

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

**Site No. 12
Kaluaggala, Colombo District - Package 3**

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Prepared for:

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

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
DFC	Department of Forest Conservation
DS	Divisional Secretary
DWLC	Department of Wild Life Conservation
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 Kaluaggala 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

1. Location details and site description

Site reference: Site No.12 - Package 3 – Colombo District, **Kaluaggala**

Site Details :

- i. The site falls administratively under Kaluaggala Niladhari Division (GN Division) of Seethawaka Divisional Secretariat Division (DS Division), Colombo District of Western Province. The proposed site is a cutting failure located at the Kaluaggala junction on Kaluaggala- Labugama road
- ii. The nearest town to the site is Hanwella, about 2.3 km from the site.
- iii. GPS reference of the site is 6.918233 N, 80.098941 E Ref. Map of the location Fig 1.
- iv. The land ownership is Road Development Authority (RDA) reservation and the church; a Roman Catholic church “Our Lady of Sorrow”

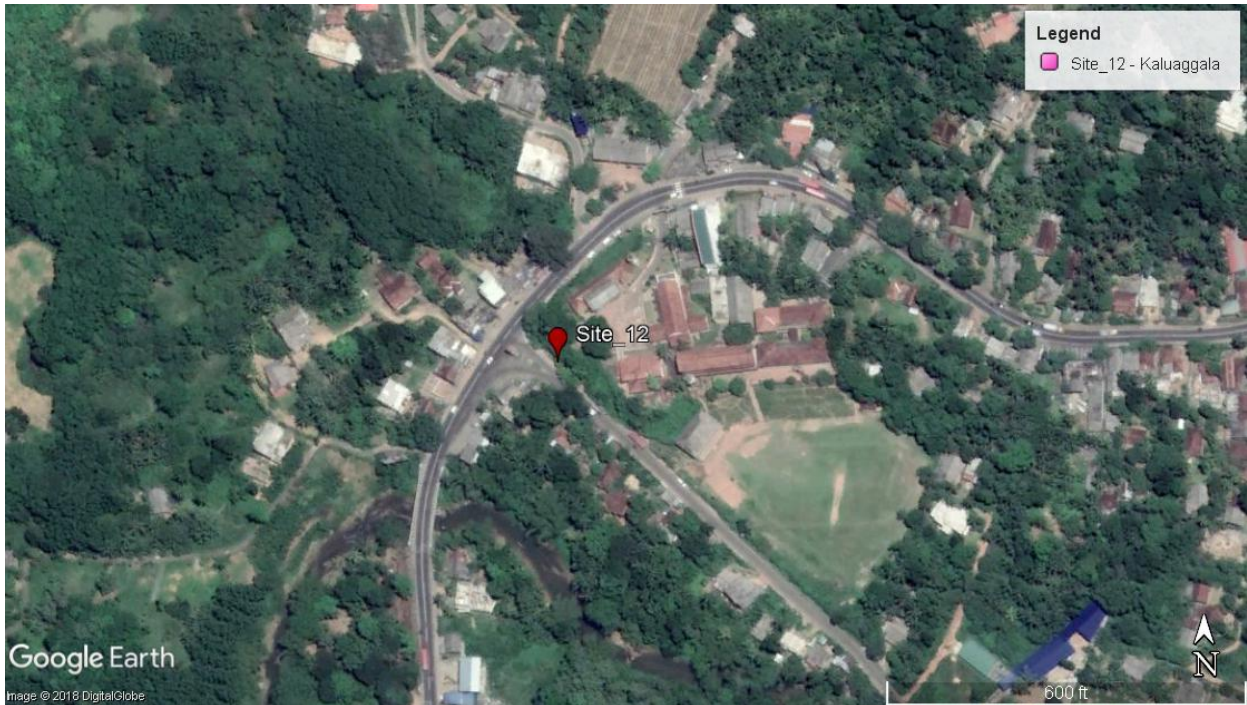


Fig 1: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure. Refer drone image for details Annexure I.

2. Landslide hazard incident details

At this location cutting failures have happened several times during rainy seasons. Those failures have extended towards the buildings of the school and church at the crown area of the slope.

The damages occurred due to incident

Due to this incident a retaining wall of about 4m height had collapsed. This had damaged the bus halt at the Kaluaggala - Labugama (B188) road near the clock tower. Currently, several cracks have appeared in the remaining parts of the retaining wall. The weep holes of the retaining wall are blocked by soil and the filter layer of the retaining wall is not functional. The mission house of the church which is a historical building built in 1693 was damaged due to the incident. Later the building was removed and new mission house has been constructed.



