

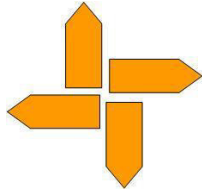
Initial Environmental Examination

May 2017

SRI: Integrated Road Investment Program

Prepared by the Road Development Authority, Ministry of Higher Education and Highways for the Asian Development Bank.

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**Ministry of Higher Education and Highways
Road Development Authority**



SRI: Integrated Road Investment Program

Road Management Contract

**Rehabilitation of
Maradankadawala (0.0km) – Habarana (25.0km)
section of
Maradankadawela – Habarana – Tirikondiadimadu (A011) Road**

Initial Environmental Examination (IEE)

Final Report

May 2017

**Prepared & Submitted by
Environmental and Social Development Division
Road Development Authority**

**Submitted to
Asian Development Bank**

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LIST OF ABBREVIATIONS

ABC	Aggregate Base Coarse
AC	Asphalt Concrete
ADB	Asian Development Bank
AEZ	Agro-ecological Zones
BAU	Business as Usual
BRT	Bus Rapid Transit
CBO	Community Based Organizations
CEA	Central Environmental Authority
DO	Dissolved Oxygen
DoF	Department of Forest
DOFC	Department of Forest Conservation
DSDs	Divisional Secretary Divisions
DWLC	Department of Wild Life Conservation
EC	Environmental Checklist
EIA	Environmental Impact Assessment
EKB	Evaluation Knowledge Brief
EMP	Environmental Management Plan
EPL	Environmental Protection License
ESDD	Environmental and Social Development Division
FBO	Farmer Based Organizations
GHG	Green House Gas
GoSL	Government of Sri Lanka
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GSMB	Geological Survey and Mines Bureau
IED	Independent Evaluation Department
IEE	Initial Environmental Examination
LAA	Land Acquisition Act
ME&MD	Ministry of Environment and Mahaweli Development
MFF	Multi Tranche Financing Facility
MOHE&H	Ministry of Higher Education and Highways
MOHPS	Ministry of Highways, Ports and Shipping
MRT	Metro Rail Transit
NAAQS	National Ambient Air Quality Standards
NBRO	National Building Research Organization
NCP	North Central Province

NEA	National Environmental Act
NMVOC	Non-Methane Volatile Organic Compounds
NWS&DB	National Water Supply and Drainage Board
OPRC	Output and Performance - based Road Contract
PIC	Project Implementation Consultant
PIU	Project Implementation Unit
PRDA	Provincial Road Development Authority
PS	Pradeshiya Sabha
RDA	Road Development Authority
ROW	Right of Way
SAPE	Survey and Preliminary Engineering
SLS	Sri Lanka Standards
TDS	Total Suspended Solids
TEEMP	Transport Emissions Evaluation Models for projects
TOR	Terms of Reference

EXECUTIVE SUMMARY

1. Approximately 85% of the Sri Lanka's population still live in peri-urban and rural areas and out of this population it has been estimated that around 85% is considered as poor. Poverty is mostly concentrated in areas where habitations, crop lands etc... are inefficiently connected with major socio-economic centres where facilities of markets, health, education and administrative are available. Although the country's road density is comparatively high in relation to the other countries in the region, it needs uplifting to serve the emerging demand. Thus, development of rural roads and continuous maintenance in national roads is necessary to maintain a good road network.

2. Taking initiative in this regard, Road Development Authority (RDA) under Ministry of Higher Education and Highways (MOHE&H) introduced an investment program where an efficient road transport will be established between rural communities and socio-economic centres. The program targets 1,000 rural communities including rehabilitation and upgrading of both rural and national roads. The program is implemented under a Multi Tranche Financing Facility (MFF) obtained from Asian Development Bank (ADB). The program is officially termed as "Integrated Road Investment Program" or simply *iRoad Program*. The investment program will deliver two outputs: (i) improved road conditions between rural communities and socioeconomic centres, and (ii) enhanced capacity of RDA in inclusive road operation and development. Under stage 1 of iRoad program five (5) national roads have been selected for rehabilitation and improvements. Total length of these road sections will be around 320 km. These national road sections will be developed as Road Management Contracts (RMC) where the rehabilitation and improvement works will be carried out for a period of two (2) years and maintained for another five (5) years.

3. During SAPE works for iRoad stage 1, an Environmental Assessment and Review Framework (EARF) was prepared to guide screening and selection of roads, environmental assessments and to monitor implementation of environment safeguards during project implementation. EARF complies with ADB Safeguards Policy Statement (SPS) as well as the national laws and regulations with respect to environmental management and conservation such as National Environmental Act (NEA) and Fauna and Flora Protection Act.

4. As per the project classification on environment aspects the RMC fall within the scope of category B. Thus Initial Environment Examinations should be carried out for each candidate road and this document presents the findings of the Initial Environmental Examination (IEE) conducted along Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawela-Habarana– Tirikkondiadimadu (A011) Road. This IEE report also discuss the possible impacts (beneficial and adverse) that would arise due to proposed development and maintenance works of the particular road section of A011 road. Candidate road section of A011 Road facilitates the connection to villages, towns and cities of Anuradhapura and Polonnaruwa Districts of North Central Province.

5. The broad objective of this project is to improve the connectivity of road network between socio economic centres, cities, townships and villages of districts in North Central Province. So that people living in the province will have a better and convenient national road connectivity which will lead to the nationwide economic and social development. To achieve these objectives, selected road section of A011 Road will be improved, rehabilitated to all weather standards with two lanes facility and maintained within the specified period.

6. This IEE was carried out in compliance with the RDA manuals on environmental and social safeguards compliance in road development projects which is in line with national environmental and social safeguards acts and also the IEE follows the guidelines specified in the EARF which is prepared based on ADB safeguards policy statement, 2009.

7. In compliance with the EARF, an Environmental checklist (EC) was prepared for the candidate road section of A011 Road to identify sensitive environmental features to be considered in the impact assessment. In addition as part of the environmental assessment, water quality and noise measurements were obtained at selected locations along the proposed section of A011 road.

8. The scope of work proposed under the RMC include the following: clearing and grubbing; roadway excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and leadaway drains; cleaning, desilting, and repairing of culverts. All improvements are limited to the available ROW and no land acquisition is necessary.

9. Material required for construction will be explored from the project area. Existing sites which are operating with relevant licenses and approvals will be used especially for extraction of soil, metal and sand. Here, material extraction sites which are currently used for the rural road component of North Central Province (NCP) can be used if the capacity of the particular sites fulfil the requirement.

Existing land use along the road

10. In general the land use of the project area could be categorized in to home gardens, townships, agricultural lands, water bodies such as streams and irrigation tanks.

Physical Environment

11. **Climate:** Based on major climatic zones of the country, candidate road section of A011 Road fall within the area classified as the low country - dry zone.

12. **Hydrology:** Candidate section of A011 Road crosses catchments Malwathu Oya and Yan Oya and Maminiyawa and Thoru wewa irrigation tanks.

13. ESDD measured water quality of surface and ground water bodies found along the A011 Road and values of pH at measured locations are within the standard limits. However the baseline Dissolved Oxygen (DO) values are slightly higher than the respective standard levels. As per the data on ground water, it is observed that the conductivity levels and TDS have lower values than the maximum desirable level of SLS Standards. The pH values measured as baseline, range between 7.0 and 8.5, within the maximum desirable level. However Turbidity of the well has higher values than the maximum desirable level and the maximum permissible level.

14. **Air Quality:** A considerable flow of traffic could be observed along the A011 Road and the flow is increased due to intersection of other trunk roads at junctions such as Maradankadawala, Ganewalpola and Habarana which are within the road section to be rehabilitated under this RMC. Therefore air quality along the A011 can also be degraded due to the existing vehicle fleet however no baseline measurements are available for project area. Chena (slash and burn) cultivation observed along the entire road section and quarry sites, crusher plants and asphalt plants observed around Ganewalpola area are also a major sources of contaminants which degrade air quality of the project area.

15. **Noise:** According to Schedules I and II of National environmental (Noise Control) regulations No.1 1996 (924/12), the study area belongs to “Low noise area”. Therefore the ambient noise level of the area can be considered as 55 dB (A) during day time (06.00 hrs-18.00 hrs) and 45 dB (A) night time (18.00 hrs - 06.00 hrs). However measured noise levels are exceeding the required ambient noise levels and this is due to the continuous traffic movement along the A011 Road during the period of measurement.

16. **Floods:** Mainly two locations of the candidate section of A011 Road are prone to floods during the period generally from November to December. These locations are; Maminiyawa Tank (5.4 – 6.6km) and Around Yan Oya (23.9km).

Ecological Environment

17. The project area does not traverse through or located adjacent to any protected areas declared under Department of Wildlife Conservation (DWLC) or any forest area declared by Department of Forest of Sri Lanka.

18. **Fauna:** As per the information from DWLC officers and the local people, herds of elephants from nearby scrub/forest areas are attracted to the banks of Kala wewa - Balalu wewa complex (which is located about 10km away from the project area) as the water levels drop in the dry season, the tank beds become lush grassland, providing the animals with fodder.

Therefore there is a possibility of roaming these in to the project area as well. As per the national red list 2012 of Sri Lanka Asian elephant is an "Endangered" species.

Socio - Economic Environment

19. **Population:** The two road sections of A011 is located within 13 GN Divisions in two DS Divisions of Anuradhapura district of North Central Province. According to Department of Census and Statistics, in 2016, estimated midyear population of Anuradhapura district was 905,000 persons. Majority of population (94.1%) is living in rural areas.

20. **Main economic activities:** Population of the project area are generally involved in agriculture, industry and service sectors for their income generation.

21. **Poverty Situation:** Poverty Head Count Index of the Anuradhapura district is 5.7%. In 2013, it has increased up to 7.6%.

Anticipated Environmental Impacts and Proposed Mitigation Measures

22. Following impacts on the existing environment and social setup during pre-construction, construction and operational stages could be anticipated from the project.

23. **Pre-construction phase:** Natural hazards aggravated by the project and impacts to the road due to natural hazards such as flood Impacts and relocating utility supply lines.

24. **Construction phase:** increase of local air pollution, noise and vibration, deterioration of surface water quality due to silt runoff, emissions and spoil from labour camps, flood impacts, social and environmental impacts due to establishment of labour camps, disruption to traffic/transportation, impact on animal movement pathways, loss of trees and vegetation, impact on aquatic fauna and flora, disturbance due to noise, vibration and dust, ecological disturbances by workers and their camp operations, impacts due to extraction and transportation of construction materials, alteration of surface water hydrology of waterways, requirement of lands for the road upgrading, safety of workers and public, impacts to roadside structures and impact to access.

25. **Operational Phase:** impacts on water resources, disposal of unsuitable material, extraction of material for repairing and maintenance works, pedestrian and commuter safety, air quality and noise and ecological impacts.

27. **Positive Impacts of the Project:** Socio - economic benefits such as Improvements in road connectivity reduce regional disparity, open up new markets, generate employment opportunities and thereby reduce poverty in lagging areas.

Climate Change Adoption (Impact and Mitigation)

28. The proposed improvement to existing highway pavements will bring a reduction in CO₂ emission even with a growth of traffic. However, this analysis is based on the assumption that the roughness of improved highway pavement surface will be maintained during the project life. Therefore it is important that the road maintenance program is maintained throughout the project span (i.e. during operational stage for seven years and beyond). The length of the particular section to be improved is 25km. Based on the net change in CO₂ emissions or CO₂ savings of the section is 28.1 Tons/km/year, the proposed investment program for A011 as RMC contract will save emissions of 702.5 Tons CO₂/year.

29. **Mitigation measures for floods:** Structures such as culverts, causeways and bridges with small spans will be constructed along with road side drains (either earth or concrete based on the requirement) to facilitate the existing flow regime as well as future discharge volumes as predicted by drainage analysis during level one designs. All hydraulic structures constructed within the selected road section of A011 highway will be of reinforced concrete. Considering the percentage of allocation (which is generally 5% - 10% of construction cost) for Environment Management plan which includes mitigation of flood impacts this allocation will be sufficient to mitigate impacts due to floods within Maradankadawala to Habarana section of Maradankadawala – Habarana – Tirikkondiadimadu (A011) highway.

Institutional Requirements and Environmental Management Plan and Grievance Redress Mechanism

30. **Institutional Arrangements:** The Ministry of Higher Education and Highways (MOHE&H) is the Executing Agency (EA) for the program and the secretary to the ministry will be responsible for decisions on overall approvals and operational policies of the project. RDA will be the Implementing Agency (IA). A Project Implementing Unit (PIU) will be setup headed by a Project Director (PD) who will be responsible for carrying out Road Maintenance Contracts. The PIU will be responsible for implementing the project. The PD will be assisted by a staff of engineers, environment and social safeguards officers and other administrative staff. The PIU will be assisted by a Project Implementing Consultant (PIC) who will be responsible to review and approve designs prepared by contractor, supervise civil works of contractor and review and certify bills submitted by contractor. A team of experts including engineers, quantity surveyors, environment and social experts will be working in the PIC headed by a Team Leader (TL). Safeguard team of PIU, PIC and the contractor is primarily responsible for safeguards compliance of all activities carried out for rehabilitation and maintenance of the candidate section of A011 road. Their specific roles and responsibilities of each party are given in chapter VI of the EARF.

Environmental Management Plan and Monitoring:

31. The EARF as well as the Environmental Safeguards Manual of RDA, outlines the requirements for an Environmental Management Plan (EMP) which is presented as a matrix developed based on best practices for environmental management. This IEE report includes EMP prepared for rehabilitation of A011 road. This EMP covers all impacts and mitigation measures identified within the project. However contractor will be responsible for preparation of Site Specific Environmental Management Action Plan (SSEMAP) based on the EMP given in this IEE. SSEMAP is supposed to include site specific impacts related site specific construction activities and relevant mitigation measures proposed to the particular locations in order to minimize relevant impacts. SSEMAP will be supported by site plans in which proposed mitigation measures are presented. Separate SSEMAPs will be prepared for each contract packages if the A011 road will be contractually subdivided. All costs for implementing the mitigation measures must be included in the Bill of Quantities (BOQ) by the contractor as implementation of the SSEMAP will be the responsibility of the contractor and the PIU will oversee the effectiveness of the implementation with the assistance of the PIC. In addition, in compliance with the EARF, ESDD is also responsible for monitoring of implementation of the SSEMAP bi annually. ESDD also assists PIU in meeting safeguards compliance and will conduct training sessions to the safeguards staff of the contractor on safeguards considerations of iRoad.

32. Monitoring of EMP implementation will be carried out during the preconstruction, operation and maintenance stages of the project. As specified in the EARF (chapter VII), Environmental Monitoring Checklist (EMC) should be prepared by the PIC based on the EMP for each of these stages.

33. In addition there will be an Environmental Monitoring Plan (EMOP) based on the project cycle to monitor EMP implementation by measuring environmental parameters. During the pre-construction phase baseline data on air, water quality and noise levels will need to be collected. This data will provide baseline information on the existing conditions which could be used to compare the changes in quality levels during construction and operational phases. Such a comparison will reflect how effective the EMP is and help to revise it to rectify any shortcomings that will cause any adverse impacts. Furthermore the contractor will also be responsible for updating/modifying the EMP, EMC and EMOP if there are any significant changes in the project site, activities, conditions, engineering design or if any unpredicted impact will arise with the approval of PIC.

34. **Grievance Redress Mechanism:** Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the Grievance Redress Mechanism (GRM) as recommended in the EARF (Chapter V – C) which is to be formed using existing local administrative system. In compliance with the EARF, grievances will be addressed at three levels depending on the nature and significance of the grievances or complaints. The first will be at the grass roots level where complaints will be

directly received and addressed by the contractor, PIC or PIU representative on site. Grievances which are simple but still cannot be addressed at the grass roots level will be addressed at the Grama Niladhari (GN) level. More complex grievances which cannot be addressed at the GN level will be addressed at the Divisional Secretariat (DS) level. There will be a Grievance Redress Committee (GRC) at the GN and DS levels.

35. **Public Consultation and Information Disclosure:** The social study team of ESDD met government officers like Grama Nilaries contacted through Divisional Secretaries. A household survey was also conducted for the social assessment and one on one interviews were conducted with the people living in the project area through the survey. The number of people contacted for the household survey is 1,180 and the sample include views of 20 people (12 males and 08 females). The other people also expressed the similar views. People provided many suggestions to improve the road condition and safety.

36. **Disclosure of information:** According to the requirements of the ADB SPS, for environment category B project roads the respective draft IEE will be disclosed before the Management Review Meeting (MRM) or equivalent meeting or approval of the respective project, if there is no MRM. Signboards with project information including details on nature of construction works, road length, construction period, name of contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil and English) for rural roads. For the national RMC roads there will be sign boards on period of works and contact information for reporting complaints or grievances in three languages.

37. During project implementation annual environmental monitoring reports will be prepared for the entire RMC package of iRoad and submitted to ADB for disclosure on the ADB website.

Conclusion and Recommendations

38. This Initial Environmental Examination has discussed various aspects of the proposed rehabilitation and maintenance of 25km from Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala – Habarana - Tirikkondiadimaduroad under RMC package of iRoad program implemented by RDA under ADB financing. Under RMC package, contractors are liable to keep the roads in operational status for approximately 5 years after rehabilitation.

39. As discussed, candidate road sections of A011 road will be rehabilitated and maintained under the project and all construction and maintenance activities will be restricted to the available ROW therefore no land acquisition is required. The road will be improved to standard two lanes status with hard shoulders, drains and other road furniture. Design will be carried out accordingly along the flood prone areas of the road in order to cater hazardous conditions and as well as to minimize road induced flood impacts.

40. The candidate road section of A011 road do not cross or located adjacent to protected areas and not falling within a declared forest area. Indirect impacts to environmental and social

set up of the project area will be minimized with effective mitigation measures as given in the chapter 5 of the report and EMP.

41. An EMP, EMC and EMOP have been prepared as part of this report. These are required to be updated and incorporated in to tender documents and converted into contract package specific documents before the commencement of construction activities.

42. The proposed improvement for A011 Road will boost economic activities in the NCP including potential growth in industries, tourism, and agriculture in lagging rural areas which will be a positive step to the socio economic development of the country.

I. INTRODUCTION

A. Background

1. Sri Lanka is an island nation having approximately 65,000 km² of land located in the Indian Ocean. The country which was affected by a near 30 year civil conflict is now showing a positive economic growth, there is an upward trend in urbanization where the standard of living has also improved significantly. Even with these developments about 85% of the country's population still live in peri-urban and rural areas. And out of this population it has been estimated that around 85% is considered as poor. Poverty is mostly concentrated in areas where habitations, crop lands etc... are inefficiently connected with major socio-economic centres where facilities of markets, health, education and administrative are available.

2. Road based transport is the main land based transportation mode in Sri Lanka. The current road network of the country comprises around 170 km of expressways (in operation), 4,200 km of "A class" roads and 8,000 km of "B class" roads (source: Annual Report of RDA, 2015). The length of the provincial roads maintained by provincial councils is approximately 16,000 km. Although the country's road density is comparatively high in relation to the other countries in the region, it needs uplifting to serve the emerging demand. Thus, development of rural roads and continuous maintenance in national roads is necessary to maintain a good road network.

3. Taking initiative in this regard, Road Development Authority (RDA) under Ministry of Higher Education and Highways (MOHE&H) introduced an investment program where an efficient road transport will be established between rural communities and socio-economic centres. During the initial studies for the program it was agreed that around 1,000 rural communities would be connected to socio-economic centres. The program includes rehabilitation and upgrading of both rural and national roads. The program is implemented under a Multi Tranche Financing Facility (MFF) obtained from Asian Development Bank (ADB). The program is officially termed as "Integrated Road Investment Program" or simply *iRoad Program*. The investment program will deliver two outputs: (i) improved road conditions between rural communities and socioeconomic centres, and (ii) enhanced capacity of RDA in inclusive road operation and development.

4. The stage 1 of iRoad program is currently implemented in rural roads in Southern, Central, Sabaragamuwa, North Central, North Western Provinces and Kalutara District in Western Province. And Preliminary Engineering and Survey (SAPE) works are in progress in Northern, Eastern, Uva and Western Provinces (including additional roads in Kalutara District) to select roads that will be rehabilitated and improved under stage 2 of iRoad program.

5. Under stage 1 of iRoad program five (5) national roads have been selected for rehabilitation and improvements. Total length of these road sections will be around 270 km. The roads are listed in table 1.1 below with the respective lengths proposed for rehabilitation and

improvements. However, sections of Awissawella – Hatton – NuwaraEliya (A007) and Colombo – Ratnapura – Wellawaya – Betticloa (A004) will be considered based on the availability of funds.

Table 1.1: National road sections which are proposed for development

No.	Road	Road Section	Length of the Road Section (Km)
01	Maradankadawela – Habarana – Tirikondiadimadu (A011) Road	Maradankadawala to Habarana Section (0.0km to 25km)	25.0
02	Colombo – Kandy (A001) Road	Nittambuwa to Peradeniya section	70.0
03	Pelmadulla – Ambilipitiya – Nonagama (A018) Road	Pelmadulla to Padalangala section	66.0
04	Awissawella – Hatton – NuwaraEliya (A007)	Awissawella to Hatton	70.0
05	Colombo – Ratnapura – Wellawaya – Betticaloa (A004)	Awissawella to Ratnapura	41.0

Source: PIU, iRoad

6. These national road sections will be developed as Road Management Contracts (RMC) where the rehabilitation and improvement works will be carried out for a period of two (2) years and maintained for another five (5) years. This type of contract significantly expands the involvement and responsibility of private sector civil contractors in infrastructure development, from a simple execution of civil works to management and conservation of national assets (in this case the road infrastructure).

7. During the contract period the contractor is responsible for environmental and social safeguards compliance as specified in the contractual agreements and necessary mitigation measures should be implemented to minimize any adverse impacts resulted due to road rehabilitation and maintenance activities.

8. During SAPE works for iRoad stage 1, an Environmental Assessment and Review Framework (EARF) was prepared to guide screening and selection of roads, environmental assessments and to monitor implementation of environment safeguards during project implementation. EARF complies with ADB Safeguards Policy Statement (SPS) as well as the national laws and regulations with respect to environmental management and conservation such as National Environmental Act (NEA) and Fauna and Flora Protection Act.

9. As per the project classification on environment aspects the RMC falls within the scope of category B (please refer REA checklist attached in appendix 1.1). Thus Initial Environment Examinations should be carried out for each candidate road.

10. This document presents the findings of the Initial Environmental Examination (IEE) conducted along Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala-Habarana – Tirikkondiadimadu (A011) Road. This IEE report also discuss the possible impacts (beneficial and adverse) that would arise due to proposed development and maintenance works on the selected road section of A011 road. The IEER is prepared based on the guidelines given in the EARF of iRoad stage 1 and is prepared by an expert staff from Environmental and Social Development Division (ESDD) of RDA. The IEER has also taken insights from Environmental Safeguards Compliance Manual of RDA.

B. Objectives of the proposed project

11. The broad objective of this project is to improve the connectivity of road network between socio economic centres, cities, townships and villages of districts in North Central Province (NCP). So that people living in the province will have a better and convenient national road connectivity which will lead to the nationwide economic and social development.

12. Specific objectives of this project are to;

- improve, rehabilitate, and maintain Maradankadawala (0.0km) to Habarana (25km) section of A011 Road to all-weather standard,
- improve connectivity between production centres and market places and improve linkage with the other districts and provinces,
- facilitate mobility by improving inter- and intra-provincial road network,
- open up rural areas for development,
- generate efficiency gains by lowering the unit cost of individual producers through transport efficiency which will lead to increase their margins and profits thus making them generating another round of investments,
- reduce rural poverty through improved access to markets and economic centres, social infrastructure, and new employment opportunities

13. To achieve these objectives, selected road section of A011 Road will be improved, rehabilitated and maintained with the following guidelines:

- Improve, rehabilitate, and maintain the existing Class A national road to all weather standards with two lanes facility
- Resurfacing the existing pavement with Asphalt Concrete (AC) if the present surface is weak
- Repair or reconstruct damaged culverts
- Introduce hard shoulders and earth drains for the entire road section and built up drains where necessary
- Remove any irregularities that are on the existing vertical profile

- Thereby improve the vehicle operating speeds to a desired level while ensuring safety of road users.

C. Objectives of the Initial Environmental Examination

14. This IEE covers proposed improvement, rehabilitation and maintenance of Maradankadawala (0.0km) to Habarana (25km) section of A011 road. The purpose of this Initial Environmental Examination Report (IEER) is to gather and provide:

- (i) Background condition of the following existing environmental and socio-economic settings of the project influential area;
 - Physical Environment (including climate, air quality, topography, soil, surface and ground water quality and hydrology),
 - Biological Environment (habitats of fauna and flora and presence of endemic and threatened species),
 - Social Environment (socio economic profile of the communities living in the project influence area, infrastructure facilities and land use etc.)
- (ii) Identify potential beneficial and adverse impacts on the existing environment during due to the proposed rehabilitation and maintenance work;
- (iii) Propose effective measures to avoid/ minimize or mitigate the project induced adverse impacts while enhancing the beneficial impacts, and;
- (iv) Formulate an effective Environmental Management Plan (EMP), so as to sensitize and guide respective divisions of RDA in environmental and social safeguards compliance and sensitize and guide respective contractors in environmental and social safeguards compliance during the project period.

D. Approach, Methodology and Personnel Involved

15. This IEE was carried out in compliance with the RDA manuals on environmental and social safeguards compliance in road development projects which is in line with national environmental and social safeguards acts and also the IEE follows the guidelines specified in the EARF which is prepared based on ADB safeguards policy statement, 2009.

16. In compliance with the EARF, an Environmental checklist (EC) was prepared for the candidate road section of A011 Road to identify sensitive environmental features to be considered in the impact assessment. The existing Right of Way is set as the primary impact zone as the improvement activities will be of maintenance related which will be within the existing ROW. A secondary impact zone is defined as 500m from the centreline of the road in order to identify the presence of any environmentally and socially sensitive areas along the road. The EC summarizes the following details;

- Road details
- Location information
- Climatic conditions
- Generic description of environment
- Specific description of the road environment
- Public consultation
- List of photographs taken along the road

17. The EC prepared for Maradankadawala (0.0km) to Habarana (25km) section of A011 Road is presented in Appendix 1.2.

18. As part of the environmental assessment, water quality and noise measurements were obtained at selected locations along the candidate section of A011 road. Water sampling locations included two surface water sources (streams) and one ground water source (well). On the other hand, noise was measured at two locations along the candidate section of A011 Road. Particular locations where water quality and noise were measured are presented in the tables below and the location map is given in Appendix 1.3.

