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

Site No. 09
Vilumbahena, between 17/3 and 17/4 culvert, Kegalle District - Package 4

Prepared for:

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

Prepared by:

Environmental Studies and Services Division
National Building Research Organization
99/1, Jawatta Rd
Colombo 05

Tel: 011-2588946, 011-2503431, 011-22500354

Table of Contents

List of Annexures

List of Figures

List of Tables

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
E & S & H & S unit of PMU	Environmental & Social & Health & Safety 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. 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, and health & safety conditions are more site specific which should be addressed specific to site conditions. Therefore, the ESMF has recommended a site specific environmental and social assessment followed by Site Specific Environmental and Social Management Plan (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 Vilumbahena between 17/3 and 17/ 4 culvert 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.09 Package 4 – Kegalle District, **Vilumbahena between 17/3 and 17/ 4 culverts**

Site Details

i. The site falls administratively under 60/D Pushpane Grama Niladhari Division (GN Division) of Bulathkohupitiya Divisional Secretariat Division (DS Division), Kegalle District of Sabaragamuwa Province. The moving ground section is located between culvert 17/3 and 17/4 .Vilumbahaena at Bulathkohupitiya.
ii. The nearest town to the site is Bulathkohupitiya, about 8.7 km from the site.
iii. GPS reference of the site is 7.139527 N, 80.357214 E Ref. Map of the location Fig 1.
iv. The land ownership is Road Development Authority (RDA), Development Construction & Machinery Authority (DECMA) and private lands.

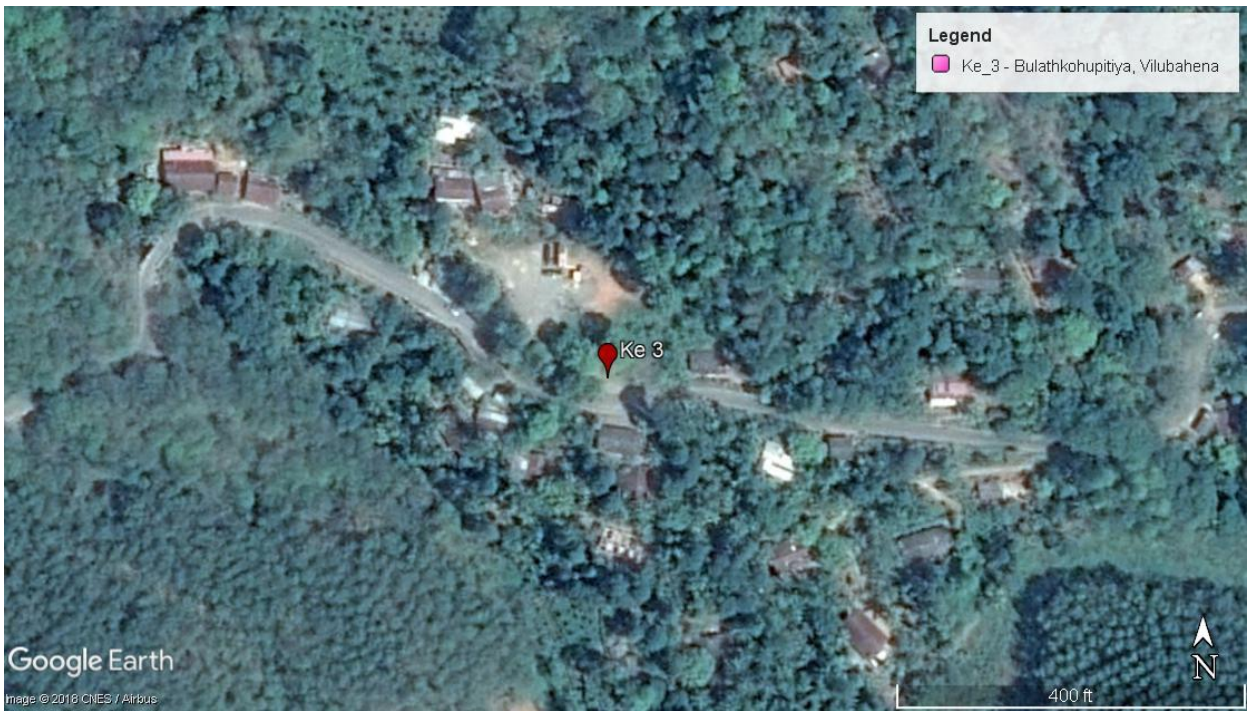

Fig 1: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure. Refer drone image for details Annexure I.

