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

Site No.11
RHS of bypass Road, Kegalle District - Package 4

September 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
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 bypass road 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. 11, package-4, Kegalle District, RHS of bypass road

Site Details

i. The site falls administratively under 51/G Meepitiya Grama Niladhari Division (GN Division) of Kegalle Divisional Secretariat Division (DS Division), Kegalle District of Sabaragamuwa Province. The slope instability has occurred at 2 sections on a vertical cut between culvert 4/2 and 4/1, and 4/4 and 4/5 bypass road at Kegalle.
ii. The nearest town to the site is Kegalle, about 1.5 km from the site.
iii. GPS reference of the two sections are sec 1 - 7.246643 N, 80.361954E and sec 2 – 7.245740 N, 80.359610 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

Series of slope instabilities in a long road stretch had been initiated as a result of a non-engineered slope excavation for a new by pass road to avoid Kegalle town. During the heavy rains slope instability of this section makes the RDA to close the road for several days causing temporary obstruction for commuters who use the road.

The slope is experiencing regular dislodge of soil/rock masses time to time in recurring rainy season. During high precipitation events, large blocks of soil masses are moving down to road obstructing its passage for commuters and pedestrians. Currently, 2 large sections in the slope at culvert between 4/1 and 4/2 and the other section is at the culvert between 4/4 and 4/5 are unstable.

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The damages occurred due to incident

During each slope instability event, the Road Development Authority close the road for days causing temporary obstruction for commuters who use the road. Houses, buildings in the down slope were not affected by the failure and no reported casualties as well. Refer Fig 2; the images of the project area.

	
Fig 2a: Upslope of the road. Section between 4/1 & 4/2	*Fig 2b: Downslope of the road, section between 4/1 & 4/2*
	
Fig 2c: Upslope of the road. Section between 4/4 & 4/5	*Fig 2d: Downslope of the road, section between 4/4 & 4/5*
	
Fig 2e. Roadside taps for drinking water for commuters and pedestrians	*Fig 2f. Pipe lines directed to a water tank behind Gimanhala*