Table 1.2: Locations of water quality measurement

Code	Water body	Location details		
		Chainage (km)	Coordinates	
			Latitude	Longitude
SWQ 1	Stream	9	8° 5.523'N	80° 37.954'E
SWQ 2	Yan Oya (Stream)	23.9	8° 2.679'N	80° 44.769'E
GWQ 1	Well	11.4	8° 5.414'N	80° 39.134'E

Table 1.3: Locations of noise measurements

Code	Location details		
	Chainage (km)	Coordinates	
		Latitude	Longitude
N1	0.0	8° 7.645'N	80° 33.763'E
N2	11.6	8° 5.441'N	80° 39.529'E

19. The environmental assessment and report preparation was carried out by trained multidisciplinary team including Environmental and Social Safeguards Officer, Hydrologist, Biologist/Ecologist, Chemist, Ecologist, Social Impact Awareness officer and Field Monitoring Assistant (Hydrology) of ESDD, RDA. This core team was supported by assistant staff members of environment and social dimensions. The support and guidance given by Director and Deputy Directors of ESDD, Project Director – iRoad and the staff of RDA is highly appreciated.

II. DESCRIPTION OF THE PROJECT

A. Location of the project

20. Candidate road section of A011 Road connects to villages, towns and cities of Anuradhapura District of NCP and facilitates connection with Polonnaruwa District of NCP. The administrative divisions including Divisional Secretariat (DS) Divisions and Grama Niladari Divisions (Subordinate of the Divisional Secretary) falling within particular section of the road are presented in table 2.1 below while the location map of the candidate section are presented in Appendix 2.1.

Table 2.1: Administrative divisions of the project road

Province	District	DS Division	GN Division
North Central	Anuradhapura	Kekirawa	Maradankadawala, Thorewewa, Maminiyawa, Kollankuttama, Kelepuliyankulama, Maminiyawa, Rambewa, Ganewalpola, Heenukkiniyawa
		Palugaswewa	Galapitagala, Senadhiriyagama, Palugaswewa, Habarana

B. Need for the Project

21. Road Development Authority (RDA) has already commenced improving and rehabilitating rural road system in Sri Lanka through iRoad program with the financial assistance of ADB and subsequently improvement of rural roads in six provinces namely; Southern, Sabaragamuwa, Central, North Western, North Central and selected roads in Western Provinces are underway. Improvement of rural roads in Anuradhapura District of North Central Province (NCP) has also been started recently and approximately 330km of roads are to be rehabilitated. Most of these roads connect to trunk roads which cross Anuradhapura District such as A011, Kandy – Jaffna (A009) and Ambepussa – Kurunegala – Trincomalee (A006) Road therefore, these roads are supposed to be up to the required standards in order to serve the connecting rural roads effectively. Accordingly A006 and A009 roads have been already rehabilitated recently however A011 Road was not undergone a recent improvement. Weak sections of the surface and absence of hard shoulders of A011 Road decreases the safety of road users and increases travel time and cost. This situation fails to serve the required role of the road and to support the socio-economic development of the project influential area and the province.

22. On the other hand, A011 Road is one of the main roads connecting Anuradhapura and Polonnaruwa Districts of NCP and also facilitates the connectivity with the Eastern Province and

the only trunk road which serves access to Polonnaruwa city. Therefore a considerable traffic including public transport busses, heavy vehicles which transport goods and traffic which bring pilgrims to Polonnaruwa sacred city could be observed along the road. On the other hand, trucks carrying sand which is mined from Manampitiya area (where A011 Road crosses Mahaweli River) mostly use the candidate road section of A011 road to access Anuradhapura areas. Inferior conditions specially failed sections of the road does not support the load of the traffic and with the time the road will be further degraded if not rehabilitated and maintained.

23. Therefore as identified by RDA, rehabilitation of the A011 Road to the standard two lanes facility introducing hard shoulders, side drains and parking areas where necessary and its maintenance is critically required in order to meet the desired transportation efficiency.

C. Analysis of Alternatives

1. No Project Alternative

24. If the selected section of A011 Road will not be rehabilitated and maintained the present road condition with the failed sections will be worsen with the increased traffic flow with the time. This will negatively affect the transportation efficiency of the road and safety of road users. Undeveloped road will not support socio-economic development of the area as it disturbs livelihood activities of the project area such as tourism, sand mining, agriculture etc... Therefore no project alternative is not a feasible solution with respect to socio-economic development of the NCP.

2. With Project Alternative

25. With the project Maradankadawala (0.0km) to Habarana (25km) section of A011 Road will be rehabilitated to standard two lanes configurations and maintained for 5 years. Under the proposed development hard shoulders, road side drains and parking facilities will be provided where necessary. Special consideration will be paid for sections of the road which are prone to floods and necessary mitigation measures will be incorporated to the design. During the maintenance period, the road will be kept up to the serviceable level. Therefore the proposed rehabilitation and maintenance, will positively affect transport efficiency along the road and better transport efficiency will enhance the socio-economic development of the project area and finally of the province.

D. Magnitude of Operations

1. Proposed improvement

26. Under RMC of iRoad, 25km length from Maradankadawala (0.0km) to Habarana (25km) of A011 Road will be rehabilitated and maintained. And it has been proposed to rehabilitate the particular section in to standard two lanes configurations. The project will not involve acquisition of additional lands and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of carriageway, hard shoulder, soft shoulder and side drains where necessary as given below.

- Carriageway: 3.5m x 2
- Hard shoulder: 1m x 2
- Soft shoulder (varies): 1.5m x 2
- Drain: 0.9m x 2
- Total: 13.8m

27. Proposed typical cross section is attached in Appendix 2.2.

28. However the typical cross section will be modified based on the location specific contexts keeping the major components unchanged.

29. At present, the cross section of the A011 road consists of a dual carriageway of 6m and soft shoulders of 1.6m each on average. And the ROW of the road generally varies around 23m however the road sections along irrigation tanks (E.g: along Maminiyawa tank (5.4 to 6.6km)), the ROW narrows down to about 15m.

2. Project activities

30. The scope of work proposed under the RMC include the following: clearing and grubbing; roadway excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and leadaway drains; cleaning, desilting, and repairing of culverts.

31. All improvements are limited to the available ROW and no land acquisition is necessary.

32. The proposed pavement is asphalt concrete (AC) with the following criteria:
- If the existing surface is asphalt; it will be overlaid by the asphalt concrete.
 - Base correction will be carried out if base failures are found along the road.
 - The build-up drain has been provided for town areas or other required areas. Otherwise the earth drain will be provided.
 - The earth work will be carried out in required areas.
 - Finally road marking will be carried out.
33. In addition, improvement to cross and side drainage will be considered in locations where structures have been badly damaged or rectification of the drainage is significantly required. Special consideration will be paid at flood prone road sections and opening sizes of cross drainage structures, surface treatment and road finished level will be determined with necessary hydrological studies which will be carried out during detailed designs.
34. The following specific design standards will be the key components of the RMC of iRoad project:
35. The applicable design standards and guidelines are:
- (i) Road Design Manual and Bridge Design Manual—RDA's standard (b) AASHTO—Geometric Design of Highways and Streets 5th edition (2004); (c) TRL—Overseas Road Note 6, A Guide to Geometric Design (1988), and (d) Austroads—Rural Road Design (2003). Bridges: RDA's Sri Lanka Bridge Design Manual of 1997, based on the British Standards Code of Practice for Bridge Design (BS5400:1990). Road Pavement: (a) Transport Research Laboratory's Road Note 31, 4th Edition (TRL-RN31), basis of RDA's pavement design process; (b) AASHTO Pavement Design Guide, and (c) design life for new pavements: 10-year life with provision for overlays during or at the end of that period to extend the life to 15–20 years. Drainage: RDA's standards incorporating relevant standards from AASHTO and the British Standard Design Manual for Roads and Bridges.
 - **Alignment and Traffic Facilities:** In general, the proposed improvements follow the existing horizontal and vertical alignment. The only minor changes are applied to the horizontal alignment for very short sections to enhance road safety, to ease the radius of curves, or minimize blind spots (within the ROW). The road safety aspects relate mostly to localized sections of the road alignments. In densely populated areas, roads, bridges, and associated sidewalks are made accessible for all, including the disabled.
 - **Road Safety:** The road safety aspects are related mostly to localized sections of the alignments. Based on the road safety inspections, carried out on the road sections

during the field evaluation, the detailed design, wherever possible, incorporates improvements to road width and alignment, including installing precautionary sign boards, direction boards and speed signs to slow down for oncoming curves or low speed areas.

- **Road Side Drains.** To minimize storm water flooding or ponding, roadside drains are reconstructed to direct surface flows away from road pavements and divert to streams or watercourses. Built up drains are provided for urban and sub-urban areas and for rural areas, earth drains are provided. For existing built up drains, which can be retained with minor repairs (retained or repaired), the waterways are restored by removing sediment materials and debris.
- **Culverts and Bridges.** Improvements comprised of repairing and or replacing existing culverts and bridge structures, depending on hydraulic and structural requirements. These interventions include structural renovation of substructure and superstructure elements together with installation or repair of guardrails and improvement of causeways and vented drifts. Depending on the terrain and outcome of hydrological studies, few new culverts may be introduced to improve drainage. Materials and construction methods are in accordance with Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **Earth Retaining Structures.** When the road is in embankment, retaining walls are introduced to get required additional road widths. Gabions, random rubble masonry and reinforced concrete retaining walls are used and Materials and construction methods are in accordance with Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **Road Pavement.** Road pavements are constructed in accordance with Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka). Road pavement consists of granular soil sub base, aggregate base course and Asphalt concrete wearing course.

36. RMC will cover the periodic, routine, and emergency maintenance of the roads. Periodic maintenance works consist of specific types of major interventions designed to ensure the residual pavement and surfacing lives are provided to RDA by the contractor at the end of the contract period. Routine maintenance services are all interventions on the roads which are to be carried out by the contractor in order to achieve maintain the road performance standards defined by the service levels included in these specifications and all activities related to the management and auditing of the road contract performance measures. Emergency works are activities needed to reinstate the roads and reconstruct their structure or their ROW which has been damaged as a result of natural phenomena such as strong storms, floods and earthquakes.

3. Extraction of Construction Material

37. Material required for construction will be explored from the project area. Existing sites which are operating with relevant licenses and approvals will be used especially for extraction of soil, metal and sand. Here, material extraction sites which are currently used for the rural road component of NCP can be used if the capacity of the particular sites fulfils the requirement.

38. Such potential locations which are currently used for iRoads of NCP as well as for other road development projects are given below.

Table 2.2: Potential locations for material extraction for A011 Road

Material	Potential location	Approx. location details
Soil	Welikanda	Around 7°58'38.79"N, 81°14'8.22"E
Aggregates	Ganewalpola	Around 8° 4'28.24"N, 80°37'22.31"E
	Welikanda	Around 7°58'16.51"N, 81°14'24.81"E
Asphalt	Ganewalpola	Around 8° 4'28.24"N, 80°37'22.31"E
Sand	Manampitiya (Mahaweli River)	At approved sites of sand mining on Mahaweli River (Crossed by the A011 road at 80km)

39. Offshore sand could also be used for construction subjected to confirmation of quality. If new material extraction sites will be opened for this project, necessary licenses and approvals will be obtained from relevant agencies. As per the estimations prepared for iRoad Program, projected approximate quantities of material required for the project are provided below:

Table 2.3: Material Requirement

	Material	Approx. quantity
1	Aggregate	50,157 m ³
2	Soil	107,648 m ³
3	Sand	2089 m ³
4	Bitumen	2281MT
5	Cement	638 MT
6	Steel	110 MT

III. POLICY AND LEGAL FRAMEWORK

A. Legal Framework

1. National Environmental Act and other applicable regulation

40. The National Environment Act (NEA) No. 47 is the key environmental policy framework which is administered through the Central Environment Authority (CEA) of the Ministry of Environment and Renewable Energy (ME&RE). NEA No. 47 was enacted in 1980 and NEA amendment Act No. 56 of 1988 stipulated the regulations for assessing and managing environmental impacts and obtaining the environmental clearance in a timely and systematic manner. It also provides guidelines for environment management, management of natural resources, fisheries, wildlife, forestry, soil conservation, environment quality, environment protection and approval of projects. The environmental clearance process is implemented through the designated Project Approving Agency (PAA) as prescribed by the Minister under section 23 Y of the NEA. The procedure that should be followed for obtaining environmental clearance is described under section 23CC and 32 of the NEA.

41. The environmental clearance process should be initiated by submitting the completed Basic Information Questionnaire (BIQ) to CEA with preliminary information about the project including exact locations of the project components, extent and environmental sensitivity related to project activities. Based on this CEA decides whether the project is a “Prescribed Project”¹ or not and who the PAA will be for administering the IEE or EIA process to obtain environmental clearance if the proposed project is a prescribed project. For Prescribed project CEA or the designated PAA will issue a TOR for the IEE or EIA required.

42. The scope of the investment program includes rehabilitation and upgrading of existing A011 Road with no widening. According to the Gazette Extra-ordinary No. 772/22 of 24th June 1993 and subsequent amendments all rehabilitation works for existing highways and roads do not fall within the category of Prescribed Projects. Hence, it is likely that the project roads under the investment program will not be required to prepare an IEE or EIA for securing an environmental clearance. However, further amendments to the NEA on requirements for material extraction, emissions, noise and vibration levels that are relevant for the project will need to be followed. Necessary revisions will need to be made within the project to meet the new requirements if there are any.

43. If a project road falls adjacent to the boundary or inside a protected area, necessary clearance will need to be sought from the Department of Wildlife Conservation (DWLC) even if

¹Under the NEA, a prescribed project means that the project requires a full Initial Environmental Examination or Environmental Impact Assessment (EIA) study depending on the TOR issued by CEA for securing the environmental clearance

there will be no widening of the road ROW. Depending on the sensitivity of the protected area, the DWLC may require conduction of an IEE or EIA study for the respective road. No works are allowed in project roads falling inside National parks and Strict Nature Reserves.

44. While the NEA is the key environmental legislation under GOSL there are a number of other environmental laws and regulations that are applicable to the investment program as given in Table 3.1 below.

Table 3.1: Applicable National Laws and Regulations for the Investment Program

Legislation	Relevance and main content	Authorizing Institution
Coast Conservation Act No 57 of 1981	This act regulates any un authorized construction within the coastal zone, by making it mandatory to obtain permits for any Development activity falling within the coastal zone.	Coast Conservation and Coastal Resources Management Department
National environmental protection and quality regulations under Extraordinary gazette notification No. 1534/18 and No. 1533/16 of 2008 under NEA section 32 & 23A, 23B	This regulates the discharge and deposit of any kind of waste or emission into the environment and stipulates requirements for an Environmental Protection License (EPL) depending on the project activity. Examples of activities requiring and EPL are: asphalt processing plant, concrete batching plants, treatment plants, sewerage networks, mechanized mining activities etc.	CEA
National Environmental (Protection and Quality) Regulation No. 1 of 1990 published in Gazette Extraordinary No. 595/16 of February, 1990	Provides standards for discharging effluents into inland surface water during proposed project activities.	CEA
National Environmental (Ambient Air Quality) Regulations, 1994, published in Gazette Extraordinary, No. 850/4 of December, 1994 and amendment gazette No. 1562/22 of 2008	Provides standards for emissions to the air during proposed project activities.	CEA
National Environmental (Noise Control) Regulations No.1 of 1996 and its amendments	Regulates maximum allowable noise levels for construction activities during proposed project activities	CEA

Legislation	Relevance and main content	Authorizing Institution
National Environmental (Vehicle Horns) Regulations, No. 1 of 2011	Regulates maximum allowable noise emanating from vehicular horns on a highway or road any motor vehicle use during project construction activities	CEA
National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	Regulates dumping municipal solid waste along sides of any national highway or at any place other than places designated for such purpose by the relevant local authority during proposed project activities	CEA
Fauna and Flora Protection Act No.2 of 1937 amended in 1993 and 2009	The act specifies that any development activity taking place within one mile from the boundary of a National Reserve declared under the Ordinance requires an EIA/IEE which provide for the protection and conservation of fauna and flora of Sri Lanka and their habitats; for the prevention of commercial and other misuse of such fauna and flora and their habitats for conservation of biodiversity of Sri Lanka; and to provide for matters connected there with.	Department of Wildlife Conservation
Forest Act No. 34 of 1951	This act is to consolidate and amend the law relating to the conservation , protection and management of forest and forest resources for the control of felling and transport of timber and Forest and for matters connected therewith or incidental thereto.	Department of Forest
Felling of Trees Control Act No. 9 of 1951 as amended through Act No. 30 of 1953	This Act sought to prohibit and control felling of specified trees (mainly intended to stop indiscriminate felling of specified trees) in the country.	Department of Forest Conservation
Water Resources Board Act, No. 29 of 1964 and (Amendment) Act, No. 42 of 1999	The act controls and regulates developments (including conservation and utilization) of water resources; prevention of pollution of rivers, streams and other water resources; formulation of national policies relating to control and use of water resources.	Ministry of Irrigation and Water Resources Management

Legislation	Relevance and main content	Authorizing Institution
Soil Conservation Act, No. 25 of 1951 and Amended No. 24 of 1996	This Act makes provisions for the enhancement of productive capacity of soil; to restore degraded land for the prevention and mitigation of soil erosion; for the conservation of soil resources and protection of land against damage by floods, salinity, alkalinity, water logging; and to provide for matters connected therewith or incidental thereto	Department of Agriculture
Explosives Act No. 36 of 1976	To provide control of explosions and regulations of matters connected with explosive activities related with the project.	Ministry Of Defence
Municipal Councils Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the Pradeshiya Sabha Act No. 15 of 1987 as amended in 2010	Regulates and control actions pertaining to socioeconomic development such as roads, culverts, bridges, ferries, waterways and other means of local transport and related site clearance for constructing worker camps, site offices etc. and methods taking place within the command area relevant to government laws and regulations	Ministry Of Local Government And Provincial Council
Flood Protection Ordinance No. 04 of 1924, No 22 of 1955	An ordinance for protection of areas subjected to damage from floods. This includes declaration of flood areas, preparation of schemes for flood protection and other rules and regulations regarding flood in the country	Irrigation Department
Crown Land Ordinance Act No. 1947	An ordinance to make provision for the grant and disposition of crown lands in Sri Lanka; for the management and control of such lands and the foreshore; for the regulation of the use of the water of lakes and public streams; and for other matters incidental to or connected with the matters related to proposed project	Land Commissioners Department
Agrarian Development Act No. 46 of 2000 (Section 32)	This act regulates using paddy land for a purpose other than agricultural cultivation without the written permission of the Commissioner General.	Agrarian Services Department
Land development statuette No. 7 of 2002 the western province provincial council, amendment No. 1287/26 of 2003	A statute for regularizing utilization of state lands situated within the western province either by state or the provincial council, for regulating the distributing of	Governor _ Western Province Provincial Council And Land

Legislation	Relevance and main content	Authorizing Institution
	the aforesaid lands and lands in possession of the provincial council, for augmenting productivity of lands and for matters connected with or incidental to them this statute is in compliance with the crown lands ordinance no. 08 of 1947 (chapter 454) and the land development ordinance no.19 of 1935 chapter 464 as amended by land development (amendment) acts, no. 16 of 1969 no.27 of 1981, no 22 of 1998, no, 22 of 1995 1996. Of divesting of state lands, no. 07 of 1979	Commissioners Department
Sri Lanka Land Reclamation and Development Corporation Act 15 of 1968 as amended by Act No 52 of 1982	This act established Sri Lanka Land Reclamation and Development Corporation which grants permission for the public to fill marshy land subject to provision of storm water drainage.	Sri Lanka Land Reclamation and Development Corporation
National Thoroughfares Act, No. 40 of 2008	This act is known as RDA act which provide for planning, design construction, development, maintenance and administration an integrated public road network in Sri Lanka.	Road Development Authority
Urban Development Authority (UDA) Law No 41 of 1978 and Urban Development Projects (Special Provisions) Act No 2 of 1980	<p>This law provides for the establishment of an UDA to promote integrated planning and implementation of economic, social and physical development of certain areas as may be declared by the minister to be urban development areas and for matters connected with the relevant project activities.</p> <p>Urban Development Projects (Special Provisions) Act No 2 of 1980 is an act to provide for the declaration of lands urgently required for carrying out urban development projects and to provide for matters connected there with relevant project activities.</p>	Urban Development Authority (UDA) under the ministry of Urban Development and Defence
Town and country planning ordinance No. 13 of 1946 and The Town & Country Planning (Amendment) Act, No. 49 of 2000	This regulates the National Physical Plan with transport as the main component	National Physical Planning Department (NPPD) under the Ministry of Urban

Legislation	Relevance and main content	Authorizing Institution
		Development and Defence
Buddhist Temporalities Ordinance No. 19 of 1931	This act provides necessary assistance to administer and protect the property of Viharas, interventions to settle disputes regarding property of Viharas and makes recommendations to release money to be paid as compensation in respect of property of Viharas acquired by government for any development project	Department of Buddhist Affairs
Cemeteries and burial grounds ordinance No. 9 of 1899 and amendments	The act regulates any disturbance, removal of burial, monuments and use of such areas for development project	Local Government Authority
Antiquities Ordinance No. 9 of 1940 and amendments	The act regulate activities of projects located in close proximity of any archaeological reserves	Department of Archaeology

45. Under the NEA (No). 47 and some of the laws and regulations listed in Table 3.1 above, there are specific requirements for clearances, permits and licenses required for road projects as listed in Table 3.2 below.

Table 3.2: Applicable Approvals required for the Investment Program

Project stage	Approvals	Project Related Activity	Relevant Agency
Pre-Construction Stage Note: Although clearances and approval should be obtained during preconstruction stage it is valid throughout the project cycle. However this	Environment clearance	Implementation of the project	Central Environment Authority
	Clearance from Coast Conservation and coastal resources management department	Development activities/project activities in the coastal zone	Coast Conservation and coastal resources management department
	Industrial Mining License (IML)	Operation of quarries, borrow areas and other material extraction sites	Geological Survey and Mines Bureau
	Environmental Protection License (EPL)	Operation of material extraction site including operation of asphalt plants, treatment plants etc.	CEA

Project stage	Approvals	Project Related Activity	Relevant Agency
should be renewed before expiry date	Local Government Authority Trade license and machinery permits	Deciding waste disposal sites, material storage and sites for worker camps and other project stations Trade license should be obtained for asphalt plants, batching plants, quarries etc.	Respective Provincial Council, Local authorities and respective Pradeshiya Sabha
	Explosive Permits	Blasting activities	Ministry of Defence
	Approval for removal of trees	Road clearance for construction	Forest department, CEA and local authorities
	Disturbance to Paddy Lands	Ground preparation for ROW and side drains	Commissioner of Agrarian Services
Construction stage	Consent from relevant government agencies	Construction of bridges, culverts and other drainage systems, land filling, dredging activities	Department of Irrigation, Department of Agrarian services, Local government authority, Land Reclamation and Development Cooperation
	Approval from relevant state /local agencies for the removal/ temporary disturbances for existing utilities	Surfacing, construction of bridges and side drains, embankment filling works	NWSDB for water lines, Ceylon electricity Board for Electric cable/poles, Sri Lanka Telecom for land line telephone cables, poles, Pradeshiya sabha, other local authorities for drainage, sewer systems etc.

2. Environmental Protection License (EPL)

46. The Environmental Protection License (EPL) is a regulatory/legal tool under the provisions of the National Environmental Act No: 47 of 1980 amended by Acts No 56 of 1988 and No 53 of 2000. Industries and activities which required an EPL are listed in Gazette Notification No 1533/16 dated 25.01.2008. Industries are classified under 3 lists i.e. List and "C" depending on their pollution potential.

47. Part "A" comprises of 80 significantly high polluting industrial activities and Part "B" comprises of 33 numbers of medium level polluting activities. EPL for industries in lists "A" and "B" have to be obtained from the relevant Provincial Offices or District Offices of the CEA.

48. Part "C" comprises of 25 low polluting industrial activities which have been delegated to Local Government Authorities, namely Municipal Councils, Urban Councils and Pradeshiya Sabhas. EPL for the industries in List "C" has to be obtained from the respective Local Authorities. The Local Authorities carry out issuing of EPLs and related functions such as follow up, monitoring and law enforcement.

49. Objectives of the EPL

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement technology and to new knowledge such as cleaner production, waste minimization etc

3. International Agreements and Conventions

50. Sri Lanka is also a signatory to a number international agreements and conventions related to environmental conservation. Those that are relevant for this investment program are provided below:

- Conventions on Wetlands of International Importance Especially as Water Fowl habitats (Ramsar)
- Convention concerning the protection of the World Cultural and Natural Heritage

- Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES)
- Convention on the conservation of Migratory Species of Wild Animals (CMS 1979)
- United Nations Framework Convention on Climate Change
- Convention on Biological Diversity
- Plant Protection Agreement for Asia and the Pacific region

B. Policy Framework

1. ADB Safeguards Policy Statement, June 2009

51. ADB's safeguard policy framework consists of three operational policies on the environment, Indigenous People, and involuntary resettlement. All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects, including private sector operations, and to all project components.

52. The objective of environment safeguards policy is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process.

53. Proposed projects are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts.

54. Projects are classified into the following four categories:

- **Category A.** A proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.
- **Category B.** The proposed project's potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

- **Category C.** A proposed project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.
- **Category FI.** A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the financial intermediary's business activities have minimal or no environmental impacts or risks.

55. **Policy Principles:** Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.

56. Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential transboundary and global impacts, including climate change. Use strategic environmental assessment where appropriate.

57. Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative.

58. Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.

59. Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.

60. Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.

61. Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.

62. Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.

63. Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.

64. Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.

65. Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.

IV. DESCRIPTION OF EXISTING ENVIRONMENT

A. Existing land use along the road

66. In general the land use of the project area could be categorized in to home gardens, townships, agricultural lands, water bodies such as streams and irrigation tanks. Specific land uses observed within the candidate road section are described below.

