REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

Site No. 60

Niwithigala Town

Ratnapura District

February 2019

Prepared for:

ASIAN INFRASTRUCTURE INVESTMENT BANK

Prepared by:

National Building Research Organisation
99/1, Jawatta Rd | Colombo 05
Tel: 011-2588946, 011-2503431, 0112-2500354

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
ESMF	Environmental and Social Management Framework
ESMP	Environmental Social Management Plan
SSE & SMP	Site Specific Environmental and Social Management Plan
GN	Grama Niladhari
GSMB	Geological Surveys & Mines Bureau
IUCN	International Union for Conservation Nature
LRC	Land Reforms Commission
NBRO	National Building Research Organization
RDA	Road Development Authority

1. Introduction

The government of Sri Lanka intends obtaining a loan from the Asian Infrastructure Investment Bank (AIIB) for mitigating/rectifying unstable slopes in high risk areas especially in 11 districts of 06 provinces of the country. The project requires to be implemented in accordance with environmental and social safeguards and mandates of the AIIB and that of Sri Lanka. Considering the nature of project actions and its implementation, an environmental and social management framework has been (ESMF) prepared as required by the AIIB environmental and social safeguard policy.

The purpose of the environmental and social management framework (ESMF) is to provide a guide for application of AIIB safeguards and national environmental and social mandates during the implementation of project actions. The project implementing agency (NBRO) is expected to ensure implementation of environmental and social management plans prepared under the ESMF during all phases of project implementation so that the impacts on the environment and community are minimum.

During the scoping exercise it was revealed that the environmental & social setting, and health & safety conditions are more site specific, and require to be addressed specific to site conditions. Therefore, the ESMF has recommended a site specific environmental and social assessments followed by Site Specific Environmental and Social Management Plans (SSE & SMP) for each site. The SSE & SMP gives planning, design, construction and operation phase environmental, social, and health & safety management measures to be considered in the project Implementation.

This is the site specific environmental and social management plan for Niwithigala Town 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. 60, Ratnapura District, Niwithigala town

Site Details

i. The site falls administratively under Nivithigala Grama Niladhari Division (GN division) of Nivithigala Divisional Secretariat Division (DS Division), Ratnapura District of Sabaragamuwa Province.
ii. The site is located behind the previous weekly fair (Sathipola) premises in Niwthigala; Right Hand Side of Thiriwanaketiya - Agalawatta Road.
iii. The nearest town to the site is Nivithigala and is in the proximity.
iv. Niwithigala Sumana Maha Vidyalaya is located to the right hand side about 75m from the proposed mitigation site.
v. GPS reference of the site is 6.59718N, 80.45484E. Ref. Map of the location Fig 1.
vi. The land ownership is a Government land belonging to Nivithigala Pradeshiya Sabha.

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

3. Landslide hazard incident details

A cut slope failure had occurred in the year 2003 at this location according to the information. Another slope failure had occurred at the same location on 26th May 2017 due to heavy precipitation. That prevailed on three consecutive days; 24th, 25th and 26th of May 2017. The non-engineered vertical cuts had made for town expansion and road construction had created unstable slope section at this location.

The damages occurred due to incident

The cut slope occurred on 26th May 2017 had damaged 4 business places (retail shops and a grinding mill). at the toe area of the slope. Out of these 4 business places a concrete mound was persisted and all other structures were damaged. Out of them one building has completely damaged while other sides of the 2 buildings have been damaged. The grinding mill building has been renovated and rented out for a vender dealing with rubber products.

Simultaneously to this incident, several building cracks and tension cracks had occurred in the adjacent buildings and on ground in the upslope area; cracks on the walls of Niwithigala Sumana Maha Vidyalaya and the upslope houses and ground cracks in their premises have occurred on the same day. The incident had not caused damage to agricultural lands, service infrastructure, crops etc. Ref. Fig 2: Images of project

Fig 2a: Current view of the failed slope area

Fig 2b: Vegetation cover of the flailed slope and the damaged structures.

Fig 2c: Two sides of the Thiriwanaketiya – Agalawatta Road adjacent to the cut slope

Fig 2d: Opposite side of the road of the cut slope (shops and houses are observed)

