Approvals from regional office of Ceylon Electricity Board will be required for power supply for site operation

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

Approval from environmental authority, Department of Forest, Department of Wildlife Conservation

- i. As the project site is located in environmentally sensitive areas approval from the district Central Environmental Authority is required. (refer Annexure IV for the procedure)
- ii. Also, the project actions may involve removal of protected species, approvals from the Forest Department through divisional secretary will be obtained for the removal of protected trees.

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 Ratnapura Urban Council 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

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

- i. Signing a legally bound agreement between the land owner Mrs. D M Amarasinghe 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
- ii. Allow land owner to extract/ or extraction by the contractor on behalf of the land owner any valuable items from the structures
- iii. Project bear the cost of removal of the structures

The tentative timeline for getting approval is given in the table 1.

Table 1: 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				—				

Approval from state land owners RDA & CEB Submission of application Respond to comments Approvals								
Approval from DFC, DWLC Submission of application Respond to comments Approval								
Other approvals 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 risk. Especially the impacts and risks identified in Sections 8 & 9. This section will include the specific recommendations and requirements of the ESMP for design stage, construction phase and maintenance operation phase.

12.1 Resettlement action plan

There is no project based resettlement in this site. The resettlement of occupants in houses identified as high risk is not completed as none had accepted the GoSL resettlement package while currently living with temporary arrangements. All in high risk houses do not permanently live in these houses. During rainy period they move out to safe places. This arrangement should be continued until proper resettlement is done for these occupants.

However, a proper intervention is required with the affected parties and the GoSL resettlement program before the project implementation to address complex issues that may arise and would hinder smooth project implementation in the future.

There are occupied houses in the hazard zone instructed to evacuate, but continue living in the same location. These houses may have some impacts in the form of structural damage during the project actions due to ground vibration induced by heavy machinery operation. (The scheme of compensation, in case of damage to structures due to project should be arranged, (Refer 2002.2.17) utilities and roadside amenities in contracts requirement to ESMP.).

12.2 Evacuation of people

The project Environmental Health & Safety unit should make sure that the occupants in high risk houses do not occupy the houses especially during the rainy period. The GN of the area should be informed of the project and the aggravated risks during construction phase and should inform him to communicate the NBRO rainfall early warning alerts to these families and to agree them to respond the alerts.

The project ES & HS unit also should be vigilant on extreme weather conditions and NBRO rainfall early warning alerts and should make early response in case of an emergency.

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

Project planning should consider to avoid intervening with housing structure of Mrs D M Amarasinghe as much as possible. As the built house even if damaged should not be removed without full approval of the owner. Meaningful consultation should be done to get the landowner agreed for this. She may consider removal of the structure at the project cost as it has no future value. But, signing a legally bound agreement between the land owner Mrs D M Amarasinghe and the project implementing authority allowing no-

objection to remove the structures is mandatory. During this process following is recommended as a minimum

- i. Thorough consultation with the land owner to get his consent
- ii. Allow land owner to extract/ or extraction by the contractor on behalf of the land owner any valuable items from the structures
- iii. Project bear the cost of removal of the structure

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

May be triggered if project based cracks occur in the risk houses or during operation of machinery. Therefore, provisions should be made to pay compensation in case of damage happens.

12.5 Public awareness and education- needed for following areas

- i. Programs to inform and educate people in the vicinity about the risks posed by landslide
- ii. Requirement for special awareness for communities with potentially high risk during construction phase; short-term early warning measures (evacuation), and measures related to construction and land-use.

12.6 Design based Environmental/ social management considerations

The site is located in aesthetically beautiful, environmentally sensitive natural environment in the rural setup. Hence, following environmentally and socially significant design considerations are recommended.

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 removal of grown tree species. Sufficient emphasis should be made to consider conservation of trees if important tree species are found	High
ii. Habitat connectivity and animal trails If large fractions of vegetation is 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 impact are localized.	Low
iii. Conservation of water resources If involves extraction of water both surface and sub-surface. The water extracted is in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by wild fauna as well as the neighboring communities for bathing and other domestic purposes even as drinking water.	high
iv. Interruption to water supplies If the water in the mitigated slope is used as a source for individual or community water supply, the chance the water source can be affected by the mitigation work is high due to water table draw down. In such instances the design should include alternative source of water for the community (temporary/or permanent).	Low
v. Aesthetically compatible design considerations The designs in aesthetically sensitive environments should consider structures that blend with natural environment to keep the visual pollution to minimum. Service of landscape architect may be important for the design of suitable mitigation structures.	High for upslope area