Fig 2: Images of project area

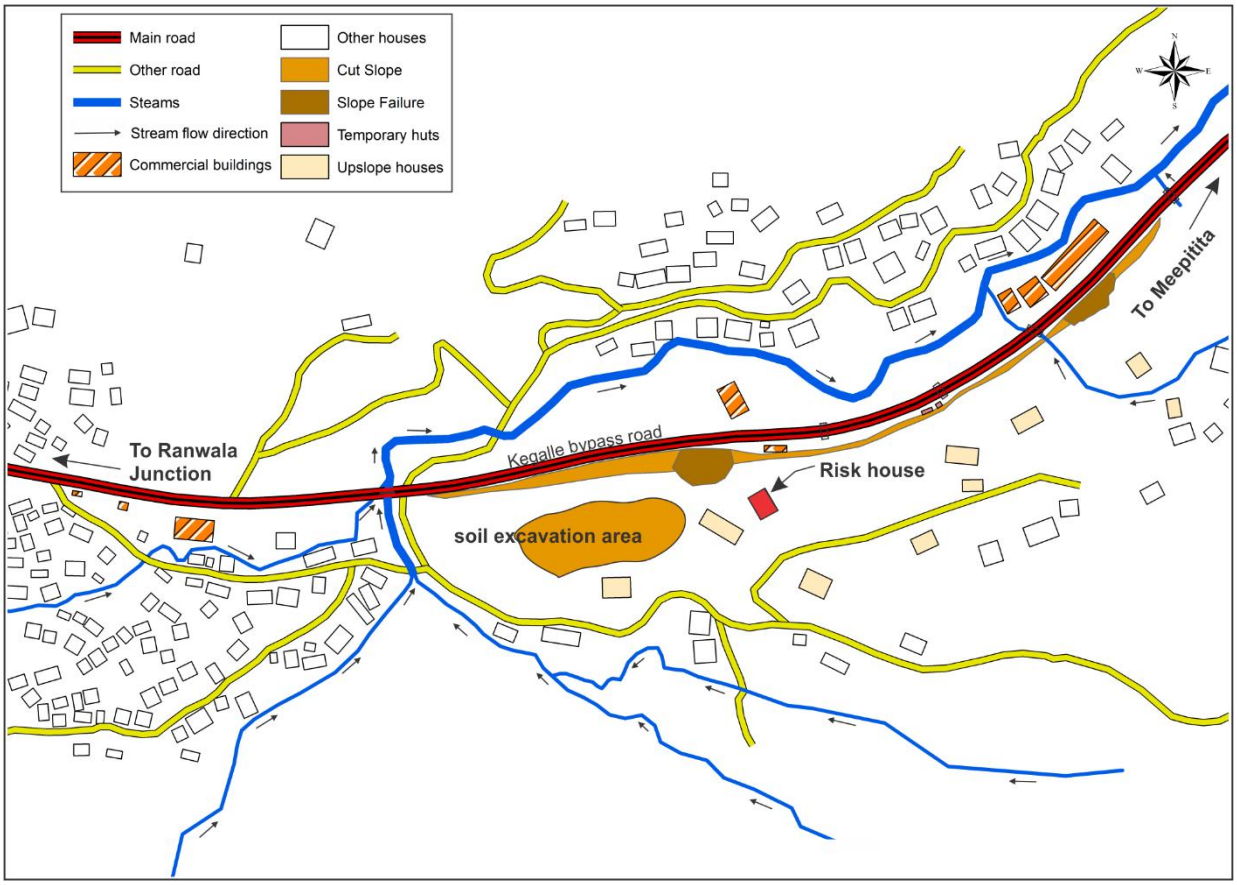

Fig 3: Diagrammatic interpretation of affected slope area and the houses currently at risk

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

The RDA close the road for traffic based on the NBRO landslide early warning for this area. The road is closed for traffic for several days and re-opens after clearing the fallen debris and when the risky condition is over. The house on the crown of the slope is also considered risky and occupants were informed to evacuate the building during the unsafe periods.

Evacuations

The occupants (house belongs to Mr Wickramarchchi) in one house at upper slope area categorized as high risk and were informed to evacuate to a temporary shelter at heavy rainfall events responding to NBRO early warning alerts. The occupants evacuate the houses and subsequently return to their original place once the hazard event is over. .

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

- The area is a sloping landscape and largely residential. The bypass road of Kegalle town traverses along the toe area of this slope.
- In this terrain, down slope is mostly a flat to gently sloping lands and extend towards a stream.
- The upslope is largely a residential lands with private ownership. There are few temporary just below the cut slope.
- Several restaurants, houses etc. have come up in the down slope area after the construction of road in 2014.

Even now, there are several impinging loose weathered soil and fractured of rocks pieces posing high risk on the commuters at the slope section 4/4 and 4/5. Therefore there is a high risk of slope instability at heavy precipitation events. This situation is risky to the road commuters.

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

The landslide area is located right hand side of the bypass road of Ranwala to Meepitiya. The vegetation in the crown area is mostly home gardens with healthy trees cover. The road cut has made the edge vegetation disturbed largely resulting the uprooted trees with soil mass down time to time during the heavy rainfalls. Slope between the culvert 4/1 and 4/2 is highly disturbed due to road cuts and they are still in succession**.** A small restaurant "Gimanhala" is located at the toe area of the slope at the culvert 4/1 and 4/2. A plot of land used for driving trainers is located opposite to this unstable slope. The next location is at the slope 4/4 and 4/5. A temporary boutique is located just down slope of this section. There are hotels named Janaki and a restaurant "Sleek Daffodil" are located opposite to the slope section between 4/4 and 4/5 culvert.

As the area is already residential there are no forested areas, wild life reservations, environmentally sensitive habitats found within the study area. The environmental and social elements that may be at risk due to project implementation area:

i. The Road traffic and the commuters, will be affected
ii. The "Gimanhala" restaurant in the immediate downslope and the people and their livelihood activities will be affected
iii. Functions of Hotel Sleek will be affected
iv. Occupants in houses of upslope area will be affected
v. The stream ecology and its water quality will be affected
vi. The several spring water and the supply pipe lines laid down on the unstable slope which are currently providing water for community will be affected
vii. The ground water source of upslope house could be affected

6. Description of the works envisaged under the project

The proposed mitigation works will be largely concentrated on the improvement to the drainage and slope reinforcement. Which will include permanent structures to convey the runoff through proper drainage management and directing the runoff to a surface drains system. Reducing the water table in the unstable seepage area by insertion of horizontal drainage systems may also be considered in subsurface drainage improvement. The mitigation works will also involve retaining walls, soil nailing and hydro seeding as the measures for this section.