67. Land use within this section is dominated by home gardens which have dense vegetation consisting of dry zone trees and shrubs. In addition, paddy lands, streams, irrigation tanks and townships could also be observed. Starting point of the road at Maradankadawala has a ribbon type development which consists of commercial buildings, houses and government buildings such as hospital and other office premises. Agricultural lands are found intermittently along the road section and road sections from 9 – 10.2km, around 14km, 15.2km, 18km, 20km and 24km are prominent out of them where paddy cultivation is commonly practiced during major rainy season which is locally known as Maha Season (November to February). Ganewalpola (around 8.7km) is a small township formed around A011/B212 junction where again a ribbon type development is found. Road section crosses the catchments of Thoru Wewa (an inland tank) and Maminiyawa irrigation tanks around 3km and from 5.4 to 6.6km respectively. The bunds of the Hirukkiriya Tank and Talpat tank touch the ROW of the road at 12.2km and 19.2km on Right Hand Side (RHS) and Left Hand Side (LHS) of the road respectively. Road crosses a tributary of Malwathu Oya and Yan Oya at 9.6 and 23.9km respectively. Batticaloa bound railway line is crossed by the road at 19.5km. Habarana is also a junction where A011 road intersect with Ambepussa – Kurunegala – Trincomalee (A006) road. Habarana junction mainly consists of commercial buildings and Habarana rest house is located on Left Hand Side (LHS) of the road.



**Figure 4.1: Maradankadawala junction
(Starting point of the Road)**



Figure 4.2: Home gardens located along the road



Figure 4.3: Road crosses Maminiyawa Tank



Figure 4.4: Yan Oya crossing

B. Physical Environment

1. Climate, land use, terrain and soil

68. Based on major climatic zones of the country, candidate road section of A011 Road fall within the area classified as the dry zone.

69. The climate of the project area is further categorized in to agro – ecological zones which are categorized based on climate, soil, natural vegetation and land use pattern of an area. The specific agro-ecological zones (AEZ) related to candidate road section and their characteristics are presented in the following Table 4.1. The AEZ nomenclature is alphanumeric where the first upper case letter denotes the climatic condition (W-wet, I-intermediate, D-dry), the second upper case letter indicates elevation (L-low, M-medium, U-upper), the first number describes the moisture regime, and the last lower case letter indicates the rainfall distribution and other environmental factors where the degree of wetness degrades from letters a to f. The candidate road section of A011 road is located in an area which receives rain only during the second inter-monsoon and north east monsoon which prevail from October to February. The area experiences dry weather conditions during the period from May to September. Rainfall distribution is influenced by monsoon winds from passing over the Indian Ocean and the Bay of Bengal.

Table 4.1: Climatic characteristics of candidate roads

Section of the road	Agro-ecological Zone	75% expectancy value of rainfall (mm)	Description		
			Land use	Terrain	Soil groups
Maradankadawala - Habarana	DL1b	> 900	Rain fed upland crop, paddy, scrub, mixed home	Undulating	RBE&LHG

Section of the road	Agro-ecological Zone	75% expectancy value of rainfall (mm)	Description		
			Land use	Terrain	Soil groups
			gardens, forest plantations		

LHG - Low HumicGley, RYP - Red Yellow Podsolc, RBL - Reddish Brown Latosolic, RBE - Reddish Brown Earth, IBL- Immature Brown Loam.

70. Monthly average rainfall and temperature variation over the year in Anuradhapura is presented in figure 4.5 below.

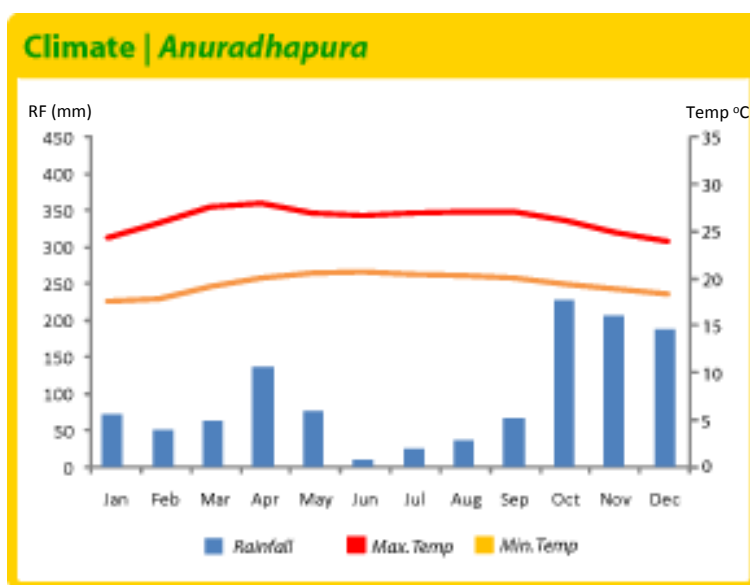


Figure 4.5: Rainfall and temperature variation of Anuradhapura District
(Source: <http://www.meteo.gov.lk/>)

2. Hydrology

71. **Surface Water Resources:** Maradankadawala – Habarana section of A011 Road crosses Malwathu Oya and Yan Oya river basins. And particular locations at which tributaries are crossed by the road are given in the table 4.2 below.

72. On the other hand, agriculture is comprehensively practiced in the project area therefore irrigation tanks are commonly observed which are built to collect rainwater. And the road section is also located nearby to such irrigation tanks as mentioned in the table below.

Table 4.2: Location of water bodies along A011 Road

No.	Water Body/Stream	Location with respect to the road	Structure available and its present condition
Maradankadawala – Habarana section			
1	Thoru Wewa (Tank)	Road crosses the catchment area around 3km	Bridge (4/2) is in good condition. Span – 3.65m
2	Maminiyawa Tank	Road crosses the catchment area from 5.4 to 6.6km	
3	Outflow of Mahamankadawala Tank	Road crosses the stream at 9km	Bridge (10/2) is in good condition Span – 12.45m
4	Tributary of Malwathu Oya (Stream)	Stream flows along the road on Left Hand Side (LHS) from 9km and crosses the road at 9.6km	Bridge (10/7) is in good condition Span – 9.2m
6	Hirukkiriya Tank	The bund touches the ROW at 12.2km on Right Hand Side (RHS) and the catchment area expands till 12.8km	N/A
7	Talpat Tank	The bund touches the ROW on LHS at 19.2km	N/A
8	Yan Oya (Stream)	Road crosses the stream at 23.9km	Bridge (24/3) is in good condition Span – 15.2m

73. **Ground Water Resources:** Dug wells are commonly observed within home gardens along the road and ground water is used to full fill domestic requirements by the households.

74. **Surface and ground water quality:** As revealed during public consultations, surface and ground water resources which are observed within the project area are utilized for domestic requirements and agriculture, however surface water is not used for drinking purpose. Due to recent kidney failures reported in NCP, the use of ground water for drinking purpose has now been limited and people tend to go for bottled water as a substitute for ground water.

75. ESDD measured water quality of surface and ground water bodies found along the A011 Road as presented in Appendix 1.2. Following tables present the results of water quality measurements carried out along the A011 Road under the assessment.

Table 4.3: Results of surface water quality measurements

Code	Water body	Location (km)	Temp (°C)	pH	Turbidity (NTU)	Salinity	DO (mg/l)	EC (µs)	TDS(mg/l)
SWQ 1	Stream	9	26.6	7.75	77	0.32	7.7	0.673	449
SWQ 2	Yan Oya	23.9	26.6	7.22	186	0.12	8.1	0.247	165
Standard level ²			-	5.5 - 9.0	-	-	3	-	-

76. The measurements were carried out on a sunny day. Baseline values of pH at measured locations are within the standard limits as specified for class III waters in proposed inland water quality standards of Central Environment Authority (CEA). However the baseline Dissolved Oxygen (DO) values are slightly higher than the respective standard levels.

Table 4.4: Results of ground water quality measurements

Test	Unit	Maximum Desirable level	Maximum Permissible level	GWQ1
Temperature	°C	-	-	26.7
pH at 25°C ± 2°C	-	7.0-8.5	6.5-9.0	7.83
Dissolved Oxygen	mg/l	-	-	7.9
Electrical Conductivity at 25°C	µS/cm	750	3500	344
Total Dissolved Solids (TDS)	mg/l	500	2000	230
Salinity	ppt	-	-	0.17
Turbidity	NTU	2	8	21.4

77. With respect to ground water, the results of pH, TDS, Turbidity and EC were compared with SLS 614:1983 Potable water part 1 as given in table 4.4. As per the data on ground water, it is observed that the conductivity levels and TDS have lower values than the maximum desirable level of SLS Standards. The pH values measured as baseline, range between 7.0 and 8.5, within the maximum desirable level. However Turbidity of two wells have higher values than the maximum desirable level and the maximum permissible level.

²Proposed inland water quality standard for class III waters of Central Environment Authority.

3. Air Quality and Noise

78. **Air Quality:** A considerable flow of traffic could be observed along the A011 Road and the flow is increased due to intersection of other trunk roads at junctions such as Maradankadawala, Ganewalpola and Habarana which are within the road section to be rehabilitated under this RMC. Due to the emissions of the traffic which flow along the road, the air quality can be degraded. As per Jayaratne (http://www.cseindia.org/userfiles/air_quality_issues_srilanka.pdf), the transport sector is one of the main contributors of SO₂, NO_x, CO, NMVOC (Non-Methane Volatile Organic Compounds) and PM10 emission to the air which cause air pollution. Therefore air quality along the A011 can also be degraded due to the existing vehicle fleet however no baseline measurements are available for project area.

79. Chena (slash and burn) cultivation observed along the entire road section and quarry sites, crusher plants and asphalt plants observed around Ganewalpola are also a major sources of contaminants which degrade air quality of the project area.

80. An extract from the National Environmental (Ambient Air Quality) Regulations, declared in 1994 is presented in Table 4.5.

Table 4.5: National ambient air quality standards

Parameter	Averaging time (hrs)	NAAQS (mg m ⁻³)	NAAQS (ppm)
Carbon Monoxide	8	10	9
Nitrogen Dioxide	24	0.10	0.05
	8	0.15	0.08
Sulphur Dioxide	24	0.08	0.03
Lead	24	0.002	-
TSP	24	0.03	-
PM10	8	0.35	-

Source: Gazette of the Democratic Socialist Republic of Sri Lanka, 850/4 (20 December, 1994)

PM 10 – particulate matter < 10 µm

NAAQS – National Ambient Air Quality Standards (NAAQS)

81. However introduction of Vehicle Emission Test (VET) has made it mandatory for all land vehicles to obtain an emission certificate with effect from 15th July 2008 in order to conform that vehicle emissions are within the limits as per the Motor Traffic Act (Emission control) Regulation of 1994, 817/6, Part I, Section I. This move is a part of the efforts the GoSL is taking towards to improve the air quality in the island. This regulation is applicable for all construction vehicles as well.

82. **Noise:** ESDD measured ambient noise levels during the environmental assessment and results are given below.

Table 4.6: Measured ambient noise levels

Code	Location	Chainage	Noise level	Time of the measurement
Weather condition - Sunny				
N1	Maradankadawala Junction	0.00km	69 leq	11.00 am
N2	Near a Temple	11.6Km	73 leq	11.35 am

83. According to Schedules I and II of National environmental (Noise Control) regulations No.1 1996 (924/12), the study area belongs to “Low noise area”. Therefore the ambient noise level of the area can be considered as 55 dB (A) during day time (06.00 hrs-18.00 hrs) and 45 dB (A) night time (18.00 hrs - 06.00 hrs). However measured noise levels are exceeding the required ambient noise levels and this is due to the continuous traffic movement along the A011 Road during the period of measurement.

84. On the other hand, noise sensitive receptors such as schools, temples etc... are located along the candidate road section of A011 as given below;

Table 4.7: Noise sensitive receptors

Chainage (km)	Noise sensitive receptor	Side of the road
0.1	Maradankadawala Divisional Hospital	LHS
4.0	Maminiyawa School	RHS
4.2	Temple	LHS
5.2	Kollankatigama School	RHS
6.9	Pre school	RHS
7.2	Mosque	RHS
8.6	Ganewalpola Muslim School	LHS
11.6	Temple	LHS
13.1	Galapitagala School	RHS
18.6	Library	RHS
19.2	Pulugawewa Secondary School	RHS
23.9	Shrine	LHS
24.3	Temple	RHS

4. Occurrence of Natural Disasters in the Project Area

85. **Floods:** Anuradhapura District was affected in 2011 floods. Based on records, over 200,000 people have been affected due to floods in Anuradhapura in year 2011. Low lying areas of Galnewa, Ipalogama, Talawa, Tambuttegama, Kalaoya and Yanoya are inundated while Horowpathana town is reported to be heavily flooded in year 2011 flood (Source: <http://www.onlanka.com/news/floods-hit-over-1-2-million.html>).

86. However above mentioned flood prone locations of Anuradhapura District are not falling within the project influential area.

87. However there are other sections of the candidate section of A011 Road which is prone to floods during the period generally from November to December. These locations are described below.

88. **Maminiyawa Tank (5.4 – 6.6km):** Road crosses the catchment area of the tank and the road is overtopped during heavy rainy season. Water gets stagnated for around 10 days which generally rise about 1ft over the road at this section (Public consultation). However during public consultation, it was mentioned that the road was impassable in 2015 due to a severe flooding condition.

89. **Around Yan Oya (23.9km):** Road gets inundated due to spilling of Yan Oya and flood water remains for about 10 – 12 days.

C. Ecological Environment

90. **General description of the project area:** The proposed trace traverses entirely through the dry zone of the country. Biogeographically, the entire section falls under floristic zone; II: Dry and arid lowlands (within dry zone) according to the floristic regions of Sri Lanka (Ashton and Gunatilleke, 1987). Dry and arid lowlands are dominated by dry-mixed evergreen forests. The proposed project area traverses through variety of natural, semi natural and human-modified landscapes.

91. **Major habitat types along the proposed corridor:** The proposed route spans over a variety of natural and man-made habitat types including terrestrial, aquatic and semi-aquatic systems in the dry and arid lowlands.

- i. Natural terrestrial and aquatic habitats: scrub areas and streams
- ii. Anthropogenic terrestrial and aquatic habitats: Home gardens, paddy fields, canals, tanks, roadsides

92. The project area does not traverse through or located adjacent (within 1 mile) to any protected areas declared under Department of Wildlife Conservation (DWLC) or declared forest reserves of Forest Department (DoF) of Sri Lanka.

Terrestrial habitats:

93. **Home gardens:** Home gardens are the habitats that have been subjected to long-term human manipulations. These home gardens provide important habitats for flora and fauna, and are valuable as habitat links providing connectivity between natural habitats.

94. **Paddy Lands:** Both cultivated and abandoned paddy lands were observed in the project area. Several species of weeds could be observed in the paddy lands. Some abandoned paddy fields serve as grazing grounds for cattle. Different stages with different farming practices of paddy creates distinct habitats for variety of animal species. Small canals, which run through the paddy fields, provide habitats for several species of freshwater fish. Therefore, the paddy fields provide provisioning services and regulating services. Also, rice fields provide regulating services by increasing water storage of the catchment, trapping of sediments, percolation from rice field help to recharge ground water. Cultivated paddy fields provide cultural services because there are many traditional and religious practices associated with the cultivation and harvesting of this crop. Also the rice fields are valued for their scenic beauty.

95. **Roadsides:** There are about 112 roadside trees on either side of the road. These tree serve many useful purposes especially in the dry zone areas where they retain soil moisture and also improve air quality, enhance aesthetic element of the area, provide shade and conserve soil. Majority of the roadside tree species include, Neem (*Azadirachta indica*), Kusum tree - Kon (*Schleichera oleosa*), Arjun tree (*Terminalia arjuna*), Milk tree (*Manilkara hexandra*), Sri Lanka satinwood (*Chloroxylon swietenia*) and Rain tree (*Samanea saman*). Please refer to Appendix 4.1 for the list of roadside trees which are located within 2m corridor from the edge of the carriageway.

Aquatic habitats:

96. **Streams, canals and tanks:** Many natural streams, man-made canals and tanks are located within and adjacent to the proposed project area. Freshwater habitats are important because they support several species of fish and other aquatic fauna such as amphibians, terrapins and other aquatic invertebrates, which in turn are food for aquatic birds and mammals. Many of these tanks also have aquatic vegetation. Some of the natural streams support riparian strips that are important for bank stability. Many of these streams and tanks are used for fishery purposes and harvested fish is a nutritional supplement for the rural communities. Most of these streams supply water to seasonal tanks which are used for irrigation.

97. **Fauna:** As per the information from DWLC officers and the local people, herds of elephants from nearby scrub areas are attracted to the banks of Kala wewa - Balalu wewa complex (which is located about 10km away from the project area) as the water levels drop in the dry season, the tank beds become lush grassland, providing the animals with fodder.

Therefore there is a possibility of roaming these in to the project area as well. As per the national red list 2012 of Sri Lanka, Asian elephant is an "Endangered" species.

98. In addition to this several other small mammals (e.g., fox) observed in the project area. Fresh water fish species are inhabiting in the inland tanks of the project area. In association of water bodies several species of wetland birds such as storks and egrets are present. Please refer Appendix 4.2 for the list of fauna species observed in the project area.

99. **Flora:** Four threatened flora species which constitute of one endangered species; Ebony, (*Diospyros ebenum*), and three vulnerable species; Satinwood, (*Chloroxylon swietenia*), Milk tree (*Manilkara hexandra*), nux-vomica tree (*Strychnos nux vomica*) are observed in the project. However, these species are not restricted only to the project area but distributed throughout the floristic zone.

D. Socio - Economic Environment

1. Population:

100. Maradankadawala – Habarana section of A011 is located within 13 GN Divisions in two DS Divisions of Anuradhapura district of North Central province as presented in table 2.1 above.

101. According to Department of Census and Statistics, in 2016, estimated midyear population of Anuradhapura district was 905,000 persons. Majority of population (94.1%) is living in rural areas.

102. In 2012, total population of Divisional Secretariat Divisions (DSDs) which is crossed by the road section is 74,823 persons. Highest population is reported from Kekirawa DSD and it is 59,241 persons.

103. In the project area, township areas such as Maradankadawala, Ganewalpola, Palugaswewa, Habarana are densely populated areas and beyond these towns, project area is sparsely populated. Table 4.8 given below shows the distribution of population of project located DSDs by gender segregation.

Table 4.8: Distribution of population of project located DSDs by gender

DS division	Male		Female		Total
	No.	%	No	%	
Kekirawa	29,196	78.9	30,045	79.43	59,241
Palugaswewa	7,802	21.1	7,780	20.56	15,582
Total	36,998	49.44	37,825	50.55	74,823

Source: Department of Census and Statistics, 2012

104. With regard to ethnicity, majority of population in these two DSDs is Sinhalese e.i. Palugaswewa 98.79%, Kekirawa 78.7%. As well as Moor is the second highest population in Kekirawa DSD. Table 4.9 shows the distribution of population of project located DSDs according to ethnicity.

Table 4.9: Distribution of population by the ethnicity

DS division	Sinhala		Sri Lankan Tamil		Indian Tamil		Moor		Burgher		Other	
	No	%	No	%	No	%	No	%	No	%	No	%
Kekirawa	46622	78.7	1484	2.51	157	0.27	10912	18.42	45	0.08	20	0.03
Palugaswewa	15394	98.79	157	1.0	3	0.0	18	0.12	7	0.04	3	0.02

Source: Department of Census and Statistics, 2012

2. Main economic activities

Table 4.10: Percentage of employment distribution by major industry group - 2015

District	Agriculture %	Industry %	Services %
Anuradhapura	51.5	14.3	34.2

Department of Census and Statistics, Labour Force Survey - Annual Report 2015

105. **Agriculture:** Agriculture is the prominent economic activity in Anuradhapura district. In 2015, out of total employed population, 51.5% in Anuradhapura District is identified as engaging in agricultural sector. Paddy is the main agricultural crop grown in Anuradhapura district. It is grown mainly twice a year in two rainy seasons; Maha (Major) season from November to February during northeast monsoon and Yala season from May to September during southwest monsoon. According to Department of Census and Statistics, Anuradhapura district has 190,482 acres of cultivable paddy lands and in 2015/2016 Maha season, it has produced 17,540,000 Bushels of paddy.

106. In the Anuradhapura district Chena cultivation (shifting and burning cultivation) is also practiced, mostly during the Maha season. Subsidiary crops such as Kurakkan (*Eleusine coracana*), Maize (*Zea mays*), Sorghum (*Sorghum bicolor*), Green gram (*Vigna radiate*), Cow pea (*Vigna unguiculata*), Gingerly (*Sesamum indicum*), Ground nuts (*Arachis hypogaea*), Sweet

potatoes (*Ipomoea batatas*), Red onion (*Allium cepa*), and Mustard (*Brassica spp*) are the most common crops that are grown in home gardens and chena lands. The country's leading agriculture research station mainly for dry zone is located in Mahalluppallama of Anuradhapura district which has a long history for agriculture researching.

107. **Industries:** The industrial sector is not well developed in Anuradhapura district. The labor force engagement is 14.3% in this district.

108. In the project area, inland fishing industry and livestock farming are carried out very successfully. Availability of a large number of manmade irrigation tanks (known as “wewas”) located within the project area has made inland fishery a common livelihood activity.

109. **Services:** In Anuradhapura district, employment contribution to services sector is 34.2%. Majority of employed population in this sector belong to wholesale and retail trade activities and government sector employments.

110. In the project area, especially in Maradankadawala, Ganewalpola, Palugaswewa, Habarana town areas a number of trade and business centers, private companies and government offices are located in the project area.

3. Poverty Situation

111. Table 4.11 shows poverty headcount index of Anuradhapura district. In 2010, Poverty Head Count Index of the Anuradhapura district was 5.7%. In 2013, it has increased up to 7.6%. However, in the rural areas of Anuradhapura district, majority of people are working in agriculture, livestock and fishery industries. Most of these people are working as casual laborers and they earn relatively lower level of monthly income. Accordingly, poverty in rural areas may not be presented as it is through the district level figures.

Table 4.11: Poverty Headcount Index of affected districts

District	Poverty Headcount Index	
	Yea - 2009/2010	Yea - 2012/2013
Anuradhapura	5.7	7.6

Source: Household Income and Expenditure Survey – 2013, Department of Census and Statistics

4. Existing Infrastructure facilities

112. **Transportation:** Roads are the main transportation mode in Anuradhapura district. In Anuradhapura district there are 349.52km of A class roads and 471.4km of B class roads, This road transportation mode is heavily used by a large number of public and private sector employees, school children and other commuters for travelling and transportation of goods. In addition to roads, rail transportation also a prominent transportation mode in the district.

113. Maradankadawala - Habarana - Tirikkondiadimadu (A011) road starts at Kandy - Jaffna (A009) road and connects with Baticaloa - Tirikkondiadimadu – Trincomalee (A15) road at the end point. Ambepussa - Kurunegala - Trincomalee (A06) road crosses the A011 road at Habarana junction. Further A011 road connects with two B class roads at Ganewalpola which are Ganewalpola–Dachchalmillewa (B133) road and Kekirawa – Ganewalpola (B212) road.

5. Energy source of households

114. Electricity is the major source of energy for lightning in these two DS divisions belonging to candidate road section, e.g. Kekirawa 88.30%, Palugaswewa 82.91%. However, in these two DS divisions Kerosene is the second major source for lightning. Meanwhile few households in these two divisions use solar power. Table 4.12 given below summarizes energy source of households of affected DS divisions.

115. During the field reconnaissance, the electricity supply lines located in the project area were observed. When carrying out the public consultations people mentioned that majority of the households in the project area use electricity to lighten their households.

Table 4.12: Principle type for energy for lightning the occupied housing units

DS division	Electricity (%)	Kerosene (%)	Solar power (%)	Other(%)
Kekirawa	88.30	11.13	0.52	0.03
Palugaswewa	82.91	16.09	0.87	0.11

Department of Census and statistics, 2012.

6. Drinking water

116. As per the table 4.13, majority of households use protected well water, e.g. Kekirawa 47.68%, Palugaswewa 57.47%. Pipe born water is the second major source for Kekirawa DS division. In Palugaswewa 29.82% of households use bottled water or water from river, tanks, streams, springs and tube wells.

Table 4.13: Source of Drinking water

DS division	Protected well	Unprotected well	Pipe born water	River/tank/streams/spring	Other (Tube well, Bottled water, etc.)
Kekirawa	47.68	2.96	30.85	1.69	16.80
Palugaswewa	57.47	2.94	9.74	0.21	29.61

Department of Census and statistics, 2012.

7. Sanitary facilities

117. As shown in table 4.14 majority of households of the affected DS divisions use water sealed toilets, e.g. Kekirawa 91.26% and Palugaswewa 89.0%. However 1.85% and 2.74% households in Kekirawa and Palugaswewa divisions are not using toilets.

Table 4.14: Type of toilets

DS division	Water sealed	Flush toilet	Direct pit	Other	Not using toilet
Kekirawa	91.26	1.09	5.76	0.03	1.85
Palugaswewa	89.00	3.09	5.09	0.07	2.74

Department of census and statistics, 2012

8. Cultural and Archeologically Important Places

118. There are no archeologically important places identified in the project area. However temples and other places of worship could be observed along the candidate road section of A011 Road as given below.

Table 4.15: Places of worship located along road section

Chainage (km)	Type of common property	Side
4.2	Temple	LHS
7.2	Mosque	RHS
11.6	Temple	LHS
23.9	Shrine	LHS
24.3	Temple	RHS

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

119. This chapter describes anticipated impacts on the existing environment and social setup during pre-construction, construction and operational stages. Feasible mitigation measures were designed based on environment best practices to minimize the adverse impacts or manage to acceptable limits while enhancing the beneficial impacts of the project. Impacts identified here are applicable for improving, rehabilitating and maintaining of the A011 Road under RMC package of iRoad. In addition impacts during the operational phase have been identified mostly based on activities to be undertaken by the contractors during the maintenance period.

A. Pre-construction phase

1. Natural hazards aggravated by the project and impacts to the road due to natural hazards

a. Flood Impacts

120. As mentioned above, sections of A011 road such as road along Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya crossing (23.9km) are prone to yearly floods and the road gets overtopped at these locations and water is stagnated for several days. Therefore surface water hydrology along the road with special attention to these flood prone locations should be deeply studied during the detailed design stage and pre-construction phase. A mitigation for above issues the cross drainage structures, road finished level and the surface treatment shall be decided accordingly in rehabilitating the road.

121. A close coordination with Department of Irrigation and Disaster Management Center (DMC) shall be maintained in this regard in order to obtain high flood levels, their return periods, respective retention periods and other recommendations in order to support the final design. Public consultation will also be used to verify the findings.