<p>vi. Consideration of green environmental features 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 & etc.</p>	High for upslope area
<p>vii. Workers/ commuters and community safety Activation of slide may occur during construction phase and may pose threat to workers and commuters. Therefore design based safety consideration such as berms, safety nets etc should be considered</p>	Very high
<p>viii. Erosion control structures In drainage management, water is extracted and conveyed to nearby streams often through culverts. During rainy season the flow in these drainage structures can be significantly high and this may cause stream bed and bank erosion. Hence the design should adequately consider flow speed breakers to reduce erosive flows entering natural streams. This should be a inclusive part of the design if there are streams and culverts in the proximity of the mitigation site.</p>	Moderate
<p>ix. 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>	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 Health and Safety (ES & HS) management during the construction phase*” to be included in construction contractors’ bid document. The main sections are summarised below (Table 3) indicating the degree of relevancy for this site. For details ESMP for construction contractors should be referred.

Table 3: Contractor requirement to comply with ES & HS

Reference No. as per construction contractors obligation to ESMP	Item	Relevant to the project
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Highly Relevant
2002.2 2)	Noise and Vibration	Highly relevant (Houses)
2002.2 3)	Cracks and damages to the buildings	Highly relevant
2002.2 4)	Disposal of waste	Relevant
2002.2 5)	Disposal of refuse	Highly relevant (road reservation)

2002.2 6)	Dust control	Highly 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	Relevant
2002.2 12)	Soil Contamination	Relevant
2002.2 13)	Borrowing Earth	Relevant
2002.2 14)	Quarry Operations	Not relevant
2002.2 15)	Maintenance vehicles and Machinery	Relevant
2002.2 16)	Disruption to public	Highly relevant (community nearby)
2002.2 17)	Utilities and roadside amenities	Highly relevant (road/ houses/community water supply)
2002.2 18)	Visual environment enhancement	Highly relevant (Aesthetically sensitive road section)
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	Optional
	Reporting and maintenance of records	Relevant
2003. Working Conditions and Community Health and Safety		
2003.2	Safety organization and communication	Highly relevant (unsafe slope/commuters/ heavy machinery)
2003.3	Child Labor and Forced Labor	Relevant
2003.4	Safety reports and notification of accidents	Highly relevant
2003.5	Safety Equipment and Clothing	Highly relevant
2003.6	Safety inspections	Highly relevant
2003.7	First Aid Facilities	Highly relevant
2003.8	Health and safety information and training	Highly relevant
2003.9	Plant equipment and qualified personnel	Relevant
<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</p> <p>Reference: Contractors Obligation for implementation of ESMP</p>		

12.7.2 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 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>	Site preparation & construction	Construction Contractor
<p>ii. Disposal of construction waste 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.</p>	Site preparation & construction	Construction Contractor
<p>iii. Dust and aerosol control screens Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged</p>	Site preparation & construction	Construction Contractor
<p>iv. Water for construction Water for construction works should be obtained only from the approved sites</p>	Construction	Construction Contractor
<p>v. Interruption to water supply The water line currently running across the failed upslope need to be installed properly without being affected during the construction phase. 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-positioned across the same location when the mitigation works are completed. In this situation a competent technical personnel should assess the situation and provide suitable solution to provide water without interruption to the affected families.</p>	Site preparation & construction	Construction Contractor
<p>vi. Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) A good traffic control should be in a following the contractors ESMP specific to this site. As there is bend on the road adjacent to the site proper road safety measures should be included with warning signs and permanent trained watchmen</p>	Construction	Construction Contractor
<p>vii. Priority Health and Safety Issues. As the workers in the site have to work in high risk conditions, it is imperative to implement recommendations given in section 2003 of contractors' obligation on ESMP under "working conditions and community health and safety". These recommendations should be followed carefully in a proper organization and safety monitoring system. 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. A good warning system and fulltime watchmen is highly recommended for this site for both worker and commuter safety.</p>	Construction	Construction Contractor