3. Landslide hazard incident details

The site at Bulathkohupitiya- Kegalle (B 677) road, is a potential landslide currently at creep movement. A part of the slope had subjected to slow creep at an extreme precipitation event on May 2016 affecting houses in a large section of the slope. The cause of the slope instability appear to be human induced. The slope at its toe areas has been modified by an extensive cutting and excavation work to obtain space for a concrete premix plant; Development Construction & Machinery Authority (DECMA) premix yard. During the construction phase deep excavations have been taken place according to the people. Partly contributed by this, a section of land had creeped forming a large tension crack posing about an estimated 25,000 m^2 land as high risk. Cracks on walls have resulted in several of houses on the unstable ground section.

The damages occurred due to incident

Cracking in the walls of the houses in down slope area has occurred. In some of the houses, large cracks in the walls have appeared making houses much unsafe to occupy. The occupants of unsafe houses had immediately evacuated the buildings and there are no casualties due to the incident.

	
Fig 2a: Potential landslide area	*Fig 2b:DECMA Premix yard at the potential landslide area*
	
Fig 2c. Tension cracks on the road (RDA has covered the cracks by tar)	*Fig 2c .A house identified as high risk*

Fig 2: Images of the project area

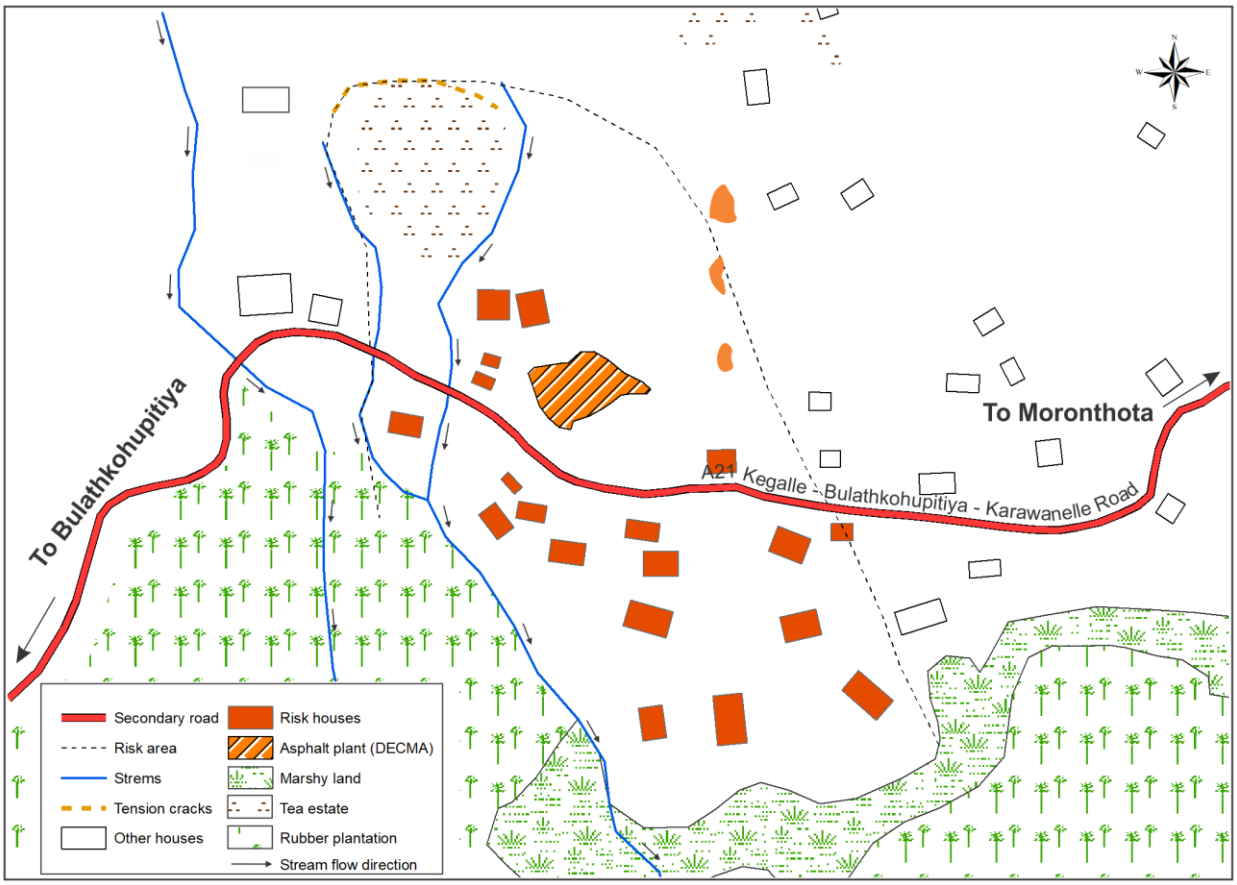

Fig 3: Diagrammatic interpretation of affected slope area and buildings due to ground movement

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

The National Building Research Organisation-Kegalle District office has inspected the site on 30.05.2016 and identified high and medium risk houses. The NBRO team has alerted the occupants including the GN officer on the risk. The people at high risk are given preparedness and evacuation alerts by Grama Niladhari of the area communicating through the Divisional Secretariat.