7. 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. Road closure will not result in the rainy periods ensuring good connectivity between the cities. This road is one of a bypass road to avoid Kegalle town. The route connects several provinces such as Central province, Northern, Northcentral provinces and several religious, educational and business cities such as Kandy, Kurunegala, Anuradhapura etc. while reducing travel time significantly. Also, many tourists visiting North and Central hilly areas (Nuwaraeliya) use this route. Many commuters take this road as a convenient route to travel. If the bypass road is closed it will cause large traffic in the Kegalle town during busy traffic hours day and night. Hence, the mitigation work at this location is highly important to ensure uninterrupted traffic flow and road connectivity throughout and will increase the safety of commuters during rainy season. Further, tourism, economic activities and other cultural and religious activities will be benefitted largely by this mitigation.

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 lands. As a result they will lose future development opportunity of their property. These lands have already become unusable for any productive purposes, 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. During construction phase the occupants and uses immediately above and below the cut slope will have to evacuate the premises due to risk inherent to slope instability. However, once the mitigation works are completed the land owners may be allowed for non-destructive land uses, extract the products from the land use and etc. They can have access to land but any future development activities on the land will be strictly controlled.

During the site operation several economic activities and water uses immediately down the slope may be affected. The "Gimanhala" owned by Mr Harsha Sri Wijethunga located immediately down slope in the road reservation of the slope section between culvert 4/2 and 4/1 may require to be removed. Also this location is used by commuters as a short-time resting place. Many vehicles stop at this place where drivers take a short rest. The water in several springs are currently used by these commuters as a source of water for washing cleaning and etc. These will require to be removed during project implementation

8.2.2 Ecological, biological impacts and fauna and flora

There is a narrow strip of vegetation on the crest of the failed slope at the section of 4/1 and 4/2 that may require to be removed for mitigation works. The vegetation includes trees of kitul, mango, arecanut, and understory vegetation is dominated by grasses species. However, the impacts on this terrestrial ecosystems are localized as many project actions will be taking place on already failed or disturbed slope sections.

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 in the crown area. If there are wells in the up slope area possibility of drying is high. There will be high flows in the stream 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 bare surfaces are exposed during slope excavations. As large area of the slope is excavated the runoff carrying sediment loads will enter nearby stream. Hence, slope erosion impact are significant at this location.

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.

These discharges may increase the pollution load in the streams with high Biochemical Oxygen Demand, Chemical Oxygen Demand, Suspended Solids, Oils and Greases etc. The emissions will exceed the ambient water quality standards prescribed for designated uses such as drinking, bathing, aquaculture and may violate even the minimum standards for water quality. The water quality impacts from discharge of wastewater and pollutants to environment during construction phase is therefore **locally significant**.

8.2.6 Open defecation and waterborne infections spread during construction phase

As the site is located by the side of the road and residential area there is little possibility of open defecation by contractor's labour force.

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 can be water deficit during dry season. The commuters will not be able to use the water sources during the construction phase and after words as there is a risk of permanent drying of some of the springs in the upslope area. However, during the site inspection it was revealed that there is pipe borne water supply for houses. Hence impacts on domestic water uses would be only for those use local water sources.

Further, the sediment laden runoff may contaminate and impair the water quality in the downstream of the stream running close to the site. There can be locally significant impacts on the aquatic ecology in this stream.

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. The direct exposure risk of occupants of the house at the crown area to air pollution is high. Further, air pollution may have an impact on the pedestrian/ commuters of the road. There are restaurants opposite side of the road. The occupants and consumers will be affected due to air pollution.

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 rock, drilling for horizontal drains and rock bolting etc. may produce high noise and ground vibration.

The impacts on noise and vibration will be significant on the house located at crown area. The commuters on the road and the visitors of restaurant 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 and the people of restaurants.