Fig 2: Images of the project area

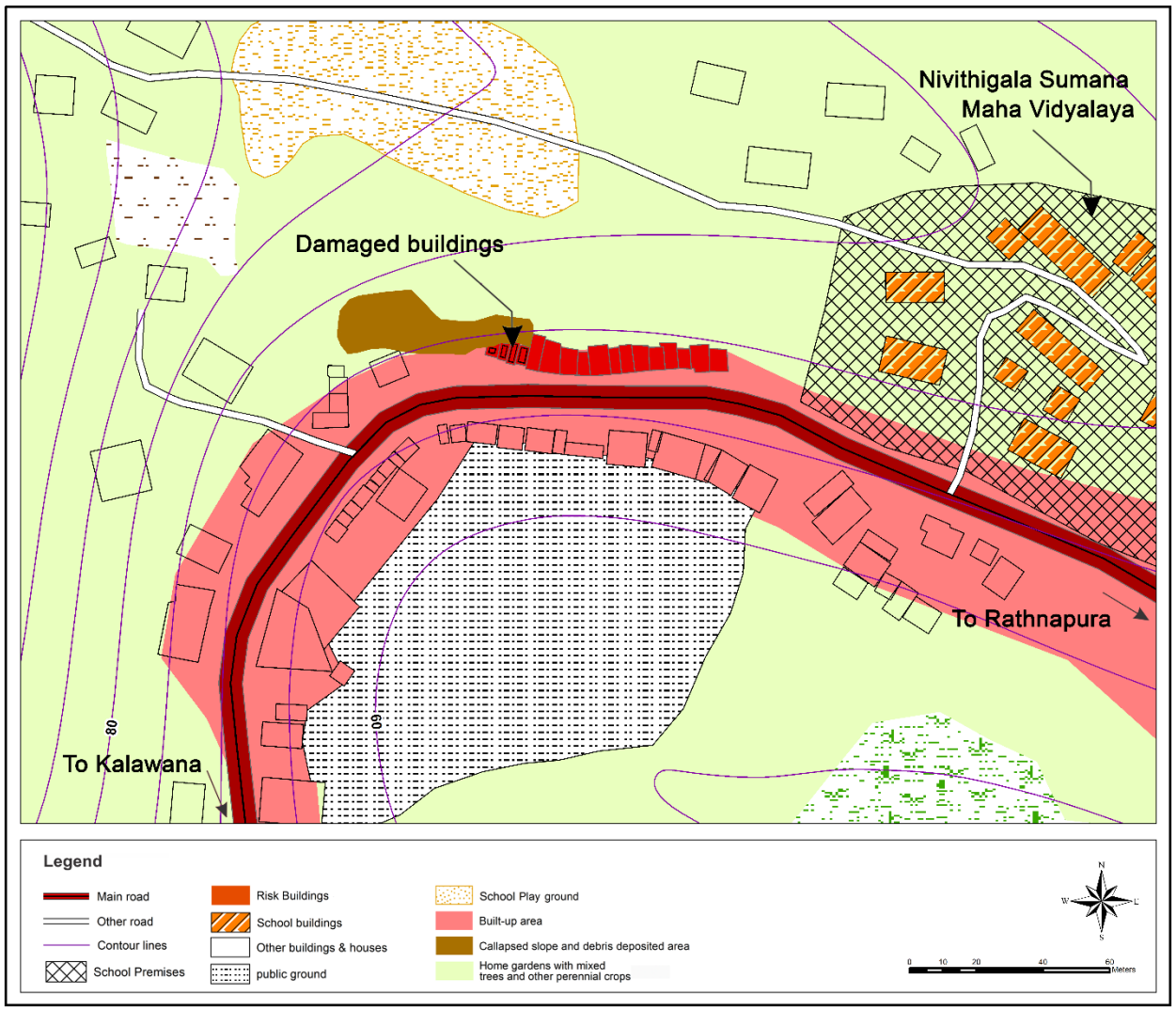


Fig 3: Diagrammatic interpretation of affected slope area and buildings due to ground movement

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

No any remedial measures has been taken to reduce the potential risk, but evacuation of the risk buildings.

4.1 Evacuations:

The incident had totally damaged 3 shops while one shop had been partially damaged and the shop owner has evacuated his business. The owners did not re-establish their shops after the incident. According to the NBRO report of Nivithigala town dated 12/09/2018, tenants of 12 shops had been advised to evacuate from their shops due to the risk of future failure. But they are evacuating their buildings only during heavy rainy period. The fair (Sathipola) had been moved to an adjacent ground at the opposite side. The NBRO report indicates that these people are allowed to live their houses and carry out their activities in the buildings however, the people have to operate their business responding to warning alters where occupants have to move if the rainfall exceeds 150mm/ day or 75mm/ hour.

4.2 Resettlement (Progress):

There is no identified resettlement mechanism for the risk communities.

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

The mitigation site is situated at the toe area of South Eastern slope of a mountain range, which is spreading to the East – West direction in a small township. The Thiriwanaketiya – Agalawatta road runs at the toe area of that terrain. The height of the sloppy area is about 40m from the road level and with the slope of 30-40 degree toward the road. A thick layer of residual soil with lateritic origin in the sloppy area could be observed and there are no bedrock exposed in the region. At present the failed slope on the upslope area is covered with a vegetation, dominated with plants like *Erabodu, Wetamara, Astonia, Kenda, Rukaththana* etc. The understorey vegetation consists with grasses like *Glyceina*, *Lemon* grass etc. The immediate area of the failed slope is RDA road reservations and commercial buildings of Niwithigala town owned by several private parties and Local Authority of Niwithigala are located alongside the road as clusters. The commercial facilities such as banks and shops are also found either side of the main road. The downslope area adjacent to the road is also used for keeping timber hunks to sell for gem miners. The playground of the Niwithigala Suamana Maha Vidyalaya is located on a flat terrain at the crown area of the slope.