Evacuations: The NBRO report indicates that under mentioned households as high risk, and as the risk for them due to this hazard is high they have been advised to evacuate the houses.

01. W.M. Ruwan Aruna Shantha
02. H. Mahinda Karunarathna
03. W.M. Priyankara Premakirthi
04. K.P. Jagath Thilakasiri
05. W.M. Jayantha Wijerathna
06. S.A. Kusumawathi
07. K.R. Jayarathna
08. R.A. Srinath Perera
09. J.A. Sumith Jayasingha
10. L.A. Dharmasena
11. W.A.H. Kusumalatha
12. L.A.Chaminda Senewirathna
13. A.R. Nandawathi
14. H.P.M. Karunarathna
15. K.W. Gamana
16. K.W. Sugath Kumara
17. K. Gunasingha
18. M.W. Podimahaththaya
19. M.W. Gunathilaka

The report further indicates that under mentioned households as medium risk

01. S.M. Anula Samarasinghe
02. Jayarathna Shop
03. Raweendra Nishantha Jayarathna
04. K.A. Podi Ralahami
05. Premalal
06. R.R. Nimalarathna

The report recommended below mentioned precautionary measures to medium risk houses as to reduce the potential further movements. Putting cascade drains and contour drains, building toe wall for unstable banks, changing slope geometry the unstable slope into steps to make stable.

Resettlement (progress): The government has offered lands and houses for all landslide hazard victims whose houses at high risk. Out of 19 high risk families had evacuated and resettled by obtaining resettlement package however, 06 families are still living in same risk houses.

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

The site is located adjoining Buthakohupitiya-Kegalle road in a mountain terrain. The area has Rubber plantations on the down slope, home gardens (both upslope and down slope) and isolated plots of tea. There are occupied houses both sides of the road. On the upslope, immediately next to road reservation there is a large flat plot of land which is a concrete premix plant yard belongs to Development Construction & Machinery Authority (DECMA). The site has been abandoned after the incident. The home gardens have a well grown tree canopy representing at least two layers.