Fig 2a: upslope of the slope failure of the Kaluaggala Junction



Fig 2b: Downslope view of the slope failure from the school side



Fig 2c. Damaged retaining wall at the toe area



Fig 2d. Three wheel park at the toe area

Fig 2: Images of the project area

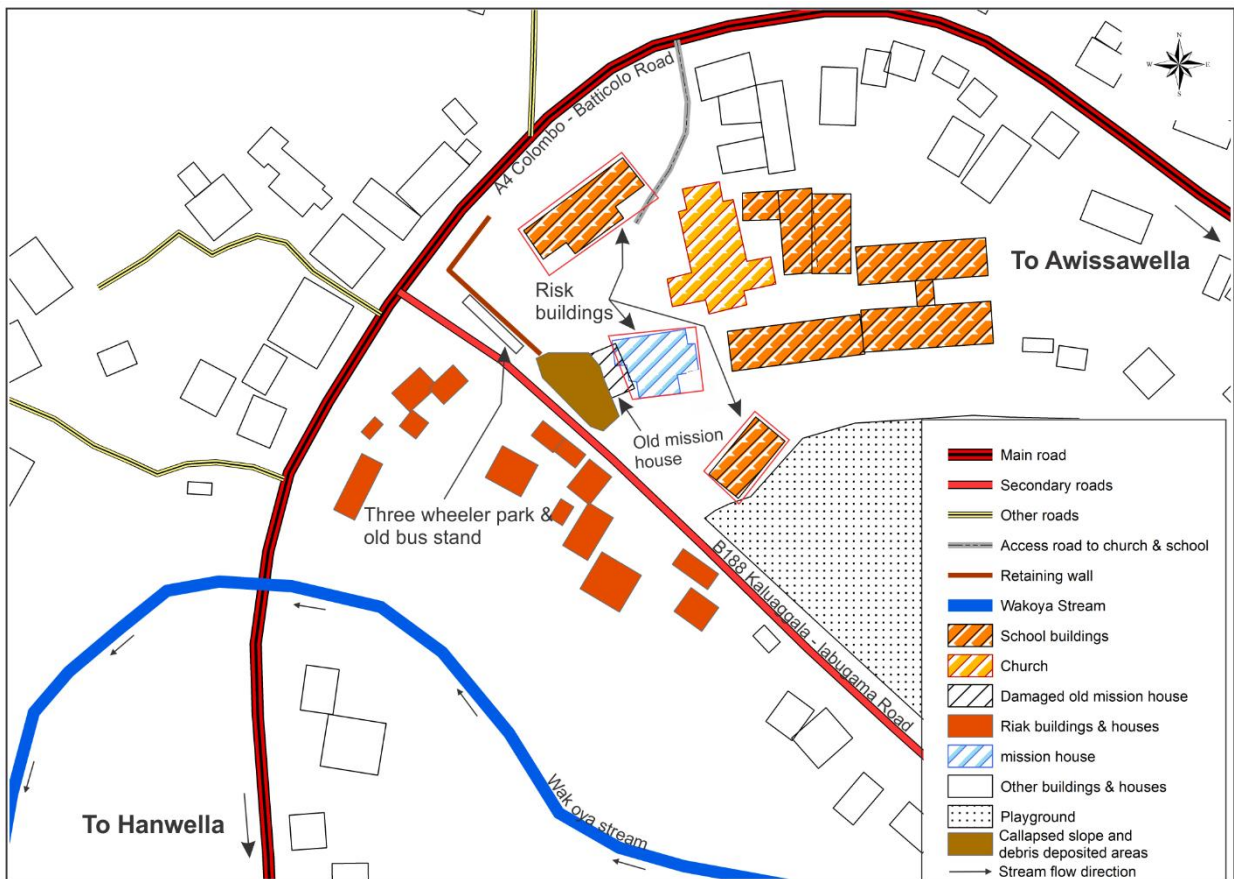


Fig 3: Diagrammatic interpretation of affected slope area and buildings due to ground movement

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

The Road Development Authority and National Building Research Organisation have inspected the site. Bus halt at Kaluaggala – Labugama road (the landslide toe area) had been removed and shifted toward Labugama side to reduce the risk of pedestrians and commuters. A Sign board has been placed warning people on slope instability risk. No any physical remediation measures done to improve the unstable slope.

Evacuations: No evacuation had been done.