2. Relocating Utility Supply Lines

122. Under the proposed scope of work for A011 Road, hard shoulders will be introduced for the entire candidate road section therefore electricity power lines, telephone lines and water supply mains located within the proposed cross section will need to be shifted. Such utility facilities are identified in EC prepared for the road and the exact number of utilities to be shifted will be updated Detailed Design stage and will be included to the preparation of Site Specific Environmental Management Action Plan (SSEMAP). Proper co-ordination with relevant line agencies such as Ceylon Electricity Board (CEB), Sri Lanka Telecom and National Water Supply, Drainage Board (NWS&DB) and Community Based Organizations (CBO) which are responsible for community based water supply schemes in advance will help to reduce the

nuisance from temporary blockades and service interruptions of these utility supply lines. Risks of accidental disruption can be reduced by ensuring that machinery such as excavators are operated by trained personnel, and that operations are adequately supervised. Water supply should be restored as soon as possible if such accidental disruption is occurred. Advance notice to the public about the times that the utility supplies will be disrupted helps the public to adjust to the situation before hand, thereby minimize the difficulties that they will face in the case of sudden disruption of these services.

B. Construction phase

1. Increase of local air pollution, noise and vibration

123. Excavation for shoulders and other earthworks, pavement improvement operations, quarry operations, operation of asphalt plant, batching plant, operation of construction vehicles during construction period will release aerial contaminants (dust and fumes) increasing local air pollution. Heavy machinery used for construction work will create noise and vibration which will cause nuisance to residents in settlements and also animals and also excessive vibration can damage buildings located nearby to the trace. Locations such as schools, temples as given in table 4.7 above are particularly vulnerable to nuisance from noise. Table below gives the identified noise levels of various construction equipment and machinery at a distance of 7 m from the source.

Table 5.1: Typical construction equipment used in road construction, noise rating, unobstructed at obstructed noise level 7m from the source

Equipment	Noise level at 7 m in dB(A)	Predicted noise 10m from source, unobstructed	Predicted noise 10m from source, obstructed by 1.5m movable barrier
Compressor	109	81	45.2
Truck, scraper or grader	94	66	30.2
Pneumatic drill	85	57	21.2
Excavator	112	84	48
Loader	112	84	48
Roller vibrator	108	80	44.2
Poke vibrator	113	85	49.2
Sound reduced jack hammers and lock drills	82	54	46.2

124. Heavy machinery used for road rehabilitation work such as vibrators and compactors and operation of heavy vehicles at high speeds (at speeds beyond 40 kmph) will create noise and vibration which will cause nuisance to residents in settlements and animals. And since baseline noise and vibration values are comparatively low in rural areas, the project induced impact for longer periods, will be severe. Locations such as schools, hospitals and places of

worship are particularly vulnerable to nuisance from noise. Buildings located closer to the road trace will have cracks due to construction vibration.

125. The impact of construction noise, vibration and emissions at sensitive areas can be mitigated by;

- Limiting operations to times when they have least impact in settlement areas, especially near schools and other sensitive locations such as hospitals and places of worship.
- Ensuring that construction plant and equipment is maintained to high operable standards, and that exhaust baffles are fitted and maintained in a high serviceable condition.
- Vibration should be controlled with the agreement of the Project Implementation Consultant (PIC) at locations where sensitive receptors are found.
- Regular sprinkling of water to dampen the construction surface will reduce the emission of dust.
- Implementation of all construction activities in compliance with acceptable levels of noise which are specified in National Environmental (Noise Control) Regulations 1996 stipulated by C amendments act 924/12 to mitigate the noise impact.
- A property condition survey will be conducted along the trace within a corridor specified by PIC. The survey shall record all details related to cracks and construction failures existing in structures along this corridor.
- Buildings cracked due to construction activities should be compensated or repaired to the satisfactory level (which is agreed by the PIC) of the affected person. Here, precondition survey conducted for surrounding buildings located within an agreed area and a corridor with the PIC will be helpful in differentiating cracks caused by construction activities.

2. Deterioration of surface water quality due to silt runoff, emissions and spoil from labour camps

126. Under the road rehabilitation, clearing of roadside vegetation near the edge of the existing road, excavation for shoulders and removal of unsuitable soil, cutting trenches for roadside drains and disposal of degraded road surface (if any) will be required. Such activities may develop temporary piles of soil and debris along the road edge.

127. All these activities could cause erosion and there after siltation of nearby water bodies would occur. If un-compacted earth surfaces or soil dumps are left exposed to rain or if they are placed near water bodies and paddy lands soil erosion will be possible. Sediments could be washed away and get silted up in the side drains, paddy lands, adjoining streams and irrigation tanks and canals causing deterioration of water quality.

128. Run off contaminated with oil, grease, and leaked fuel from construction vehicles, equipment and material stores, wastewater and solid waste from worker camp sites will contain pollutant materials. Such materials have the potential to cause deterioration of surface water and ground water sources if they are released to adjacent water bodies.

129. Following measures shall be adopted to mitigate deterioration of surface water and ground water quality due to silt runoff, emissions and spoils from construction and labour camps;

- Reuse of soil removed for filling sites if any as much as possible and unsuitable materials can be used to refill borrow pits with the approval of the PIC
- Where earthworks take place adjacent to water bodies, drainage of storm water should be managed in order to minimize the soil erosion to nearby water bodies. This should be planned prior to the commencement of earthwork activity
- All temporary unsuitable soil dumps and debris should be removed from site to approved disposal sites (approved by the relevant local authority) as early as possible
- All disposal sites should be sited in locations which are not affected by floods or exposed to soil erosion
- If temporary soil dumps are left at the site for a long time proper remedial measures to minimize soil erosion should be practiced (E.g.: Placing sand bags around the dump etc...)
- Temporary soil dumps should not be placed near water bodies or flood prone areas
- All fills, back fills and slopes should be compacted within the shortest possible time to reach the specified degree of compaction,
- Suitable local drainage measures should be established to properly drain the water in the construction area to the nearby waterways
- Turfing of all embankment slopes with suitable turf material,
- All materials (including toxic and hazardous material) required for construction shall be stored at secured and managed sites, sited away from water bodies,
- Construction vehicles and equipment will be maintained in good operable condition, ensuring no undue leakage of oil or fuel,
- Construction vehicles and equipment will be serviced only at properly managed and equipped workshops and waste oil will be collected and disposed at approved locations,
- Sanitation arrangements and an adequate water supply will be made at worksites and at any accommodation facilities provided for workers' accommodation, ensuring that no open dumping of solid wastes, no raw sewage is released into drains or water bodies.

3. Flood Impacts

130. Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains. The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Contractor's activities shall not lead to aggravate floods when working in flood prone areas. Further, any recommendations laid down by the hydrological studies, should be adopted at flood prone areas. Contractor shall not select land within flood prone areas for the purpose of disposing excavated and unsuitable material, locations for material stock piles, yards and other locations where chemicals and other construction material are stored.

4. Social and Environmental Impacts due to Establishment of Labour Camps

131. Labour camps may need to be established near the road alignment and improper sanitation, lack of water supply, improper disposal of wastewater and solid waste will increase risk of contaminating nearby surface water sources. Stagnant water at the labour camp can create mosquito breeding and vector for communicable diseases to the workers and host communities. Social conflicts may arise due to use of illicit liquor and unpleasant behaviour which causes inconvenience to local community.

132. Labour camps will be located at least 100m away from the major water resources and site specific mitigatory measures as agreed with the PIC will be strictly applied if camps are to be located nearby a water body or other environmentally/socially sensitive location. Proper sanitary facilities will be provided to the labour camps and any wastewater and other waste matter generated from the camps shall be disposed in environmentally friendly manner as agreed with the PIC.

133. Maximizing recruiting of local labour will minimize the need for migrant workers and avoid potential and health conflicts with the host community. Awareness programs should be conducted targeting workers as well as local community in order to minimize and avoid any such conflicts.

5. Disruption to Traffic/Transportation

134. Disruption of access to infrastructure or social resource due to construction activity will cause nuisance and to a certain extent additional cost to the public in terms of longer travel period due to diversion or traffic. It will also pose risk of accident to motorist at night if these blockages and disruption are not clearly demarcated.

135. Following measures should be considered to minimize the impacts on existing traffic;

- Providing advance information to the public about the planned construction works,
- Providing properly marked by-passes and one-way section including barriers, reflectors, and night illumination
- Use of flagmen to control traffic flows at constricted sites, including safe crossing for pedestrians especially near town areas and schools.

6. Biological impacts

a. Impact on animal movement pathways

136. There is a possibility of disturbing animal movements and affecting their natural behavior during the construction stage due to construction noise and other activities. Especially if elephants are roaming near to the project area their natural behavior will be disturbed. This will be a danger to the particular animals and human safety as well. In order to mitigate this issue the following mitigation measures will be taken.

137. Movement of elephants and other animals in the project area will be confirmed with officers of Department of Wildlife Conservation (DWLC) of the region. If such movements will be notified, construction works will be managed and restricted in the particular areas during identified times in order to facilitate their movements. Excavated temporary pits and trenches within identified areas will be avoided as far as possible and such trenches and pits will be barricaded with high visibility material during the construction stage if avoidance is not possible and restored soon after the construction works to prevent animals from falling into them.

138. Back filling of such trenches and pits within the shortest possible time will have more advantages in avoiding animals falling in to such pits.

b. Loss of trees and vegetation

139. Due to the construction activities, clearing of vegetation, felling and/or trimming of trees will be required. This may in turn result in loss of soil moisture and soil, improve air quality, reduction of aesthetic value and loss of shade.

140. In order to mitigate this impact; unnecessary removal of vegetation and felling of trees will be prevented by finalizing the tree list with the Environmental Specialist of the PIC. All trees to be felled will be marked and handed over to State Timber Corporation for cutting and removal. Moving of construction vehicles and machineries will be restricted only to designated areas in order to save vegetation beyond the proposed project area due to trample. Weedicides will not be recommended as it causes many damages to the environment.

141. Suitable native tree species such as Milk Tree (*Manilkara hexandra*), Arjun tree (*Terminalia indica*), Goda Kaduru (*Strychnos nux vomica*), Baheda tree (*Terminalia belerica*)

etc... could be selected for the replanting purpose at 1:3 ratio. Replantation with threatened and endemic species should be given priority.

142. Replanting program will be carried out within the ROW and at locations with public importance (such as schools and other government institutes) according to the necessity. Fruit bearing species which are native to the project area will be selected if replanting to be undertaken outside the ROW. Planting 'bole rooted' plants are not recommended, since it destroy another habitat to make this habitat good. After establishing in the field, continuous supervision and maintenance during operational stage will be needed in order to ensure proper survival of trees.

c. Impact on aquatic fauna and flora

143. There will be soil erosion from construction sites, stock piles due to rain and wind, excavation, oil and grease from construction vehicles. Accumulation of these materials in water bodies such as inland tanks, streams and irrigation canals will cause increase in turbidity level lower the water quality. This will lead to reduction of light penetration and make it an undesirable place for aquatic fauna and flora. Further due to the reduced light penetration to the water body, the primary productivity of the biota in the water body will be reduced resulting in increased mortality of aquatic organisms. In addition, when these particles settle on the bottom it will affect the breeding ground of aquatic animals. Pollution of water bodies will also be adversely impact the inland fishery.

144. This impact could be mitigated by; location of all hot mix plants, crushing plants, workshops, depots and temporary worker camps and storing of toxic and hazardous materials at approved locations, and recycling and dumping of solid waste matter at locations approved by local authorities, maintenance of vehicles and equipment in good operable condition, ensuring no leakage of oil or fuel and the fitting of proper exhaust baffles. Any solid waste should not be dumped into water bodies.

d. Disturbance due to noise, vibration and dust

145. Noise, vibration and dust due to large construction machinery have the potential to disturb faunal species in the project area. Noise during civil works, excavations and movement of construction vehicles can potentially interfere with normal animal behavior. Furthermore, deposition of dust and mud on vegetation can interfere with physiological functions of trees.

146. Construction vehicles and machinery should be well maintained to reduce the noise and vibration disturbances. In addition mitigation measures mentioned in the section B.1 of chapter 5 will also be adhered in order to mitigate this impact.

e. Ecological disturbances by workers and their camp operations

147. Several adverse impacts such as dumping of refuse, sanitary waste and sewage into waterways, clearance of vegetation for worker camp sites, hunting of animal species and collection of firewood from scrub areas may be particularly intense at camp sites. This may cause several adverse impacts. Open dumping of garbage at these sites could also increase threats of mosquitoes, flies and the spread of rats and crows. Such garbage dumps can attract wild fauna, posing some threats to both humans and wildlife. Local labour will be recruited as much as possible in order to minimize this impact. Strict labour supervision, provision of labour camps with electricity or LP gas for cooking, to eliminate them using the fire wood from surrounding vegetation. Fishing and poaching will not be allowed within the project area. Solid waste and sanitary waste arising from labour camps and other sites shall be properly collected and disposed. Accepted sanitation methods (e.g. mobile toilets) with proper sewage disposal facilities should be provided. Under no circumstances should such waste be released untreated into the water bodies, near scrub areas.

7. Impacts Due to Extraction and Transportation of Construction Materials

148. Sources of construction materials such as soil/metal will be obtained from quarries and borrow sites (tables 2.2 and 2.3). Extraction and transportation of materials from such sites will cause noise, vibration, dust, induced slope failure, negative visual impacts, creation of mosquito breeding sites, and damage to private properties and minor roads. Heavy trucks transporting materials to construction sites will cause disturbances to local traffic, damage minor roads, and increase dust and noise nuisance.

149. Quarries and borrow pits operated with a valid approval shall be used for the project and above impacts could be mitigated by adhering to conditions laid down by licencing agencies for such quarries and borrow sites such as Geological Survey and Mines Bureau (GSMB) and CEA under their approval. Keeping provisions for repairing and restoration of all property damages including the roads used for the transportation of construction materials by the contractor in the contract document and use of covers over transported materials to guard against dust blow and water spraying to dampen the gravel surfaces will mitigate the impacts due to transportation of construction material.

8. Alteration of surface water hydrology of waterways

150. The reconstruction of culverts may temporarily divert streams, disturbing the natural drainage pattern and create flooding condition in the area. Improperly stored construction materials can also block natural drainage pattern.

151. The contractor will take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear at all times. Temporary storage of material will be made only in approved sites by the PIC where natural drainage is not disturbed. All wastes will be disposed at

locations approved by the Local Authority. If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.

152. No material including excavated soil will be allowed to be disposed near water bodies or in paddy lands, even on temporary basis, to curtail any undue wash off of soil and debris to nearby water bodies and agricultural lands. The contractor will ensure that not to damage or block any manmade drainage canal even for temporary basis. If blocked, the contractor will remove such debris without any delay. In addition the contractor shall schedule his construction activities in compliance with the rainfall pattern of the project area and activities which will induce soil erosion shall be planned to avoid heavy rainy periods.

9. Requirement of lands for the road upgrading

153. The land acquisition has not been envisaged for this project expecting that available right of way will be adequate to carry out road improvements. During construction, temporary occupation of privately owned land may be required for stock piling, labor camps and use as yards. If such a necessity occurs the contractor under the supervision of PIC will sign a temporary occupation contract with the land owner and contractor is bound to implement conditions of the agreement (if any) during operation and completion of the site.

10. Safety of Workers and Public

154. Construction activities pose potential hazards to both workers and public. Safety to workers and the public will be enhanced by;

- Continuous proper briefing and training of workers on safety precautions, and their responsibilities for the safety of themselves and others
- Provision to workers of Personnel Protective Equipment (PPE) to be used at every time involved in when construction activities and high visibility jackets at night
- Ensuring that plant and vehicle operators are properly licensed and trained
- Arranging for the adequate provision of first aid facilities, readily available trained paramedical personnel, and emergency transport facility to the nearest hospital
- Ensuring that quarry operations, particularly blasting is carried out under supervision of trained personnel, explosives are stored in a secure location and all due precautions are taken to ensure that blasting does not induce rock falls
- Provision of hazard warning signals around construction sites, and directing vehicle and pedestrian traffic away from work sites
- Provision of traffic management plans during construction including barricading of openings and lighting at night where required.

11. Impacts to roadside structures

155. There are no permanent structures observed within the ROW. However, during field inspections it was found that in around two shops in Ganewalpola (8km – 9km) and Habarana (24km – 25km) townships, the temporary structures used as shades are within the ROW and project towards the road. The main structures of these are located away from ROW.

156. The owners of these structures welcome the project and are willing to readjust the structures if it is required during construction period.

12. Impact to Access

157. There are commercial, residential, government and community places located close to the road and there are by roads diverting from A011 road. Although these structures or roads are not affected due to the improvements, there will be loss of access during construction period due to construction of the hard shoulder and/or drains. This will be a disturbance to owners of structures and public.

158. This impact will be mitigated by providing temporary access during construction period until permeant access are provided.

C. Operational Phase

1. Impacts on water resources

159. Improvements to the road drainage will result in improved storm water flows, and reduce the tendency of blockages to occur in roadside drains. Risks to the public health caused by such stagnant water bodies by acting as disease vector breeding places will be reduced. By designing the drains to withstand appropriate storm events will reduce the risk of any operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

160. In addition, improper handling of chemicals used for maintenance works such as paints, pesticides, asphalt etc. will also degrade water bodies located nearby to the road. Proper handling of such chemicals under strict supervision will help to minimize the water pollution during the maintenance period.

2. Disposal of unsuitable material

161. De-silting of drains, culverts and bridges, removal of road side vegetation and removal of damaged/degraded road surfaces during the maintenance period will generate unsuitable soil, vegetation and debris. If these materials are disposed to road sides, agricultural lands, areas susceptible to floods, there is a possibility of siltation of water bodies, agricultural lands and

blocking of drainage paths due to washing away by storm water. Proper disposal of all unsuitable material resulted from periodic and routine maintenance activities in the approved locations (by the relevant local authority) will minimize this impact.

3. Extraction of material for repairing and maintenance works

162. For repairing of maintenance of carriageway and other structures, material such as gravel, aggregates and sand will be required. And mitigation measures specified in sub topic No. 9 above (Impacts due to extraction and transportation of construction materials) could be adopted to minimize impacts due to maintenance activities of the roads.

4. Pedestrian and commuter safety

163. Improvements to the road surface will be conducive to safe vehicle travel at higher speeds. Such speeds may increase the incidences of accidents. Incorporating the following measures could offset this negative impact;

- Provision of hard shoulders, centreline road marking where possible and edge delineation etc...
- Provision of clearly marked signing at townships, sensitive areas such as schools, temples
- Enforcement of speed limits and other traffic rules, especially within the town limits
- Placing of sign boards for animal crossings etc.

164. Furthermore, necessary safety precautions as agreed with the PIC such as sign boards, barricading and flag men etc... should be in place when repairing activities are undertaken for carriageway and hydraulic structures during the operational phase.

5. Air quality and noise

165. Desired higher speeds will reduce the travel time through the area and better surface conditions will reduce the number of accelerations and decelerations in travelling thereby reduce the emissions to the air. The project is therefore expected to have a positive effect on overall air quality. Clear signing will be put in sensitive areas such as schools, temples to warn drivers and avoid making unnecessary horn signals.

166. On the other hand, processing of construction material for maintenance activities such as processing of asphalt and concrete will generate emissions to air and noise which cause air and air and noise pollution. Here contractor is bound to implement mitigation measures as given in sub title V-1 above during the maintenance phase as well in order to minimize the impacts.

6. Ecological Impacts

167. With the increase of traffic flow at higher speeds there is a potential of collision of animals such as small mammals, reptiles, amphibians and birds. Moreover there are some feral cattle, buffaloes cats and dogs frequently approaching the roads particular during the nights. This will result in the increase number of animal accidents and disturbing their natural movement.

168. In order to avoid this impact, it is important to place warning signs especially within the section of the road that passes along identified animal roaming areas (if any) located across the road. Here officers of DWLC will be requested identify the locations of the road where animals commonly move and they will be facilitated to erect the relevant sign board. Advance sign posts should be placed at least 1 km before approaching the area in order for the drivers to be more vigilant and reduce speed.

D. Positive Impacts of the Project

1. Socio - economic benefits

169. Following socio-economic benefits are expected to transmit to the affected populations of roads selected under the RMC of iRoad Program.

- Improvements in road connectivity reduce regional disparity, open up new markets, generate employment opportunities and thereby reduce poverty in lagging areas.
- An efficient and convenient transportation system will accelerate the economic growth by facilitating easy and faster mobility of people, goods and services and reducing disparities in regional development.
- Improvement of Maradankadawala – Habarana section of A011 Road will boost economic activities including potential growth in industries, tourism, and agriculture in lagging areas connected by the road.
- Good road network will reduce transport cost and travel time leading to increase the profit margin of the small scale farmers. The market expansion increases the marketability of the product.
- Similarly, better road network will provide access to schools and other services. In the long term this will improve education level and other associated life values (health status, awareness and social skills) of the people.

VI. CLIMATE CHANGE ADOPTION (IMPACT AND MITIGATION)

170. Growth in vehicle traffic and energy use are indicators of people moving in to better living conditions or poverty reduction. However growth in vehicular traffic and energy use will also lead to increased Green House Gas (GHG) emissions which directly affect global warming. According to “International Energy Outlook 2016” (IEO2016) prepared by U.S. Energy Information Administration, the energy use in the transportation sector includes energy consumed in moving people and goods by road, rail, air, water, and pipeline. Transportation sector has accounted for 25% of total world delivered energy consumption in 2012. And it is forecasted that transportation energy use to increase by 1.4% per year from 2012 to 2040 in the IEO2016 Reference case.

171. The evaluation study by ADB’s Independent Evaluation Department (IED) in year 2010 (Evaluation Knowledge Brief, July 2010 – EKB) on reducing Carbon emission for transport projects has indicated the need of a shift in ADB’s investments on transport sector in to low Carbon growth across Asia and the Pacific regions.

172. Improving the surface (pavement) of existing Maradankadawala (ch. 0+000) to Habarana (ch. 25+000) section of Maradankadawala – Habarana – Tirikkondiadimadu (A011) road under road maintenance contract will bring about a change in vehicle operation speeds, traffic composition along the highway.

173. Such changes with respect to present conditions will have an impact on emission levels of the gases emitted by vehicles travelling along the section of A011 highway. Most common types of vehicles that would move on the particular section are bicycles, motor cycles, three wheelers, cars, vans, buses, light and heavy commercial vehicles. Thus emission of Carbon Dioxide (CO₂) from motorized vehicles which is a GHG needs to be analyzed to evaluate the overall contribution of this investment program in terms of the change in CO₂ emissions.

174. The EKB has developed a set of spreadsheet-based models to evaluate the CO₂ impacts of rural roads, urban roads, bikeway projects, expressways, light rail and Metro Rail Transit (MRT) projects, Bus Rapid Transit (BRT) projects, and railways. These Transport Emissions Evaluation Models for projects (TEEMPs) consider passenger and freight travel activity, the shares of trips by different modes and vehicle types (structure), fuel CO₂ efficiency (intensity), and fuel type, validated by more detailed emission factor models. The models directly estimate CO₂ emissions for a business-as-usual case (a no-action alternative) vs. one or more alternative modal investment interventions (including improvement to road pavement) and calculate scenario differences. The models consider induced traffic demand generated by changes in the generalized time and money cost of travel by different modes, building on best practice analysis techniques.

175. The TEEMP model for urban roads was used for the analysis with using default parameters for base fuel consumption, emission factor and upstream emission percentage. Occupancy-loading, average trip lengths of each type of vehicle, vehicle type growth and roughness factors (before and after improvements) were fed to the model based on the details of traffic and economic analysis for the selected section of A011 road. The model was run separately for the road section. A summary of these input parameters are presented below.

Table 6.1: Input parameters for TEEMP model for the candidate road section of A011 road

Parameter	Input values
	ch. 0+000 – 25+000
Occupancy/loading	
Two wheeler	1.6
Three wheeler	2.2
Passenger car	3.5
Light Commercial Vehicle	3.0 Ton
Bus	30.0
Heavy Commercial Vehicle	8.0 Ton
Bicycle	1.0
Roughness	
Before improvement	5.0 m/km
After improvement	3.0 m/km
Lane configuration	
Before	Two lane @ 3.5 m pavement
After	Two lane @ 3.5 m pavement

Model predicted CO₂ emission levels

176. Model output includes CO₂ emissions at Business as Usual (BAU) or without project; with project (i.e. with improvements) and with induced traffic; and with project and without induced traffic.

Table 6.2: CO₂ emission at PAU, Project & induced traffic and Project without induced traffic

	Emission of CO ₂ in Ton/km/year (net change in emission)
BAU	1725.4
Project with induced traffic	1697.3 (28.1)
Project without induced traffic	1697.3 (28.1)

177. As indicated in the model output and summarized in above table the proposed improvement to existing highway pavements will bring a reduction in CO₂ emission even with a growth of traffic. However, this analysis is based on the assumption that the roughness of improved highway pavement surface will be maintained during the project life. Therefore it is important that the road maintenance program is maintained throughout the project span (i.e. during operational stage for seven years and beyond). The length of section 1 of A011 to be improved is 25.00 km. Based on the net change in CO₂ emissions or CO₂ savings of the section which are 28.1 Tons/km/year, the proposed investment program A011 as RMC contract will save emissions of 702.5 Tons CO₂/year.

Mitigation measures for floods

178. Climate change in a global perspective has brought about a change in rainfall pattern and especially the intensities of rainfall. Therefore special attention shall be paid to road side drainage and cross drainage in designing of the improvements for these roads. Structures such as culverts, causeways and bridges with small spans will be constructed along with road side drains (either earth or concrete based on the requirement) to facilitate the existing flow regime as well as future discharge volumes as predicted by drainage analysis during level one designs. All hydraulic structures constructed within the candidate section of A011 highway will be of reinforced concrete. Based on the Preliminary Survey and Engineering works, approximately 2% of the total construction cost estimated for the road section of A011 highway has been allocated in the Bills of Quantities (BOQs) to construct new structures and rehabilitate existing structures in selected roads. Considering the percentage of allocation (which is generally 5% - 10% of construction cost) for Environment Management Plan which includes mitigation of flood impacts this allocation will be sufficient to mitigate impacts due to floods within Maradankadawala to Habarana section of Maradankadawala – Habarana – Tirikkondiadimadu (A011) Road.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

A. Institutional Arrangements

179. The Ministry of Higher Education and Highways (MOHE&H) is the Executing Agency (EA) for the program and the secretary to the ministry will be responsible for decisions on overall approvals and operational policies of the project. RDA will be the Implementing Agency (IA). A Project Implementing Unit (PIU) will be setup headed by a Project Director (PD) who will be responsible for carrying out Road Maintenance Contracts. The PIU will be responsible for implementing the project. The PD will be assisted by a staff of engineers, environment and social safeguards officers and other administrative staff. The PIU will be assisted by a Project Implementing Consultant (PIC) who will be responsible to review and approve designs prepared by contractor, supervise civil works of contractor and review and certify bills submitted by contractor. A team of experts including engineers, quantity surveyors, environment and social experts will be working in the PIC headed by a Team Leader (TL).