From the earlier incident walls of several houses down slope had cracked; in some of the inspected houses cracks have been observed on several walls, on the floors, and even collapse of several walls. The occupants have renovated the houses and still residing there. According to them they have no place to go, and not prepared to accept the resettlement offer provided by the government.

These occupants will be at risk from future landslide hazard mainly due to structural deformation followed by collapse of walls. Due to nature of failure (a deep seated creep) potential impact of debris fall and obstructing the traffic and commuters on road is low, also there is a buffer between the unstable high elevation section and the road to act as a disposition area for debris.

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

The vegetation in the area is largely home gardens and isolated patches of tea. Most of the home gardens too resemble forest like vegetation with well grown tree species consisting of both natural and planted trees. The crest of the mountain in the upslope has a well grown forest like tree cover.

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

i. The Road activities and the commuters
ii. People who come to the Bulathkohupitiya or Kegalle town for administration, social commercial, activities and patients who come to the hospital will be affected.
iii. The stream water quality and the river ecology of the downslope area will be affected by the project actions
iv. The people who have not still evacuated in the downslope and their livelihood activities
v. The houses and buildings in the risk area
vi. The hospital emergency service and patients using the road. (Udugoda Divisional Hospital is located about 1km from the site)
vii. Transportation of tea leaves and rubber products

7. Description of the works envisaged under the project

The proposed mitigation works will be largely on the, improvement to the drainage such as permanent structures to convey the runoff to existing drain system, sub surface drainage improvement and surface erosion control measures, slope reinforcement and erosion control measures. This will involve drilling, excavations, surface treatments etc.

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

8.1 Positive impacts

The mitigation will make currently unstable slope at the road side stable, securing safety of commuters. Ensure good connectivity between the cities; Kegalle and Bulathkohupitiya. Also the transportation of tea and rubber products will be secured.The land, the buildings and houses currently at risk will be safe to

occupy and for developments. As the land are in the proximity of the Bulathkohupitiya town it has a high residential value and a higher development demand. The future development opportunities in the will be ensured by the project. The mitigation work will ensure uninterrupted traffic flow and road connectivity throughout and will increase the safety of commuters during rainy season.

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 opportunities

The land where the project activities are envisaged belongs RDA reservations, *DECMA* and to private persons. The intended project activity area has no built structures in the upslope. However, the premix plant machinery of DECMA are in the toe area. The construction machinery and activities will be carried out mostly in this land. At the moment detailed designs of the mitigation is not available. Hence, whether the mitigation work will permanently occupy the land of DECMA premix plant cannot be clearly stated. At least part of the land will be permanently occupied by the mitigation structures. At present this plant is not functional due to landslide risk and public protest.

8.2.2 Ecological, biological impacts, and fauna and flora

There are home gardens with well grown tree cover including both planted and natural trees. Some plots of tea are also present in the upslope area. Some of these lands will be cleared for slope modifications, construction of surface drains etc. There can be locally significant impacts on ecology, fauna and flora if larger extents of land is cleared for the project work, or else removal of trees intentionally or due to carelessness. Valuable timber species, species protected under fauna and flora protection ordinance, IUCN red list species etc may be removed for the project, intentionally or due to carelessness.

8.2.3 Impacts on the drainage pattern of the area

Currently, there are several springs in the area. The proposed mitigation will change these springs, will drawdown the groundwater storage and it will result low dry weather flow. These impacts are locally significant, but will be confined only to this location.

8.2.4 Erosional impacts and stream bed alterations

The proposed mitigation works will be largely focused on the upslope area. There will be a network of surface drains to improve the drainage. This will result in sediment laden runoff leading to nearby stream. After the mitigation the runoff will be increased during rainy period. The erosion in nearby stream banks and beds may also result as the flow in the rainy season increases. All these impacts are significant, but will be confined only to this location. And the impacts can be mitigated by proper design considerations.

8.2.5 Water pollution impacts from construction activities

Washout of fines, sedimentation in existing watercourses and siltation in the downstream channels can be expected during the removal of debris and 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 could occur causing adverse impacts on quality of the stream running in the toe area.

