



REDUCTION OF LANDSLIDE VULNERABILITY BY MITIGATION MEASURES PROJECT

Site Specific Environmental and Social Management Plan

**Site No.85 – Location 02
Isipathana Mahamewna Asapuwa
Dodangoda
Kalutara District**

May 2021

Prepared for:



Prepared by:



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Abbreviations

AIIB	Asian Infrastructure Investment Bank
CEA	Central Environmental Authority
CEB	Ceylon Electricity Board
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 and Social Management Plan
GN	Grama Niladhari
GOSL	Government of Sri Lanka
GSMB	Geological Surveys & Mines Bureau
LHS	Left Hand Side
NBRO	National Building Research Organization
RDA	Road Development Authority
RHS	Right Hand Side
SSE & SMP	Site Specific Environmental and Social Management Plan

1. Introduction

1.1 Project overview

The Government of Sri Lanka has obtained 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 (ESMF) has been 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 **Isipathana Mahamewna Asapuwa, Kalutra** landslide mitigation site. This plan has been prepared by an in-depth environmental and social assessment to:

- i. Identify sensitive environmental and social elements in the project influence area
- ii. Identify significant environmental and social impacts due to project actions
- iii. Propose mitigation measures
- iv. Decide appropriate environmental and social monitoring requirements specific to this project
- v. Study relevant environmental regulations and procedures to be followed during project implementation specific to the site

1.2 Intended users

The document provides an in-depth insight into site specific environmental and social issues associated with the proposed project and the mitigation measures and intend to be used by landslide mitigation design team, the PMU and the contractor in the implementation of ESMP component of the project. The SSE&SMP is published in NBRO website and can be viewed by wide range of interested parties (public, stakeholder organizations) can be utilized by the contractors for the project and will form the basis of site-specific management plans that will be prepared by the contractors as part of their Site Specific Environmental and Social Management Action Plans (SS- ESMAP) prior to commencing works.

2. Description of the project and site descriptions

2.1 Name of the project

Reduction of Landslide Vulnerability by Mitigation Measures site No. 85 (Location 02), Isipathana Mahamewnaw Asapuwa, Dodangoda, Kalutara District

2.2 Location details

The proposed mitigation site falls under Serupita East GN Division of Dodangoda DS division in Kaluthara District of Western Province.

GPS references of the site - 6.613818°N, 80.011862°E

Elevation – 115ft AMSL (35m)

Nearest town to the site – Kalutara town about 10km from the site

Accessibility to the location

Isipathana Mahamewnaw Asapuwa is located in Dodangoda DS Division. The site can be accessed via Colombo – Galle highway (A02) road from Kalutara. Take the Riverside Road (Palatota Road) from the Clock Tower Junction once it passed the Kalutara Temple. When travel around 8.5km from the Kalutara city along Riverside Road can be found rural road which leads to village (on right site). The mitigation site can be found when travel around 2.5m while passing Aesthetic Training School, Civil Security Department via the road from junction.

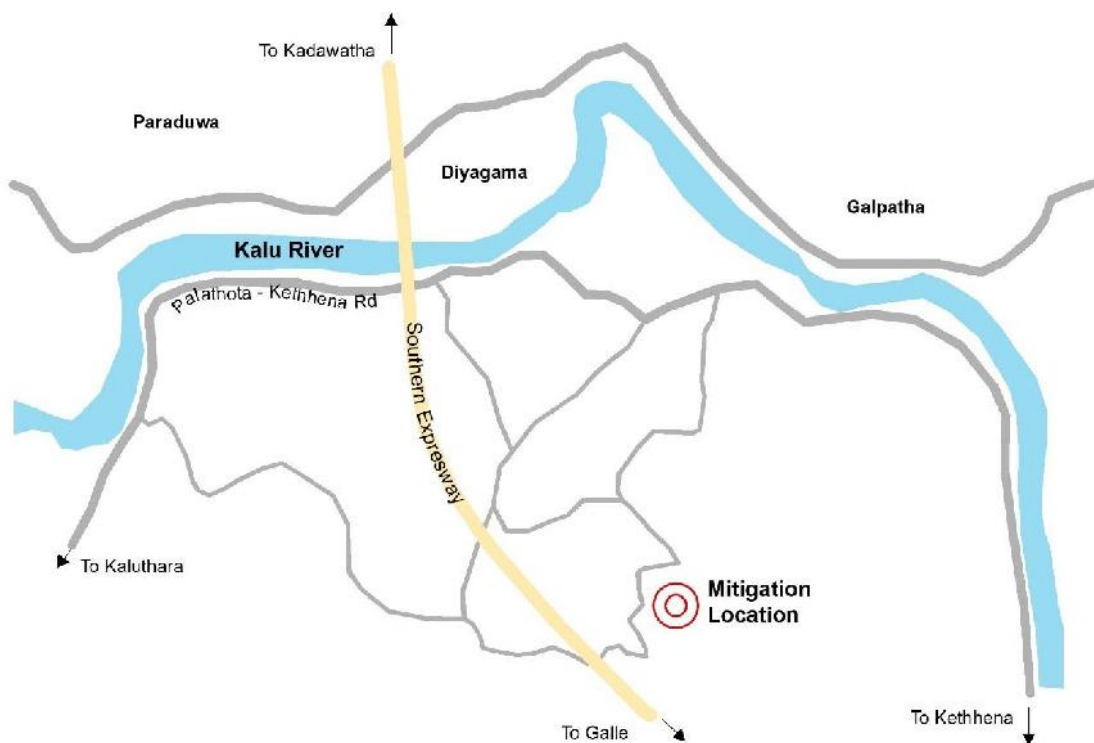


Figure 1: Accessibility to the location.

2.3 Topography and land ownership

The proposed mitigation site is located within the Isipathana Mahamewnaw Asapuwa (Temple) premises. General ground slope angle is around 30° - 32° directed to north –west. Total height of failed cut slope is 10 m – 12 m, and length of the unstable cut is 24 m. 1 m thick colluvium soil layer present at the top underlain by silty SAND residual soil layer

The extent of the land area of the Temple is about Eight (08) acres. The temple is located in a flat as well as hilly terrain where the natural slope is used and modified several of terraces to gain space for building construction. Regarding the land ownership it is under the custodian of the Temple land under the Vihara Dewalagam Act.

(Ref. Fig 2 for Google image of the proposed landslide mitigation site and surrounding features and service infrastructure.)