Safety barriers and safety nets should be installed at places of risk to protect workers and commuters from boulder falling risk		
viii. Working hours The construction activities should be restricted to day time only. Working after 6.p.m. is not recommended for any reason due to safety issues	Construction	Construction Contractor
ix. Need for people to enter or cross the site Possible unauthorized access to the site should be avoided by awareness, warning signs and vigilance by the contractor's full time watchmen.	Construction	Construction Contractor
x. Households living in high-risk or medium-risk areas adjacent or near to the site (up-slope, down-slope, downstream, etc.) The high noise, vibration and air pollution activities during construction phase should be done respecting the national pollution control regulations. Operations of machinery in off time should be avoided. Meaningful consultation should be done with the occupants of the houses avoid any disputes that may arise during operation of heavy machinery in unavoidable circumstances.	Construction	Construction Contractor
xi. During construction good housekeeping should be maintained to minimize visual pollution	Site preparation & construction	Construction Contractor

12.7.3 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	Stream water quality	-
	Pre crack survey of the high risk houses	Once*
	Ground vibration	Once*
	Background noise measurement	Once*
	Air quality: particulate matter	When doing slope excavations, ground soil boring works
ii. During construction	Stream water quality	-
	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	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 high risk houses -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.

13. Grievance redress mechanism for this site

The consultants ES officer is responsible for establishing the grievance redress mechanism for this site as high risk (Ref. NBRO/LRRMD/RT/L1/17/31/34458) namely Mrs DM Amarasinghe, Mr R G Thomas, and Mr R D G Rajapakshe. House owned by Mr S D Thilakarane has been considered as medium risk while following houses are considered low risk Mrs T W Chithrakanthi, Mr DM Ariyaratne, Mrs DM Sriyalatha, Mrs S H Sopinona, Mrs P P Podimenike, Mr G Suranga, Mr U M Wijesingha Silva, Mr R W Sarath Pushpakumara, and Mr W Shantha

14. Information disclosure

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

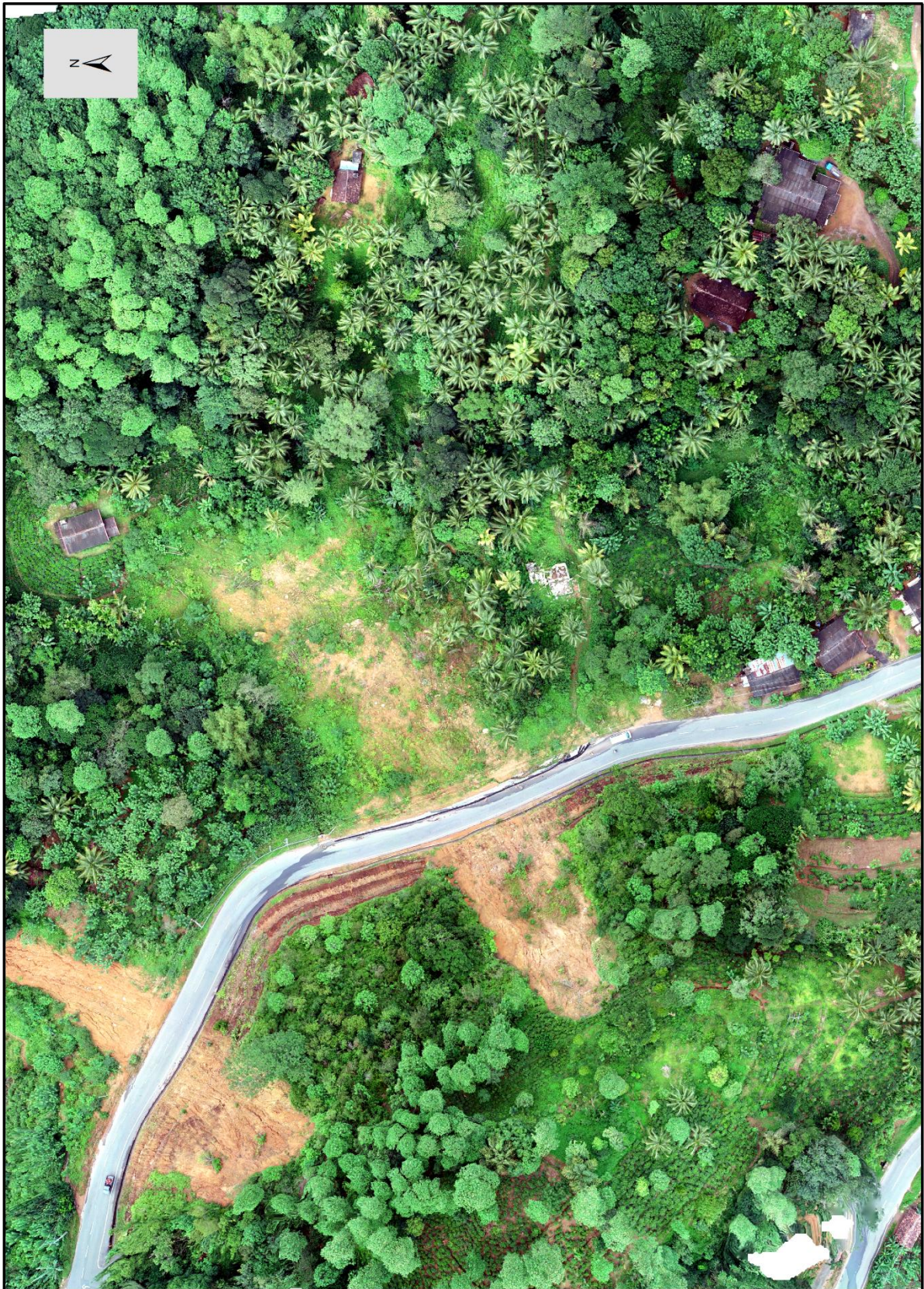
Table 6: Proposed scheme of information disclosure