Intentional or careless disposal of construction waste including cements/ grout materials etc. used for soil strengthening can mix with surface runoff to cause temporary water quality degradation and accumulation of unwanted substances in the downstream.

The 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, and aquaculture and may violate even the minimum standards for water quality during the construction phase. The water

quality impacts from discharge of wastewater and pollutants to environment during construction phase is therefore highly significant.

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

Impacts on water quality and aquatic ecology in the natural stream will be high as the emissions will exceed the ambient water quality standards prescribed for designated uses such as drinking, bathing, and aquaculture and may violate even the minimum standards. The water pollution impacts on downstream area discharge of wastewater and pollutants to environment during construction phase is therefore highly significant as this natural stream carry clean water used by the local people for various domestic needs.

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. Since the site is located closes to the road, improper solid waste management can cause impacts on pedestrians, commuters and unpleasant, awful visual pollution. The effect is significant if proper solid waste disposal mechanism is not used during the construction period.

8.2.9 Air pollution impacts

Construction activities that contribute to air pollution include land clearing activities, operation of diesel engines, demolition activities, burning, and transportation of construction materials, construction waste and working with toxic materials. During the construction, it generates high levels of dust (typically from concrete, cement, wood, stone, and silica) and can become airborne. Since there are households nearby the effect is significant.

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

Since there are houses close to the site, the impact of noise and vibration is significant on human. The damage to buildings can occur due to ground vibration. Also, lowering of ground water table can have an settlement of houses and formation in cracks in buildings etc.

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

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

8.2.12 Work camps and lay-down sites requirement

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

8.2.13 Risks of public accessing the site during construction

The construction activities will be taking place in a large extent of land in the upslope area; eg; surface drains. There are private lands with occupied houses in the upslope area. The construction machinery will be operated in the premises of private lands owners. There is a risk of public, especially children mingling in construction areas.

8.2.14 Explosive hazards and hazardous materials

Explosives may be used if the rock blasting is envisaged. This may pose a 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 at this site**.**

8.2.15 Road traffic and safety to the public from construction activities: risk to commuters

As much of the construction work will be taking place in the upslope area and in the flat lands of DECMA plant yard, possible impacts on traffic due to construction vehicles and machinery are low.

8.2.16 Workers safety during construction

During the construction, heavy machinery and construction vehicles will be operating. The hazard risk from workers' safety is considered highly significant. As the area has thick vegetation cover resembling forest ecology, snake bite risk is there at this site. Contractor may engage under age workers (children) for construction work, which is risky, can result serious accidents and injuries.

9. Public and stakeholder consultations that have been and/or will be held

The house owners living in the houses ranked as risk with respect to the slide by NBRO were involved in the consultation. The Grama Niladhari Mrs TA Inoka Udeni and many residents in the area were consulted. Mrs Chandima Dilhani, married with two children, her mother and farther living in separate houses were interviewed further by visiting their houses which were the most damaged by the incident. They have been made aware of the project and the concerns of these people were obtained. According to them there are 19 families categorised as high risk informed to evacuate. Of them 13 families have accepted the notification and evacuated the houses. Evacuated families were given houses built by the government. Six (6) other families who have not accepted the resettlement offer of the government stated that the resettlement will result long-term hardship and dissatisfaction for the affected communities and persons. Shifting to another place would affect their carrier, schooling and other livelihood activities. Hence people expressed their disagreement toward resettlement. The occupants in these houses were made aware of the project and the social concerns pertinent to the project.

9.1 Stakeholders involved in the consultations, 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:

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 stream water quality.

10.2 Erosional impacts and stream bed alterations

Erosional impacts in the project area will be high during the construction phase. Due to increased discharge after mitigation, 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)

Road closure is not needed as an adequate space is available for vehicles, machinery movement. Hence impact on transport structure, commuters is less significant.