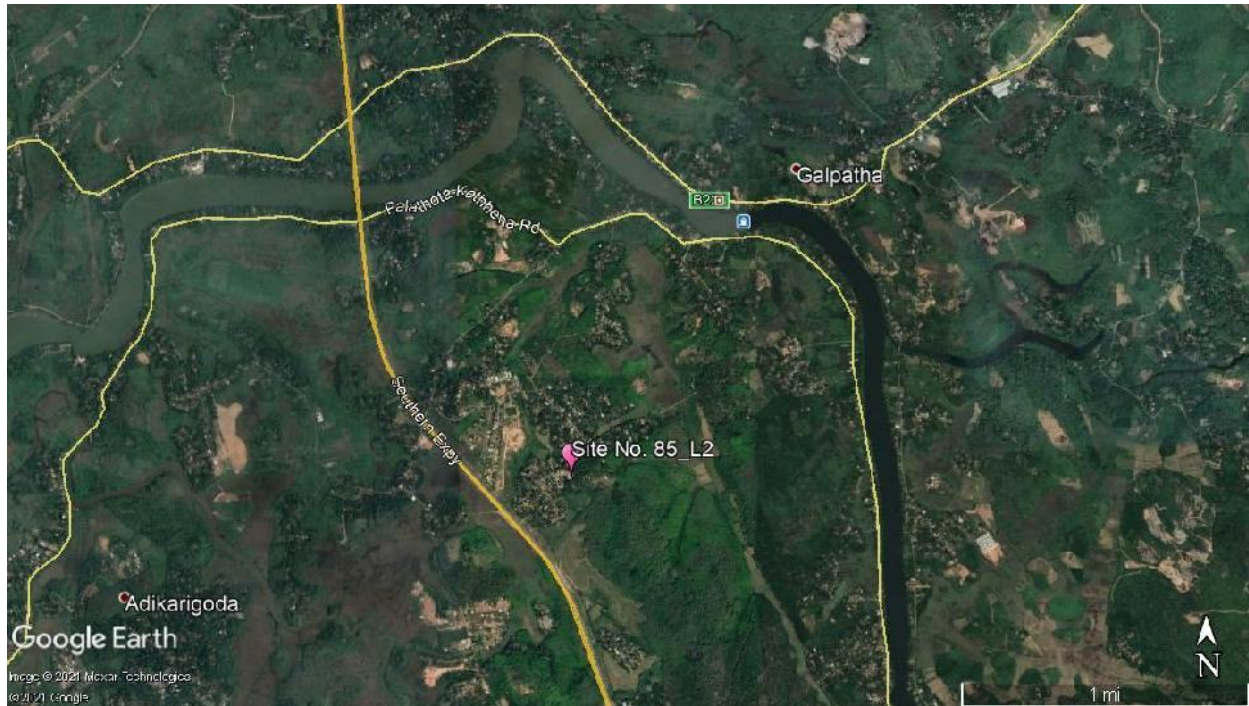


Figure 2: Google image of the proposed landslide mitigation site, the surrounding environmental features and service infrastructure.

2.4 Meteorology of the area

There is significant rainfall in most of months of the year. Average annual rainfall figures of Kalutara District area is 3000mm and get frequent rain from South West Monsoon. The average annual temperature in Kalutara is 28°C per year. (Source: Divisional Secretariat, Dodangoda)

2.5 About the Temple

The temple was constructed in 1998 and registered in 2005 under the Min. Buddhist affairs. This is one of the Temples established under the “Mahamewna” Buddhist programme. The temple is mainly using for meditation and other religious activities and consisted of facilities providing center for those meditation activities including meditation chambers. Construction of Dagaba of the temple has been started in 2017 and simultaneously other facilities in the premises were developed. The temple is currently used by monks for meditation and its facilities, and 20-30 monks reside in the temple for the above purposes. On an average, about 1,500 devotees attend the religious services organized by the temple on Poya Day and about 500 on weekends.

3. Landslide hazard incident details

3.1 Account of incident

As per the previous studies, the main cause of the slope failure and instability due to the cutting failure which was occurred while constructing massive retain wall near the Dagoba. Slope modifications did not

follow engineering slope stability standards and slope drainage management in the site absences. Slope instability is caused by excessive rainwater infiltration due to improper land use practices. Due to the failure debris of the rubble spread over the area.

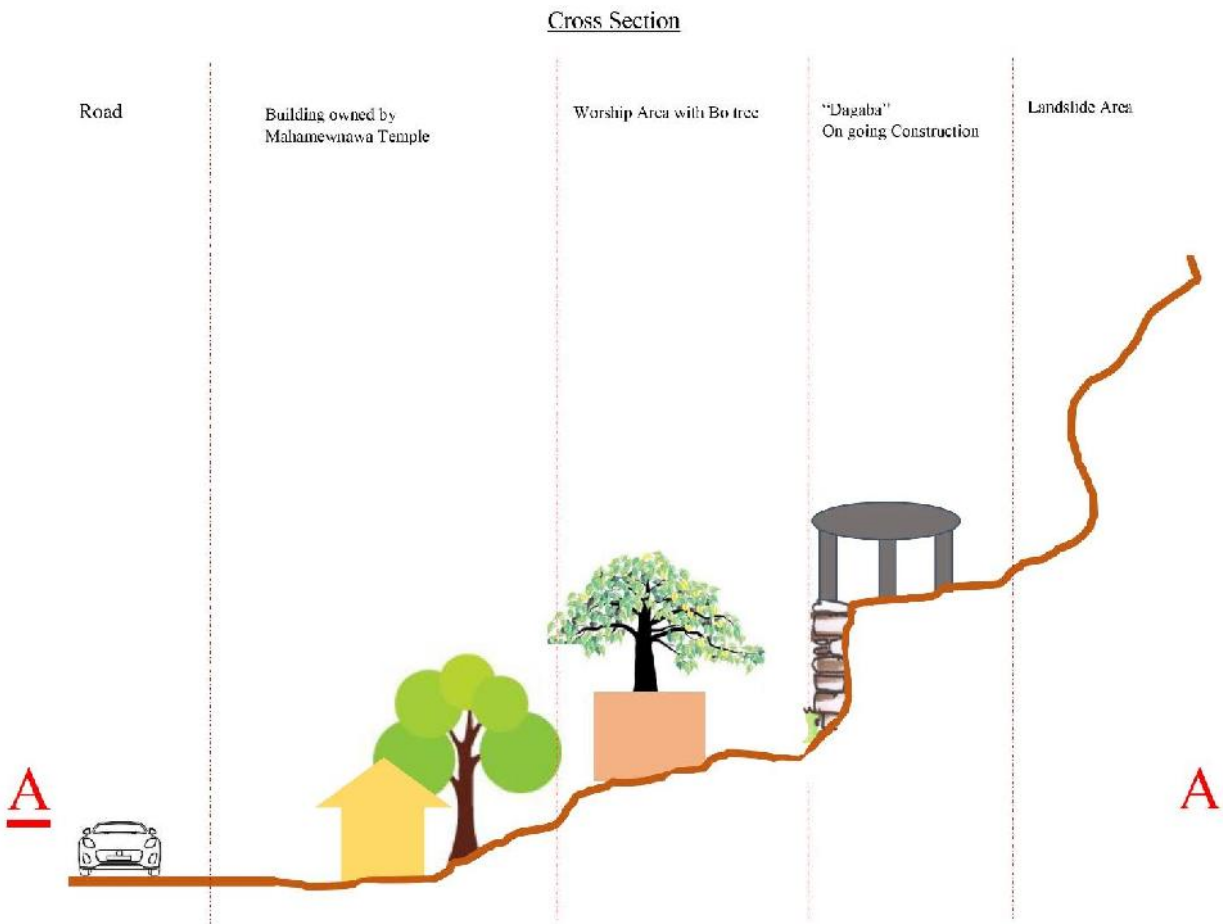
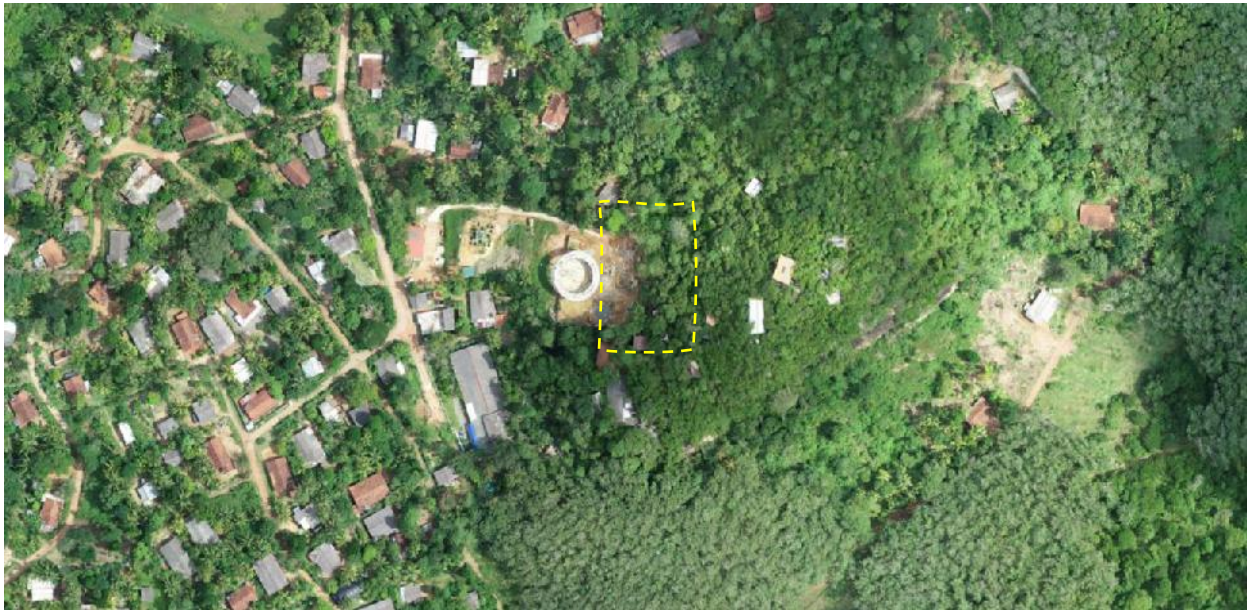


Figure 3: Landslide Incident area and the cross section (Source – Drone Image captured by NBRO)

The landslide occurred in 2017 and since 2016 the land has undergone major changes due to various construction activities.