8.2.12 Work camps and lay-down sites requirement

The solid waste and sewage removal in the camp if not properly arranged 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 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 be at 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 Road traffic and 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 vehicles 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. Further, workers may 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

8. Public and Stakeholder Consultations - That have been held and/or will be held

Occupants of the houses at the landslide crown (Mr W A D Wickramarchchi, Mr KSP Subasinghe, and Mr SAAP Samarasinghe) were consulted during the site visit of NBRO. They were made aware on the project and the people has no objection on the project.

Mr Harsha Sri Wijethunga owner of the Gimnahala, a restaurant in temporary hut located in immediate downslope of the section between 4/1 and 4 /2 was consulted. According to him, he is paying tax to the Pradeshiya sabaha for continuing the restaurant. If the hut is damaged or removed it would be a great loss for about 05 families who are dependent on this business.

Mr W Kumarasinghe, Manager Sleek Daffodil hotel was consulted during the filed visit by NBRO. He expressed concern on followings. The construction activity should not affect the functions that are held in the hotel with a gathering of 300-400 people. The machinery, noise should not be a nuisance to the people. Also he emphasizes need of a traffic management, safety signs and a flagman.

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). This includes long-term impacts and potential impacts and risks during construction/remediation of the landslide site

Washout of fines, sedimentation to existing watercourses and siltation in the downstream channels can be expected during the removal of debris and 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 Erosional impacts and stream bed alterations

The impacts on environmental flow, stream banks/ bed and aquatic ecosystems will be locally significant.

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 during the week days, in office hours, school times, on holy days, season of pilgrimage. This will cause nuisance to pedestrians and commuters. The road closure may affect the driver training school, functions of Sleek Hotel and other restaurants.

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

There are water supply lines laid down the failed slope. The water in the line flows under gravity and directed to tanks kept at the road side. The water is used for commuters and pedestrians for various purposes such as cleaning, washing, bathing and even for drinking. 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 at crown areas and the building located opposite side of the road.

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

There are small boutiques, temporary huts in the proximity needing to be removed. There may be impact on them during the project period. No specific agriculture practices or other immediately adjacent to the site hence has no significant impact.

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

There are restaurant at the opposite side of the site. The visual pollution, nuisance impacts, noise, vibration and traffic impacts during construction phase is significant on these. 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 from operating machinery, and vehicles, electricity, and may be 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

The 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 and clothing.

10.10 Child labour & forced labour

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

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 Kegalle Urban council

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. However, approval may require from Forest Department through Divisional secretary if there are trees to me removed, controlled by Fauna and Flora Protection Ordinance.

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 Kegalle 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.

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

i. Signing a legally bound agreement between the land owners and the project implementing authority will be made allowing no-objection to remove the structures, access the land, implement construction works, and engage in long-term maintenance works

ii. 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
Project implementation ***Approval from the District Secretariat*** Submission of application Project briefing Respond to comments Approvals								
Approval from planning committee Submission of application Project briefing Respond to comments Approvals								
Approval from state land owners Provincial Eng: Office & CEA Submission of application Respond to comments Approvals								
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 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

This is no relocation of houses. However, Gimanhala restaurant operated in RDA road reservation may require removal temporarily. His income activities will be affected. According to him he has a permit from the local authority to function the restaurant at this location. This facility may require to be shifted to a safer slope section. The project may consider shifting the restaurant at project cost subjected to the fact that he has not been identified under any form of disaster based resettlement package.

12.2 Evacuation of people

The occupants in the house in crown area, the Gimanhala restaurant may have a life threatening impact during the construction phase. As possible activation of slide during the construction phase may occur, and also as the mitigation work has a strong influence to the aggravation of slope failure risk, it is logical to consider that the risk is linked with project works. Therefore a temporary evacuation of the house is strongly recommended to this site during the critical time of risks.

12.3 Procedure for removal of damaged structures, facilities infrastructure

The Gimanhala restaurant and some other temporary sales huts will require to be removed. They can be asked to shift to safe sections of the slope. As these huts are located in the RDA reservation their legal occupancy is controversial. Consultation may be required with local authority, the restaurant owner and RDA if temporary shifting of restaurant facility envisage. Such shifting if take place the cost may consider to be borne by the project. The ES & HS officers of PMU should conduct necessary consultation between the agencies and the restaurant owner to shift the facility or to compensate the loss of business.