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

The proposed mitigation will involve improvement to drainage (surface and subsurface). The groundwater table will be brought down to safer limits to improve the slope stability. Lowering of ground water table will result drying of springs. During the site visit, several springs were observed used by the people in the area as domestic water sources. There is a possibility that some of these springs will dry out due to project actions

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 buildings of the upslope houses previously demarcated as high risk

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

There are no areas used for business, 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

The mitigation work will fall partly on the DECMA concrete premix plant. Currently the plant is not functioning. The machinery and other infrastructure of the plant still remain in this premises. The construction activities can damage some of the valuable machinery. The valuable spare parts can be stolen by the contractor's workforce. Some spaces may be permanently used for structures. Therefore the impacts on business due to project will be significant at this site. On the other hand the mitigation work will make the land safe to continue the plant operation. Although part of the land will be given off for the project the balance land can be used for plant operation.

10.8 Need for people to enter or cross the site

The mitigation works will spread in a large extent of lands belongs to private ownership. Many project works, especially surface drains will be laid in private lands. There are houses with occupants who may be at risk due to operating machinery, and vehicles, electricity, and may even by blasting materials and they could be influenced by contractor's workforce.

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 equipment and clothing in the section 2003: Working conditions and community health and safety in the Bidding document.

Additional risks are, as the site is a difficult terrain with green cover resembling forest ecology, possible snake bite risk is high.

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. The 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 PMU will obtain the approval to project from the planning committee of the Bulathkohupitiya Local Authority.

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

i. The relevant agencies are DECMA as part of the project actions are taking place in the premises of DECMA premix plant. Necessary agreements will be made between NBRO, and DECMA 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 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. As the area does not cover under jurisdiction of Department of Forest or Wildlife Conservation approval is not required. However, approval from the Department of Forest is required if cutting of tree species controlled by the fauna and flora protection ordinance envisages.

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 Bulathkohupitiya local authority will be obtained for the disposal of waste and plant litter.
iv. Approval through the Divisional Secretory 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

A legally bound agreement between the land owner and the project implementing authority will be signed allowing no-objection to remove the structures, access the land, implement construction works, and engage in long-term maintenance works. The tentative timeline for getting approval is given in the table 1.

Table 1: Tentative timeline for getting approval

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 RDA & CEB 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)

This section will describe the mitigation measures highly specific to this site, considering specially the impacts and risks identified in Sections 8 & 9.

12.1 Resettlement action plan

Will not be applicable to this site as there is no project based resettlement.

12.2 Evacuation of people

This will not be applicable to this site

12.3 Procedure for removal of damaged structures, facilities infrastructure

The mitigation design should consider carefully the current machinery area of the DECMA plant to avoid occupying machinery area by permanent or temporary structures. The DECMA management should be informed of the project plan with the details of land requirement (temporary during construction, permanent for mitigation structures). As there is adequate space available, the machinery installed area can be avoided from the mitigation works. Machinery area need to be separated from the project work area with proper protection fencing so that contractor's workforce will not enter the machinery area and damage to machinery by construction works will be avoided. Inventory of machinery should be taken with an assessment on conditions of machinery and infrastructure with the agreement/presence of DECMA management before accepting the site for project work. Care should be taken to prevent any form of damage to machinery during construction phase. In case if such damage happens the contractor should bear the cost of replacement. Same inventorying and evaluation procedure of machinery should be repeated at the project completion and then only the site should be handed over to the DECMA. Some facilities may require relocation in very rare instances, if such situation arises it should be done by the project cost with full approval of DECMA management. A meaningful consultation with DECMA by PMU is strongly recommended for this site.

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

Will be possible for this site if damage to Machinery in the premix plant of DECMA happens. Damage to houses of upslope mitigation area happens due to ground vibration or due to lowering of water table.

12.5 Public awareness and education- needed for following areas

Strong social awareness to people in the area should be conducted as mitigation work will take place inside the premises of private lands with occupied houses. The awareness should include the social issues common to construction sites near settlements, sexual abuses, child abuses, protection of properties from unknown external workforce, discipline on sharing common resources such as common bathing places etc.