Resettlement (progress): No resettlement

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

The affected site is located at the Kaluaggala junction, just left hand side of Kaluaggla-Labugama road. The area is a relatively a flat terrain with an isolated hillock. The flat terrain is largely urban commercial and residential area. On the hillock a catholic church “Our Lady of Sorrow” and St. John Bosco’s College buildings and facilities are located. The unstable slope section is found at the North Western slope corner of this hillock.

The location

The site is located adjoining the Colombo-Batticaloa (A4) road and Kaluaggala Labugama (B188) road. Colombo-Batticaloa (A4) road is a major road which connect Colombo, Rathnapura, Badulla, Monaragala and Batticaloa districts. Kaluaggala -Labugama road is a connectivity road between A4 road and Labugama. This road also connects Thummodara Puwakpitiya road (B426).

This is the main access road to Labugama and Kalatuwawa reservoir and Labugama water purification plant and also Labugama Kalatuwawa forest reserve; Seethawaka Wet Zone Botanical Garden is also located in Thummodara Puwakpitiya road which can be accessed through B188 road. This garden mainly serves as a research site and a conservation area for threatened and vulnerable endemic species in the Sinharaja Rain Forest region. Improving export floriculture, ex-situ conservation of wet lowland plants and bamboo cultivation are also promoted in this garden. This garden is opened in 2014 and it is the most recently constructed botanical garden in Sri Lanka.

Leisure World water park too is situated in Kaluaggala, located 900m away from the site can be accessed by this road. Therefore mitigation of this slope failure has a significant positive impact because local and foreign tourists will be benefitted.

The area is a historical location of early Sinhalese King Sithawaka Rajasinghe in 1500s. Kingdom was extended to Kosgama, Ruwanwella, Hanwella, Kaluaggala, Awissawella, Eheliyagoda and Kuruwita. The terrain borders to the East by a mountain range. The hillock at this location was used as a defence fort to attack to the Portuguese, who invaded the country in 1505 during the period of Seethawaka Rajasinghe’s Kingdom. Seethawaka king also offered fierce resistance to Portuguese.

The church

The church at the upslope area is famous “Our Lady of Sorrow” Church Kaluaggala. At the upslope area the mission house, church and a culvery statue are located. Culvery statue was built in 1927 and gives a significant landmark to the area. The mission house of the church is a historical building built on 1693 was damaged due this slope failure. Later the building was removed and new mission house was constructed. The church is a Parish church and it governs six other local churches at Kaluaggala, Hanwella, Minipola Pahathgama, Yattowita and Welgma. Mass is held daily at 6.30 morning and special masses are held on Friday and Sunday evenings. Sunday school is also held weekly. Specially, Christmas festival, Easter (pasku) and Good Friday are celebrated with attending about 1000 devotees. Other religious and cultural activities such as wedding ceremonies, funeral ceremonies and religious sermons etc are also held at the church during the year.

St. John Bosco's College

This is a Government acquired school from the church management. Currently student population is about 1300 with 62 teaching staff. One building of the primary section is located close to the sloppy area. At that building there are classes of grade 5. In addition the building has rooms for arts, a room for Catholic religious activities, room for citizenship education, and a room for differently abled students.

Current level of risk

If the site is left un-attended failure of the slope may occur in recurring extreme precipitation events. Movement of the slope or a collapse may pose both direct and indirect impacts on several sensitive elements.

Immediate to the unstable slope there is a three wheeler park. During rush hours and school times public wait in this location for buses despite the warnings on slope instability risk. The commuters, pedestrians and about nearly 1000 students who are studying the primary section of the school are at very high risk. Devotees and religious functions in the church will be at risk as they are using the roads and transport system to participate in church sermons. The historical statue on crucifixion of Jesus Christ built in 1927 named as "Calvary Statue" on the hill top adjoining the failed slope is at high risk as further failure could damage this statue.

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

Disturbed vegetation with grass species are observed on the sloppy sections. Several boutiques and a nursery school are located on the other side of the road opposite to unstable slope. At the upslope area there are buildings of the church and the part of the school. The playground of the school is located further away from the unstable slope section.

No forested areas, wild life reservations, environmentally sensitive habitats found within the study area. No ecologically significant habitats found.