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

There can be cracks forming on the house on the upslope and buildings (restaurants) 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.

12.5 Public awareness and education- needed for following areas

The Environmental health and safety unit of PMU should pay a special educational and awareness programs to make the RDA responsive to the risk management measurers to be developed during the implementation of the project.

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
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 tree species. Sufficient emphasis should be made to consider conservation of trees if important tree species are found	Moderate
ii. Habitat connectivity and animal trails 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.	Low
iii. Interruption to water supplies The chances of drying of water source/s mentioned above by the mitigation work is very high due to water table draw down. (Temporary/or permanent). It is strongly recommended that design considers integrating the currently active springs as a source of water to be used by the commuters on road who are currently depending on these springs. Also, drying up of water sources in the upslope houses should be taken care off in the water table draw down design. Necessary steps should be taken to secure their water sources if project activities result them drying up. Further, there can be possibility of drying of large trees when water table drawdown is very much below the root zone. Possible impacts may be localized. But the project should consider these aspects seriously in the drainage management designs	Very High
iv. 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. The design should consider natural stream features to this location. Inputs of landscape architect may be important for the design of suitable mitigation structures	Very High
v. 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	High

inclusion of potentially invasive species use of excavated materials for construction & 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.	
vi. Workers/ commuters and community safety The mitigation site is located on a high vertical cut. The occupants specially children in houses are at high risk of falling if they try to use the bordering lands. Hence it is recommended that the design considers suitable defense wall or fencing to protect up slope occupants from falling hazard. 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 (these will be temporary measurers restricted only to the construction phase)	Very High
vii. 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 an inclusive part of the design as there is a streams and culverts in the proximity of the mitigation site.	High
viii. 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 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.	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
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Highly Relevant (roadside)
2002.2 2)	Noise and Vibration	Highly Relevant (roadside)
2002.2 3)	Cracks and damages to the buildings	Highly Relevant (public places/ houses)
2002.2 4)	Disposal of waste	Highly Relevant (roadside)
2002.2 5)	Disposal of refuse	Relevant (road reservation)
2002.2 6)	Dust control	Highly Relevant (commuters/ pedestrians/ restaurants & buildings)
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 (public places)
2002.2 17)	Utilities and roadside amenities	Highly Relevant (road & buildings)
2002.2 18)	Visual environment enhancement	Highly Relevant (aesthetically sensitive road sections)
2002-5. Environmental Monitoring	Baseline surveys (air, water, noise , vibration, crack surveys)	Refer site specific monitoring plan
	Surveys during construction (air, water, noise , vibration, crack surveys)	Refer site specific monitoring plan
	Surveys during operation phase	Refer site specific monitoring plan
	Reporting and maintenance of records	Highly Relevant (safety)
2003. Working Conditions and Community Health and Safety		
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
Relevant: *The section is relevant to the site as a common ESMP applicable to any site* ***Highly relevant:*** *The contractor should pay special emphasis in the preparation of environmental method statements to ensure that the relevant ESMP is implemented specific to the site*		

Possibly relevant: *This ESMP will be triggered if the site come across with relevant aspect during project implementation*
Not relevant: *The section may not be relevant to this site under disclosed conditions*
Optional: *require to be implement if needed only*
Refer site specific monitoring plan*: Contractor is obliged to carry out monitoring as specified in the site specific monitoring plan in addition to monitoring requirement indicated in contractors ESMP*
Reference: Contractors Obligation for implementation of ESMP

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
i. Clearing the vegetation cover The contractor should be careful in clearing of vegetation cover if construction works are envisaged in the crown area to minimize slope instability risk, erosional impact and etc.; Should avoid clearing of large areas, intentional and unintentional felling of trees and etc.		
ii. 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. As the slope area is exposed during mitigation, the erosional impacts are high. Hence proper erosion and sediment strategies are compulsory at this site to control erosion and to minimize sediment laden runoff on the road and nearby waterways.	Site preparation and construction	Construction Contractor
iii. Invasive species 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.	Construction	Construction Contractor
iv. 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. Under no circumstances that construction waste should be disposed to nearby stream or its riparian zone. The project should consider use of rock material for construction. If not suitable for this work, the rock material should be allowed to be recovered by interested parties to be used as a construction material	Site preparation and construction	Construction Contractor
v. Dust and aerosol control screens Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged	Site preparation and construction	Construction Contractor
vi. Water for construction Water for construction works should be obtained only from the approved sites	Site preparation and construction	Construction Contractor
vii. Impacts on transport infrastructure (especially temporary loss of road or rail access, risks of traffic congestion) A good traffic control should be in place following the contractors ESMP specific to this site. Proper road safety measures should be included with warning signs and permanent trained watchmen. As the	Site preparation and construction	Construction Contractor