The community awareness on responding to NBRO early warning alerts and temporary evacuation at times of extreme events is recommended.

12.6 Design based environmental/ social management considerations

Following environmentally and socially significant design considerations are recommended to consider in designing the mitigation works.

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	Very High
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.	High
iii. Conservation of water resources The mitigation works involve extraction of water both surface and sub-surface. The water extracted is in a 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. The water in the springs are used by the community in upslope areas	Very high
iv. Interruption to water supplies The water in the mitigated slope is used as a source for individual water supplies, the chance the water source can be affected by the mitigation work is high due to water table draw down. It is strongly recommended to consider optimal water table drawdown to ensure factor of safety while minimizing the permanent drying up of springs. If permeant drying up of springs are envisaged the design should include alternative source of water for the community. These could be i) extraction sources of water ii) storage systems ii) conveyance systems or providing permanent alternative water supply from another source.	Very high
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.	Medium
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, use of excavation materials for construction and etc.	Very High

vii. Workers/ commuters and community safety Activation of slide may occur during construction phase and may pose threat to workers and occupants in houses. Therefore design based safety consideration such as berms, safety nets etc. should be considered.	Should be considered after evaluation of site specific requirements
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 drain liner and 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 if there are streams and culverts in the proximity of the mitigation site. **A natural stream with potentially high aquatic diversity flows at the toe area of the failed slope.**	High
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 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 used 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 9Table 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**	**Relevance to the project**
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Relevant
2002.2 2)	Noise and Vibration	Relevant (houses in upslope areas)
2002.2 3)	Cracks and damages to the buildings	Highly Relevant (houses in the upslope area)
2002.2 4)	Disposal of waste	Relevant
2002.2 5)	Disposal of refuse	Highly Relevant (Houses)
2002.2 6)	Dust control	Highly Relevant (Houses)
2002.2 7)	Transport of Construction materials and waste	Relevant

2002.2 8)	Water	Highly Relevant (Houses)
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 (Houses)
2002.2 17)	Utilities and roadside amenities	Relevant (road/ houses)
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	Optional
	Reporting and maintenance of records	Relevant
2003. Working Conditions and Community Health and Safety		
2003.2	Safety organization and communication	Highly relevant (unsafe slopes/commuters/ machinery)
2003.3	Child Labor and Forced Labor	Highly Relevant
2003.4	Safety reports and notification of accidents	Highly Relevant
2003.5	Safety Equipment and Clothing	Highly Relevant
2003.6	Safety inspections	Highly Relevant
2003.7	First Aid Facilities	Highly Relevant
2003.8	Health and safety information and training	Highly Relevant
2003.9	Plant equipment and qualified personnel	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*
Reference: Contractors Obligation for implementation of ESMP

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 mitigatory measures

Mitigation item	Project implementation phase	Responsibility
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 before rainy season begins and avoid such activities on upslope area in the wet season as much as possible. This should be considered in project planning stage.	Site preparation and construction	Construction Contractor

ii. 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. Tree plants for vegetative control can be obtained from the Forest Department nurseries, by informing them in advance on the requirement.	Construction	Construction Contractor
iii. Vibration impacts Vibration generating activities should be done within the prescribed limits to specially to avoid damage structures. Cracks in the buildings should be monitored before, during and after completion of the project. Suitable compensation should be made if damage cracks due to construction work occur in the building. **Cracks and settlements in the upslope buildings and houses due to rapid water table drawdown** Implementation of sub surface drainage control system should be carefully done to prevent sudden water table drawdowns. As it may result settlements and structural deformations (cracks) in upslope houses.	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.	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. Workers health and safety i. 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. ii. 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. iii. A good warning system and fulltime watchmen is strongly recommended for this site for both worker and commuter safety. iv. Onsite sanitary facilities should be made available for the workers, and sanitary waste should be properly disposed v. Proper emergency management system for snake bites (include awareness on snake bites, safety shoes while at work, first aid on a snake bite, hospitalization and admission to correct hospital where snake bite management facilities are available vi. The electrical wiring systems and laying out should be done with proper safety measures approved by the PMU to ensure that accidents mainly to children from electric shocks are prevented. Electrical system should be disconnected during off times.	Site preparation and construction	Construction Contractor