Figure 4 – Changers of the Land uses over the last five years (a – 2016, b – 2017, c – 2020) (Source – Google Earth)

3.2 Effects and consequences of landslide

During heavy rains, the scattering of soil mass and rock/boulders across the unstable cutting slope tends to fall creates a risk for monks, pilgrims using the Temple premises and Dagaba area to meditation chamber.

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

There is no any remedial measures have been taken after the landslide incident to reduce the potential risk. With the occurrence of cut slope failure, Landslide Research and Risk Reduction Division of NBRO in Kalutara District has recommended following remedial measures to reduce the potential risk in the site.

- i. Construction of proper surface and sub-surface drainage system to prevent infiltration and accumulation of rainwater in the slope.
- ii. Internal soil reinforcement methods such as soil nailing or cable anchoring are recommended rather than constructing retaining the wall.

3.4 Evacuations

No any building was evacuated due to the risk.

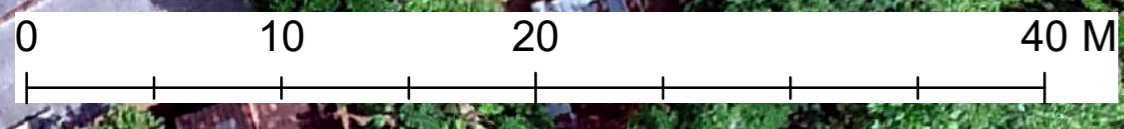
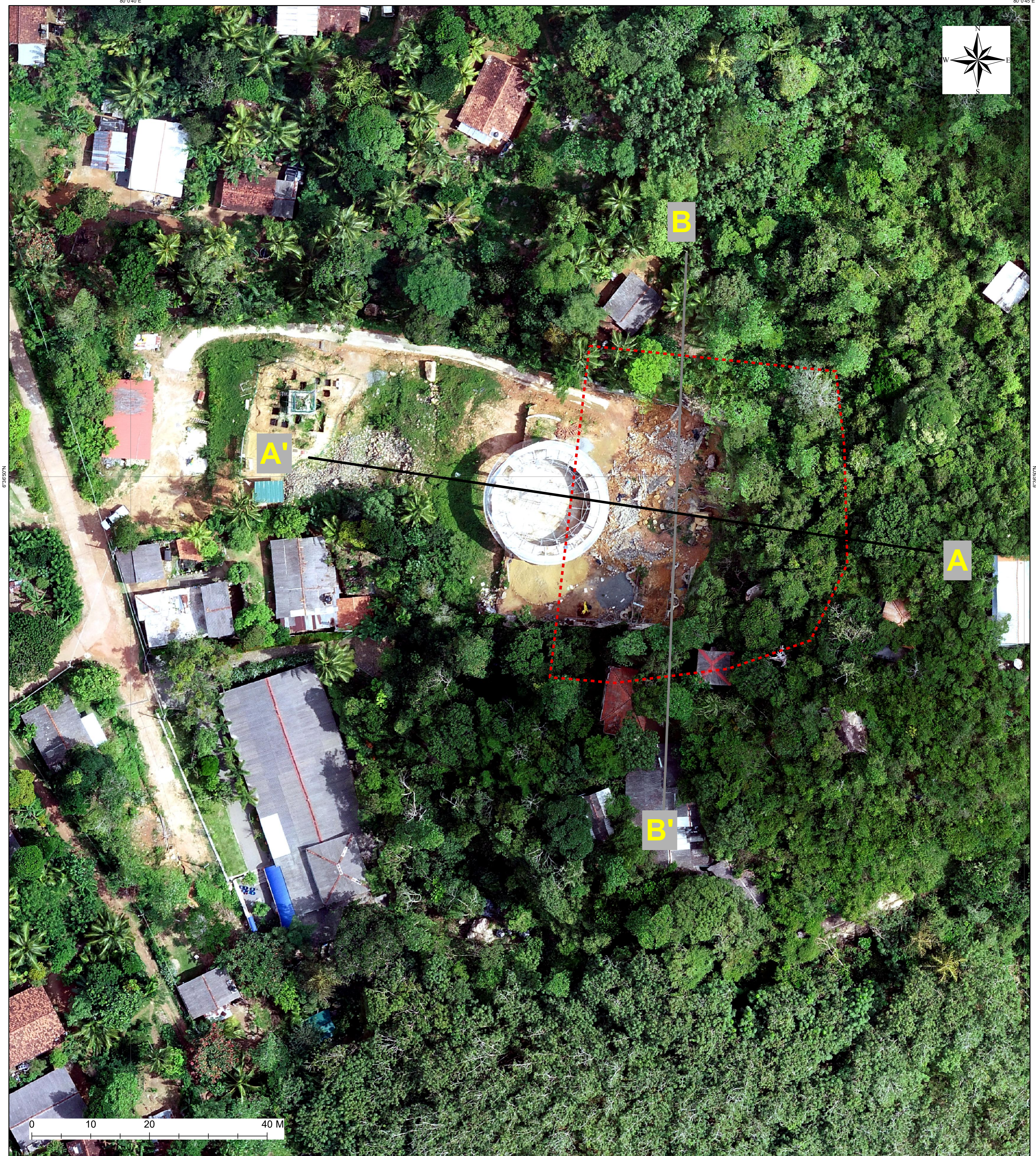
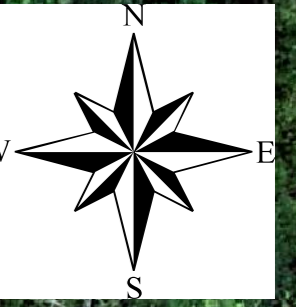
3.5 Resettlement (progress)

No any resettlement for this site.