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

- i. The buildings at upslope
- ii. School children, teachers, staff
- iii. The historical crucifixion statue of Jesus Christ
- iv. Road traffic and commuters on the road and pedestrians
- v. The priests, worshippers, devotees in the church and the religious events
- vi. Car park at the upslope area/ location of student assembly and activity areas
- vii. Occupants/ sellers of boutiques
- viii. Children , parents of the nursery school
- ix. The three wheel park

7. Description of the works envisaged under the project

The proposed mitigation works will construct structures in North-eastern, Northern and North Western slopes of the School and Church premises facing Colombo-Batticaloa road and Kaluaggala-Labugama road. The specific construction works will include:

- Demolition of existing disturbed RRM retaining wall at the toe
- Construction of cut –off drain at the top of the slope (inside the church and school) to prevent rainwater runoff in to the slope and divert water to the road side drains at toe area by crown and cascade drains
- 20m horizontal drain at the toe of the slope to dissipate the excess pore water
- Stabilize slope by soil nails of 10 m, 8 m length
- Protection of slope surface by hydro seeding / turffing

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

8.1 Positive impacts

The mitigation of slope at this location has a wide range of benefits to commuters, passengers the school and the church. The church buildings, functions and historical statue, the school buildings and students and activities will be safe. The project has a strong positive impacts on the safety of students and teachers of school. The passengers and commuters taking the road to Labugama will be safe.

The road will be safe for commuters and devotees of the church. Further the project has a positive impact on the users, sellers, and occupants of the boutiques at road side. And also the functions of the nursery school can be done without fear. The three wheel park can be operated safely and bus halt can be reestablished.

8.2 Negative impacts

The mitigation works are very much 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 to RDA reservations and to the church. The project will not result loss to land ownership. No impact on accessing the site and no significant impact on electricity and telephone lines, and road structure etc would occur.

8.2.2 Ecological, biological impacts, and fauna and flora

There are no annual crops within the study area and there will be no impact on them.

8.2.3 Impacts on the drainage pattern of the area

There will be no change to drainage pattern in the area.

8.2.4 Erosional impacts and stream bed alterations

The proposed mitigation works will be largely focused on the upslope area. The slope reshaping may pose slope more vulnerable to erosion especially in the rainy season. This will result sediment laden runoff leading to nearby stream. All these impacts are significant, but will be confined only to this location and the impacts can be mitigated by proper design constructions.

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 stream "Wak Oya" with high Biochemical Oxygen Demand, Chemical Oxygen Demand, Suspended Solids, Oils and Greases etc. The emission 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

As the site is located in a commercial and built area possibility of open defecation is low.

8.2.7 Impacts on the downstream water uses

The sediment laden runoff may enter nearby stream “Wak Oya” to cause sediment pollution and will exceed the ambient water quality standards prescribed for designated uses such as drinking, bathing, and aquaculture.

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 close 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, operation of diesel engines, demolition, burning, from storage, transportation disposal of construction materials, construction waste and working with toxic materials (blasting chemicals). During construction, it generates high levels of dust typically from concrete, cement, wood, stone, and silica. The effect is significant to school children if heavy air polluting activities are carried out during school hours. As the sensitive elements (commuters, students in class rooms etc.) are located in the same proximity the air pollution impacts from dust and fumes are **significant**.

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

Noise and vibration is expected from construction equipment. Noise impact is significant as the construction is carried in the proximity of the class rooms, the church buildings and structures etc. And this will affect to the children at nursery school. Hence the impacts of noise is **considered significant at this site**.

There can be impacts due to high ground vibration (cracks in the buildings) on the buildings and structures on hill top (the statue, school buildings etc)

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

The construction workers at this site will be from different social backgrounds and from different geographical areas often under poverty. Usually, they are with poor educational and social background. Such communities may have a wide range of social issues to cause dis-stress on the school and the residents as indicated below.

- Expose school children towards narcotics, alcohol, sex abuse, smuggling, and various criminal offenses and a wide range of unsuitable habitual behaviours
- Cause nuisance to smooth operation of school work
- Unauthorised entry into school buildings
- Quarrels with children and parents
- Distracting children from education
- Tempting children and parents towards offensive deals
- Informal form of child labour
- Various forms of disputes with members of the church and devotees
- Use of sanitary facilities of school and church by the workforce

Although the workers who would engage in such issues will be rare, even few possibilities cannot be ignored. Therefore, social and community issues at this site will be considered **highly significant**.

8.2.12 Work camps and lay-down sites requirement

The work camps will be established closer to the site. Often the contractor rent out houses in the proximity. The camps sites will be selected in the neighbourhood of community. If proper camp management is not in place it may result several labour issues, social issues with community, conflicts for shared resources with the community, nuisances, and management of waste etc.

If temporary camps are built in the close proximity of the site, management of solid waste and sewerage will be an issue. Therefore, **the risks are significant**.