Following named houses, business places are marked as medium risk (Table 1) by the NBRO report.

Table 1: Risk Houses and Business Places

Shops located in Left Hand Side of Thiriwanaketiya Agalawatta road	**Shops located in RHS of Thiriwanaketiya Agalawatta road**
01 Mr. Sisira	01. Commercial Astrological Service center
02. Indika Hotel (H.M Samarakoon Bandara)	02. Shop No 66/H
03. Fertilizer shop	03. Shop No 66/G
04. Ms. Kumari	04. Shop No 66/F
05. Pinkanda	05. Mr. Lakshman
	06. Ushan tailors
	07. Daya Cycle Center

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

Surrounding area consists of commercial and service buildings, houses, home gardens and the road infrastructure. No forested areas, wild life reservations, environmentally sensitive habitats found within the study area. No ecologically significant habitats found in the area. The natural ecology of the area is greatly disturbed and displaced by urban commercial and residential buildings and infrastructure.

Due to the project actions following will be affected

i. Road traffic and commuters of the road and pedestrians
ii. Playground of the Niwithigala Sumana Maha Vidyalaya and its users, children of the school
iii. Occupants of the houses and tenants of commercial buildings
iv. Current economic activities of the area
v. High tension power line (33000 V) , public water supply lines and telephone line which are running through the mitigation site

7. Description of the works envisaged under the project

The proposed mitigation works will be construction of surface drains at the playground area, horizontal drains, soil nailing and planting on nail surface

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

8.1 Positive impacts

i. The affected site is located at the Niwithigala town centre. The proposed mitigation will make currently unstable slope at the road side stable, securing safety of commuters. Ensure good connectivity between the cities; Thiriwanaketiya - Agalawatta Road.

ii. The land, the buildings and houses currently at risk will be safe for living and business activities. The occupants of risk houses or tenants at business places will not require for evacuation. As the land in the Niwithigala town has a higher development demand, the future development opportunities will be ensured.

iii. This road is one of an access road to the world heritage site in Sri Lanka the Sinharaja Forest Reserve located in a distance of about 23 km, the mitigation work will ensure the safety of the travelers; both local and international.

8.2 Negative impacts

The work is confined to an area which is already disturbed by a slope failure. Therefore, negative impacts are much localized and limited only to construction period as described bellow

8.2.1 Loosing access to land and future development activities

The mitigation work at this site is confined largely to a slope which has already failed. Considering the very nature of construction work in a confined area there will be no permanent loss to access or losses to future development opportunities.

8.2.2 Ecological, biological impacts, and fauna and flora

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

8.2.3 Impact on the drainage pattern of the area

Disruption of existing surface and sub-surface drainage pattern in the area is envisaged with the project implementation.

8.2.4 Erosional impacts and stream bed alterations

The mitigation works in this will focus largely on the drainage improvement. Therefore, during rainy season sediment laden flow of runoff is expected to enter the storm water drains in the Niwithigala town.

8.2.1 Water pollution impacts from construction activities

Since there are no streams nearby the (within 100 m distance), the impact is not highly significant.

8.2.6 Open defecation and waterborne infections spread during construction phase

The effect is insignificant as the site is located in an urban area and adequate sanitary facilitates are available in the near distances.

8.2.7 Impacts on the downstream water uses

The water quality impacts from discharge of wastewater and pollutants to environment during construction phase is not very significant as there are no water ways nearby.

8.2.8 Solid waste disposal issues

Haphazard disposal of solid waste can become a nuisance, can pollute the runoff and leave various environmental impacts if proper disposal mechanism is not in place during the construction period. Since the mitigated site is located at the Niwithigalala town adjacent to Thiriwanaketiya - Agalawatta Road, disorganized disposal of solid waste may create inconveniences to commuters and pedestrians and the inhabitants close to the site. This can make obnoxious feeling to these people. Therefore, environmental and social impacts of poor management of solid waste in this site **is highly significant**.

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 and 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, silica) and this can carry for large distances over a long period of time. The direct exposure risk of residents to air pollution is significant as there are houses, service and commercial buildings alongside the road. Further, air pollution may have an impact on the customers of commercial buildings, pedestrians/ commuters of the road too.

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

Noise and vibration is expected from construction equipment. Noise impact is significant as there are buildings with occupants living close to the site. Hence the project will have noise and vibration impacts on the neighboring community; specially the occupants in the houses and commercial buildings and day today customers coming to the business places. Vibration can affect the stability of already cracked buildings.

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

There may be disputes with the workers of construction site and the occupants in the houses, and the workers and customers of nearby shops as all of them have to use common access paths.