Landslide Mitigation Site No - 085 (L2) - Kaluthara - Dodangoda- Isipathana Mahamewna Asapuwa - (RLVMMP)

80°0'40"E

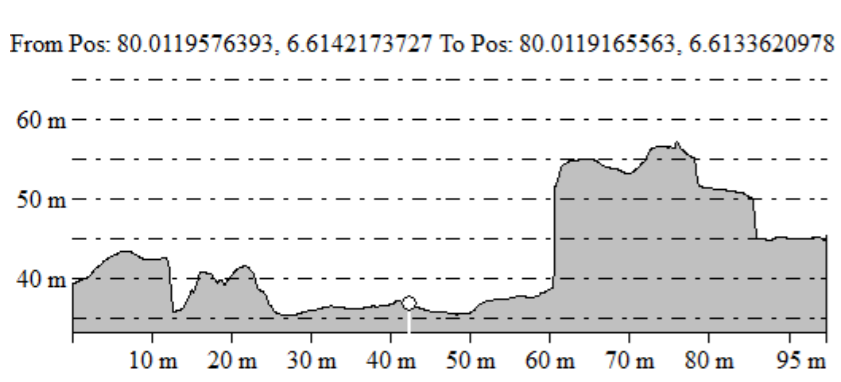
80°0'45"E



80°0'40"E

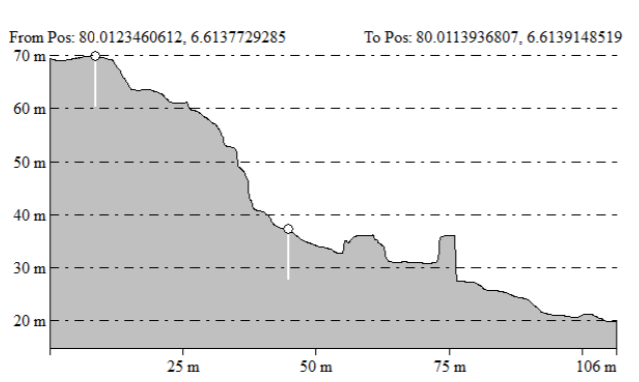
80°0'45"E

Profile Details



Longitudinal Profile Details A - A'

Start Position: 80.0119576393, 6.6142173727
 Start Height: 39.323 m
 End Position: 80.0119165563, 6.6133620978
 End Height: 45.376 m
 Path Length: 95 m
 Straight-Line Distance: 95 m
 3D Distance on Surface: 140 m
 Vertical Difference (Start to Finish): 6.1 m
 Total Climbing: 39.8 m over 72 m on surface
 Total Descending: 33.8 m over 68 m on surface
 Minimum Elevation on Path: 35.332 m
 Maximum Elevation on Path: 57.118 m
 Azimuth: 182° 44' 59.8"
 Slope/Tilt: 3.66°
 Max Path Slope: 88.93° [60 m along path]



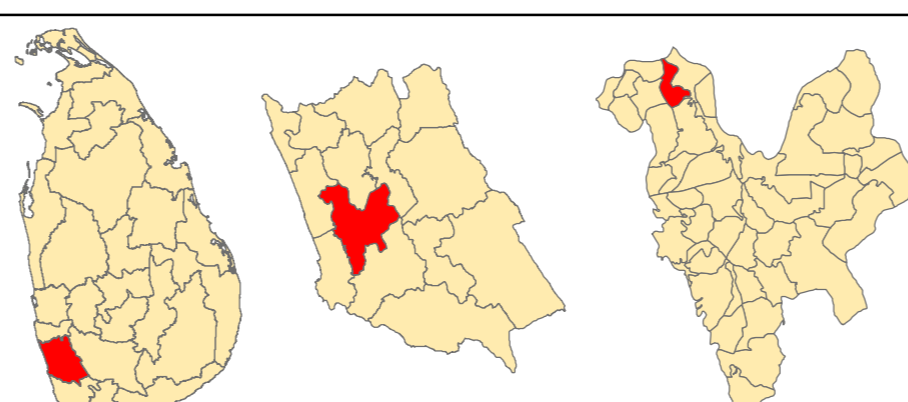
Cross Sectional Profile Details B - B'

Start Position: 80.0123460612, 6.6137729285
 Start Height: 69.383 m
 End Position: 80.0113936807, 6.6139148519
 End Height: 19.826 m
 Path Length: 106 m
 Straight-Line Distance: 106 m
 3D Distance on Surface: 148 m
 Vertical Difference (Start to Finish): -49.6 m
 Total Climbing: 11.8 m over 31 m on surface
 Total Descending: 61.3 m over 117 m on surface
 Minimum Elevation on Path: 19.826 m
 Maximum Elevation on Path: 69.845 m
 Azimuth: 278° 28' 34.6"
 Slope/Tilt: -24.96°
 Max Path Slope: 87.89° [76 m along path]

Site Details

Location Information

1. Location : Isipathana Mhamewna Asapuwa
2. GN Division : Serupitw East
3. DS Division : Dodangoda
4. District : Kaluthara



Source - This map was prepared using the drone images captured by NBRO above Serupita Isipathana Mahamewna Asapuwa landslide potential site.

Physical Information

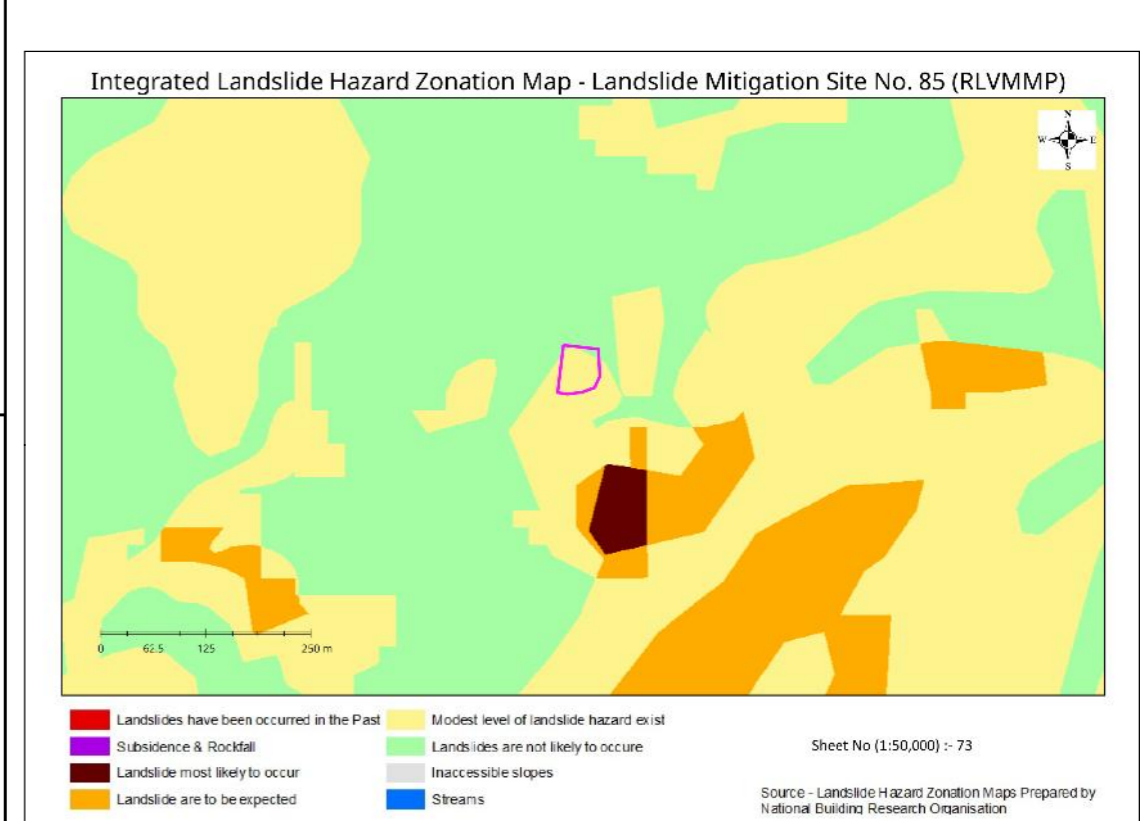
1. No. of Vulnerable Buildings : 02
2. Infrastructure Damage : Road, Electricity line
3. Current Land use : Temple
4. Land use management : Poorly managed+ Human impacted
5. Previous Land use : Forest
6. Level of Hazard : Modest level of landslide hazard (1:50,000 scale)
7. Type of Failure : Progressive slope failures

Legend

- Project Impact Boundary (Red dashed line)
- Area of Slope Failure (Yellow dashed line)
- Longitudinal Section A - A' (Black solid line)
- Cross Section B - B' (Grey solid line)

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Location in Landslide Hazard Zonation Map



Sheet No (1:50,000) : 73
 Source - Landslide Hazard Zonation Maps Prepared by National Building Research Organisation

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

4.1 Surrounding area of the slope failure

The affected area is located on the northwestern boundary of the Isipathana Mahamewana Asapuwa (Temple). The failure of the slope will directly affect the elements including the meditation chambers of the temple and the Dageba of the temple. Indirectly, it blocked access to other facilities, such as Dana Shalawa, the shrine-room, and the meditation chambers on the premises. There is a residential building adjoin to the failure outside the temple boundary and which has high risk and proposed mitigation works will be carried out very closer to this building.