Information	Proposed agencies	Mode of information disclosure
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, DFC, DWLC, AIIB,	Meetings, District Coordination Committee, submission of relevant report to sign agreements, approvals and consents
iii. Monitoring reports (baseline and during construction)	District CEA, DFC, DWLC, 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, DFC, DWLC, 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, DFC, DWLC, 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

Date	Institution	Person contacted for information
08/08/2018 @ 10.30 hrs	Road Development Authority	Mr. WPGL Werajeewa –Executive Engineer
08/08/2018 @ 13.00 hrs	Forest Department	Mr Nimal S Dewage – Range Forest Officer
09/08/2018 @ 10.00 hrs	Central Environmental Authority	Mr. K G.D.N Kiriella Director –CEA Ratnapura District
09/08/2018 @ 13.00 hrs	Department of Wildlife & Conservation (DWLC)	Mr Manjula Vidyaratna / Wild Life Rangw Officer Ratnapura
09/08/2018 @ 14.00 hrs	Land Reforms Commission	MS. Dulmini Patabadiarachchi Staff Assistant

Annexure I: Drone Image of the project area



Annexure II: Images of the site condition and the consultation



Fig a: A long tension crack on the road



Fig b: Ms. Ariyaratna was made aware about the mitigation work by NBRO staff (04-09-2018)



Fig c: The water supply line crossing the failed upslope.



Fig d: Deposited debris on the down slope.



Fig e: creaked house of Mr. S. D. Thilakarathna.



Fig f: Vegetation of the downslope.

Annexure III: Report on the Stakeholder Consultation: Ratnapura District

Date: 08/08/2018 and 09/08/2018		
Institution	Name and designation of the contact officer	Concerns raised
Road Development Authority	Mr. WPGL Werajeewa – Executive Engineer	<ul style="list-style-type: none"> ✓ This area is under the jurisdiction of Ratnapura- Awissawella RDA regional office ✓ The RDA has no objection and states the mitigation is very much needed. ✓ Other concerns raised <ul style="list-style-type: none"> • A proper handing over of the project is required after the mitigation • RDA will do the maintenance after mitigation • It is emphasised that during the construction the contractor should use Personal Protective Equipment • At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, flagmen and for the night work, lights and illumination should be provided. ✓ It is also stated that Construction waste/ excavated materials should not be a nuisance to public/commuters
Forest Department	Mr Nimal S Dewage – Range Forest Officer	<ul style="list-style-type: none"> ✓ The Forest Department has no objection on the project <p>Following matters were emphasized.</p> <ul style="list-style-type: none"> ✓ There are Forest reservation in the Ratnapura district. However, some large portions of land still remain without clear boundaries and many of them are under jurisdiction of LRC. Currently the surveying of forested area is in progress. ✓ However, all lands under forest, private or under LRC and any other if cleared require approval from Forest Department ✓ Private/LRC/Forest land require approval from forest Department for complete clearance of land as in the case of boundaries are still not clear. ✓ Role of Forest Department is that they examine the plot to be cleared, measure the girth of trees to be removed and specific habitat significance of the area to be cleared. The plot will be surveyed by the FD and report will be submitted to Timber Cooperation. The tree can be cut by the contractor, however, removal will be done by the Timber cooperation. All trees dB of > 18 cm will be taken by the Timber Cooperation. ✓ Regarding the project implementation, he said that mitigation proposal with draft layout should be submitted to Conservator Forest and approval to be obtained. ✓ This does not apply only forested areas but isolated any location in the proximity of forest ✓ As Ratnapura is having lot of forest areas such project is necessary to obtain consent for project implementation with the services of conditions such as; <ul style="list-style-type: none"> • No entry of forest reserves, extraction of forest species, timber for project work, any other • Chemical blasting should be done in a manner not harmful to fauna • Structural mitigation measures should essentially have followed environmentally friendly aesthetically comparable designs. • If plants are used for remediation prior approval should be obtained