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 the community. If proper camp management is not in place it may result several labour issues, social issues, 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 have machinery with high hazard risk such as drilling, boring and excavation machines etc. Only skilled workforce will be safe working in this environment. If unauthorized persons access the site they may be at risk of being subjected to accidents by the heavy machinery.

8.2.14 Explosive hazards and hazardous materials

The slope does not contain large boulders, hence explosives are not needed.

8.2.15 Safety to the public from construction activities: High risk for commuters

As this is a busy area in the town, many use this area in weekends and day of the fair (*sathipola*). On the other hand several heavy construction machinery are expected to be operated at the site. The free space between the failed slope and the main road and other buildings are very much low for simultaneous operation of both shops functions and construction activities. Therefore, disturbance to smooth operation of shops, obstruction to passage, and risk of accidents from moving machinery is **highly significant during construction phase.**

8.2.16 Workers safety during construction

The worker safety during construction phase has risks common to any landslide mitigation site. Contractor may engage under age workers (children) for construction work, which is risky results serious accidents and injuries.

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

Ms Kumuduni Nayana; a shop owner was consulted during the field visit. She was made aware about this mitigation project. As this mitigation work is very much beneficial to shop owners Ms Nayana has indicated full support to the project.

9.1 Stakeholders involved in the consultations: recommendations or agreements reached in the consultations (Refer annexure III)

Niwithigala Pradeshiya Sabha and Mr. K.A.Weerasinghe, principal of Niwithigala Sumana Maha Vidyalaya were consulted about this mitigation project.

10. Significant Environmental and Social Issues: Social or Environmental impacts or risks that will require special measures on the part of NBRO

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 the environment. Since there is no water stream nearby the impacts will be localized and insignificant.

10.2 Erosional impacts and stream bed alterations

Erosional impacts on the upslope area is high if the work envisaged during rainy weather periods. The water with high suspended solids may enter storm water drains during wet periods.

10.3 Explosive hazards and hazardous materials

There are no large rocks or rock boulders in the affected slope area. The rock blasting may not be encountered for this site.

10.4 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 (children who are using the playground tenants in shops and customers, commuters and pedestrians) noise, air pollution and vibration impacts, and cracks in downslope buildings (shops and other service buildings)

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

The mitigated site is located in a highly business area, Niwithigala town. Several offices (Banks), shops and service providing places are in the vicinity. The moving machinery, noise, vibration may have impacts on occupants, business venders and on the buildings during construction.
Further, the place where the gem sales are conducted is located about 150m from the affected area towards. The traffic is high during gem sales times. The moving machinery may have impacts on the traffic movement as there are more than 100 people (buyers, labours and owners of gem pits) get involved in gem sales on the road at a time (usually in the morning)

10.6 Safety to the public from construction activities: High risk for commuters

As this is a busy area in the town, many people are moving in the peak hours (school time, office time). On the other hand several heavy construction machinery are expected to be operated at the site. The free space between the failed slope and the road and other buildings is less for simultaneous operation of town functions and mitigation works. Therefore, disturbance to smooth operation of town, obstruction to passage, and risk of accidents from moving machinery is highly **significant during construction phase.**

10.7 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 may occur due to intentional or unintentional purposes may at risk due to operating machinery, and vehicles, electricity, and may be blasting materials.

10.8 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.

10.9 Child labour & forced labour

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

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

11.1 Project implementation

i. Approval from the District Secretariat
   The approvals will require to be obtained from the District secretary for the implementation of project where the proposals need to be presented at the district coordinating committee, to which chief minister and stakeholder agencies in the district will also participate. The Officer of PMU will present the project, disclose the project details and various concerns including environmental and social. This issues will be discussed, the recommendation at this meeting will be considered in the implementation of the ESMP.

ii. Approval from the planning committee
   The project will obtain the approval from the planning committee of the Niwithigala Local authority.

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

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

According to the Central Environmental Authority, the area comes under a sensitive area under the Soil Conservation Act 772/22 of 1996. of National Resource Management Centre, Ratnapura District has been gazetted a sensitive area except the Embitipitiya area, hence CEA approval is needed. As there are no

forest reservations and wildlife habitats; Department of Forest and Department of Wildlife Conservation approvals are not needed.

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 Niwithigala 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
vi. Approval from Additional Director National Plant Quarantine Service Katunayake for Director General of Agriculture under the Plant Protect Act No. 35 of 1999 Plant or seed if needed for bio Project Managed slope mitigation shall be imported into Sri Lanka under the authority and in accordance with the conditions, of a plant importation permit issued.

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

Signing a legally bound agreement between the land owners (Niwithigala Local Authority) and the project implementing authority allowing no-objection to remove the structures, access the land, implement construction works, and engage in long-term maintenance works. Allow land owner to extract/ or extraction by the contractor on behalf of the land owner any valuable items from the structures. Project bear the cost of removal of the structures.
The tentative timeline for getting approval is given in the table 2.