4.2 Current level of risk

During heavy rains, the scattering of soil mass and rock/boulders across the unstable cutting slope creates a risk. Due to these buildings and elements in the Temple premises and adjoining residential buildings are at risk.

5. Description of the works envisaged under the project

The proposed project aimed to combat further progressive failure of cut slope. The Buddhist Temple is highly potential for cutting and slope failures; therefore, the slope will be stabilized by using Soil nailing with Random Rubble Masonry raining wall for the toe of the slope including surface drainage management.

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

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

- i. Monks and Pilgrims using the Temple during the Poya and other religious activities,
- ii. Buildings and elements of the Temple
- iii. Activities of the Temple
- iv. Residential buildings adjoin to the temple.

Ref. Fig. 6: Sensitive elements that may be affected by the project actions.



Figure 6a: Dageba area in Temple Premises



Figure 6b: Temple buildings at upslope area (Awasa Geya)



Figure 6c: Access road to the temple



Figure 6d: Residential buildings closer to the site

Figure 6: Sensitive elements that may be affected by the project actions

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

Chart below summarizes the positive and negative impacts which are envisaged during project actions and their significance

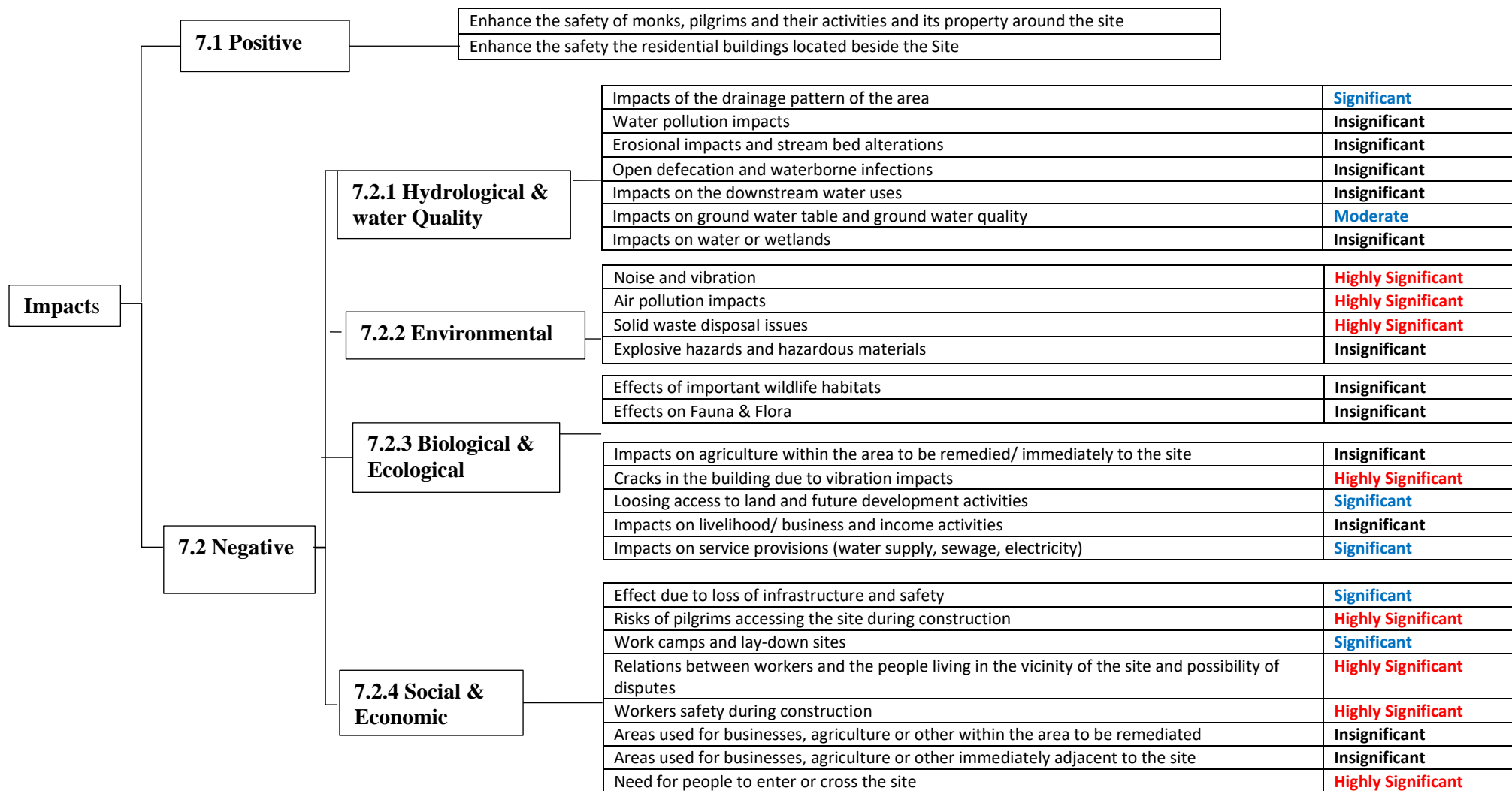


Figure 7: Summary of the impacts which are envisaged during project

7.1 Positive impacts

- The objective of this project is to ensure that further failures of slopes are prevented to an acceptable level. Meditation chambers and other buildings will be protected above the landslide in the Buddhist temple premises which are currently at risk and the unstable areas of the temple will be protected from future slope failures.
- Further, the Mitigation action will enhance the safety of the people who are residing adjacent to the site.
- The properties are currently used by temple monks for meditation and its facilitation activities and there are 20-30 monks are residing for the above purpose in the Temple.
- During the Poya day there it was recorded that there are averagely 1500 pilgrimage were participated for the religious activities organized by the temple.
- Improved slope stability with the proposed structural mitigation significantly increases the safety of the temple and its properties.

7.2 Negative impacts

The mitigation works are generally confined to an area which is already unstable and highly potential for slope failures. Therefore, negative impacts are much localized and also limited to construction period.

Table 1: Negative impacts and their level of significance

Impacts during the construction period	Level of Significance
7.2.1 Hydrological and water Quality impacts	
7.2.1.1 Impacts of the drainage pattern of the premises Disruption of existing surface and sub-surface drainage pattern in the area is envisaged due to the reshaping of the unstable slopes, removal of soils, and diversions of existing drainage and surface runoff flow paths. The mitigation works in this site will focus largely on the drainage improvement. Due to diversions, cut-off drains and increased sub-surface drainage, the premises will have increased flows at higher velocities in rainy periods.	Significant
7.2.1.2 Water pollution impacts There are no water streams close to the mitigation site	Insignificant
7.2.1.3 Erosional impacts and stream bed alterations There are no water streams close to the mitigation site	Insignificant
7.2.1.4 Open defecation and waterborne infections As the site is located within a temple in an open area possibility of open defecation is low	Insignificant
7.2.1.5 Impacts on the downstream water uses There are no water streams or water supply lines close to the mitigation site	Insignificant
7.2.1.6 Impacts on ground water table and ground water quality Due to the migratory activities carried out in the slope area, there is a possibility of ground water table tends to draw down.	Moderate
7.2.1.7 Impacts on water or wetlands There are no water streams close to the mitigation site	Insignificant