		<ul style="list-style-type: none"> • Early informing the project, the Forest Department can support the project by providing good quality trees for planting. • Prior approval for suitable species for reforestation should be obtained from Forest Department. <ul style="list-style-type: none"> ✓ The Central Environmental Authority (CEA) will directly intervene for removal of forested area of > 1ha in the lands of LRC or private lands ✓ The Central Environmental Authority (CEA) and forest Department will intervene removal of forested area of < 1ha in the lands of LRC or private lands ✓ The clearance process may demand baseline studies for certain sites in which aquatic and terrestrial habitat surveys may be recommended. Similar reports may be demand by CEA during the project implementation.
Central Environmental Authority	Mr.K G.D.N Kiriella Director –CEA Ratnapura District	<ul style="list-style-type: none"> ✓ Under the Soil Conservation Act 772/22 of 1996. of National Resource Management Centre, Ratnapura District has been gazetted a sensitive area except the Embitipitiya area ✓ Under this gazette any development is not allowed irrespective of the magnitude of the project. ✓ In a disaster this is not needed. ✓ The Basic Information Questionnaire (BIQ) is needed to fill for the project and submit the application ✓ Since the waterway is located downslope in the area it is need to keep the Environmental flow ✓ There may be endemic species, special habitats (niches), fauna flora study are needed ✓ This Environmental assessment may be required to see their difference after mitigation ✓ The CEA issue the approval with conditions ✓ The CEA will grant approval with recommendations.
09/08/2018		
Institution	Name and designation of the contact officer	Concerns raised
Department of Wildlife & Conservation (DWLC)	Mr Manjula Vidyarathna / Wild Life Rang Officer Ratnapura	<ul style="list-style-type: none"> ✓ No objection on the project ✓ A report to be submitted to DWLC for approval ✓ Peak Wideners area is located closes to (about 10 km of upslope site) of Durekkanda site ✓ Removal of Fauna & Flora is needed under Wild Life Ordinance ✓ Removal of flora & fauna; endemic, threatened, identified under Red List needed approval from DWLC.
Land Reforms Commission	Dulmini Patabadhiarachchi Staff Assistant	<ul style="list-style-type: none"> ✓ If the land tenure is Land Reforms Commission an approval should be obtained from Commission –Land Reforms Commission through a letter

Annexure IV: Proposed procedure for obtaining approvals from state land owners and environmental agencies.

1. Proposed procedure by RDA for approval for implementation of landslide mitigation projects in RDA reservation areas

- i. 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.
- ii. RDA regional office will evaluate the proposal and may call for project briefing. The PMU should provide necessary briefing as appropriate
- iii. On the approval by RDA an agreement will be signed between RDA and Project implementing agency to access the site, erect structures, and implement mitigation works.
- iv. A conditions that would include is
 - A proper handing over of the project is required after the mitigation
 - RDA will do the maintenance after mitigation
 - It is emphasised that during the construction the contractor should use Personal Protective Equipment
 - At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, flagmen and for the night work, lights and illumination should be provided.
 - Construction waste/ excavated materials should not be a nuisance to public/commuters

2. 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 references, 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

Name	Designation	Position in the study
TDSV Dias	Director/ ESSD/NBRO	Team leader
SAMS Dissanayake	Senior Scientist/ESSD/NBRO	Senior Environmental Scientist
P Liyanaarachchi	Scientist/ ESSD/NBRO	Environmental scientist
Abheetha Wanasundara	Officer in charge / Ratnapura District	Geotechnical Engineer
Indu Upamali	Scientist/ LRRMD/NBRO	Geologist
H Kusalasiri	Technical Officer/ESSD/NBRO	GIS/Demographic data /survey support

Annexure VI: List of references.

1. NBRO site investigation report on landslide disaster at Pebotuwa – (Ref. Report No. NBRO/LRRMD/RT/L1/17/31/34458
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