8.2.13 Risks of public accessing the site during construction

The site may use excavation machines, loaders, trucks etc. The machines and heavy vehicles etc will be used in the proximity of the school where school children and ordinary rural people are moving. Site may use high voltage power for operation of certain machinery. Construction may use materials such as metal aggregates, steel etc which are injurious under improper storage and handling. The school children will be attracted to these machinery materials and may even enter the site without proper awareness of the site staff. Ignorance of entry of school children and careless operation of machinery can cause fatal injuries and accidents to school children. **The risk on school children at site is therefore highly significant**.

8.2.14 Explosive hazards and hazardous materials

Affected slope has no large rocks, hence it is highly unlikely that rock blasting will encounter

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

As the construction activities are to be carried out adjoining a busy junction, during construction phase the road will be obstructed by frequently moving machinery, loaders, trucks etc. The moving heavy machinery and construction vehicles may pose a risk on these commuters.

8.2.16 Workers safety during construction

As the construction activities are to be carried out adjoining a busy junction, during the construction, heavy machinery and construction vehicles will be operating. The hazard risk from workers' safety is considered highly significant. 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

Deputy Principal; Mr Dilanka Kuperapperuma and a teacher Mr.Chandima Rupasinghe of St. John Bosco's college were consulted during site visits. Both of them stated their agreement to the project. Rev. Father Anton Ranjith of the church was also consulted. The Rev. Father expressed his views on the historical importance of the location and current risk on church devotees. He stated his full consent and extended full support to the project. He expressed his willingness to support to the project and indicated he could shift the car park at the upslope area to provide space for construction works. Ref: *Annexure II- Images of consultation*).

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)

The traffic due to full/partial road closure may obstruct the smooth flow of vehicles during the week days, in office hours, school times and on the days of special religious functions. This will cause nuisance to pedestrians and commuters and devotees.

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

Will not be highly significant to this site.

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 school and the church.

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

There are small boutiques, near the site. The impacts during construction are significant due to nuisance from moving machinery and workforce. There is a nursery school opposite to the proposed site. The construction will pose nuisance and moving machinery will pose hazard risk in the nursery school occupants and children. 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 the people/ school children may occur due to intentional or unintentional purposes and they may be at risk due to operating machinery, and vehicles, electricity.

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.

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 Seethawaka Pradeshiya Sabha.

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

The relevant agencies are Road Development Authority as part of the project actions are taking place on the road reservation. Necessary agreements will be made between NBRO, and 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

Approval will be required as waste materials (solid/waste water) etc. will be generated. .

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 Seethawaka Pradeshiya Sabha will be obtained for the disposal of waste and plant litter.
- iv. Approval through the Divisional Secretary from the district office of Ministry of Defense will be obtained for the sites if requiring rock blasting.
- v. Approvals from regional office of Ceylon Electricity Board will be required for power supply for site operation.

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

Signing a legally bound agreement between the chief priest of the church, Ministry of education 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.

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

Table 1: Tentative timeline for getting approvals

Approvals	Month 1				Month 2			
	W1	W2	W3	W4	W1	W2	W3	W4
Project implementation								
<i>Approval from the District Secretariat</i>								
Submission of application	—							
Project briefing		—						
Respond to comments		—	—	—				
Approvals					—			
<i>Approval from planning committee</i>								
Submission of application	—							
Project briefing		—						
Respond to comments			—	—	—			
Approvals					—			
<i>Approval from state land owners RDA & CEB</i>								
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

- The school buildings adjoining the North Eastern slope section should be evacuated during the whole construction phase.
- The three wheeler park should be shifted to a safer place (further towards labugama side) evacuated throughout the construction phase

12.3 Procedure for removal of damaged structures, facilities infrastructure

The retaining wall at the site need removing. The wall has been constructed by the Church. The church should be informed of the requirement to remove the wall and the removal should be done with approval of the Rev. Farther.

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

Will be triggered if damage to school buildings and the structures of the church and school buildings occur.

12.5 Public awareness and education- needed for following areas

Programs to inform and educate residents on the opposite side of the unstable slope section, the drivers in the three wheel park and nursery school, staff of St. John Bosco's school, and the church on the risks

posed by landslides, the impacts and nuisances. Awareness on the efforts made by the ESMP to mitigate the impacts and to minimize the nuisance. Provisions for grievance redress and etc.