7.2.2 Environmental Impacts	
<p>7.2.2.1 Noise and vibration impacts</p> <p>Construction noise are expected from machinery in site preparation and landscaping. Impact is significant as the construction is carried out in the proximity of the temple and scattered residential area. The noise generated from the machinery will disturb the residential, pilgrims, monks and their functions.</p> <p>If heavy machinery is operated the vibration can affect the temple buildings, and residential. As a result, structural deformations such as cracks and collapse of walls etc. may happen.</p>	Highly Significant
<p>7.2.2.2 Air pollution impacts</p> <p>Potential impacts on the air quality will be due to the fugitive dust and the exhaust gases generated in and around the construction site due to vehicular movement and site clearance, storage and handling of construction materials such as sand, cement, etc. As temple and residential buildings are in the close proximity to the mitigation location, the effect is highly significant to monks, students, and pilgrims and people who are living in the area if heavy air polluting activities are carried out.</p>	Highly Significant
<p>7.2.2.3 Solid waste disposal issues</p> <p>Poor management of solid waste such as litter, food waste, construction waste during the construction phase may lead to create inconveniences to people, can block the drains to make breeding grounds for water borne refection vectors and pathogens peril. Waste can pollute the soil, and leave various environmental impacts if proper disposal mechanism is not in place during the construction period.</p> <p>The existing debris from the previously constructed structure of the retaining wall also should be removed from the site.</p>	Highly Significant
<p>7.2.2.4 Explosive hazards and hazardous materials</p> <p>Since the affected area has no rock boulders, explosives may not be used and the rock blasting is not envisaged.</p>	Insignificant
7.2.3 Biological /Ecological Impacts	
<p>7.2.3.1 Effects of important wildlife habitats</p> <p>There are no forested/ wild-life reservation areas within the project influence area with high biodiversity, or habitat fragmentation.</p>	Insignificant
<p>7.2.3.2 Effects on Fauna & Flora</p> <p>Majority of the trees found in the area are not endemic, threatened and identified in the red list of IUCN.</p>	Insignificant
7.2.4 Social and Economic Impacts	
<p>7.2.4.1 Impacts on agriculture within the area to be remedied/ immediately to the site</p> <p>There are no agricultural practices within the area to be remedied or immediately to the site.</p>	Insignificant
<p>7.2.4.2 Cracks in the building due to vibration impacts</p> <p>There are several buildings located in the proximity of the mitigation site. Dageba of the temple, Meditation Chambers, and residential buildings are located close to the unstable slope. There are other temple buildings also located in the premises at different elevations. During the construction heavy machinery will be used and the vibration can cause cracks in these buildings and it can affect the stability of the nearby buildings immediate to the slope as well.</p>	Highly Significant

<p>7.2.4.3 Loosing access to land and transport infrastructure</p> <p>Since the Construction is not in close proximity to the main access road, the construction will make less impact to the pedestrian and vehicles. However, one of the access path to meditation chambers, Shrine Room, Awasage and other facilities is lay in between the Dageba and proposed construction site. Therefore, the construction will affect to uses of the temple during the Construction period. The particular path closer to the site need to be temporary closed and uses must need use the other alternative paths.</p>	<p>Significant</p>
<p>7.2.4.4 Impacts on livelihood/ business and income activities</p> <p>There is no significant impact on livelihood, business or income activities of the area because the site is located within a temple.</p>	<p>Insignificant</p>
<p>7.2.4.5 Impacts on service provision (water supply, sewage, electricity)</p> <p>The construction works, moving machinery will certainly damage these lines.</p>	<p>Significant</p>
<p>7.2.4.6 Effect due to loss of infrastructure and safety</p> <p>Most of the construction activities will be focused on unstable slope area within the temple premises. It therefore has a significant impact on the infrastructure sector during the construction phase. However, the contraction must need to ensure the safety and provision of other access path to the Temple users during the constructions.</p>	<p>Significant</p>
<p>7.2.4.7 Risks of people accessing the site during construction</p> <p>Excavation machineries, loaders, trucks etc. will be used in the temple premises where pilgrims and pedestrian are moving. Site may use high voltage power for operation of certain machinery. Construction may use materials such as metal aggregates, steel etc. which can be injurious under improper storage and handling. Ignorance of entry of people and careless operation of machinery can cause fatal injuries and accidents to them.</p>	<p>Highly Significant</p>
<p>7.2.4.8 Work camps and lay-down site requirements</p> <p>The camps site will be selected with the Temple Land. If proper camp management is not in place it may result several labour issues, social issues with community, conflicts for shared resources with the Temples, nuisances, and management of waste etc. If temporary camps are built in the close proximity of the site, management of solid waste and sewage will be an issue.</p>	<p>Significant</p>
<p>7.2.4.9 Relations between workers and Users of the Temple (Monks and Pilgrims) and people living in the vicinity of the site and possibility of disputes</p> <p>Construction workers at this site will 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 users and neighboring community as indicated below.</p> <ul style="list-style-type: none"> • Relationships between Monks, users and neighboring community and Construction works during the construction at the site • Relationships between Villagers and Construction works outside the construction site. • Behaviors of the works in the Site both during the construction and non-construction time • Behaviors of the works in the Temple Premises • Construction activities performing during the Poya-days and weekends <p>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.</p>	<p>Highly Significant</p>

<p>7.2.4.10 Workers safety during construction</p> <p>The workers may be exposed to risk from falling. Fatal injuries may occur if the slopes fail. The heavy construction machinery may be used in limited work spaces. Contractor may not engage under age workers (children) for construction work, which is risky and can results serious accidents and injuries.</p>	<p>Highly Significant</p>
<p>7.2.4.11 Areas used for businesses, agriculture or other within the area to be remediated</p> <p>There are no areas used for business, specific agriculture practices or other within the area to be remediated.</p>	<p>Insignificant</p>
<p>7.2.4.12 Areas used for businesses, agriculture or other immediately adjacent to the site</p> <p>There are no areas used for business, specific agriculture practices or other commercial activities immediately adjacent to the site hence has no significant impact.</p>	<p>Insignificant</p>
<p>7.2.4.13 Need for people to enter or cross the site</p> <p>There is no special need for pedestrian and the residential or pilgrims to enter the site for other purposes. However, in such case occur due to intentionally or unintentionally and they may be at risk due to operating machinery, vehicles, electricity, and may be blasting materials.</p>	<p>Highly Significant</p>

8. Significant Environmental and Social Impacts

Environmental, social impacts or risks that will require special attention on the part of NBRO.

8.1 Priority Health and Safety Issues. Specific H&S concerns that require measures that go beyond the standard contractual requirements for contractors

The health and safety issues pertinent to this site is significant as the workers have to work on almost vertical unstable slope with a risk of slope collapse. The health and safety issues of workers safety is highly significant at this 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.

8.2 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.

9. Environmental Social Management Plan (ESMP)

Measures to manage and or mitigate the impacts and risk. Especially the significant impacts and risks identified in sections 7 & 8. This section will include the specific recommendations and requirements of the ESMP for design stage, construction phase and maintenance operation phase.

9.1 Resettlement action plan

There is no project based resettlement in this site.

9.2 Evacuation of people

During the construction period of the project it may require to evacuate the monks and students of the temple as it is located in the downslope area of the unstable slope. Also, the area in the downslope should be named as a “No Entry Zone” for the construction period.

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

Consent from owners (monks) to remove the articles is required.

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

It may require to compensate if any damages happen to the structures of the temple, neighbouring houses, infrastructures or any other element of the area during constructions.

9.5 Public awareness and education- needed for following areas

- i. Programs to inform and educate the monks and users of the premises on the potential risk during construction.

9.6 Design based Environmental/ Social Management considerations

Following environmental and social design considerations are recommended for this depending on its environmental and social relevance.