180. Safeguard team of PIU, PIC and the contractor is primarily responsible for safeguards compliance of all activities carried out for rehabilitation and maintenance of the candidate section of A011 road. Their specific roles and responsibilities of each party are given in chapter VI of the EARF.

B. Environmental Management Plan and Monitoring

181. The EARF as well as the Environmental Safeguards Manual of RDA, outlines the requirements for an Environmental Management Plan (EMP) which is presented as a matrix developed based on best practices for environmental management. This IEE report includes EMP prepared for rehabilitation of A011 road which is given in Appendix 6.1. This EMP covers all impacts and mitigation measures identified within the project. However contractor will be responsible for preparation of Site Specific Environmental Management Action Plan (SSEMAP) based on the EMP given in this IEE. SSEMAP is supposed to include site specific impacts related to site specific construction activities and relevant mitigation measures proposed to the particular locations in order to minimize relevant impacts. SSEMAP will be supported by site plans in which proposed mitigation measures are presented. Separate SSEMAPs will be prepared for each contract packages if the A011 road will be contractually subdivided. All costs for implementing the mitigation measures must be included in the Bill of Quantities (BOQ) by the contractor as implementation of the SSEMAP will be the responsibility of the contractor and the PIU will oversee the effectiveness of the implementation with the assistance of the PIC. In addition, in compliance with the EARF, ESDD is also responsible for monitoring of

implementation of the SSEMAP bi annually. ESDD also assists PIU in meeting safeguards compliance and will conduct training sessions to the safeguards staff of the contractor on safeguards considerations of iRoad.

182. Contractors who implement RMC package will be responsible to keep the road in operational condition for a period of 5 years after rehabilitation. Therefore the EMP has been modified accordingly paying more attention on the environmental impacts and mitigation measures during the operational stage together with rehabilitation stage. The EMP prepared for A011 road is attached in Appendix 6.1.

183. Monitoring of EMP implementation will be carried out during the preconstruction, operation and maintenance stages of the project. As specified in the EARF (chapter VII), Environmental Monitoring Checklist (EMC) should be prepared by the PIC based on the EMP for each of these stages. The EMC monitors the degree of compliance of the mitigation measures proposed in the EMP in all three stages. At least one EMC should be completed during pre-construction, bi-annually during operation and maintenance period. Sample EMC based on the EMP is provided in Appendix 6.2. Records of these completed monitoring checklists must be systematically maintained within the PIC and/or PIU office. Based on these records and site visits, monitoring reports will be prepared during the construction and operation stage on an annual basis and submitted to ADB for disclosure on the ADB website.

184. In addition there will be an Environmental Monitoring Plan (EMOP) based on the project cycle to monitor EMP implementation by measuring environmental parameters. During the pre-construction phase baseline data on air, water quality and noise levels will need to be collected. This data will provide baseline information on the existing conditions which could be used to compare the changes in quality levels during construction and operational phases. Such a comparison will reflect how effective the EMP is and help to revise it to rectify any shortcomings that will cause any adverse impacts. Appendix 6.3 presents the EMOP prepared for A011 Road. Based on the EMOP, the contract will be required to prepare contract package specific EMOPs.

185. Furthermore the contractor will also be responsible for updating/modifying the EMP, EMC and EMOP if there are any significant changes in the project site, activities, conditions, engineering design or if any unpredicted impact will arise with the approval of PIC.

C. Grievance Redress Mechanism

186. Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the Grievance Redress Mechanism (GRM) as recommended in the EARF (Chapter V – C) which is to be formed using existing local administrative system. In compliance with the EARF, grievances will be addressed at three levels depending on the nature and significance of the grievances or complaints. The first will be at the grass roots level where complaints will be directly received and addressed by the contractor, PIC or PIU representative on site. Grievances which are simple but still cannot be addressed at the grass roots level will be addressed at the Grama Niladhari (GN) level. More complex grievances which cannot be addressed at the GN level will be addressed at the Divisional Secretariat (DS) level. There will be a Grievance Redress Committee (GRC) at the GN and DS levels.

187. At the GN level the GRC members will be:

i)	Grama Niladhari of the area	Chairman
ii)	Representative of PIU	Secretary
iii)	Representative of Supervision Consultant	Member
iv)	Representative of Contractor	Member
v)	A community member/religious leader	Member
vi)	Woman representative from the local community	Member

188. At the DS Level GRC members will be:

i)	Divisional Secretary of the area	Chairman
ii)	Representative of PIU	Secretary
iii)	Grama Niladhari	Member
iv)	Representative of Supervision Consultant	Member
v)	Representative of Contractor	Member
vi)	Representative of a social organization (NGO/CBO) of the area	Member
vii)	A community member/religious leader	Member
viii)	Woman representative from the local community	Member

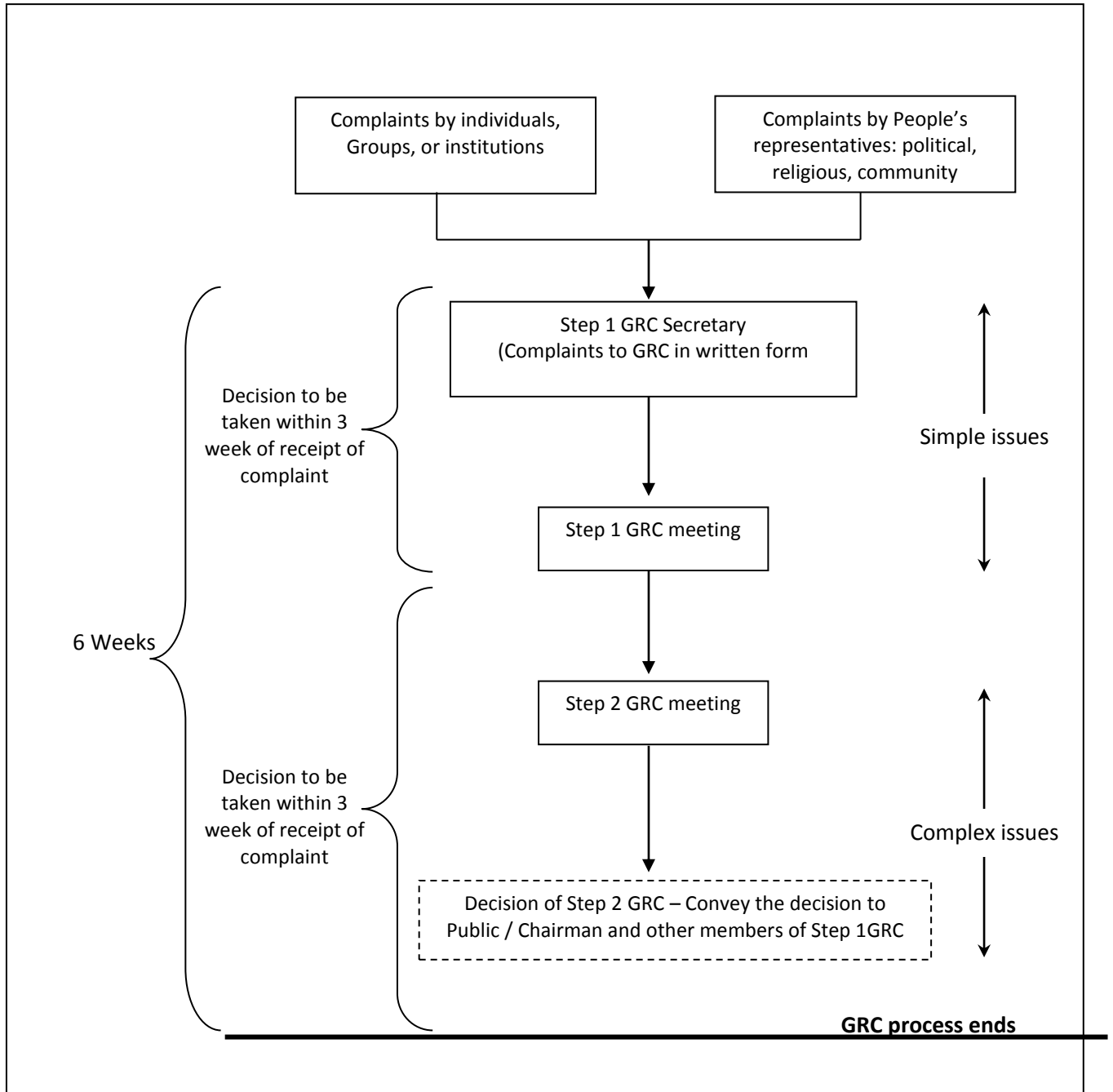
189. To make the GRM process gender responsive the GRC will include one woman member to represent the local community women. Further when grievances or complaints are submitted to the GRC, both women and men complainants will be treated equally and necessary measures will be taken to address the grievance in the best way possible.

190. Recommended steps with timeline on the operation of the GRM is provided in Figure 6.1. Adjustments may be made to the GRM during processing of succeeding tranches if necessary and accordingly described in the respective IEE. In addition a complaints contact person will be designated within the PIU to help address all concerns and grievances of the local communities and affected parties. Contact details of this person will be provided in the project information display board that will be placed at the project site.

191. The flow chart of the GRM is presented in the succeeding Figure.

192. For RMC roads, the contractor will be required to establish an information centre for receiving and addressing complaints or grievances and forwarding them to the PIU and PIC as necessary.

Figure 6.2: GRM process



VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. One on one consultation

193. The social study team of ESDD met government officers like Grama Nilaries contacted through Divisional Secretaries. A household survey was also conducted for the social assessment and one on one interviews were conducted with the people living in the project area through the survey. A sample of these interviews is attached in Appendix 8.1.

194. The number of people contacted for the household survey is 1,180 and the sample include views of 20 people (12 males and 08 females). The other people also expressed the similar views. People provided many suggestions to improve the road condition and safety. The main points presented by the public are listed below.

- The road development is appreciated.
- Flooding sections of the road. Ex: Maminiyawa
- Vehicles go speedily and there is no enough space for pedestrians.
- The roadside drains need to be improved.
- Bus bays, sign boards and crossings need to be provided in required places.
- Noise and dust mitigation near sensitive places like hospitals.
- In some areas the population is very poor and they have very low standard socio economic conditions
- The agricultural products are transported to Dambulla and nearby townships.

195. Objective of this activity was to understand the viewpoints of the stakeholders and to respond to their concerns and suggestions during the early stages of the project there by reducing any objections towards the project, incorporate any valuable suggestions by the public in to the design so as to reduce any adverse impacts to the environment.



Figure 8.1: Consultation with a GN








Figure 8.2: Consulting a commercial owner

B. Focus Group Discussions (FGDs)

196. Parallel to the one on one interviews, FGDs were carried out with government officers and public as a part of the social assessment. A total of five FGDs were conducted with the participation of 98 people (49 Males and 49 Females). Key comments and suggestions made during these discussions are listed below;

Table 8.1: Summary of key points discussed in FGDs

Location	Key points	Photographs
Kekirawa DS Division	<ul style="list-style-type: none"> During rainy season, the Kolankuttigama and Maminiyawa (around 5km) section get flooded. The water remain there for about 10 days. There are dangerous bends in road section from Maradakadawala to Habarana. It is better to consider these in this project. The vehicles go very speedily in this road, therefore it is better to put necessary sign boards. 	
Maradakadawala Hospital	<ul style="list-style-type: none"> There is no pedestrian crossing and bus bay near the hospital. It is important for the patients and hospital staff. There are about 400 people coming to OPD. Sign boards indicating speed need to be there and hospital access need to be developed. The people and staff comes from Habarana and Anurdhapura areas. During construction period, it is important to reduce noise and dust emission near the hospital. 	
ManiyawaGN Division	<ul style="list-style-type: none"> The dangerous bend (around 2km) need to be widened. Road side drains need to be improved, if not the road get damaged. The bridges and culverts are narrow and some culverts are old and damaged (Ex: Thoruwewa culvert) Bus bays, sign boards and road crossings are required. Maminiyawa section get flooded (around 5km). In 2015, the section got flooded and 	

Location	Key points	Photographs
	<p>people had to use alternate routes.</p> <ul style="list-style-type: none"> Majority of people are farmers and vendors come to get products or people go to Dambulla market. 	
Palugaswewa DS Division	<ul style="list-style-type: none"> Bridges are narrow and some culverts are damaged. The road surface also is cracked. The cycle lane is narrow, this is dangerous. The road get flooded close to Habarana due to overflowing of Yan Oya. The water remain for 10 – 12 days. The buses go very speedily. There need to be speed limits. Some bends are dangerous. These need to be widened. Vendors from Ganewalpola and Kekirawa come to purchase vegetables. 	
HabaranaGN Division	<ul style="list-style-type: none"> Around 23km, the road get flooded. Water comes for 2 – 3 1/2 inches. However, the raising the road will not be a solution as already around 70 people get affected from floods. The culverts and streams need to cleaned. Around 23km – 25km, the accidents take place because of bends. There's tourism activities in Habarana area. Many people do self employments of making hand crafts and sell those to tourist centers. 	

C. Disclosure of information

197. According to the requirements of the ADB SPS, for environment category B project roads the respective draft IEE will be disclosed before the Management Review Meeting (MRM) or equivalent meeting or approval of the respective project, if there is no MRM. Signboards with project information including details on nature of construction works, road length, construction period, name of contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil and English) for rural roads. For the national RMC roads there will be sign boards on period of works and contact information for reporting complaints or grievances in three languages.

198. During project implementation annual environmental monitoring reports will be prepared for the entire RMC package of iRoad and submitted to ADB for disclosure on the ADB website.

IX. CONCLUSION AND RECOMMENDATIONS

199. This Initial Environmental Examination has discussed various aspects of the proposed rehabilitation and maintenance of 25km from Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala – Habarana – Tirikkondiadimadu (A011) road under RMC package of iRoad program implemented by RDA under ADB financing. Under RMC package, contractors are liable to keep the roads in operational status for approximately 5 years after rehabilitation.

200. As discussed, candidate road section of A011 road will be rehabilitated and maintained under the project and all construction and maintenance activities will be restricted to the available ROW therefore no land acquisition is required. The road will be improved to standard two lanes status with hard shoulders, drains and other road furniture. Design will be carried out accordingly along the flood prone areas of the road in order to cater hazardous conditions and as well as to minimize road induced flood impacts.

201. The candidate road section of A011 road do not cross or located adjacent to protected areas or declared forest areas. Other than the indirect impacts, project induced social impacts are also negligible as the project does not allow acquisition of lands for the road rehabilitation. Indirect impacts to environmental and social set up of the project area will be minimized with effective mitigation measures as given in the chapter 5 of the report and EMP.

202. An EMP, EMC and EMOP have been prepared as part of this report. These are required to be updated and incorporated in to tender documents and converted into contract package specific documents before the commencement of construction activities.

203. The proposed improvement for A011 Road will boost economic activities in the NCP including potential growth in industries, tourism, and agriculture in lagging rural areas which will be a positive step to the socio economic development of the country.

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Integrated Road Investment Program (I road) - Road Management Contract (RMC) package

Sub project: Rehabilitation and Improvement of Maradankadawala to Habarana section of Maradankadawala – Habarana – Tirikondiadimadu (A011) Road

Sector Division: Roads & Highways

Project Location:

A011 Road starts from Kandy – Jaffna (A009) Road at Maradankadawala of Anuradhapura District of North Central Province (NCP) and ends at Tirikkondiadimadu of Trincomalee District of Eastern Province after meeting Batticoloa – Trincomalee (A015) Road. Proposed improvement is limited to Maradankadawala to Habarana section of the A011 Road and administrative divisions which are crossed by particular road section are given in the following table.

Province	District	DSD
North Central Province	Anuradhapura	Kekirawa
		Palugaswewa

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site		✓	
▪ Protected Area		✓	
▪ Wetland		✓	
▪ Mangrove		✓	
▪ Estuarine		✓	
▪ Buffer zone of protected area		✓	
▪ Special area for protecting biodiversity		✓	
B. Potential Environmental Impacts Will the Project cause...			
▪ Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		✓	
▪ Encroachment on precious ecology (e.g. sensitive or protected areas)?		✓	
▪ Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		✓	
▪ Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		✓	

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing? 		✓	<p>Activities such as earth works, cutting and filling rock blasting etc... will not be practiced under the RMC package. Therefore impacts due to above activities will not be experienced.</p> <p>However temporary impacts due to asphalt processing will be possible at asphalt plants and these impacts are restricted to such plant sites. Erection of noise and dust barriers, dampening the surfaces which can emit dust, using exact amount of chemicals for bitumen processing and most importantly siting the asphalt plants well away from protected areas and sensitive sites such as settlement areas, temples and schools will mitigate the impacts from asphalt plants.</p>
<ul style="list-style-type: none"> Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation? 	✓		It is proposed to prepare a separate health and safety plan to be implemented during road maintenance period and a regular monitoring schedule to be proposed under close supervision and coordination of a professional Occupational Health & Safety Officer of the Project Implementation Consultant.
<ul style="list-style-type: none"> Noise and vibration due to blasting and other civil works? 		✓	The proposed project is to overlay and maintain the candidate road to given standards therefore activities which result these impacts will not be coming under the proposed project.
<ul style="list-style-type: none"> Dislocation or involuntary resettlement of people? 		✓	
<ul style="list-style-type: none"> Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups? 		✓	
<ul style="list-style-type: none"> Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress? 		✓	

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Hazardous driving conditions where construction interferes with pre-existing roads? 	✓		<p>This impact is possible during transportation of asphalt concrete to the site through pre-existing roads.</p> <p>Adequate awareness will be made among the construction staff including drivers and they will be educated in order to minimize hazardous driving conditions along such roads.</p> <p>Contractor will be advised to use alternative roads to the best possible to avoid roads which are heavily used by the public.</p>
<ul style="list-style-type: none"> Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations? 	✓		<p>During the construction phase. Using local labour to the extent possible, briefing the workers on sanitation, communicable diseases, providing proper sanitary facilities and providing proper waste disposal system at worker camps are measures to mitigate this impact. Site specific environmental management action plans will be necessary in order to mitigate specific impacts to such labor camps.</p> <p>Further it will be ensured that labor camp, yards or any other site which emit solid waste or wastewater will not be located within or adjacent to the forest reserve from 113 to 127km.</p>
<ul style="list-style-type: none"> Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents? 		✓	
<ul style="list-style-type: none"> Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials? 	✓		<p>Using sign boards, barricades and other safety arrangements along the road during overlaying, informing the public on possible hazards in advance and using PPE for the staff engaged in maintenance activities will minimize this impact.</p> <p>Storing of toxic material will be required only in asphalt plants and they should be stored in well secured containers with labels and necessary first aid facilities and firefighting equipment should be available at these sites.</p>

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Increased noise and air pollution resulting from traffic volume? 	✓		<p>Adaptation of speed limits for construction vehicles and timely servicing and maintaining them up to the given standards will reduce the volume of emissions and noise levels to the surrounding. Frequent monitoring of noise levels and air quality will support to review the effectiveness of the mitigation measures.</p> <p>Smooth and steady flow of traffic along the road during the operational phase will ensure the emissions and the noise kept below the maximum permissible levels.</p>
<ul style="list-style-type: none"> Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road? 		✓	
<ul style="list-style-type: none"> Social conflicts if workers from other regions or countries are hired? 		✓	
<ul style="list-style-type: none"> Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		✓	
<ul style="list-style-type: none"> Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation? 		✓	
<ul style="list-style-type: none"> Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning. 		✓	

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Road Management Contract (RMC) Package of I Road Project of Sri Lanka
Maradankadawela - Habarana -Tirikkondiadimadu (A011) Road

Sector: Roads & Highways

Subsector: Roads & Highways

Division/Department: Environmental

Screening Questions		Score	Remarks¹
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya crossing (23.9km) are prone to floods during heavy rainy periods.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Project design may need to consider locations which are prone to floods and necessary mitigation measures need to be incorporated to the surface treatment.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

¹ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening: Medium Risk

Project Classification:

Proposed Environmental Classification: **B**

Remarks

A011 Road is an existing trunk road and will be overlaid and maintained to the given standards during the project period under Road Management Contract (RMC) package of I Road of Road Development Authority (RDA). And the scope of the project includes improvement of the road surface with asphalt concrete where necessary and maintaining the road to the given standards. All activities related to surface treatment and maintenance will be restricted to the existing Right of Way (ROW) of the road. Therefore, it is obvious that the proposed project will not encroach to the protected sites or cause significant environmental issues to the protected areas as mentioned in the section A of the checklist.

In addition an Environment Management, Development and Monitoring Plan will be implemented under the project within/adjacent to protected areas in order to facilitate the conservation of identified protected areas in collaboration with the relevant government agencies such as Department of Wildlife Conservation, Department of Forest and Department of Archeology.

Therefore it is proposed that the project can be classified as Category B.

Prepared by:

Ecologist and Hydrologist
Environmental and Social Development Division,
Road Development Authority

ENVIRONMENTAL CHECKLIST

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD)

Road Name: Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala – Habarana – Thirukkondaiadimadu (A011) road

District Names: Anuradapura,

DSD & G NDs:

Province	District	DS Division	GN Divisions
North Central	Anuradhapura	Kekirawa	Maradankadawala, Thorewewa, Maminiyawa, Kollankuttama, Kelepuliyankulama, Maminiyawa, Rambewa, Ganewalpola, Heenukkiniyawa
		Palugaswewa	Galapitagala, Senadhiriyagama, Palugaswewa, Habarana

Total Length of the road to be improved: 25.0Km

iRoad project aims to rehabilitate and maintain Maradankadawala (0.0km) – Habarana (25.0km) section of A011 Road under Road Management Contract (RMC) package. The total length of the candidate road sections is 25.0km.

Climatic Conditions

Temperature	Mean annual temperature: 25 – 27.5°C
Humidity	High: 90% Low: 64%
Rainfall Rainy Season	Mean annual rainfall: 1000 - 1500 mm/year Main rainfall season: October to January

(Source: National Atlas, Second Edition, Department of Survey, Sri Lanka, 2007)

A. Location of the Road and Generic description of Environment

No:	Type of Ecosystem	Yes	No	Explanation
1.	Type of Terrain (Plain/ Undulating/ Hilly/ Mountainous etc.) (Explain the topography of the area and how many km of the road are located in the hilly area)	√		Altitude: In general, the road traverses along a flat terrain and elevation of the trace varies between 6 – 79m MSL.
2.	Forest Area / Mangrove / Other natural habitats (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?		√	
3.	Inhabited Area	√		Entire section of A011 road to be rehabilitated is inhabited.
4.	Agricultural Land	√		Agricultural lands could be observed intermittently along the candidate road section of A011 Road and mainly paddy cultivation is practiced during the rainy season.
5.	Barren Land		√	

B. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road?	√		Water bodies crossed by or located nearby to the candidate section of A011 road is given in D.VI.

No.	Parameter/ Component	Yes	No	Explanation
	(If yes, list them indicating the location Right/ Left or crossing and the chainage)			
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		During rainy season (generally from November – January) following sections of the road is inundated and road gets overtopped to about 1 – 3ft. Flood water retains for about 5 – 10 days (public consultation); Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya (23.9km),
4.	Are there any trees with a girth of 600mm or more at breast height within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side) and the chainage)	√		112 trees were observed within the existing ROW during the field reconnaissance. However, tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate if these trees will be felled due to road improvement.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)	√		Seasonal tanks provide water body which is a good habitat for inland fish and indigenous birds species
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?	√		Villagers mentioned that wild elephant roaming could be observed around at 3.0 to 4.0km, 20.0 to 21.0km. Asian elephant has been listed as endangered species by International Union for Conservation of Nature (IUCN)
7.	Are there any utility structures ¹ within 2 m on either side from the centre line of the road alignment or within the existing ROW of the road? (If yes, attach list with chainage)	√		Electrical poles are observed along the entire two sections of the road. However most of them are located well away from the study corridor and poles located within the study corridor are given in DI.

¹ Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures

No.	Parameter/ Component	Yes	No	Explanation
8.	Are there any religious, cultural or community structures/buildings ² within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		<p>Community structures were found along the road as given in section DII.</p> <p>(Please refer to section DII)</p> <p>However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimise impacts due to degradation of air quality, noise and vibration at these sensitive receptors. In addition safety measures are recommended at the schools during both construction and operational phases of the project.</p>

C. Public Consultation

No	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. (Attach list of people met and dates)	√		Public was consulted during field reconnaissance carried out for preparation of the Environmental Checklist. Please refer to the appendix VIII.1 of the IEE report for the list of public consulted and their views.
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public expressed the need of raising the road, increase the openings of cross drainage structures and clearing clogged structures in order to reduce the flood impact.
3.	If suggestions received, were they incorporated into the design?	√		It is recommended that the design team will incorporate the findings of the environment checklist to the designs of the road.

² Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

D. Please attach the following:

- I. List of utility structures located within the study area (within existing ROW or within 2m corridor of either sides of the road from the edge of the carriageway if the ROW is not clear) indicating location and side of the road (Right Hand Side (RHS) or Left Hand Side (LHS)) as required under B.7.