Table 2: Tentative timeline for getting approvals

Approvals	Month 1				Month 2			
	W1	W2	W3	W4	W1	W2	W3	W4
Project implementation ***Approval from the District Secretariat*** Submission of application Project briefing Respond to comments Approvals								
Approval from planning committee Submission of application Project briefing Respond to comments Approvals								
Approval from state land owners CEB, CEA Submission of application Respond to comments Approvals								
Other approvals GSMB Ministry of Defense (Depends on the requirement)								

12. Environmental Social Management Plan (ESMP)

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

12.1 Resettlement action plan

There is no project based resettlement plan. However, there are business places in the risk zone

12.2 Evacuation of people

The occupants of three damaged shops have been already removed from the toe area of the failed slope. According to the NBRO report, 12 shop owners advised to evacuate from their shops either sides of the road in the toe area due to the risk. But they evacuate from their shops only during heavy rainy periods. Fair (sathi pola) had moved to adjacent ground due to collapse

12.3 Procedure for removal of damaged structures, facilities infrastructure

Damaged shops (3 retail shops and grinding mill) need to be removed during the construction phase. As the built house even if damaged should not be removed without full approval of the owner. Meaningful consultation should be done to get the owners agreed for removal if the house needs demolition. The owner may require removal of the structure at the project cost as it has no future value. But, signing a legally bound agreement between the land owners and the project implementing authority allowing no-objection to remove the structures is mandatory.

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

Possible compensations may be required at several elements as the project activities will take place on highly congested limited space. The possible damages requiring compensation may include

i. Cracks from excavations and vibration on already damaged buildings
ii. Cracks from excavations and vibration on other risk buildings
iii. Service infrastructure such as electricity lines, water supply lines and telephone lines if damaged, provide alternative sources or immediate repairs etc.

12.5 Public awareness and education- needed for following areas

i. Programs to inform and educate people in the vicinity about the risks posed by landslides and occupants in risk houses to respond to rainfall based early warning alerts of NBRO
ii. Program to inform and educate school community; staff, student on risk of accessing playground during the mitigation activities.

12.6 Design based environmental/ social management considerations

Following environmentally and socially significant design considerations are recommended.

Table 3: 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	Medium
ii. Habitat connectivity and animal trails If large fraction of vegetation is required to be cleared in ecologically fragile habitats as for permanent structures or for access , or if deep drains etc. are to	low

be made the designs should include habitat connectivity features, animal trails and vegetation strips and etc. even if the impact are localized.	
iii. Conservation of water resources This involves extraction of water both surface and sub-surface. The water extracted is in relatively good quality. In a well thought design this extracted water can be conveyed in such a manner that the water can be accessed by people for drinking and other purposes. The consultation indicated water scarcity during dry season in this area, the extracted water can be used as an alternative water source for the area.	Not relevant
iv. Aesthetically compatible design considerations The designs in aesthetically sensitive environments should consider structures that blend with natural environment to keep the visual pollution to minimum. Service of landscape architect may be important for the design of suitable mitigation structures.	High as the road slide slope
v. Consideration of green environmental features As many of the mitigations works are carried out in ecologically sensitive habitats, it is recommended to consider green environmental designs as much as possible in the designs e.g.: use of local vegetation species for erosion control, combination of plants to sustain species diversity in the environment, avoiding inclusion of potentially invasive species & etc.	High
vi. 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	Very High
vii. Erosion control structures In drainage management, water is extracted and conveyed to nearby surface water drains. During rainy season the flow in these drainage structures can be significantly high and this may additional loads. Hence the design should adequately consider flow speed breakers to reduce erosive flows entering storm water drains and drain along the roads.	low
viii. Low post maintenance and operation designs The mitigation should consider passive techniques such as gravity drains for drainage management. Correct pipe diameters, pore diameters and laying angles should be considered to avoid clogging of drains. Low maintenance structurers 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 should be chosen carefully so as to withstand weather conditions with high durability. Designs should specially consider corrosion prevention techniques if steel structures are used.	Very high

12.7 Mitigation of impacts during the construction phase

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

Measures to manage and to mitigate the environmental and social impacts are generally common to all landslide mitigation sites. Such impacts are largely attributed to activities in the construction phase. The mitigation of impacts therefore becomes an obligation of construction contractor. NBRO has prepared a comprehensive document on "***contractors' requirement to comply with environmental and social, Health and Safety (ES & HS) management during the construction phase"*** to be included in construction

contractors' bid document. The main sections are summarised below indicating the degree of relevancy for this site. For details ESMP for construction contractors should be referred.