Table 2: Design stage Environmental & Social considerations

Design feature	Recommended level of consideration for this site
i. Natural resource management and resource optimized designs Project specific designs should be considered to eliminate mass clearing of vegetation and minimum number of removals of grown tree species. Sufficient emphasis should be made to consider conservation of trees if important tree species are found.	Moderate
ii. Site Planning During site planning it is necessary to be cautious on possible re-activation of slope failures and movements of soil masses. Hence vehicle parking sites, material storage and temporary shelters etc. should not be installed in the danger zones of the slides.	High
iii. Habitat connectivity and animal trails If large fractions of vegetation are required to be cleared in ecologically fragile habitats as for permanent structures or for access, or if deep drains etc. are to be made the designs should include habitat connectivity features, animal trails and vegetation strips and etc. even if the impacts are localized.	Low
iv. Conservation of water resources If extraction of water is involving as a mitigation measure, as the extracted water is in a good quality and yield it can be considered as a source of water for usage such as gardening and sanitary activities. Special attention to the quality of the water should be given as septic tank is located close to the proposed mitigatory site.	Low
v. Interruption to water supply lines and sewage lines Water lines supplying water to the downslope runs through the unstable slope.	Low
vi. Aesthetically compatible design considerations The designs in aesthetically sensitive environment should consider structures that blend with natural environment to keep the visual pollution to minimum. Since the mitigation works will constructed close to Temple Dageba area, it should not visually impact to the Dagoba. Therefore, Service of landscape architect may be important for the design of suitable mitigation structures.	Very High

<p>vii. Consideration of green environmental features As many of the mitigation works are carried out in well maintained premises, it is recommended to consider green environmental designs as much as possible in the designs e.g.: use of local vegetation species for erosion control, combination of plants to sustain species diversity in the environment, avoiding inclusion of potentially invasive species & etc.</p>	High
<p>viii. Workers and community safety Activation of slide may occur during construction phase and may pose threat to workers, and the community. Therefore, design based safety consideration such as berms, safety nets, safety fencing etc. should be considered specific to safety of community and users.</p>	Very high
<p>ix. Erosion control structures During rainy season the flow in the drainage structures can be significantly high. During rainy season the heavy flow of surface runoff can be expected through the unstable slopes. This water should be conveyed to nearby storm water drains. Hence the design should adequately consider flow speed breakers to reduce erosive flows of slopes.</p>	High
<p>x. Low post maintenance and operation designs The mitigation should consider passive techniques such as gravity drains for drainage management. Correct pipe diameters, pore diameters and laying angles should be considered to avoid clogging of drains. Low maintenance structures and designs such as designs to withstand erosive forces, sediment trapping systems etc should be considered if drain water is expected be directed to natural streams. The materials used for structures and should be chosen carefully so as to withstand weather conditions with high durability. Designs should specially consider corrosion prevention techniques if steel structures are used.</p>	High

9.7 Mitigation of impacts during the construction phase

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

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

Table 3: Contractor requirement to comply with ES & HS

Reference No. as per construction contractors obligation to ESMP	Item	Relevant to the project
2002. Environmental and Social Monitoring		
2002.2 1)	Storage on site	Highly Relevant (Site Management at the Temple)
2002.2 2)	Noise and Vibration	Highly Relevant (Due to the activities related Temple and Residential)
2002.2 3)	Cracks and damages to the buildings	Highly Relevant (Temple buildings and Residential Units)
2002.2 4)	Disposal of waste	Highly Relevant (Activities related Temple)
2002.2 5)	Disposal of refuse	Highly Relevant (Activities related Temple)

2002.2 6)	Dust control	Highly Relevant
2002.2 7)	Transport of Construction materials and waste	Highly Relevant
2002.2 8)	Water	Relevant
2002.2 9)	Flora and Fauna	Low Relevance
2002.2 10)	Physical and cultural resources	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 (pollution)	Highly Relevant
2002.2 16)	Disruption to public	Highly Relevant
2002.2 17)	Utilities and roadside amenities	Highly Relevant
2002.2 18)	Visual environment enhancement	Highly Relevant (Site closed to the Dageba of the Temple)
2002.5. Environmental Monitoring	Baseline surveys (air, water, noise, vibration, crack surveys)	Highly Relevant - Refer site specific monitoring plan
	Surveys during construction (air, water, noise, vibration, crack surveys)	Highly Relevant - Refer site specific monitoring plan
	Surveys during operation phase	Refer site specific monitoring plan
	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	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
<i>Relevant: The section is relevant to the site as a common ESMP applicable to any site</i>		
<i>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</i>		
<i>Possibly relevant: This ESMP will be triggered if the site come across with relevant aspect during project implementation</i>		
<i>Not relevant: The section may not be relevant to this site under disclosed conditions</i>		
<i>Optional: require to be implement if needed only</i>		
<i>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</i>		
<i>Reference: Contractors Obligation for implementation of ESMP</i>		

9.7.2 Site Specific mitigation

Given below is the site specific mitigation measures that the project is expected to implement during the construction period.

Table 4: Site specific ES & HS mitigation measures

Mitigation item	Project implementation phase	Responsibility
<p>i. Minimize erosional impacts during construction</p> <p>It is recommended that mitigation works involved with site clearance, slope reshaping, removal of debris etc. are avoided during rainy season. Therefore, it is imperative that site works in upslope mitigation are carried out in the dry season and avoid such activities on upslope area in the wet season as much as possible. This should be considered in project planning stage. Silt traps should be introduced to cut down sediment laden runoff.</p>	Site preparation & construction	Construction Contractor

<p>ii. Planning project activities inside the sites As contractor has to operate mitigation actions within the temple premises, he should carefully prepare a plan for management of construction activities inside the premises. This should include careful selection of material storage as vehicle parking, mixing of concrete, cleaning activities etc. which considering the safety and optimization of space.</p>	Site preparation & construction	Construction Contractor
<p>iii. No Entry Zone The PMU should make a detailed assessment on possible risk of slope destabilization in the site during construction phase. “No entry zone” may require to be declared. Also mitigate the risk of accidents from moving vehicles operational machinery construction activities, electrical leakages etc. should be given high priority in the health and safety management plan. Sign boards indicating slope instability risk are strongly recommended at this site.</p>	Construction	E & S Unit of PMU contractor
<p>iv. Machinery and material transportation The concrete paved access road within the project area will require to use for machinery, materials and vehicle transportation during construction phase. Therefore, extreme care should be taken as possible accidents and damages to the road are high. The entrance structure of the temple also should be considered in transporting machinery and equipment. Alternative parking facility for the pilgrims should be arranged with consultation of temple.</p>	Construction	E & S Unit of PMU Contractor
<p>v. Invasive species Should be avoided in using vegetative erosion control structures. Native plants in the local environment should be chosen for vegetative control.</p>	Construction	Construction Contractor
<p>vi. Noise and Vibration control The noise and vibration generating activities may disturb the activities of the temple. Vibration generating activities should be done within the prescribed limits to avoid damage to structures. Cracks in the buildings should be monitored before, during and after completion of the project. Suitable compensation should be made if cracks from the damages or cracks enlarge due to construction work.</p>	Construction	Construction Contractor
<p>vii. Disposal of construction waste The contractor should pay special attention with respect to disposal of construction waste. Waste if generated should store properly without getting washed off and dispose according to approved procedures by the PMU. Construction waste should not dispose within the temple premises or along the access road.</p>	Site preparation & construction	Construction Contractor
<p>viii. Dust and aerosol control screens The construction activities would be carried out closer to The dust particles generated during the construction period can influence the community and pedestrians. Special screens etc. should be used if heavy dust or aerosol generating activities are envisaged.</p>	Site preparation & construction	Construction Contractor