Location (km)	Utility type	Side of the road	
		LHS	RHS
Maradankadawala – Habarana section			
0 - 5	Electrical poles	3	30
5 - 10	Electrical poles	5	7
10 - 15	Electrical poles	13	4
15 - 20	Electrical poles	-	19
20 - 25	Electrical poles	7	2

- II. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8);

Chainage (km)/ GPS	Location	Left	Right
0.1	Maradankadawala Divisional Hospital	√	
4.0	Maminiiyawa School		√
4.2	Temple	√	
5.2	Kollankatigama School		√
6.9	Pre school		√
7.2	Mosque		√
8.6	Ganewalpola Muslim School	√	
11.6	Temple	√	
13.1	Galapitagala School		√
17.5	Ayurveda Medical Centre	√	
18.6	Library		√
19.2	Pulugawewa Secondary School		√
19.7	Community Hall	√	
23.9	Shrine	√	
24.3	Temple		√

- III. Project location map is attached in appendix 2.1 of the IEE report.
- IV. Photographs of the project area showing at least 2 m on either side from centre line of road alignment.
Please refer to the chapter IV of the IEE report.
- V. List of trees with 600mm of girth (at breast height) or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

Chainage (km)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees

0.6 -0.7	Suriya Mara	<i>Albizia odoratissima</i>	01			
	Burutha	<i>Chloroxylon swietenia</i>	01			
	Neem	<i>Azadirachta flabellifer</i>	02			
1.0 - 1.2	Burutha	<i>Chloroxylon swietenia</i>	01			
	Mara/ Rain tree	<i>Samanea saman</i>	01			
1.2 - 1.5	Milla	<i>Vitex altissima</i>	01			
	Jack	<i>Artocarpus heterophyllus</i>	01			
	Suriya Mara	<i>Albizia odoratissima</i>	01			
	Mara/ Rain tree	<i>Samanea saman</i>	01			
2.0 -2.3	Mara/ Rain tree	<i>Samanea saman</i>	01			
	Kon	<i>Schleichera oleosa</i>	01			
2.7 - 3.0	Kubuk	<i>Terminalia indica</i>	05			
	Neem	<i>Azadirachta flabellifer</i>	01			
3.0 3.4				Jack	<i>Artocarpus heterophyllus</i>	01
				Palu	<i>Manilkara hexandra</i>	01
				Kubuk	<i>Terminalia indica</i>	01
3.5 - 3.7	Neem	<i>Azadirachta flabellifer</i>	03	Halaba	<i>Mitragyna parvifolia</i>	01
20.8-20.9	Kubuk	<i>Terminalia indica</i>	1	Kon	<i>Schleichera oleosa</i>	01
4.0 - 4.2	Bo tree	<i>Ficus religiosa</i>	02	Kubuk	<i>Terminalia indica</i>	01
	Neem	<i>Azadirachta flabellifer</i>	02			
4.5 - 4.6	Kon	<i>Schleichera oleosa</i>	01	Bo tree	<i>Ficus religiosa</i>	01
	Bo tree	<i>Ficus religiosa</i>	01	Kon	<i>Schleichera oleosa</i>	01
	Kon	<i>Schleichera oleosa</i>	01			
	Neem	<i>Azadirachta flabellifer</i>	02			
6.0 - 6.4				Goda-Kaduru	<i>Strychnos nux vomica</i>	02
				Mara/ Rain tree	<i>Samanea saman</i>	01
				Jack	<i>Artocarpus heterophyllus</i>	02
				Palu	<i>Manilkara hexandra</i>	01
6.9 -7.0	Palu	<i>Manilkara hexandra</i>	03	Palu	<i>Manilkara hexandra</i>	02
7.1 -7.2	Palu	<i>Manilkara hexandra</i>	03			
	GodaKaduru	<i>Strychnos nux vomica</i>	02			
7.5 - 8.0				Kalu-wara	<i>Diospyros ebenum</i>	01
				Halmilla	<i>Berrya Cordifolia</i>	01
				Palu	<i>Manilkara hexandra</i>	01

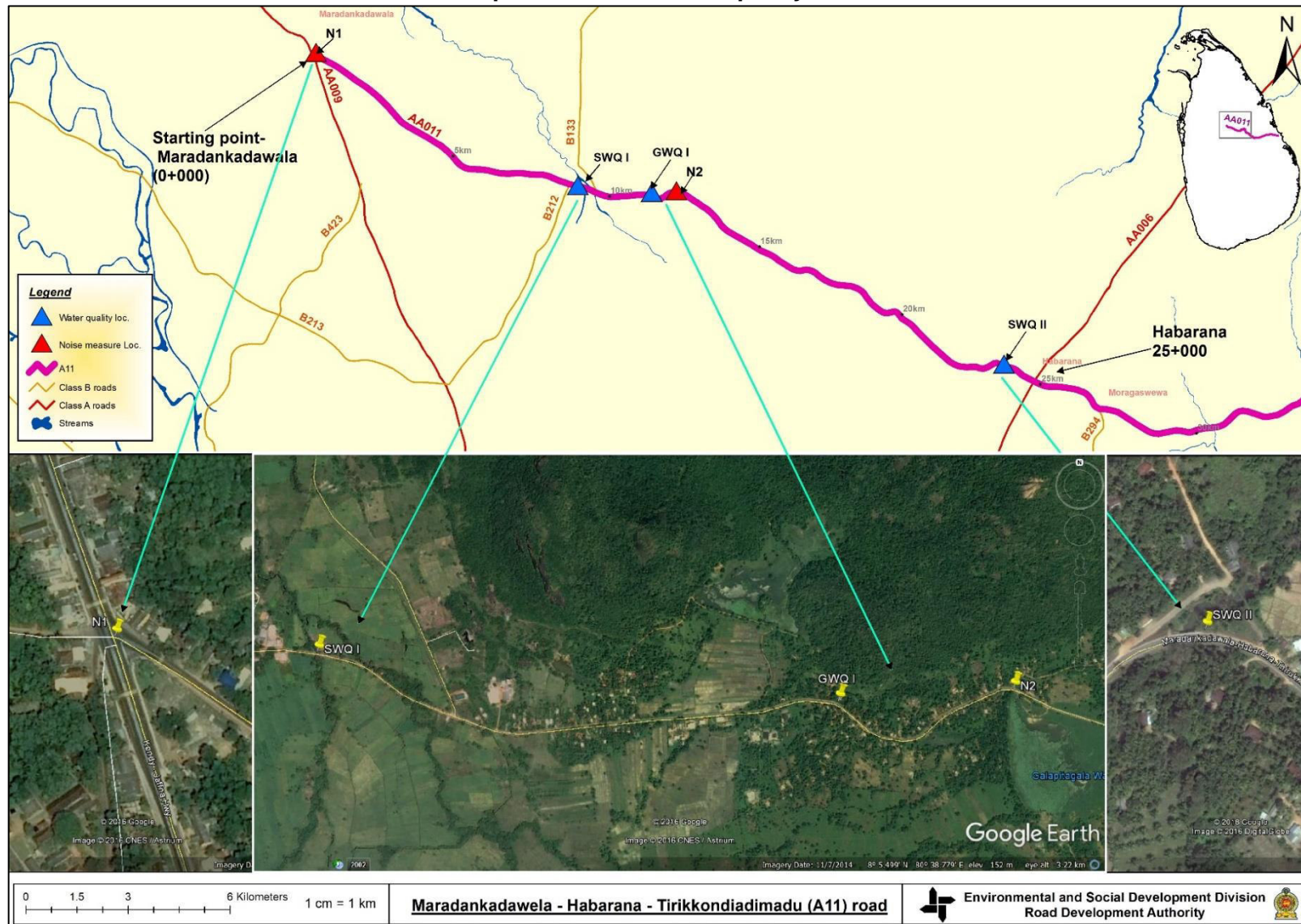
				Goda-kaduru	<i>Strychnos nux vomica</i>	01
8.3 - 8.4				Jack	<i>Artocarpus heterophyllus</i>	01
8.6 -8.7	Mara/ Rain tree	<i>Samanea saman</i>	01	Mara/ Rain tree	<i>Samanea saman</i>	01
9.5 - 9.6	Palu	<i>Manilkara hexandra</i>	01	Nuga	<i>Ficus benghalensis</i>	01
10.8 - 11.0				Jack	<i>Artocarpus heterophyllus</i>	01
				Neem	<i>Azadirachta flabellifer</i>	01
				Palu	<i>Manilkara hexandra</i>	01
				Nuga	<i>Ficus benghalensis</i>	01
12.0				Ma dan	<i>Syzygium cumini</i>	01
12.5-12.7				Kubuk	<i>Terminalia indica</i>	10
12.8 - 13.0				Nuga	<i>Ficus benghalensis</i>	02
13.5.-13.6				Palu	<i>Manilkara hexandra</i>	01
				Nadun	<i>Pericopsis mooniana</i>	01
				Teak	<i>Tectona grandis</i>	01
				Neem	<i>Azadirachta flabellifer</i>	01
14.0 - 14.1				Kubuk	<i>Terminalia indica</i>	01
15.7 - 16.0	Kon	<i>Schleichera oleosa</i>	01			
	Jack	<i>Artocarpus heterophyllus</i>	01			
	Ma dan	<i>Syzygium cumini</i>	01			
	Bak mee	<i>Nauclea orientalis</i>	01			
16.1	Nuga	<i>Ficus benghalensis</i>	01			
16.3	Kon	<i>Schleichera oleosa</i>	01			
16.9-17.3	Suriya Mara	<i>Albizia odoratissima</i>	01			
	Kon	<i>Schleichera oleosa</i>	01			
	Palu	<i>Manilkara hexandra</i>	01			
	Kon	<i>Schleichera oleosa</i>	01			
	Neem	<i>Azadirachta flabellifer</i>	02			
18.0-18.1	Bulu	<i>Terminalia belerica</i>	01			
18.6-18.7	Palu	<i>Manilkara hexandra</i>				
19.4-19.5	Nuga	<i>Ficus benghalensis</i>	01			
	Palu	<i>Manilkara hexandra</i>	01			
20.0-20.5				Bu-rutha	<i>Chloroxylon swietenia</i>	01
				Suriya Mara	<i>Albizia odoratissima</i>	01
				Bu-rutha	<i>Chloroxylon swietenia</i>	01

21.0-21.5	Palu	<i>Manilkara hexandra</i>	01	Palu	<i>Manilkara hexandra</i>	01
24.3-24.5				Mara/ Rain tree	<i>Samanea saman</i>	02
				Nuga	<i>Ficus benghalensis</i>	01
24.6-24.8				Palu	<i>Manilkara hexandra</i>	02
				Nuga	<i>Ficus benghalensis</i>	01
	Total		57	Total		55

VI. Water bodies located along the road

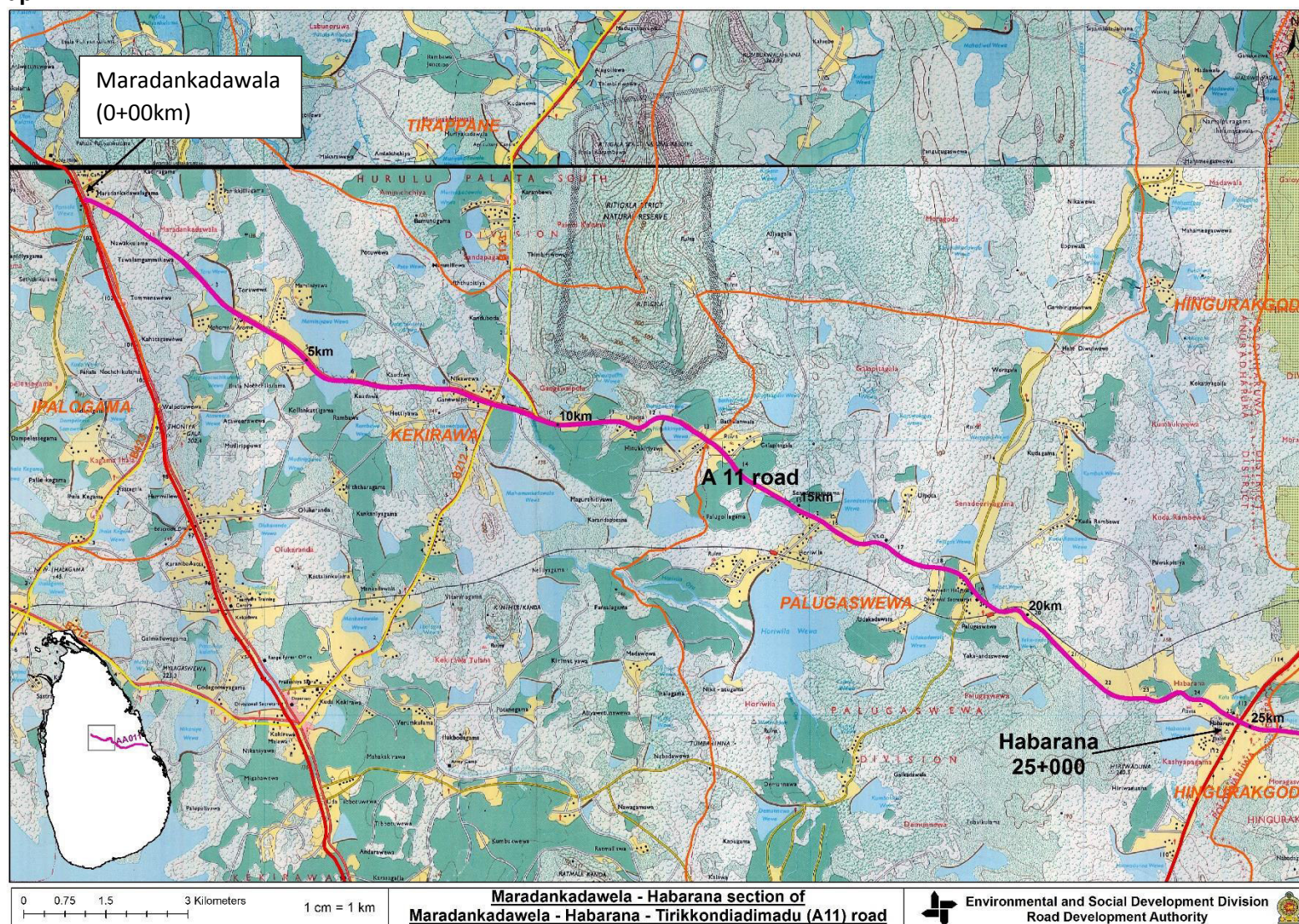
No.	Water Body/Stream	Location with respect to the road
Maradankadawala – Habarana section		
1	Thoru Wewa (Tank)	Road crosses the catchment area around 3km
2	Maminiyawa Tank	Road crosses the catchment area from 5.4 to 6.6km
3	Outflow of Mahamankadawala Tank	Road crosses the stream at 9km
4	Tributary of Malwathu Oya (Stream)	Stream flows along the road on Left Hand Side (LHS) from 9km and crosses the road at 9.6km
6	Hirukkiriya Tank	The bund touches the road at 12.2km on Right Hand Side (RHS) and the catchment area expands till 12.8km
7	Talpat Tank	The bund touches the road on LHS at 19.2km
8	Yan Oya (Stream)	Road crosses the stream at 23.9km

Location map of noise and water quality measurement

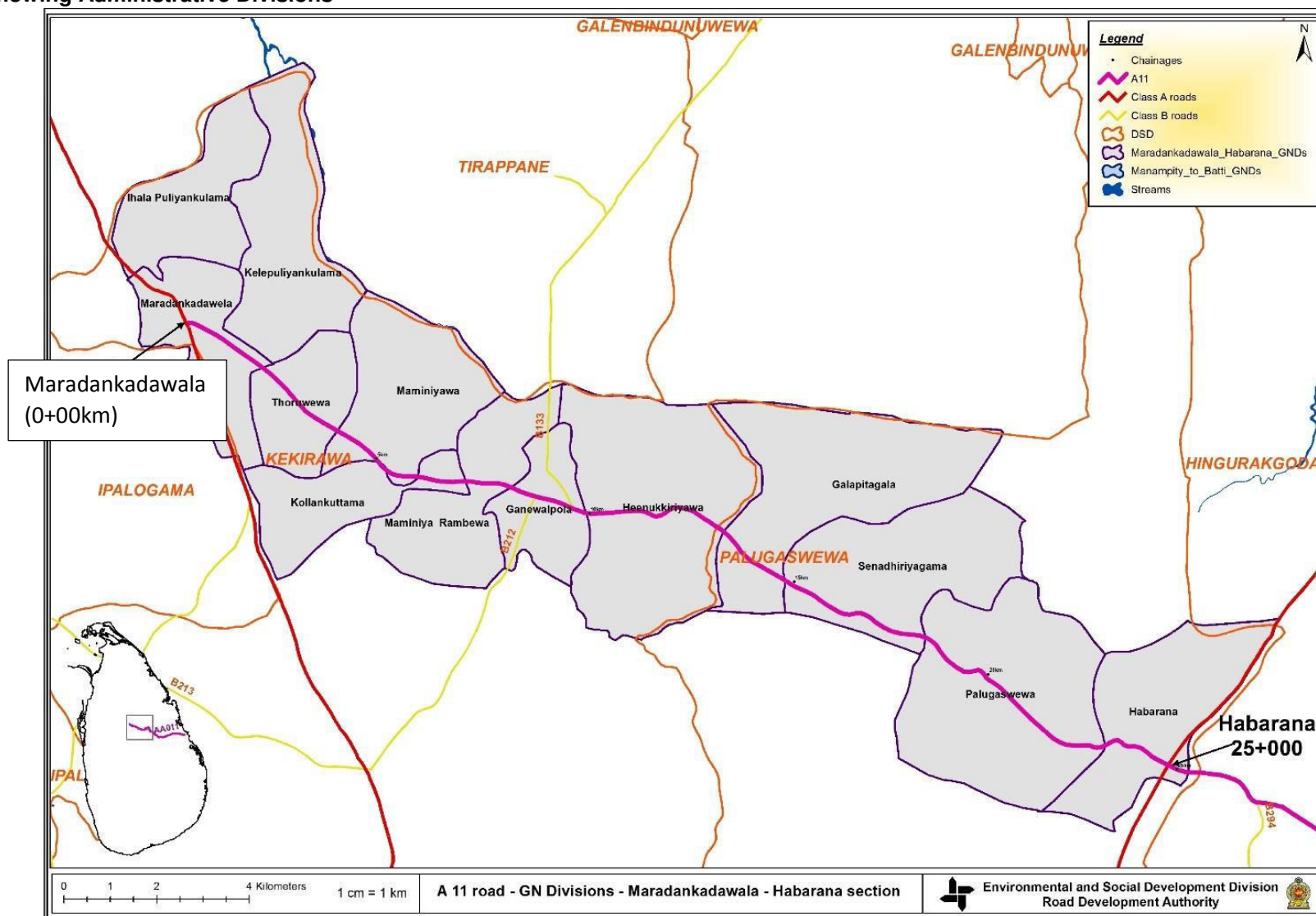


Location map

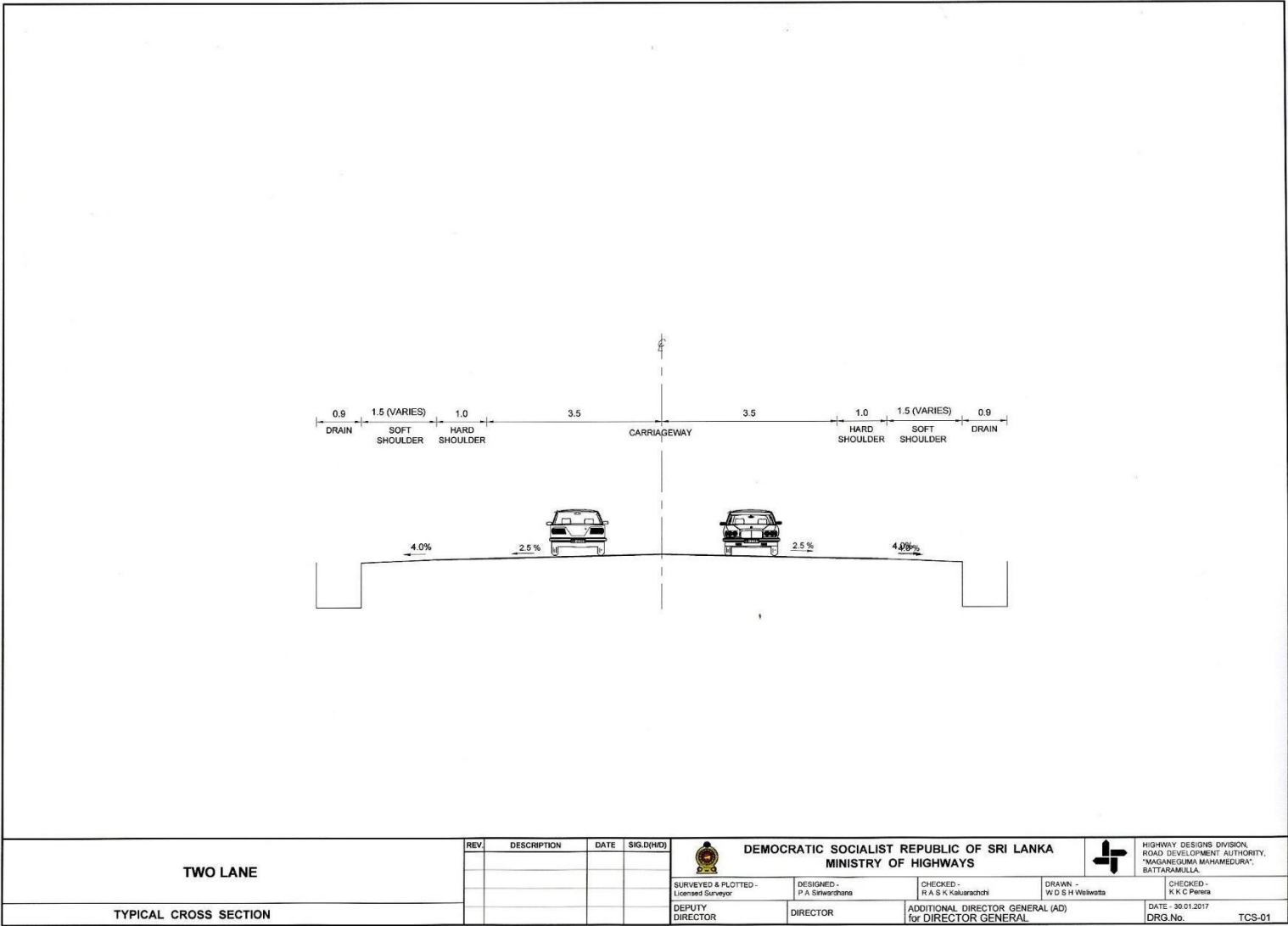
Land use map



Maps showing Administrative Divisions



Proposed Typical Cross Section



List of roadside trees along the proposed project area
Maradankadawala - Habarana section

Chainage (km)	LHS			RHS		
	Common Name	Scientific name	No. of trees	Common Name	Scientific name	No. of trees
0.6 - 0.7	Tea shade tree	<i>Albizia odoratissima</i>	01			
		<i>Chloroxylon swietenia</i> (vu)	01			
	Satinwood					
	Neem	<i>Azadirachta indica</i>	02			
1.0 - 1.2	Satinwood	<i>Chloroxylon swietenia</i> (vu)	01			
	Rain tree	<i>Samanea saman</i>	01			
1.2 - 1.5	Peacock tree	<i>Vitex altissima</i>	01			
	Jack	<i>Artocarpus heterophyllus</i>	01			
	Tea shade tree	<i>Albizia odoratissima</i>	01			
	Rain tree	<i>Samanea saman</i>	01			
2.0 - 2.3	Rain tree	<i>Samanea saman</i>	01			
	Ceylon oak	<i>Schleichera oleosa</i>	01			
2.7 - 3.0	Arjun tree	<i>Terminalia arjuna</i>	05			
	Neem	<i>Azadirachta indica</i>	01			
3.0 - 3.4				Jack	<i>Artocarpus heterophyllus</i>	01
				Milk tree	<i>Manilkara hexandra</i> (vu)	01
				Arjun tree	<i>Terminalia indica</i>	01
3.5 - 3.7	Neem	<i>Azadirachta indica</i>	03	yellow cheese wood	<i>Mitragyna parvifolia</i>	01
20.8- 20.9	Arjun tree	<i>Terminalia indica</i>	1	Ceylon oak	<i>Schleichera oleosa</i>	01
4.0 - 4.2	Scared fig tree	<i>Ficus religiosa</i>	02	Arjun tree	<i>Terminalia indica</i>	01
	Neem	<i>Azadirachta indica</i>	02			
4.5 - 4.6	Ceylon oak	<i>Schleichera oleosa</i>	01	Scared fig tree	<i>Ficus religiosa</i>	01

				tree		
	Scared fig tree	<i>Ficus religiosa</i>	01	Ceylon oak	<i>Schleichera oleosa</i>	01
	Ceylon oak	<i>Schleichera oleosa</i>	01			
	Neem	<i>Azadirachta indica</i>	02			
6.0 - 6.4				GodaK aduru	<i>Strychnos nux vomica</i> (vu)	02
				Rain tree	<i>Samanea saman</i>	01
				Jack	<i>Artocarpus heterophyllus</i>	02
				Milk tree	<i>Manilkara hexandra</i> (vu)	01
6.9 - 7.0	Milk tree	<i>Manilkara hexandra</i> (vu)	03	Milk tree	<i>Manilkara hexandra</i>	02
7.1 - 7.2	Milk tree	<i>Manilkara hexandra</i> (vu)	03			
	Goda Kaduru	<i>Strychnos nux vomica</i>	02			
7.5 - 8.0				Ebony tree	<i>Diospyros ebenum</i> (En)	01
				Peacock tree	<i>Berrya Cordifolia</i>	01
				Milk tree	<i>Manilkara hexandra</i> (vu)	01
				Godaka duru	<i>Strychnos nux vomica</i>	01
8.3 - 8.4				Jack	<i>Artocarpus heterophyllus</i>	01
8.6 - 8.7	Rain tree	<i>Samanea saman</i>	01	Rain tree	<i>Samanea saman</i>	01
9.5 - 9.6	Milk tree	<i>Manilkara hexandra</i> (vu)	01	Banyan tree	<i>Ficus benghalensis</i>	01
10.8 - 11.0				Jack	<i>Artocarpus heterophyllus</i>	01
				Neem	<i>Azadirachta indica</i>	01
				Milk tree	<i>Manilkara hexandra</i> (vu)	01
				Banyan tree	<i>Ficus benghalensis</i>	01
12.0				Java plum	<i>Syzygium cumini</i>	01
12.5- 12.7				Arjun tree	<i>Terminalia indica</i>	10
12.8 - 13.0				Banyan tree	<i>Ficus benghalensis</i>	02
13.5.- 13.6				Milk tree	<i>Manilkara hexandra</i> (vu)	01
				Nedun	<i>Pericopsis mooniana</i> (vu)	01
				Teak	<i>Tectona grandis</i>	01

				Neem	<i>Azadirachta indica</i>	01
14.0 - 14.1				Arjun tree	<i>Terminalia indica</i>	01
15.7 - 16.0	Ceylon oak	<i>Schleichera oleosa</i>	01			
	Jack	<i>Artocarpus heterophyllus</i>	01			
	Ma dan	<i>Syzygium cumini</i>	01			
	Bak mee	<i>Nauclea orientalis</i>	01			
16.1 16.3	Banyan tree	<i>Ficus benghalensis</i>	01			
	Ceylon oak	<i>Schleichera oleosa</i>	01			
16.9- 17.3	Tea shade tree	<i>Albizia odoratissima</i>	01			
	Ceylon oak	<i>Schleichera oleosa</i>	01			
	Milk tree	<i>Manilkara hexandra</i> (vu)	01			
	Ceylon oak	<i>Schleichera oleosa</i>	01			
	Neem	<i>Azadirachta indica</i>	02			
18.0- 18.1	Baheda tree	<i>Terminalia belerica</i>	01			
18.6- 18.7	Milk tree	<i>Manilkara hexandra</i> (vu)				
19.4- 19.5	Banyan tree	<i>Ficus benghalensis</i>	01			
	Milk tree	<i>Manilkara hexandra</i> (vu)	01			
20.0- 20.5				Satinwood	<i>Chloroxylon swietenia</i> (vu)	01
				Tea shade tree	<i>Albizia odoratissima</i>	01
				Satinwood	<i>Chloroxylon swietenia</i> (vu)	01
21.0- 21.5	Milk tree	<i>Manilkara hexandra</i> (vu)	01	Milk tree	<i>Manilkara hexandra</i> (vu)	01
24.3- 24.5				Mara/Rain tree	<i>Samanea saman</i>	02
				Banyan tree	<i>Ficus benghalensis</i>	01
24.6- 24.8				Milk tree	<i>Manilkara hexandra</i> (vu)	02
				Banyan tree	<i>Ficus benghalensis</i>	01

	Total		57	Total		55

Vu-Vulnerable species as per " The national red list 2012 of Sri Lanka".