	road is busy even in the night, a night watchmen and permanent night lamps, safety signs on slope instability hazard risk etc. are important for this site		
viii.	**Workers health and safety** As the workers in the site have to work in high risk conditions, it is imperative to implement recommendations given in section 2003 of contractors' obligation on ESMP under "working conditions and community health and safety". These recommendations should be followed carefully in a proper organization and safety monitoring system. i. Additionally, work should be discontinued for sufficient time period during rainy period as working on unstable slopes will be highly risky in the rainy season. ii. A good warning system and fulltime watchmen is strongly recommended for this site for both worker and commuter safety. iii. Safety barriers and safety nets should be installed at places of risk to protect workers, commuters and the community in the downslope from boulder/debris falling risk iv. A service of fulltime watchmen to be used in the site as the road consists several bends v. At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, should be provided.	Site preparation and construction	Construction Contractor
ix.	**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	Site preparation and construction	Construction Contractor
x.	**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	Site preparation and construction	Construction Contractor
xi.	**During construction good housekeeping** should be maintained to minimize visual pollution	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	Once*
	Pre crack survey of the high risk houses	Once*
	Ground vibration	Once*
	Background noise measurement	Once*
	Air quality: particulate matter	Once*
	Stream water quality	Once*

ii. During construction	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	**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. **Micro habitat and ecosystem richness:** As per the instructions of DWC **Rainfall:** Reports to be analysed by the ES & HS unit of PMU to be vigilant on the potential risk of slope failure and to develop response mechanism	

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 for following impact communities **a) occupant of house of the crown area, b) Regional RDA-Kegalle Office, c) Owner of the Gimanhala restaurant; Mr Harsha Sri Wijethunga** (Reference: Environmental and Social Management Framework for recommended procedure for establishment of grievance redress mechanism).
The house owners of the upslope area, owner of Gimanhala restaurant and other restaurant owners were informed of the Grievance mechanism is established through the site office Kegalle.

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

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, 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, Hapugastenna Este management	Meetings, written and verbal communications

Table 7: Level of information gathered through consulting institutions

Date	**Institution**	**Person contacted for information**
13/09/2018 @ 10.00 hrs	Provincial RDA - Kegalle	Mr. KAH Bandara –Executive Engineer – RDA Ambanpitiya Kegalle
13/09/2018 @ 12.30 hrs	Land Reforms Commission (LRC)	Mr D Sendanayake Director LRC
03/10/2018 @ 9.30 hrs	Forest Department	Mr K G Sepala District Forest Officer Kegalle District
03/10/2018 @ 11.00 hrs	Central Environmental Authority	Mr.S U D Ghankeerthi Senior Environmental Officer – District office Kegalle

Annexure I: Drone image of the project area

Annexure II: Images of the site condition and the consultation

Fig a: Scientists of ESSD /NBRO inspecting the upward view of the slope failure.

Fig b: The risk home located upslope

Fig c: Consultation with high risk house owner , Mr. Wickramarachchi

Fig d: Consultation with a worker “Janaki Hotel”

Fig e: Gimanhala at immediate downslope area

Fig f: Consultation with Manager Sleek Hotel

Annexure 1I1: 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**
Provincial RDA - Kegalle	Mr. KAH Bandara –Executive Engineer – RDA Ambanpitiya Kegalle	✓ Concerns raised • 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 K G Sepala District Forest Officer	The mitigation of this site not cover/concerns under this institution.
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	✓ 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 ✓ 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 ✓ 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 will grant approval with recommendations.

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 Arial 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

Name	Designation	Position in the study
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 RHS of bypass road
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