<p>ix. Water for construction</p> <p>Water for construction should be obtained only from approved places. If the Contractor intends to use water and electricity from temple, they should be informed and the required permission should be taken.</p>	Construction	Construction Contractor
<p>x. Priority Health and Safety Issues</p> <p>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.</p> <ul style="list-style-type: none"> i. Additionally, work should be discontinued for sufficient time period during rainy period as working on unstable slopes will be highly risky in the rainy season. ii. A good warning system and fulltime watchmen is highly recommended for this site for both worker and pedestrian's safety. iii. Safety barriers and safety nets should be installed at places of risk to protect workers and community from boulder falling risk iv. Proper emergency management unit for other accidents (first aids facilities, safety items, hospitalization facilities and transportation facilities) should be maintained for this site. 	Construction	E & S Unit of PMU contractor
<p>xi. Safety structures/sign boards</p> <p>During construction phase adequate safe fencing should be established to prevent potential falling risk of workers from upslope areas. Warning sign boards indicating slope instability risk should be placed at the unstable slope area. 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.</p>	Construction	E & S Unit of PMU contractor
<p>xii. Interruption to water lines</p> <p>Necessary arrangements should be taken to provide alternative water supply in case of an interruption to water supply. The water users should be consulted during project mobilization to inform the requirement to shift the water lines to a safe location if water lines are running through the project site.</p>	Construction	Construction Contractor
<p>xiii. Use of sanitary facilities of contractor's workforce</p> <p>Separate sanitary facilities should be arranged for the workforce.</p>	Construction	Construction Contractor
<p>xiv. Working hours</p> <p>The construction activities should be restricted to day time only. Working after 6.p.m. is not recommended for any reason due to safety issues. It also should avoid disturbance to religious activities during the Poyaday and other events</p>	Construction	Construction Contractor
<p>xv. Need for people to enter or cross the site</p> <p>Possible unauthorized access to the site should be avoided by awareness, warning signs and vigilance by the contractor's full-time watchmen.</p>	Construction	Construction Contractor
<p>xvi. During construction good housekeeping should be maintained to minimize visual pollution</p>	Site preparation & construction	Construction Contractor
<p>xvii. Workers code of conduct</p> <p>The construction works are carried out in a temple premises and therefore disputes between labor force and monks, pilgrims and</p>	Construction	Construction Contractor

neighbors should be prevented by maintaining the agreed code of conduct by the contractor.		
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9.7.3 Monitoring requirements specific to the site

Following monitoring plan is strongly emphasized during the construction phase specific to this site. In addition to this, monitoring procedure indicated in the contractors' obligation to ESMP should also be implemented by construction contractor. The contractor is expected to indicate in the bid the ESMP procedure to be implemented along with relevant proofs of his competency. The cost for ESMP will require to be indicated as a separate pay item. The environmental and social management method statement is expected to be submitted by the selected construction contractor and to be approved by the PMU unit.

Table 5: Environmental and Social monitoring plan; construction phase

Monitoring requirement	Parameters	Frequency
i. Baseline monitoring	Water quality	-
	Pre crack survey for the temple building and structures	Once*
	Ground vibration	Once*
	Air quality: particulate matter	Once*
	Background noise measurement	Once*
ii. During construction	Water quality	-
	Crack survey for the temple building and structures	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 *
iii. Vehicular Emission	All machinery/vehicles operational should have the emission control test certificate as applicable - should be checked by the site ES officer of the consultant	
iv. Monitoring agency	* A competent independent monitoring agency with registration of Central Environmental Authority for all parameters except crack surveys **Crack surveys should be conducted by competent agency acceptable to PMU	
v. Reporting requirements	Stream water quality – Comparison with ambient water quality standards published by the CEA, 2017 Pre crack survey of the buildings -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.	

10. Public and Stakeholder Consultation

Institution	Name	Concerns raised
Isipathana Mahamewnawa Temple	Wijithawansa Thero Head Priest of the Temple	<ul style="list-style-type: none"> ✓ The proposed Structure need to be less highlighted, since it is close to the Dageba. ✓ Protection of the available access closer to site after conduction of the site. ✓ Protection of vegetation cover and replantation of vegetation after the works ✓ Concerns on the temple activities and pilgrim's safety during the construction period. ✓ Avoid disturbance to religious activities during the Poyaday and other events
Residents	D. Jinadasa K.D. Karunaratna Y. Pushpalata Serupita Janapadaya, Kalutara North. People are living close proximity to the site.	<ul style="list-style-type: none"> ✓ Many of them appreciate the mitigation activities in the area. On rainy days, unprecedented waterways appear after the landslides. ✓ Concerns on the Noise, Vibrations and dust on the site and its impact to the residential area. ✓ Attitude of the construction works; raise their concerns on workers and behaviours.

11. Preventive Measures for Covid-19 that was issued by Sri Lankan National Health Authority

COVID-19, the novel coronavirus infection has not been totally eradicated in the world. Therefore, to prevent/ control of the spread of infection also to prevent panic situations in the event of detecting a suspected case, all contractors are required to develop a COVID-19 Preparedness plan and need implementing in the site as per the "Health and Safety Guidelines for Sri Lankan Construction Sites to be adopted during COVID 19 outbreak" Guidelines given by Construction Industry Development Authority CIDA 29th April 2020.

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

Table 6: Clearances, no objection, consent and approvals

Requirement / Approval / Institution	Relevance to the project
10.1 Project implementation	
Approval from the District Secretariat	The approvals will be required and the proposals need to be presented at the District Coordinating Committee, to which chief minister and stakeholder agencies in the district will also participate. The Officer of PMU will present the project, disclose the project details and various concerns including environmental and social issues will be discussed at this meeting. The issues arrived will be addressed in the ESMP, the decisions and recommendations taken up at this meeting will be considered in the ESMP.

Approval from the planning committee	The approval from the planning committee of the Dodangoda Pradeshiya Sabha
10.2 Approval from the state lands owners relevant to the project	
Central Environmental Authority	Consent from District Central Environmental Authority is required.
Department of Forest Department of Wildlife Conservation	As there are no forest reservations and wildlife habitats; Department of Forest and Department of Wildlife Conservation approvals are not needed
Geological Surveys and Mines Bureau	Approval will be obtained for for extraction of materials, transportation and disposal of earth, rocks and mineral debris. (if necessary, only).
Dodangoda Pradeshiya Sabha	Approvals from Dodangoda Pradeshiya Sabha will be obtained for the disposal of waste and plant litter.
Ceylon Electricity Board	Approvals from regional office of Ceylon Electricity Board will be required for power supply for site operation.
National Plant Quarantine Service	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.
10.3 Consent/ no objection/ legally bound agreement from the private land ownerships	
Land owner (Temple)	Signing a legally bound agreement between the land owners 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

The tentative timeline for getting approval is given in the table 7.

Table 7: 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					—			
Other approvals								
GSMB		—	—					
Ministry of Defense (Depends on the requirement)								
Consent/ no objection from the land ownership (Temple)	—							

11. Grievance redress mechanism for this site

The PMU ES officer is responsible for establishing the grievance redress mechanism for this site for impact communities; (*Reference: Environmental and Social Management Framework for recommended procedure for establishment of grievance redress mechanism*).

12. Information disclosure

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

Table 8: Proposed scheme of information disclosure

Information	Proposed agencies	Mode of information disclosure
i. Project plan (site details, design implementation arrangements)	District Secretariat, Divisional secretary, Religious leaders of Temple, Other district levels Agencies, NBRO district office, AIIB	Meetings, District coordination committee, submission of relevant report to sign agreements, approvals and consents.
ii. Environmental and Social Management plan	District CEA, AIIB	Meetings, District Coordination Committee, submission of relevant report to sign agreements, approvals and consents
iii. Monitoring reports (baseline and during construction)	District CEA, AIIB and relevant parties as appropriate	Progress meetings, special meetings, submission of relevant reports
iv. Site inspections for environmental conformance workers health and safety	District CEA, Divisional secretary, Religious leaders of Temple, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate	Written and verbal communications, submission of relevant reports
v. Decisions taken and progress review meetings pertinent to ES matters	District CEA, Divisional secretary, Religious leaders of Temple, Grama Niladhari, District Office NBRO, AIIB and relevant parties as appropriate	Meetings, submission of relevant reports
vi. Grievance redress mechanism	Relevant parties, Religious leaders of Temple, AIIB	Meetings, written and verbal communications

Annexure I: Images of the site condition and the consultation



Discussion with Monks of the Temple



Discussion with residents closer to the site



Mitigation area



Retaining wall constructed near mitigation area



Mitigation area



Shops and residential houses nearby