En-Endangered species as per " The national red list 2012 of Sri Lanka".

List of faunal species observed in the project area

SF : Scrub/ forest
 WB: Water Bodies
 HG: Home Gardens
 PF: Paddy

Class/Family/Scientific name	Common name	Status	Habitat			
			S F	W B	HG	P F
Class: Actinopterygii						
Family: Anabantidae						
<i>Anabas testudineus</i>	Kawaiyya			+		
Family: Aplocheilidae						
<i>Aplocheilus parvus</i>	Udahandaya			+		
Family: Belontiidae						
<i>Trichogaster pectoralis</i>	Theppili			+		
Family: Channidae						
<i>Channa striata</i>	Lula			+		
Family: Cichlidae						
<i>Etroplus suratensis</i>	Koraliya			+		
<i>Oreochromis spp</i>	Thilapia			+		
Class: Amphibia						
Family: Bufonidae						
<i>Bufo melanostictus</i>	Common house toad				+	+
Class: Aves						
Family: Ardeidae						
<i>Bubulcus ibis</i>	Cattle egret	Resident	+			+
<i>Egretta garzetta</i>	Little egret	Resident	+			+
<i>Mesophoyx intermedia</i>	Intermediate egret	Resident	+			
<i>Ardeola grayii</i>	Indian pond heron				+	+
<i>Ardea purpurea</i>	Purple heron				+	+
Family : Accipitridae						
<i>Accipiter badius</i>	Shikra		+			+
<i>Haliastur indus</i>	Brahminy kite	Resident	+	+		+
<i>Haliaeetus leucogaster</i>	White bellied sea eagle	Resident	+	+		
<i>Lchthyophaga ichthyaetus</i>	Grey headed fish eagle	Resident	+	+		
<i>Spilornis cheela</i>	Crested Serpent eagle	Resident	+	+		+
Family : Aegithinidae						
<i>Aegithinia tiphia</i>	Common iora					
Family : Bucerotidae						
<i>Ocyrceros gingalensis</i>	Sri Lanka Grey Hornbill	Endemic	+			
Family: Alcedinidae						
<i>Alcedo atthis</i>	Common Kingfisher	Resident	+	+		

<i>Halcyon smyrnensis</i>	White throated Kingfisher	Resident	+	+		
<i>Ceryle rudis</i>	Pied Kingfisher	Resident	+	+		
Family: Columbidae						
<i>Columba livia</i>	Pigeons	Feral			+	
<i>Stigmatopelia chinensis</i>	Spotted dove	Resident				+
<i>Chalcophaps indica</i>	Emerald Dove	Resident			+	+
Family: Corvidae						
<i>Corvus splendens</i>	House crow	Resident	+		+	+
Family: Cuculidae						
<i>Centropus sinensis</i>	common coucal	Resident	+			
<i>Eudynamis scolopaceus</i>	Asian koel	Resident	+		+	
Family: Ciconiidae						
<i>Mycteria leucocephala</i>	Painted Stork	Resident	+			
<i>Anastomus oscitans</i>	Asian Openbill	Resident	+			
Family: Chloropseidae						
<i>Chloropsis jerdoni</i>	Jerdon's leafbird	Resident	+			
Family: Dicaeidae						
<i>Dicaeum erythrorhynchos</i>	Pale billed flowerpecker	Resident			+	
Family: Dicruridae						
<i>Dicrurus caerulescens</i>	White bellied drongo	Resident				+
Family : Estrildidae						
<i>Lonchura malaca</i>	Black headed munia		+			
Family: Jacanidae						
<i>Hydrophasianus chirurgus</i>	Pheasant tailed jacana	Resident	+			
Family: Meropidae						
<i>Merops orientalis</i>	Green Bee eater	Resident	+			+
Family: Monarchidae						
<i>Terpsiphone paradisi</i>	Asian paradise flycatcher	Resident/migrant			+	
Family: Motacillidae						
<i>Anthus refulus</i>	Paddy field pipit		+			
Family: Nectariniidae						
<i>Nectarinia zeylonica</i>	Purple rumped sunbird				+	
Family: Oriolidae						
<i>Oriolus xanthornus</i>	Black hooded oriole				+	
Family: Phalacrocoracidae						
<i>Phalacrocorax niger</i>	Little Cormorant	Resident	+	+		
Family: Phasianidae						
<i>Gallus gallus domesticus</i>	Domestic hen/cock	Domestic			+	
<i>Gallus lafayetii</i>	Sri Lanka jungle fowl	Endemic	+			
<i>Pavo cristatus</i>	Indian Peafowl	Resident	+			+
Family: Picidae						
<i>Dinopium benghalense</i>	Black rumped flameblack	Resident			+	
Family : Psittacidae						
<i>Psittacula krameri</i>	Rose ringed parakeet	Resident			+	+
Family:Pycnonotidae						

<i>Pycnonotus cafer</i>	Red vented bulbul	Resident				+
<i>Hypsipetes leucocephalus</i>	Asian black Bulbuk	Resident	+			
Family : Ramphastidae						
<i>Megalaima zeylanica</i>	Brown headed Barbet	Resident			+	+
<i>Megalaima rubricapillus</i>	Crimson fronted Barbet	Endemic	+			
Family: Oriolidae						
<i>Oriolus xanthornus</i>	Black Hooded Oriole	Resident			+	+
Family: Rallidae						
<i>Amaurionis phoenicurus</i>	White breasted waterhen	Resident	+	+		
<i>Porphyrio porphyrio</i>	Purple swampen	Resident	+			
<i>Gallinula chloropus</i>	Common Moorhen	Resident	+			
Family: Rhipiduridae						
<i>Rhipidura aureola</i>	White Browed fantail	Resident				
Family: Rallidae						
<i>Amaurionis phoenicurus</i>	White breasted waterhen		+	+		
Family: Sturnidae						
<i>Acridotheres tristis</i>	Common myna	Resident			+	
Family: Sylviidae						
<i>Orthotomus sutorius</i>	Common tailorbird	Resident			+	
Family: Timalidae						
<i>Turdoides affinis</i>	Yellow billed babbler	Resident			+	
Family: Threskiornithidae						
<i>Threskiornis melanocephalus</i>	Black headed Ibis	Resident	+			
Class: Mammalia						
Family: Bovidae						
<i>Bos indicus</i>	Cattle	Domestic			+	+
<i>Bubalus bubalus</i>	Buffalo	Domestic			+	+
Family: Canidae						
<i>Canis familiaris</i>	Dog	Domestic			+	+
<i>Canis aureus</i>	Jackal		+			
Family : Cercopithecidae						
<i>Macaca sinica</i>	Toque monkey	Endemic	+			
Family: Colobinae						
<i>Trachypithecus vetulus</i>	Purple faced leaf monkey	Endemic	+			
Family : Elephantidae						
<i>Elephas maximus</i>	Asian Elephant	Endangered ¹	+			
Family: Felidae						
<i>Canis familiaris</i>	Cat	Domestic				+
Family: Herpestidae						
<i>Herpestes brachyurus</i>	Brown mongoose		+			
Family : Leporidae						
<i>Lepus nigricollis</i>	Black -naped hare		+			
Family: Sciuridae						
<i>Funambulus palmarum</i>	Palm squirrel				+	

<i>Ratufa macroura</i>	Giant squirrel	Vulnerable ¹	+			
Family: Suidae						
<i>Sus scrofa</i>	Wild boar		+			
Class: Reptilia						
Family: Agamidae						
<i>Calotes calotes</i>	Pala katussa		+			
<i>Calotes versicolor</i>	Green garden lizard		+			
Family: Colubridae						
<i>Coluber mucosus maximus</i>	Common rat snake					
Family: Elapidae						
<i>Naja naja</i>	Indian cobra		+			
Family: Testudinidae						
<i>Geochelone elegans</i>	Star tortoise	Vulnerable ¹			+	
Family: Varanidae						
<i>Varanus salvator</i>	Water monitor		+			
Class: Insecta						
Family: Apidae						
<i>Apis cerana</i>	Asian honey bee		+			
Family: Chrysomelidae						
<i>Aspidimorpha miliaris</i>	Tortoise beetle		+			
<i>Aspidimorpha sanctaecrucis</i>	Tortoise beetle					+
Family: Coccinellidae						
<i>Chilomenes sexmaculata</i>	Ladybird beetle					+
<i>Coccinella transversalis</i>	Ladybird beetle					+
Damselflies			+			
Family: Coenagrionidae						
<i>Ceragrion coromandelianum</i>	Yellow waxtail	Common	+			
Dragonflies						
Family: Libellulidae						
<i>Neurothemis tullia tullia</i>	Pied parasol	Common	+			
<i>Orthetrum Sabina sabina</i>	Green skimmer	Common	+			
<i>Rhyothemis variegata variegata</i>	Variegated flutterer	Common	+			
Butterflies						
Family: Danaidae						
<i>Danaus limniace</i>	Blue tiger		+			
Family: Lycaenidae						
<i>Castalius rosimon</i>	Common pierrot		+			
<i>Discolampa ethhion ethhion</i>	Banded blue pierrot					+
<i>Zizula hylax</i>	Tiny Grass Blue		+			
Family: Nymphalidae						
<i>Tirumala limniace</i>	Blue tiger					+
<i>Danaus plexippus</i>	Common tiger					+
<i>Danaus septentrionis</i>	Dark blue tiger					+
<i>Euploea core</i>	Common Indian crow					+
<i>Neptis hylas</i>	Common sailor		+			
<i>Precis atlites</i>	Grey pansy		+			

Family: Pieridae						
<i>Catopsilia pomona</i>	Lemon emigrant		+			
<i>Delias eucharis</i>	Jezebel		+			
<i>Leptosia nina</i>	Psyche		+			
Family: Papilionidae						
<i>Delias eucharis</i>	Jezebel					
<i>Graphium agamemnon</i>	Tailed jay		+			
LANDS SNAILS						
Class : Gastropoda						
Family: Achatinidae						
<i>Lissachatina fulica</i>	Giant African snail		+			

¹ As per " The national red list 2012 of Sri Lanka"

Environmental Management Plan

Rehabilitation and maintenance from Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala – Habarana – Tirikkondiadimadu (A011) Road

This Environmental Management Plan (EMP) is the summarized matrix of all possible impacts that may occur during upgrading and maintenance of Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala - Habarana – Tirikkondiadimadu (A011) Road to all weather standards under Road Management Contract (RMC) of iRoad Program implemented by Road Development Authority (RDA). And this EMP should be updated and Site Specific Environmental Management Action Plan (SSEMAP) should be prepared with site/ location specific measures which is specific for each contract package (if the road will be contractually sub divided) before commencement of the project. The updated SSEMAP for each contract package should be approved by the Project Implementation Consultant (PIC) well in advance to the construction phase.

This EMP should form part of the Bid Documents and shall be considered alongside with the specifications. Thereby the prescriptions detailed in the EMP are mandatory in nature and also contractually binding. The EMP will also equally applicable to sub-contractors including nominated sub-contractors if any. The Contractor shall be responsible for the compliance with the requirements of the EMP. With the assistance of the PIU, the PIC, on behalf of the Employer the Road Development Authority (RDA) will monitor the compliance of EMP by the Contractor.

The bidders are advised to carefully consider the EMP requirements when preparing the bid and pricing the items of work. As a thumb of rule it is suggested that the contractor allows 10~15% of construction cost as cost to execute environmental compliance requirements. The prescriptions and clauses detailed in the EMP are integral component of the specifications for relevant item of work unless separate items are included in the Bill of Quantities. Thus separate payments will not be made in respect of compliance with the EMP. In case the Contractor or his sub-contractor/s fails to implement the EMP recommendations after informing in writing, the PIC will take whatever actions it is deemed necessary to ensure that the EMP is properly implemented. If the contractor or his sub-contractor/s still fails to comply with EMP requirement, the PIC may levy a penalty based on the level of non-compliance, cost incurred to rectify the damages caused by such negligence and/ or recover the cost from contractor's payments.

The Contractor through an appointed Environmental Officer shall assist the PIC to discharge his duties as required in the EMP implementation by (a) maintaining up to date records on actions taken by the Contractor with regard to implementation of EMP recommendations (b) timely submission of reports, information and data to the PIU through PIC, (c) participating in the meetings conveyed by the PIC and (d) any other assistance requested by the Engineer.

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
I	Design and Preconstruction Stage					
1.	Climate Change Consideration and Vulnerability screening	<ul style="list-style-type: none"> ○ Compliance to climate change vulnerability check point given under IEE and adoption of necessary mitigative measures as may be required ○ Cross drainage structures to be designed and located based on recommendations of hydrological studies to be conducted during detailed design phase. Alteration of rainfall intensities due to climate change therefore change of peak flows of waterways and land use changes should be clearly studied under hydrological assessments and appropriate mitigation measures should be incorporated to final designs. ○ Efforts shall be made to plant additional trees for increasing the carbon sink. The trees may be selected with help of DoF (Department of Forest) and space for additional planting (if the remaining space within ROW is not adequate) will be secured with the help of DoF, Divisional Secretary 	Throughout the project and flood prone areas (specially Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya (23.9km)) and other possible areas of tree planting	Design costs.	PIU, Design consultant of the contractor	Project Implementation Unit (PIU) and Project Implementation Consultant (PIC) & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		(DS) and Community Based Organizations (CBO).				
2.	Clearing of vegetation and removing trees	<ul style="list-style-type: none"> ○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from DS shall be obtained for cutting of roadside trees ○ Cut trees shall be handed over to the Timber Corporation. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis using grown up saplings (having at least 3ft height). ○ Only native species with the advice of DoF will be selected for replanting and locations for tree replanting will be as closer as possible to the tree removed. ○ And if road side space for replanting is not available, other possible locations such as schools, public areas will be explored with the help of DoF, DS and CBOs of the area. ○ Provision shall be made for additional compensatory tree plantation. Any 	Throughout the project area	Costs for tree removal. Costs for compensatory tree replanting.	Contractor	PIU, PIC, DS & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		leftover of trees shall be removed and disposed in approved manner.				
3.	Shifting of utilities	<ul style="list-style-type: none"> ○ The proposed Right of Way (ROW) shall be clearly demarcated on the ground. ○ All efforts will be made to minimize shifting of utilities ○ Utility shifting shall be planned in consultations and concurrence of the relevant service provider. ○ Required permissions and necessary actions will be taken from relevant service provider on a timely basis for removing and shifting utility structures before road construction activities begin. ○ The public/users of the particular service should be aware well in advance about the timing of the shifting/removal of the relevant utility lines when the service will be disrupted 	Utility facilities located along either the side of the road which may be shifted due to the road improvement	Costs to cover shifting and reconstruction of utilities and common property resources must be included under project costs.	Contractor	PIU, PIC, RDA, CEB, Sri Lanka Telecom, NWS&DB, CBO for Community based water supply schemes if any

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
4.	Hydrology and Drainage	<ul style="list-style-type: none"> Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. Here, special attention should be paid for flood prone areas. The discharge capacity of the cross drainage structure shall be designed accordingly. Provision of adequate drainage structures shall be made in water stagnant/logging areas if recommended by hydrological studies. Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. 	Near all drainage crossings, rivers, streams and flood prone areas.	Included in project costs.	PIU, Design consultants of the contractor	PIU, PIC and RDA
II.	□ Construction Stage					
1.	Flood impacts	<ul style="list-style-type: none"> The contractor shall take all measures necessary or as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. Here special attention should be paid to flood prone areas along the candidate road sections of A011 road. Temporary storage of material should only be within approved sites by the engineer where natural drainage is not disturbed. 	Throughout the project area with special attention to road sections which are prone to floods specially Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya (23.9km)	To be included under contractors costs	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> ○ All wastes should be disposed only at locations approved by the Local Authority of the area. ○ If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property. ○ The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff or else location specific drainage management plans should be arranged in advance to the rainy season with the approval of PIC. ○ No material including excavated soil should be allowed to be disposed near water bodies or in paddy lands (even on temporary basis) to curtail any undue wash off of soil and debris in to such nearby water bodies and agricultural lands. ○ The contractor should be advised not to damage or block any manmade drainage canal even for temporary basis. If blocked the contractor should remove such debris without any delay preventing any long interruptions 				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		of water flow which could damage or hinder cultivation activities resulting in loss of crop and produce especially in the upstream side of the drainage path.				

2.	Sourcing and transportation of construction material	<p>□ Borrow Earth:</p> <ul style="list-style-type: none"> ○ The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. ○ And if new borrow pits are opened for the project, necessary approvals and licenses should be obtained from GSMB and CEA. And all conditions laid down in such licenses should be strictly adhered. ○ All completed borrow pits should be rehabilitated to satisfy conditions given in the industrial mining license of GSMB ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. <p>□ Aggregate :</p> <ul style="list-style-type: none"> ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU through PIC. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage. <p>□ Transportation of Construction Material</p> <ul style="list-style-type: none"> ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. 	Throughout the project area with special attention to borrow pits and quarries to be used in each package	To be included under contractors costs	Contractor	PIU, PIC
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SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
3.	Loss of productive soil, erosion and land use change	<ul style="list-style-type: none"> ○ The top soil from the productive land (borrow areas etc...) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Shrubs shall be planted in loose soil area. ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use/as agreed with the land owner before handing it over to land owner. 	Throughout the project area and borrow sites, camps sites, storage areas, vehicle parks, yards and temporary offices	To be included under contractors costs	Contractor	PIU, PIC & RDA
4.	Slope protection and stabilization	<ul style="list-style-type: none"> ○ Slope protection measures must be carried out for embankments using appropriate turfing material in combination with drainage improvement measures were appropriate ○ Follow up watering and maintenance of the turf must be carried out to ensure the survival of the plants and success of the slope stabilization. 	Along embankments	To be included under contractors costs	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
5.	Compaction and Contamination of Soil	<ul style="list-style-type: none"> ○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. ○ Fuel, lubricants and other construction chemicals shall be stored at the predefined storage location under a roof and on an impervious layer in order to avoid exposure to rain or runoff. ○ The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. ○ All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. ○ To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to relevant parties. ○ Any land degraded due to construction activities should be restored to the satisfactory level of the owner. 	Throughout the project area with special attention to yards, vehicle parking and servicing areas and construction activities near to paddy and other agricultural lands	To be included under contractors costs	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
6.	Establishment of Construction Camp, temporary office and storage area	<ul style="list-style-type: none"> Construction camp sites and storage areas shall be located away from any local human settlements, water bodies and forested areas (minimum 0.2 km away) and preferably located on land which is not productive (barren/waste lands presently). If these are not possible, private lands maybe taken on lease as standard practice. The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. No wastewater is allowed to be sent to the environment without meeting the desired standards. All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. Personal Protective Equipment (PPEs) such as helmet, boots, ear plugs for workers, first aid and firefighting equipment shall be available at construction sites before start of construction. An emergency plan shall 	Throughout the project area with special attention to labour camps, storage areas and office premises	To be included in contractor's cost	Contractor	PIU, PIC, RDA, LA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		<p>be prepared to fight with any emergency like fire.</p> <ul style="list-style-type: none"> ○ Provision shall be made for domestic solid waste disposal in acceptable manner. The solid waste shall be handed over to the waste collecting system of the Local Authority (LA) of the area (if any) and wastewater should be disposed in an environmentally acceptable manner (meeting the desired water quality standards) with the approval of the PIC. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage and a provision of roof where appropriate to avoid interception with the rain. 				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
7.	Construction Debris and waste	<ul style="list-style-type: none"> Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping if recommended by PIC. Unusable debris material and removed pavements of roads should be suitably disposed off at pre-designated disposal locations, with approval of the relevant local authority. Potential sites should be approved by the PIC in advance before applying for the approval. The bituminous wastes if any shall be disposed in secure manner and environmentally accepted manner eg. Disposed in a pit that is covered properly and adequate revegetation is carried out or others. In establishing disposal sites, unproductive/wastelands shall be selected with the help the PIC and villagers. The dumping site should be of adequate capacity. It should be located without causing nuisance to residential areas. Dumping sites. Further flood prone areas, forest reserves, adjacent to streams and irrigation tanks should be avoided in selecting disposal sites and existing drainage paths should not be disturbed. Appropriate soil conservation measures as agreed with the PIC should be practiced in the disposal sites in order to avoid washing off the disposed soil. 	Throughout the project area and all disposal sites	To be included under contractors costs	Contractor	PIU, PIC, RDA and LA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
8.	Air and Noise Quality and vibration	<ul style="list-style-type: none"> ○ Vehicles delivering loose and fine materials like sand and aggregates shall be covered. ○ Dust suppression measures such as water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles, crusher plants and asphalt mixing areas. ○ Batching plants and asphalt (hot mix) should be operated with necessary licenses (Environmental Protection License (EPL) and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and should not disturb normal life of residents. ○ Material storage areas shall also be located downwind of the habitation area. ○ Hot mix plant shall be fitted with stack of adequate height (30m) or as may be prescribed in the EPL to ensure enough dispersion of exit gases. ○ Diesel Generators (DG) shall also be sound proof or fitted with stack of adequate height. ○ Construction vehicles and machineries shall be periodically maintained. ○ All heavy equipment and machinery shall be fitted in full compliance with the national regulation, Noise Control Regulations - Extra Ordinary Gazette No. 924/12 May 1996 amended by 	Throughout the project road with special attention to schools, hospitals and religious places located along the candidate road sections	To be included under contractors costs	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		<p>Extra Ordinary Gazette 937/7 April 1997.</p> <ul style="list-style-type: none"> o No construction along community areas will be permitted during night time o Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration. If any damages occur, contractor will be responsible for rectifying the damage. 				
9.	Tree plantation	<ul style="list-style-type: none"> o Compensatory afforestation shall be made on 1:3.ratio basis. o Only native species should be selected with the consent of DoF for replanting o Additional trees shall be planted wherever feasible. o Follow up maintenance of planted saplings will be carried out 	Throughout the all project roads.	To be included under contractors costs	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
10.	Ground Water and Surface Water Quality and Availability	<ul style="list-style-type: none"> ○ The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. ○ Water intensive activities shall not be undertaken during dry period to the extent feasible. ○ Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible. ○ Preventive measures such as proper storage of unsuitable soil, construction chemicals, servicing construction vehicles in approved sites, slope stabilisation, etc shall be taken for prevention of siltation and pollution of water bodies. 	Throughout the project area with special attention to streams, irrigation tanks and public wells	To be included under contractors costs	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
11.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. ○ First aid facility should be readily available at every construction site throughout the construction period ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA or should be disposed in environmentally friendly manner with the approval of PIC. ○ Records on health and safety related accidents measures taken to address must be maintained. 	Throughout the project road sections	Costs to be borne by Contractor	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
12	Traffic Management and Road Safety	<ul style="list-style-type: none"> ○ Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should comply with the Road Safety Manual of RDA. ○ It is proposed to discuss with the Department of Railways for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing. ○ Road furniture including footpaths, railings, storm water drains, crash barrier, traffic signs, speed zone signs, pavement markers and any other such items will be provided to enhance the road safety where necessary at the completion of the project ○ Night time illumination should be in place at every location where the road is narrow, diverted and structures are repaired and any other places where the PIC recommends to do so. ○ Monitor and record road crashes during construction and maintenance stages and take appropriate remedial actions 	Throughout the candidate sections of the road	To be included in contractor's cost	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
13.	Impacts on Biodiversity	<ul style="list-style-type: none"> ○ No solid waste or spoil dumping sites, hot mix plants and worker camps should be located within or close to the forest reserve. ○ Strict worker force supervision should be carried out by the contractor when conducting construction work within the area and the construction works should be completed within a minimum specified time period. ○ Restrictions on the daily working hours between daylight and sunset must be enforced in sites near the forest area. ○ Conditions which may be required by the DOFC for roads located adjacent or close to forest areas must be met ○ Ensure that the timing of tree removal does not coincide with breeding season of birds or other fauna if the trees are being used by birds and other fauna <ul style="list-style-type: none"> ○ Labourers should be made aware on possible movement of elephants and construction activities should be modified if such movements will occur. 	Throughout the road sections with special attention near the forest reserve	To be included in contractor's cost	Contractor	PIU, PIC & RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
III	Operational & maintenance Stage					
1.	Hydrology and Drainage	<ul style="list-style-type: none"> Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points especially before the monsoon season. Renovation of the drainage system by repairing removing encroachments/congestions shall be regularly conducted 	At project road locations with drainage structures	To be included in contractor's maintenance cost	Contractor (during maintenance period and RDA afterwards)	PIC, PIU and RDA
2.	Air and Noise Quality	<ul style="list-style-type: none"> Placing sign boards for speed limitation and honking restrictions to be enforced near sensitive locations. Removal of dust & mud collected on road surface to avoid dust emanation Strategically locating compensatory plantation along sensitive noise receptors to provide additional attenuation Installation of noise and dust barriers if levels are found to exceed required standards. 	Throughout the project roads	construction cost and maintenance cost	Contractor (during maintenance period and RDA afterwards)	PIC, PIU and RDA
3.	Site restoration	<ul style="list-style-type: none"> All construction camp/temporary office/material storage areas are to be restored to its original conditions or as agreed with the land owner. The borrow areas rehabilitation will be as per the conditions laid down in GSMB approval. 	All locations of construction camps/temporary office/material storage, and borrow areas	To be borne by the contractor	Contractor (during maintenance period and RDA afterwards)	PIC, PIU and RDA
4.	Tree replanting	<ul style="list-style-type: none"> Contractor to undertake survivability assessment and report to PIC the status of compensatory tree plantation. 	All tree replanted areas	To be borne by the contractor	Contractor (during maintenance period and RDA afterwards)	PIC, PIU and RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> Additional plants should be planted for dead plants if any 				
5.	Occupational Health and Safety	<ul style="list-style-type: none"> The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the maintenance workers and it should be ensured that labourers use PPE during working hours. First aid facility should be readily available at the construction site Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA. Records on health and safety related accidents measures taken to address must be maintained 	Throughout the project roads and camp sites if any	To be borne by the contractor	Contractor (during maintenance period and RDA afterwards)	PIC, PIU and RDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
6.	Repairing of road surface and drainage structures	<ul style="list-style-type: none"> ○ If drainage structures and road surface are to be repaired during maintenance period, possible impacts to the environment and social setup should be minimized by implementing applicable mitigation measures as given for the construction phase above. ○ In addition PIC/PIU/RDA can impose any mitigation measure for any unpredicted impact can be occurred during maintenance period which is not identified in the EMP. 	Throughout the road sections of the road	To be borne by the contractor	Contractor (during maintenance period and RDA afterwards)	PIC, PIU and RDA