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
<p>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</p>	low
<p>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.</p>	Low
<p>iii. Conservation of water resources The mitigation works involve extraction of water both surface and sub-surface. The water extracted is in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by wild fauna as well as the neighboring communities for bathing and other domestic purposes even as drinking water.</p>	Low
<p>iv. Interruption to water supplies If the water in the mitigated slope is used as a source for individual or community water supply, the chance the water source can be affected by the mitigation work is high due to water table draw down. In such instances the design should include alternative source of water for the community (temporary/or permanent).</p>	Low
<p>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.</p>	Very High
<p>vi. Consideration of green environmental features As many of the mitigations works are carried out in ecologically sensitive habitats, It is recommended to consider green environmental designs as much as possible in the designs e.g.: use of local vegetation species for erosion control, combination of plants to sustain species diversity in the environment, avoiding inclusion of potentially invasive species, use of excavation materials for construction and etc.</p>	Very High
<p>vii. Workers/ commuters and community safety Activation of slide may occur during construction phase and may pose threat to workers and commuters. Therefore design based safety consideration such as berms, safety nets etc. should be considered.</p>	Very High
<p>viii. Erosion control structures In drainage management, water is extracted and conveyed to nearby streams often through culverts. During rainy season the flow in these drainage structures can be significantly high and this may cause stream bed and bank erosion. Hence the design should adequately consider flow speed breakers to reduce erosive flows entering natural streams. This should be an inclusive part of the design if there are streams and culverts in the proximity of the mitigation site.</p>	low
<p>ix. Safety structures The North Eastern and North Western sections of slope are high elevation steep slopes. Even now there is a risk of falling. After the mitigation the slope will be</p>	

exposed more and occupants (Children and Students) will be highly vulnerable to falling risk. Therefore, it is strongly recommend to incorporate protective fencing or wall to prevent people from falling risk.	Very high
<p>x. Low post maintenance and operation designs</p> <p>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.</p> <p>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.</p>	Very high

12.7 Mitigation of impacts during the construction phase

12.7.1 Construction contractors' requirement to comply with environmental and social management during the construction phase

Measures to manage and to mitigate the environmental and social impacts are generally common to all landslide mitigation sites. Such impacts are largely attributed to activities in the construction phase. The mitigation of impacts therefore becomes an obligation of construction contractor. NBRO has prepared a comprehensive document on “*contractors’ requirement to comply with Environmental and Social and Health and Safety (ES & HS) management during the construction phase*” to be included in construction contractors’ bid document. The main sections are summarised below Table 3) indicating the degree of relevancy for this site. For details ESMP for construction contractors should be referred.

The contractor is expected to indicate in the bid the ESMP procedure to be implemented along with relevant proofs of his competency. The cost for ESMP will require to be indicated as a separate pay item. The environmental and social management method statement is expected to be submitted by the selected construction contractor and to be approved by the PM 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 (school premises/church)
2002.2 2)	Noise and Vibration	Highly Relevant (school premises/church)
2002.2 3)	Cracks and damages to the buildings	Highly Relevant (historical structures/ school buildings)
2002.2 4)	Disposal of waste	Highly Relevant school premises/church)
2002.2 5)	Disposal of refuse	Highly Relevant school premises/church)
2002.2 6)	Dust control	Highly Relevant school premises/church)
2002.2 7)	Transport of Construction materials and waste	Highly Relevant school premises/church)
2002.2 8)	Water	Highly Relevant (stream nearby)
2002.2 9)	Flora and Fauna	Relevant
2002.2 10)	Physical and cultural resources (temple)	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 (pollution)	Highly Relevant
2002.2 16)	Disruption to public (schoolchildren)	Highly relevant school premises/church)
2002.2 17)	Utilities and roadside amenities (road to temple)	Highly relevant (public
2002.2 18)	Visual environment enhancement	Highly Relevant (busy junction)
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 (school children)		
2003.2	Safety organization and communication	Highly Relevant
2003.3	Child Labor and Forced Labor	Highly Relevant
2003.4	Safety reports and notification of accidents	Highly Relevant
2003.5	Safety Equipment and Clothing	Highly Relevant
2003.6	Safety inspections	Highly Relevant
2003.7	First Aid Facilities	Highly Relevant
2003.8	Health and safety information and training	Highly Relevant
2003.9	Plant equipment and qualified personnel	Highly Relevant
<p>Relevant: The section is relevant to the site as a common ESMP applicable to any site</p> <p>Highly relevant: The contractor should pay special emphasis in the preparation of environmental method statements to ensure that the relevant ESMP is implemented specific to the site</p> <p>Possibly relevant: This ESMP will be triggered if the site come across with relevant aspect during project implementation</p> <p>Not relevant: The section may not be relevant to this site under disclosed conditions</p> <p>Optional: require to be implement if needed only</p> <p>Refer site specific monitoring plan: Contractor is obliged to carry out monitoring as specified in the site specific monitoring plan in addition to monitoring requirement indicated in contractors ESMP</p> <p>Reference: Contractors Obligation for implementation of ESMP</p>		