Table 4: Contractor requirement to comply with ES & HS

Reference No. as per construction contractors obligation to ESMP	**Item**	**Relevant to the project**
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Highly Relevant (roadside)
2002.2 2)	Noise and Vibration	Highly relevant (buildings, commuters and Pedestrians)
2002.2 3)	Cracks and damages to the buildings	Highly relevant (buildings)
2002.2 4)	Disposal of waste	Highly relevant (roadside)
2002.2 5)	Disposal of refuse	Highly relevant
2002.2 6)	Dust control	Highly Relevant (tenants in buildings, commuters & pedestrians)
2002.2 7)	Transport of Construction materials and waste	Relevant
2002.2 8)	Water	Relevant
2002.2 9)	Flora and Fauna	Low Relevance
2002.2 10)	Physical and cultural resources	Possibly relevant
2002.2 11)	Soil Erosion	Highly 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
2002.2 17)	Utilities and roadside amenities	Highly relevant
2002.2 18)	Visual environment enhancement	Relevant
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
2003.3	Child Labor and Forced Labor	Relevant
2003.4	Safety reports and notification of accidents	Highly relevant
2003.5	Safety Equipment and Clothing	Highly relevant
2003.6	Safety inspections	Highly relevant
2003.7	First Aid Facilities	Highly relevant
2003.8	Health and safety information and training	Highly relevant
2003.9	Plant equipment and qualified personnel	Highly relevant

Relevant: *The section is relevant to the site as a common ESMP applicable to any site*
Highly relevant: *The contractor should pay special emphasis in the preparation of environmental method statements to ensure that the relevant ESMP is implemented specific to the site*
Possibly relevant: *This ESMP will be triggered if the site come across with relevant aspect during project implementation*
Not relevant: *The section may not be relevant to this site under disclosed conditions*
Optional: *require to be implement if needed only*
Refer site specific monitoring plan*: Contractor is obliged to carry out monitoring as specified in the site specific monitoring plan*
Reference: Contractors Obligation for implementation of ESMP

12.7.2 Site specific mitigation

Table 5: Site specific ES & HS mitigatory measures

Mitigation item	Project implementation phase	Responsibility
i. **Dust and aerosol control screens** Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged	Construction	Construction Contractor
ii. **Noise and vibration control** The noise and vibration generating activities should be controlled and performed according to the recommended environmental regulations	Construction	Construction Contractor
iii. **Water for construction** Water for construction works should be obtained only from the approved sites	Construction	Construction contractor
iv. **Need for people to enter or cross the site** Possible unauthorized access to the site should be avoided by awareness, warning signs and vigilance by the contractor's full time watchmen.	Construction	Construction contractor
v. **Workers health and safety** As the workers in the site have to work in high risk conditions, it is imperative to implement recommendations given in section 2003 of contractors' obligation on ESMP under "working conditions and community health and safety". These recommendations should be followed carefully in a proper organization and safety monitoring system. 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. Safety barriers and safety nets should be installed at places of risk to protect workers, commuters and the community in the downslope from boulder/debris falling risk	Construction	Construction contractor
vi. **Removal of structures**: Require consent from the land owners for the site works.	Site preparation	E&SU of PMU
vii. **Awareness and education programs** on the following are important to be implemented. Programs to inform and educate people in the vicinity about the risks posed by landslides and occupants in medium risk houses to respond to rainfall based early warning alerts of NBRO Requirement for special awareness for school students exposed to potentially high risk during construction phase from moving machinery.	During the project implementation	E&SU of PMU
viii. **Erosion control and overland runoff management** 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 not let to flow through the road, but should be directed properly to storm water drains. Silt traps should be placed to reduce the load of sediments entering the drains. Sediment are filled in the public drains they should be cleaned regularly by the contractor.	Construction	Construction contractor

ix. Safety to the public from construction activities: High risk for commuters Disturbances to smooth operations in shops in Niwithigala town should be avoided as much as possible. Avoid or minimize moving of construction vehicles and machineries in the morning. Proper safety measures should be in place to avoid risk of accidents from moving machinery. The contractor should make necessary arrangement to avoid possible obstructions to access to the school ground, commercial and service facilities in the area	Construction	Construction contractor
x. No Entry Zone The PMU should make a detailed assessment on possible risk of slope destabilization in the site during construction phase. Evacuation of school playground of the Niwithigala Sumana Maha Vidyalaya and no entry zone may require to be declared for the playground during construction phase. Then should be made adequately documented and communicated to the contractor and the school management.	Construction	E & S Unit of PMU contractor
xi. Working hours The construction activities should be restricted day time only. Working after 6.00pm is not recommended. For any reasons due to safety issues.	Construction	Construction contractor
xii. Disruption to public (Road traffic and safety on road at night) Special attention should be made for road traffic management concerning traffic management in day time during crowded hours, and in night including traffic management for ambulances of the hospital. During crowded hours obstructions to traffic due to project actions should be minimal and reliable night lamps are mandatory. Watchman including night is compulsory at this site as the site is located near the hospital.	Construction	Construction contractor
xiii. Social disputes between workers and gem selling dealers The PMU should be made better awareness of contractor and the workforce about gem selling activities on the road near mitigation area. Gem selling is a specific business in this area and mainly it depends on the mutual trust of the buyers and sellers. There is a high possibility of create social disputes between contractor's workforce and gem dealers. Possible disputes between the labor force and the gem dealers should be prevented by maintaining the agreed code of conduct by the contractor.	Construction	Construction contractor