viii. Managing disputes between construction workers and public and workers code of conduct The PMU should made the contractor aware on all potential issues between contractor workforce and households that should be properly managed. Following are recommended for contractors workforce **i.** Proper awareness, education on code of conduct, monitoring and punishing. **ii.** Define project activity zone with restricted access to other areas in households **iii.** Workers cannot use water sources of the households without proper permission **iv.** Workers cannot use sanitary facilities of the houses, on site sanitary facilities should be arranged to avoid possible open defecation **v.** The contractor should not use children for any form of project related works (direct/indirect) **vi.** The heavy machinery operators should be extremely cautious in operation of machinery as possible accidents will be high. **vii.** Parking and storage areas should be done in approved locations by the PMU **viii.** Establish a system of vigilance to monitor the behaviour of the workforce and the movement and address immediately any dispute that would rise during construction phase **ix.** Ensure that strict code of conduct in the worksite is maintained. They include No alcohol, no smoke, indiscipline noisy behaviour, any form of sexual abuses with females		
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 issues and impacts due noise and vibration on wildlife.	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 watchmen.	Site preparation and construction	Construction Contractor
xi. During construction good housekeeping should be maintained to minimize visual pollution.	Site preparation and construction	Construction Contractor

12.8 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*
ii. During construction	Stream water quality	During slope excavations, ground soil boring works (every month) *
	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

Should be followed as per the recommendations of ESMF

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.

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 at the 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**
16/10/ 2018 @ 10.30 hrs	Road Development Authority –Ruwanwella	Mr.H K RAWickramanayake Executive Engineer Ruwanwella
03/10/2018 @ 13.00 hrs	Forest Department	Mr K G Sepala District Forest Officer
03/10/2018 @ 14.00 hrs	Central Environmental Authority	Mr.SU D Ghankeerthi Senior Environmental Officer – District office Kegalle Director – CEA Ratnapura District
03/10/2018 @ 14.00 hrs	Land Reforms Commission	Mr. D. Sendanayaka Director, LRC, Kegalle

Annexure I: Drone image of the project area

Annexure II: Images of the site condition and the consultation

Fig a: Evacuated house

Fig b: Bore hole testing point located on landslide area.

Fig c: NBRO team communicating with the residents and GN about the project

Fig d: The natural stream in the upslope area

Annexure III: Report on the Stakeholder Consultation: Kegalle District

Date: 13/09/2018 and 03/10/2018		
Institution	**Name and designation of the contact officer**	**Concerns raised**
Road Development Authority Ruwanwella	Mr. H K RA Wickramanayake – Executive Engineer – Provincial Engineer Office	✓ This area is under the jurisdiction of RDA – Ruwanwella ✓ The Executive Engineer Office has no objection and states the mitigation is very much needed. ✓ Other concerns raised • 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 • A proper handing over of the project is required after the mitigation • Engineer Office will do the maintenance after mitigation
Forest Department	Mr K G Sepala District Forest Officer	The mitigation of this site not cover/concerns under this institution
Department of Wildlife & Conservation (DWLC)	No Wild Life Office Found in the district	
Land Reforms Commission (LRC)	Mr D Sendanayake Director LRC Kegalle District	The mitigation of this site not cover/concerns under this institution
Central Environmental Authority	Mr.SU D Ghanakeerthi 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 ✓ 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 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 approved 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 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
Dilhani Jayalath	Officer in charge / Kehalla District	Geologist
H Kusalasiri	Technical Officer/ESSD/NBRO	GIS/Demographic data /survey support
D I U Jayawardena	Scientist/ LRRMD/ NBRO	Geologist

Annexure VI: List of references

1. NBRO site investigation report on potential landslide disaster at Vilumbahena
2. Contractor's obligations for 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