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
<p>i. Erosion control and overland runoff management</p> <ul style="list-style-type: none"> • During the excavation work if the surfaces are to be exposed during rainy season it is recommended that it is covered appropriately to prevent erosion and generation of sediment laden runoff • Sediment laden runoff if generated should be directed properly to storm water drains • Silt traps should be placed to reduce the load of sediments entering the drains • If sediment are filled in the public drains they should be cleaned regularly by the contractor 	Site preparation and construction	Construction Contractor

<p>ii. Disposal of construction waste</p> <ul style="list-style-type: none"> • 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 any circumstance construction waste should not be released to the school or church premises. Contractor should obtain the approval from the Seethawaka Pradeshiya Sabha for disposal of solid waste at approved locations. 	Site preparation and construction	Construction Contractor
<p>iii. Safety of structures</p> <ul style="list-style-type: none"> • The construction works should not cause any damage to the historical statue. The moving machinery should be careful of not to damage the statue and the structures. • The vibration generating activities should be carried out within the prescribed limits to ensure that no damage happens to the statue and the school buildings 	Construction	Construction Contractor
<p>iv. Dust and aerosol control screen</p> <ul style="list-style-type: none"> • The heavy dust generation activities should be carried out with sufficient care. • Adequate water spaying is recommended to this site. 	Site preparation and construction	Construction Contractor
<p>v. Water for construction</p> <ul style="list-style-type: none"> • Water for construction works should be obtained only from the approved places. • Water in the school or church sources should not be used for construction work under any circumstance. If water in the school or church is used consent from school management or from the priest of the church should be required. 	Construction	Construction Contractor
<p>vi. Working hours</p> <ul style="list-style-type: none"> • The construction activities should be in accordance with school management. • Noise, vibration and dust generation activities should be carried out after school. • During exam times disturbing (noise and vibration) activities are not allowed • If night time operations are required to achieve project targets such works should be carried out with adequate safety measures • Work should be discontinued on special festival days of the church • The school management and the church should be informed of heavy noise/vibration generation activities 	Construction	Construction Contractor
<p>vii. Warning dissemination</p> <ul style="list-style-type: none"> • There is a risk of damage to upslope buildings due to project actions. During heavy rain possible damages to the building can happen even if there is no project work. • Therefore it is best to advice the school management to respond to NBRO warnings during the rainy season and evacuate the risky school buildings during the construction phase. 	Construction	E & S Unit of PMU
<p>viii. Safety of school children</p> <ul style="list-style-type: none"> • The school management should be made adequately aware of possible issues detrimental to school children as indicated bellow <ol style="list-style-type: none"> Expose school children towards narcotics, alcohol, sex abuse, smuggling, and various criminal offenses and a wide range of unsuitable habitual behaviours Bulling and harassment to children Quarrels with children and parents Distracting children from education Tempting children and parents towards offensive deals Informal form of child labour Various forms of disputes with members of the church and devotees Use of sanitary facilities of school and church by the workforce 	Construction	E & S Unit of PMU contractor