13. Monitoring requirements specific to the site

Following monitoring plan is strongly emphasized during the construction phase specific to this site. In addition to this, monitoring procedure indicated in the contractors' obligation to ESMP should also be implemented by construction contractor. 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 6: Environmental and Social monitoring plan; construction phase

Monitoring requirement	**Parameters**	**Frequency**
i. Baseline monitoring	Stream water quality	-
	Pre crack survey of the high risk houses	Once *
	Ground vibration	Once *

	Background noise measurement	Once *
	Air quality: particulate matter	Once *
ii. During construction	Stream water quality	-
	Crack survey of the high risk houses	If noticeable displacement is observed during construction **
	Ground vibration	During operation of drilling machinery, boring works, or any works that generate ground vibrations*
	Construction noise	Once a month during heavy noise generation times *
	Air quality particulate matter	Once a month *
	Fire safety system	Regular***
	Electrical wiring systems	Regular***
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 *** Safety officer contractor	
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. **Fire safety:** *As per fire safety standards for filling stations*	

14. Grievance redress mechanism for this site

The PMU ES officer is responsible for establishing the grievance redress mechanism for this site **with special consideration for impact communities;** a) Tenants of business places of Niwithigala town area, b) School management c) Other effected parties (*Reference: Environmental and Social Management Framework for recommended procedure for establishment of grievance redress mechanism)*

15. Information disclosure

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

Table 7: Proposed scheme of information disclosure

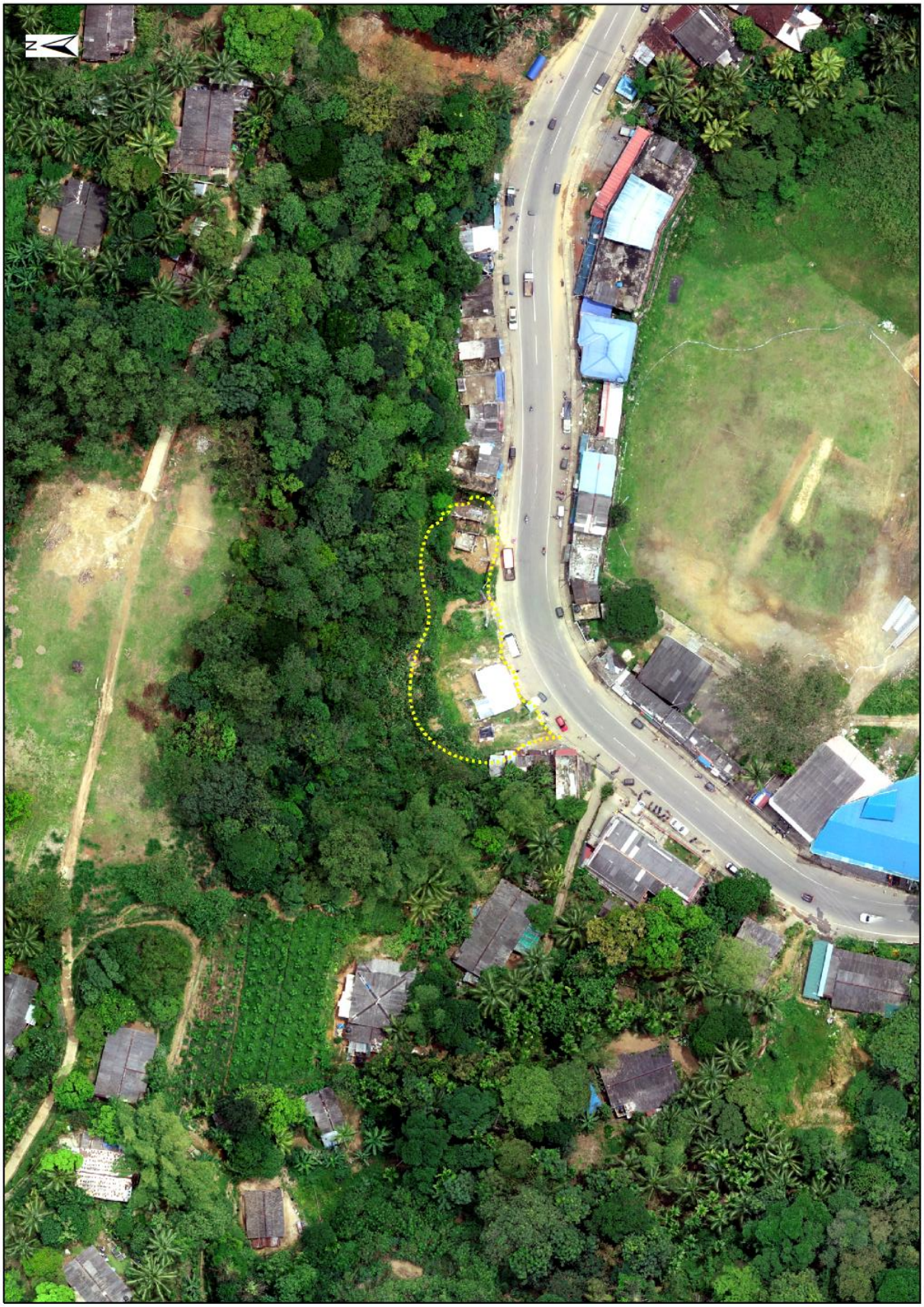
Information	Proposed agencies	Mode of information disclosure
i. Project plan (site details, design , implementation arrangements)	District CEA, DFC, DWLC, District Secretariat, Divisional secretary, Other district levels Agencies, NBRO district office, AIIB	Meetings, District coordination committee, submission of relevant report to sign agreements, approvals and consents.
ii. Monitoring reports (baseline and during construction)	District CEA, AIIB and relevant parties as appropriate	Progress meetings, special meetings, submission of relevant reports
iii. Site inspections for environmental conformance workers health and safety	District CEA, 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