I. Environmental Monitoring Checklist during Design and Pre-Construction Stage
Rehabilitation and Maintenance of Maradankadawala – Habarana section of A011 Road

District:

Road Name:

Road ID:

Total length:

Report No. and date:

Completed by:

SL. NO	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
I. Pre-construction & Design phase					
1.	Climate Change Consideration and Vulnerability screening	<ul style="list-style-type: none"> ○ Compliance to climate change vulnerability check point given under IEE and adoption of necessary mitigative measures as may be required ○ Cross drainage structures to be designed and located based on recommendations of hydrological studies to be conducted during detailed design phase. Alteration of rainfall intensities due to climate change therefore change of peak flows of waterways and land use changes should be clearly studied under hydrological assessments and appropriate mitigation measures should be incorporated to final designs. ○ Efforts shall be made to plant additional trees for increasing the carbon sink. The trees may 	Throughout the project and flood prone areas (specially Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya) and other possible areas of tree planting		

		be selected with help of DoF (Department of Forest) and space for additional planting (if the remaining space within ROW is not adequate) will be secured with the help of DoF, Divisional Secretary (DS) and Community Based Organizations (CBO).			
2.	Clearing of vegetation and removing trees	<ul style="list-style-type: none"> ○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from DS shall be obtained for cutting of roadside trees ○ Cut trees shall be handed over to the Timber Corporation. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis using grown up saplings (having at least 3ft height). ○ Only native species with the advice of DoF will be selected for replanting and locations for tree replanting will be as closer as possible to the tree removed. ○ And if road side space for replanting is not available, other possible locations such as schools, public areas will be explored with the help of DoF, DS and CBOs of the area. ○ Provision shall be made for additional compensatory tree plantation. Any leftover of trees shall be removed and disposed in approved manner. 	Throughout the project area		
3.	Shifting of utilities	<ul style="list-style-type: none"> ○ The proposed Right of Way (ROW) shall be clearly demarcated on the ground. ○ All efforts will be made to minimize shifting of utilities ○ Utility shifting shall be planned in consultations and concurrence of the relevant service provider. ○ Required permissions and necessary actions will be taken from relevant service provider on a timely basis for removing and shifting utility 	Utility facilities located along either the side of the road which may be shifted due to the road improvement		

		<p>structures before road construction activities begin.</p> <ul style="list-style-type: none"> ○ The public/users of the particular service should be aware well in advance about the timing of the shifting/removal of the relevant utility lines when the service will be disrupted 			
4.	Hydrology and Drainage	<ul style="list-style-type: none"> ○ Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. Here, special attention should be paid for flood prone areas. ○ The discharge capacity of the cross drainage structure shall be designed accordingly. ○ Provision of adequate drainage structures shall be made in water stagnant/logging areas if recommended by hydrological studies. ○ Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. 	Near all drainage crossings, rivers, streams and flood prone areas.		
II. Construction phase					
1.	Flood impacts	<ul style="list-style-type: none"> ○ The contractor shall take all measures necessary or as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. Here special attention should be paid to flood prone areas along the candidate road sections of A011 road. ○ Temporary storage of material should only be within approved sites by the engineer where natural drainage is not disturbed. ○ All wastes should be disposed only at locations approved by the Local Authority of the area. ○ If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to prevent loss of 	Throughout the project area with special attention to road sections which are prone to floods specially Maminiyawa Tank (5.4 – 6.6km) and around Yan Oya (23.9km).		

		<p>access to any land or property and prevent damage to land and property.</p> <ul style="list-style-type: none"> ○ The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff or else location specific drainage management plans should be arranged in advance to the rainy season with the approval of PIC. ○ No material including excavated soil should be allowed to be disposed near water bodies or in paddy lands (even on temporary basis) to curtail any undue wash off of soil and debris in to such nearby water bodies and agricultural lands. ○ The contractor should be advised not to damage or block any manmade drainage canal even for temporary basis. If blocked the contractor should remove such debris without any delay preventing any long interruptions of water flow which could damage or hinder cultivation activities resulting in loss of crop and produce especially in the upstream side of the drainage path. 			
2.	Sourcing and transportation of construction material	<p><input type="checkbox"/> Borrow Earth:</p> <ul style="list-style-type: none"> ○ The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. ○ And if new borrow pits are opened for the project, necessary approvals and licenses should be obtained from GSMB and CEA. And all conditions laid down in such licenses should be strictly adhered. 	Throughout the project area with special attention to borrow pits and quarries to be used in each package		

		<ul style="list-style-type: none"> ○ All completed borrow pits should be rehabilitated to satisfy conditions given in the industrial mining license of GSMB ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. □ Aggregate : <ul style="list-style-type: none"> ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU through PIC. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage. □ Transportation of Construction Material <ul style="list-style-type: none"> ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. 			
3.	Loss of productive soil, erosion and land use change	<ul style="list-style-type: none"> ○ The top soil from the productive land (borrow areas etc...) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Shrubs shall be planted in loose soil area. ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use/as agreed with the land owner before handing it over to land owner. 	Throughout the project area and borrow sites, camps sites, storage areas, vehicle parks, yards and temporary offices		

4.	Slope protection and stabilization	<ul style="list-style-type: none"> ○ Slope protection measures must be carried out for embankments using appropriate turfing material in combination with drainage improvement measures were appropriate ○ Follow up watering and maintenance of the turf must be carried out to ensure the survival of the plants and success of the slope stabilization. 	Along embankments		
5.	Compaction and Contamination of Soil	<ul style="list-style-type: none"> ○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. ○ Fuel, lubricants and other construction chemicals shall be stored at the predefined storage location under a roof and on an impervious layer in order to avoid exposure to rain or runoff. ○ The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. ○ All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. ○ To avoid soil contamination at the wash-down and re-fuelling areas, “oil interceptors” shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to relevant parties. o ○ Any land degraded due to construction activities should be restored to the satisfactory level of the owner. 	Throughout the project area with special attention to yards, vehicle parking and servicing areas and construction activities near to paddy and other agricultural lands		
6.	Establishment of Construction Camp,	<ul style="list-style-type: none"> ○ Construction camp sites and storage areas shall be located away from any local human 	Throughout the project area with special		

	temporary office and storage area	<p>settlements, water bodies and forested areas (minimum 0.2 km away) and preferably located on land which is not productive (barren/waste lands presently). If these are not possible, private lands maybe taken on lease as standard practice.</p> <ul style="list-style-type: none"> ○ The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. No wastewater is allowed to be sent to the environment without meeting the desired standards. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. ○ The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipment (PPEs) such as helmet, boots, ear plugs for workers, first aid and firefighting equipment shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. ○ Provision shall be made for domestic solid waste disposal in acceptable manner. The solid waste shall be handed over to the waste collecting system of the Local Authority (LA) of the area (if any) and wastewater should be disposed in an environmentally acceptable manner (meeting 	attention to labour camps, storage areas and office premises		
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		<p>the desired water quality standards) with the approval of the PIC.</p> <ul style="list-style-type: none"> ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage and a provision of roof where appropriate to avoid interception with the rain. 			
7.	Construction Debris and waste	<ul style="list-style-type: none"> ○ Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping if recommended by PIC. ○ Unusable debris material and removed pavements of roads should be suitably disposed off at pre-designated disposal locations, with approval of the relevant local authority. Potential sites should be approved by the PIC in advance before applying for the approval. ○ The bituminous wastes if any shall be disposed in secure manner and environmentally accepted manner eg. Disposed in a pit that is covered properly and adequate revegetation is carried out or others. ○ In establishing disposal sites, unproductive/wastelands shall be selected with the help the PIC and villagers. The dumping site should be of adequate capacity. It should be located without causing nuisance to residential areas. Dumping sites. ○ Further flood prone areas, forest reserves, adjacent to streams and irrigation tanks should be avoided in selecting disposal sites and existing drainage paths should not be disturbed. ○ Appropriate soil conservation measures as agreed with the PIC should be practiced in the disposal sites in order to avoid washing off the disposed soil. 	Throughout the project area and all disposal sites		

8.	Air and Noise Quality and vibration	<ul style="list-style-type: none"> ○ Vehicles delivering loose and fine materials like sand and aggregates shall be covered. ○ Dust suppression measures such as water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles, crusher plants and asphalt mixing areas. ○ Batching plants and asphalt (hot mix) should be operated with necessary licenses (Environmental Protection License (EPL) and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and should not disturb normal life of residents. ○ Material storage areas shall also be located downwind of the habitation area. ○ Hot mix plant shall be fitted with stack of adequate height (30m) or as may be prescribed in the EPL to ensure enough dispersion of exit gases. ○ Diesel Generators (DG) shall also be sound proof or fitted with stack of adequate height. ○ Construction vehicles and machineries shall be periodically maintained. ○ All heavy equipment and machinery shall be fitted in full compliance with the national regulation, Noise Control Regulations - Extra Ordinary Gazette No. 924/12 May 1996 amended by Extra Ordinary Gazette 937/7 April 1997. ○ No construction along community areas will be permitted during night time ○ Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration. If any damages occur, contractor will be responsible for rectifying the damage. 	Throughout the project road with special attention to schools, hospitals and religious places located along the candidate road sections		
9.	Tree plantation	<ul style="list-style-type: none"> ○ Compensatory afforestation shall be made on 1:3.ratio basis. 	Throughout the all project roads.		

		<ul style="list-style-type: none"> ○ Only native species should be selected with the consent of DoF for replanting ○ Additional trees shall be planted wherever feasible. ○ Follow up maintenance of planted saplings will be carried out 			
10.	Ground Water and Surface Water Quality and Availability	<ul style="list-style-type: none"> ○ The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. ○ Water intensive activities shall not be undertaken during dry period to the extent feasible. ○ Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible. ○ Preventive measures such as proper storage of unsuitable soil, construction chemicals, servicing construction vehicles in approved sites, slope stabilisation, etc shall be taken for prevention of siltation and pollution of water bodies. 	Throughout the project area with special attention to streams, irrigation tanks and public wells		
11.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. ○ First aid facility should be readily available at every construction site throughout the construction period ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA or should be 	Throughout the project road sections		

		<p>disposed in environmentally friendly manner with the approval of PIC.</p> <ul style="list-style-type: none"> Records on health and safety related accidents measures taken to address must be maintained. 			
12	Traffic Management and Road Safety	<ul style="list-style-type: none"> Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should comply with the Road Safety Manual of RDA. It is proposed to discuss with the Department of Railways for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing. Road furniture including footpaths, railings, storm water drains, crash barrier, traffic signs, speed zone signs, pavement markers and any other such items will be provided to enhance the road safety where necessary at the completion of the project Night time illumination should be in place at every location where the road is narrow, diverted and structures are repaired and any other places where the PIC recommends to do so. Monitor and record road crashes during construction and maintenance stages and take appropriate remedial actions 	Throughout the candidate sections of the road		
13.	Impacts on Biodiversity	<ul style="list-style-type: none"> No solid waste or spoil dumping sites, hot mix plants and worker camps should be located within or close to the forest reserve. Strict worker force supervision should be carried out by the contractor when conducting construction work within the area and the construction works should be completed within a minimum specified time period. Restrictions on the daily working hours between daylight and sunset must be enforced in sites near the forest area. 	Throughout the road sections with special attention near the forest reserve		

		<ul style="list-style-type: none"> ○ Conditions which may be required by the DOFC for roads located adjacent or close to forest areas must be met ○ Ensure that the timing of tree removal does not coincide with breeding season of birds or other fauna if the trees are being used by birds and other fauna ○ Labourers should be made aware on possible movement of elephants and construction activities should be modified if such movements will occur. 			
III. Operational & maintenance Stage					
1.	Hydrology and Drainage	<ul style="list-style-type: none"> ○ Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points especially before the monsoon season. ○ Renovation of the drainage system by repairing removing encroachments/ congestions shall be regularly conducted 	At project road locations with drainage structures		
2.	Air and Noise Quality	<ul style="list-style-type: none"> ○ Placing sign boards for speed limitation and honking restrictions to be enforced near sensitive locations. ○ Removal of dust & mud collected on road surface to avoid dust emanation ○ Strategically locating compensatory plantation along sensitive noise receptors to provide additional attenuation ○ Installation of noise and dust barriers if levels are found to exceed required standards. 	Throughout the project roads		
3.	Site restoration	<ul style="list-style-type: none"> ○ All construction camp/temporary office/material storage areas are to be restored to its original conditions or as agreed with the land owner. ○ The borrow areas rehabilitation will be as per the conditions laid down in GSMB approval. 	All locations of construction camps/temporary office/ material storage, and borrow areas		

4.	Tree replanting	<ul style="list-style-type: none"> ○ Contractor to undertake survivability assessment and report to PIC the status of compensatory tree plantation. ○ Additional plants should be planted for dead plants if any 	All tree replanted areas		
5.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the maintenance workers and it should be ensured that labourers use PPE during working hours. ○ First aid facility should be readily available at the construction site ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA. ○ Records on health and safety related accidents measures taken to address must be maintained 	Throughout the project roads and camp sites if any		
6.	Repairing of road surface and drainage structures	<ul style="list-style-type: none"> ○ If drainage structures and road surface are to be repaired during maintenance period, possible impacts to the environment and social setup should be minimized by implementing applicable mitigation measures as given for the construction phase above. ○ In addition PIC/PIU/RDA can impose any mitigation measure for any unpredicted impact can be occurred during maintenance period which is not identified in the EMP. 	Throughout the road sections of the road		

Environmental Monitoring Plan (EMoP) for the Rehabilitation and Improvement of Maradankadawala (0.0km) to Habarana (25km) section of Maradankadawala – Habarana – Tirikondiadimadu (A011) Road

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Air Quality	Before construction stage	SPM, PM10, NO ₂ , CO, SO ₂ , CO ₂	1. At 0.0km 2. At Maminiyawa school (4.0)km 3. At Ganewalpola muslim school (8.6km) 4. At Pulugawewa Secondary School (19.2km) 5. At the temple (24.3km) 6. Selected quarry sites and crusher plants 7. Selected burrow sites 8. Selected asphalt plants	Once	NAAQS of Sri Lanka	Per sample 40,000	320,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
	Construction stage	SPM, PM10, NO ₂ , CO, SO ₂ , CO ₂	1. At 0.0km 2. At Maminiyawa school (4.0)km 3. At Ganewalpola muslim school (8.6km) 4. At Pulugawewa Secondary School (19.2km) 5. At the temple (24.3km) 6. Selected quarry sites and crusher plants 7. Selected burrow sites 8. Selected asphalt plants	Construction - 2 times/Year for 2 Years (however, additional measurements may need to be taken in case there are complaints of deterioration of air quality)	NAAQS of Sri Lanka	Per sample 40,000	1,280,000	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Maintenance stage	SPM, PM10, NO ₂ , CO, SO ₂ , CO ₂	1. At 0.0km 2. At Maminiyawa school (4.0)km 3. At Ganewalpola muslim school (8.6km) 4. At Pulugawewa Secondary School (19.2km) 5. At the temple (24.3km) 6. Selected quarry sites and crusher plants 7. Selected burrow sites 8. Selected asphalt plants	Once a year for 5 years	NAAQS of Sri Lanka	Per sample 40,000	1,600,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
Water Quality	Before construction stage	Temperature, pH, Electrical Conductivity, DO, BOD ₅ , TSS, Turbidity, Salinity, Total Coliform count	1. Maminiyawa tank (5.4 to 6.6km) 2. Stream at 9.6km 3. Talpat Tank (19.2km) 4. Yan Oya stream (23.9km)	Once	CEA Water Quality Regulation	Per sample 10,000	40,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
	Construction stage	Temperature, pH, Electrical Conductivity, DO, BOD ₅ , TSS, Turbidity, Salinity, Total Coliform count	1. Maminiyawa tank (5.4 to 6.6km) 2. Stream at 9.6km 3. Talpat Tank (19.2km) 4. Yan Oya stream (23.9km)	Construction – 2 times/Year for 2 Years	CEA Water Quality Regulations	Per sample 10,000	160,000	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Maintenance stage	Temperature, pH, Electrical Conductivity, DO, BOD ₅ , TSS, Turbidity, Salinity, Total Coliform count	1. Maminiyawa tank (5.4 to 6.6km) 2. Stream at 9.6km 3. Talpat Tank (19.2km) 4. Yan Oya stream (23.9km)	Once a year for 5 years	CEA Water Quality Regulations	Per sample 10,000	200,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
Noise and Vibration Noise and vibration	Before construction stage	Leq10 and Leq 50 values	1. At 0.0km 2. At Maminiyawa school (4.0)km 3. At Ganewalpola muslim school (8.6km) 4. At Pulugawewa Secondary School (19.2km) 5. At the temple (24.3km) 6. Selected quarry sites and crusher plants 7. Selected burrow sites 8. Selected asphalt plants	Once	CEA Regulations on ambient noise levels and permissible ground vibration levels	Per sample 10,000	80,000	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Construction	Leq10 and Leq 50 values	1. At 0.0km 2. At Maminiyawa school (4.0)km 3. At Ganewalpola muslim school (8.6km) 4. At Pulugawewa Secondary School (19.2km) 5. At the temple (24.3km) 6. Selected quarry sites and crusher plants 7. Selected burrow sites 8. Selected asphalt plants	Construction - 2 times/Year for 2 Years (however, additional measurements may need to be taken in case there are complaints of high noise and vibration levels).	CEA Regulations on ambient noise levels and permissible ground vibration levels	Per sample 10,000	320,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
	Maintenance stage	Leq10 and Leq 50 values	1. At 0.0km 2. At Maminiyawa school (4.0)km 3. At Ganewalpola muslim school (8.6km) 4. At Pulugawewa Secondary School (19.2km) 5. At the temple (24.3km) 6. Selected quarry sites and crusher plants 7. Selected burrow sites 8. Selected asphalt plants	Once a year for 5 years	CEA Regulations on ambient noise levels and permissible ground vibration levels	Per sample 10,000	400,000	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Flora	Before construction stage	No. of trees to be removed	Land available within the proposed ROW	Once	-	Per sample 30,000	30,000	Contractor RDA/ PIU through PIC and consultation with ESD Division (DOF if required)
	Construction stage	No. of trees replanted	Land available within the proposed ROW	2 visits/ year for 2years	No. and Diversity of species replanted	Per sample 30,000	120,000	Contractor RDA/ PIU through PIC and consultation with ESD Division (DOF if required)
	Maintenance stage	Survival of trees and number of trees planted to replace dead plants	Land available within the proposed ROW	Once a year for 5 years	Percentage of survival	Per sample 30,000	150,000	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Fauna (including aquatic fauna)	Before construction stage	Diversity of species and presence of animal corridors/pathway, locations/number of animal crossing structures to be placed during construction stage	Land available within the proposed ROW	Once		Per sample 30,000	30,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
	Construction stage	Adequacy of animal crossing structures	Land available within the proposed ROW	2 visits/year for 2years		Per sample 30,000	120,000	Contractor RDA/ PIU through PIC and consultation with ESD Division
	Maintenance stage	No. of animal death due to the road accidents	Land available within the proposed ROW	Once a year for 5 years		Per sample 30,000	150,000	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Waste disposal	Before construction stage	<ul style="list-style-type: none"> Submission of the list of disposal sites selected for the project and their locations to the PIC 		Once	-	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division
	Construction phase and maintenance phase	<ul style="list-style-type: none"> Submission of the list of disposal sites used for the project and their locations to the engineer Submission of approvals obtained for such sites to the engineer Submission of progress of disposal of all debris and spoil from the site to approved sites by the site engineer to the engineer Submission of number of disposal sites restored after completion to the engineer 		Once a month during construction and once in six months during maintenance period	-	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division
Dust Generation	Construction phase	Submission of; <ul style="list-style-type: none"> Construction activities and their locations along the road Number of bowsers allocated for water sprinkling including for roads used to transport material Frequency and locations of water sprinkling Public complaints regarding dust issues to the PIC Presence of; <ul style="list-style-type: none"> Appropriate dust control measures (approved by PIC) at material storage yards Using covers on trucks transporting material 		Once a month	-	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environmental component	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Occupational safety	Construction phase and maintenance phase	Submission of; <ul style="list-style-type: none"> Number of labor occupied in the project List of PPE supplied to laborers (in appropriate sizes) Record from Field Supervisors on use of PPE Frequency of conducting tool box meetings and attendance of laborers to the engineer Method of supplying sanitary facilities, drinking water and waste disposal system 		Once a month during construction and once in six months during maintenance period	Road safety manual of RDA	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division
Public safety	Construction phase and maintenance phase	Submission of; <ul style="list-style-type: none"> Construction activities and their locations along the road List of safety precautions such as placing sign boards, barricading, direction boards, use of flag men and blinkers applied for the project based on the construction activities and their locations to the engineer 		Once a month during construction and once in six months during maintenance period	Road safety manual of RDA	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division
Soil erosion	Construction phase and maintenance phase	<ul style="list-style-type: none"> Incorporation of site specific mitigatory measures to control soil erosion in the SSEMAP which is approved by PIC Implantation of proposed mitigation measure at the given locations in compliance of SSEMAP 		Once a month during construction and once in six months during maintenance period	-	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division
Slope stability	Construction phase and maintenance phase	<ul style="list-style-type: none"> Incorporation of site specific mitigatory measures to ensure slope stability in the SSEMAP which is approved by PIC Implantation of proposed mitigation measure at the given locations in compliance of SSEMAP 		Once a month during construction and once in six months during maintenance period	-	-	-	Contractor RDA/ PIU through PIC and consultation with ESD Division

Environ mental compon ent	Project Stage	Parameters to be Monitored	Location	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Total Cost for monitoring of before construction and construction stage ¹							5,000,000 (US\$ 32,637)	

Notes:

BOD = Biological Oxygen Demand, CO=Carbon monoxide, CO₂= Carbon Dioxide, PIC = Construction Supervision Consultant, DO = Dissolved Oxygen, DOF = Forest Department, ESD Division = Environmental and Social Development Division, NAAQS= National Air Quality Standards, NO₂= Nitrogen Dioxide, PM₁₀= Reparable particulate matter<10micrometers diameter, RDA=Road Development Authority, SO₂=Sulphur dioxide, SPM= Suspended particulate matter, TSS = Total Suspended Solids

1. Contractor should secure the cost of monitoring for “before construction”, “construction” and “maintenance” stages of above monitoring plan.
2. Locations of monitoring shall be updated and number of locations will be altered based on field conditions, contract packages and weather conditions with the consent of the PIC
3. 1US\$ = Rs. 153.2 (April, 2017)

**Stakeholder and Public Consultation Carried out during the Preparation of Environment and Social Assessments for
Maradankadawela – Habarana – Tirikondiadimadu (A011) Road**

Name of the Respondent	Age	Sex	Designation/ Address	Views
Mr. M. Wijebandara	55	Male	Administrative Grama Niladari, Kekirawa DS Office	The road get flooded near Maminiyawa lake. There are no archaeological places near the road. People in the area mainly do agriculture activities. They take their produce to Dambulla and sometimes the vendors come to the project site to buy produce. There's a collecting centre at Thonigala.
Ms. Ranjani	40	Female	Grama Niladari, Maminiyawa	Kollankottigama and Maminiyawa get flooded. This need to be considered. The bends are dangerous and prone to accidents.
Ms. H.K. Sandya	45	Female	Nurse, Mradankadawala Hospital	There will be dust and noise during construction period. These need to be mitigated specially near the hospital. There are about 400 people coming to OPD and There are people coming to visit patients.
Mr. Muthubanda	65	Male	Farmer, 4 th Post, Maradankadawala	The sign boards on speed need to be implemented. The bends near 4 th post are dangerous. There is no safety for pedestrians. The vehicles go very speedily.
Mr. M.R.M. Faizar	45	Male	Shop Owner, Royal Motors, Maradankadawala	There need to be a roundabout for Maradankadawala junction and sign board on road information. The section Ganewalpola to Maradankadawala, is prone to accidents. The road get flooded near Maminayawa lake.
Mr. W. Majula	33	Male	Shop Owner, Maradankadawala	The roundabout for Maradankadawala junction is essential and the sign boards with the name of the road. The speed sign boards are also important. The accidents take place in bend in Nochchikulama.
Ms. A.M. Ariyawathi	64	Female	Resident, No.24, 30 houses, Maradankadawala	There is no space for pedestrians, therefore width need to be improved. The bus bays need to be included and the road need to be maintained. The speed limit boards should also be there.
Ms. Shriyani manel	41	Female	Resident, 13 th mile post, Habarana road, Palugaswewa	The roadside drains need to be improved. The sign boards should be placed in locations where there are high possibility for accidents.