<ul style="list-style-type: none"> • The PMU ES unit should engage in meaning full consultation with school management and the church regarding above mentioned issues. Each issues should be properly communicated and adequately discussed. Also, it is advised that PMU request from the school management and church on the following <ol style="list-style-type: none"> i. Make students and parents aware of the project ii. Possible social issues that will have impact on children iii. Establish a system of vigilance to monitor the behaviour of children with the workforce and the movement of workforce during construction phase iv. Establish a confidential information received system in the school premises to receive any complains pertinent to the project v. Enforce a system to punish or remove troublesome workers vi. Make the priest in the church adequately aware of the project, interruptions, impacts of noise and dust etc vii. Conduct meaningful consultation to obtain consent of the priest to the project, and to form a platform to manage any disputes that may arise during the construction phase • The PMU should made contractor aware on all potential issues with contractor workforce and school children and church that should be properly managed. Following are recommended for contractors' workforce <ol style="list-style-type: none"> i. Proper awareness, education, monitoring and punishing. ii. Define project activity zone beyond which workers cannot enter in to school premises iii. Workers cannot use water sources of the school/ church iv. Workers cannot use sanitary facilities of the school/church 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. Full time watchmen should be kept in the risk area to ensure safe movement of heavy machinery and vehicles <ol style="list-style-type: none"> i. Adequate no entry / danger signs and monitoring should be established so that school children are not permitted in the project areas ii. Discontinue construction work on religious festival days of Christians iii. The electrical wiring systems and layout should be done with proper safety measures approved by the PMU ensure that accidents mainly to children from electric shocks are prevented iv. Parking and storage areas should be done in approved locations by the PMU 		
<p>ix. Safety structures/sign boards</p> <ul style="list-style-type: none"> • During construction face adequate safe fencing should be establish to prevent potential falling risk of Children/ students from upslope areas. • Warning sign board indicating slope instability risk should be placed at the down slope areas which are occupied by the public for various reasons (wait for buses, three wheel parking, idling etc). As the risk is high during the rainy season where there is no construction work it is mandatory that safety signs boards are displayed even during the no project period as well. 	Construction	E & S Unit of PMU contractor
<p>x. Traffic management and safety</p> <ul style="list-style-type: none"> • Traffic management system should be in place day and night. A good traffic management plan should be prepared with the concurrence of Hanwella Police and RDA as this is a busy junction vulnerable to accidents. And should be approved by the PMU. 	Construction	E & S Unit of PMU contractor
<p>xi. Contractors workforce code of conduct</p> <ul style="list-style-type: none"> • The contractor should take necessary steps to maintain high level of discipline among the workforce. The workforce should be made aware of the rules and regulations and behaviour inside the premises. Suitable supervision arrangement should be made to control labour force miss 	Construction	E & S Unit of PMU contractor

conduct within the premises during construction work. Proper arrangement should be to provide sanitary facilities for workforce. It is recommended not to use the sanitary facilities inside the premises without full permission of the court management. A good record of violation of code of conduct should be maintained for this site.		
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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	Recommended only after considering the detailed project works and site drainage conditions
	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 subject to) *
	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 *
ii. 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	
iii. 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	
iv. Reporting requirements	Stream water quality – Comparison with ambient water quality standards published by the CEA, 2017 Pre crack survey of the high risk houses -Professional report Ground vibration -as per The interim standards on vibration for the Machinery, Construction activities and Vehicular movements, CEA Background noise measurement –Extraordinary Gazette No.924.1, May 23,1996, CEA Air quality particulate matter - The National Ambient Air Quality standards stipulated under the Extraordinary Gazette, No. 1562/22 August 15, 2008 -Central Environmental Authority of Sri Lanka.	

13. Grievance redress mechanism for this site

The consultants ES officer is responsible for establishing the grievance redress mechanism for this site **with special consideration for following impact communities;** a) Principal St. John Bosco's College, b) Priest of the church c) Occupants of nearby boutiques.

(Reference: *Environmental and Social Management Framework for recommended procedure for establishment of grievance redress mechanism*).

It is also recommended to place a grievance box in church buildings as well often discussion with Rev. Father.

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
19/10/2018 @ 8.00am	St. John Bosco's College Kaluaggala.	Mr. Dilanka Kumarapperuma Vice Principle St. John Bosco's College Kaluaggala.
22/10/2018 @ 9.00am	Our Lady of Sorrow Church Kaluaggala.	Rev: Anton Ranjith Chief Parish Priest Our Lady of Sorrow Church Kaluaggala.

Annexure I: Drone image of the project area (soon after the failure)



Annexure II: Images of the site condition and the consultation



Fig a: Our Lady Sorrow Church



Fig b: St. John Bosco's College



Fig c: NBRO team was communicating with the Parish Priest of the church



Fig d: NBRO team was counseling the deputy principal of the school



Fig e: Risk culvery statue of the church



Fig f: Risk school buildings

Annexure III: Report on the Stakeholder Consultation: Colombo District

Date: 22/10/2018 (over the telephone conversation)		
Institution	Name and designation of the contact officer	Concerns raised
Road Development Authority	Mr. E.A.N.S. Edirisinghe –Executive Engineer – RDA, Awissawella	<ul style="list-style-type: none">✓ This area is under the jurisdiction of RDA – Awissawella✓ The RDA has no objection and states the mitigation is very much needed.✓ Other concerns raised<ul style="list-style-type: none">• 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 office Awissawella.• A proper handing over of the project is required after the mitigation• RDA will do the maintenance after mitigation
Central Environmental Authority	Ms. M.R. Namalee Assistant Director – CEA, Western Province	<ul style="list-style-type: none">✓ No objection of CEA with the mitigation of this site

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
H Kusalasiri	Technical Officer/ESSD/NBRO	GIS/Demographic data /survey support

Annexure VI: List of references

1. NBRO site investigation report on landslide disaster at Kaluaggala
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