iv. Decisions taken and progress review meetings pertinent to ES matters	District CEA, RDA, Divisional secretary, Police, State Land Owners, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate	Meetings, submission of relevant reports
v. 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**
09/08/2018 @ 10.00 hrs.	Central Environmental Authority	Mr.K G.D.N Kiriella Director –CEA Ratnapura District
08/03/2019 @ 11.00 hrs.	Pradeshiya Sabha -Niwiwthigala	Mr. Kulathunga Liyanage Chairman, Niwithigala Pradheshiya

Annexure 1: Drone image of the project area



Annexure 1I: Images of the site condition and the consultation

Fig a: Owner of the Rubber and Timber shop was made aware about the mitigation work by NBRO staff (08-03-2019)

Fig b: Mr.Kumuduni Nayana , owner of a retail shop was made aware about the mitigation work by NBRO staff (08-03-2018)

Fig c: Timber hunks kept at the downslope area and reconstructed business place after collapse

Fig d: Old Weekly fair premises

Fig e: Damaged buildings by the slope failure

Fig f: Vegetation cover of the failed slope area.

Annexure 1I1: Report on the Stakeholder Consultation: Ratnapura District

Date: 09/08/2018 and 08/03/2019		
Institution	**Name and designation of the contact officer**	**Concerns raised**
Central Environmental Authority	Mr.K G.D.N Kiriella Director –CEA Ratnapura District	✓ Under the Soil conservation Act 772/22 of 1996. of National Resource Management Centre, Ratnapura District has been gazetted a sensitive area except the Embitipitiya area ✓ Under this gazette any development is not allowed irrespective of the magnitude of the project. ✓ In a disaster this is not needed. ✓ The Basic Information Questionnaire (BIQ) is needed to fill for the project and submit the application ✓ Since the waterway is located downslope in the area it is needed to keep the Environmental flow ✓ There may be endemic species, special habitats (niches) , fauna flora study are needed ✓ This Environmental assessment may be required to see their difference after mitigation ✓ The CEA will grant approval with recommendations.
Pradeshiya Sabha - Niwiwthigala	Mr. Kulathunga Liyanage Chairman, Niwithigala Pradheshiya	✓ This site located in Niwithigala town is under the jurisdiction of Niwithigala Pradeshiya Sabha. ✓ Niwithigala Pradeshiya Sabha has no objection and states the mitigation is very much needed. ✓ Other concerns raised • A proper handing over of the project is required after the mitigation • Niwithigala Pradeshiya Sabha will do the maintenance after mitigation • It is emphasised that during the construction the contractor should use Personal Protective Equipment • At all times, the contractor shall provide safe and convenient passage for vehicles, pedestrians, and traffic safety measures, barricades, flagmen and for the night work, lights and illumination should be provided. ✓ It is also stated that Construction waste/ excavated materials should not be a nuisance to public/commuters

Annexure IV: 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 scientist
Abheetha Wanasundara	Officer in charge / Ratnapura District	Geotechnical Engineer
Indu Upamali	Scientist/ LRRMD/NBRO	Geologist
H Kusalasiri	Technical Officer/ESSD/NBRO	GIS/Demographic data /survey support

Annexure V: List of references

1. NBRO site investigation report on landslide disaster at Niwithigala Town – dated 12/09/2018
2. Contractor's obligations for Generic Environmental and Social Management Plan- Sri Lanka Landslide Mitigation Project-AIIB
3. Environmental and Social Management Framework-Sri Lanka Landslide Mitigation Project _AIIB
4. Resettlement Planning Framework- Sri Lanka Landslide Mitigation Project _AIIB