Initial Environmental Examination

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SRI: Integrated Road Investment Program —Improvement, Rehabilitation and Maintenance of Selected Roads in Anuradhapura District, North Central Province

This Initial Environmental Examination prepared by the Road Development Authority, Ministry of Highways and Road Development and Petroleum Resources Development for the Asian Development Bank.

Asian Development Bank

Ministry of Highways and Road Development
& Petroleum Resources Development
Road Development Authority

SRI: Integrated Road Investment Program
Road Maintenance Contract

Improvement, Rehabilitation and Maintenance of Selected Roads in Anuradhapura district, North Central Province

Initial Environmental Examination Report

Final Report

March 2019

Prepared by

Master Hellie's Engineering Consultants Ltd

On behalf of

Road Development Authority
Ministry of Highways and Road Development and Petroleum Resources Development

Submitted to

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Initial Environmental Examination

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Survey and Preliminary Engineering (SAPE) works for Integrated Road Investment and Development Program

Rehabilitation and improvement of:

1. Kekirawa – Thalawa Road (B213)
2. Kekirawa – Ganewalpola Road (B212)
3. Ganewalpola – DachchiHammillewa Road (B133)

Prepared by Master Hellie's Engineering Consultants (Pvt) Ltd for the Road Development Authority, Sri Lanka

ABBREVIATIONS

ADB	-	Asian Development Bank
AMSL	-	Above Mean Sea Level
BIQ	-	Basic Information Questionnaire
BOD	-	Biochemical Oxygen Demand
CEA	-	Central Environmental Authority
DS	-	Divisional Secretary
EA	-	Executing Agency
EHS	-	Environment, Health & Safety
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EMoP	-	Environmental Monitoring Plan
EPL	-	Environmental Protection License
FFPO	-	Fauna and Flora Protection Ordinance
FS	-	Feasibility Study
GHG	-	Greenhouse Gas
GN	-	Grama Niladhari
GoSL	-	Government of Sri Lanka
GRC	-	Grievance Redress Committee
GRM	-	Grievance Redress Mechanism
GSMB	-	Geological Survey and Mines Bureau
H&S	-	Health and Safety
H&SP	-	Health and Safety Plan
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IFC	-	International Finance Corporation
iRoad	-	Integrated Road Investment and Development Program
IUCN	-	International Union for Conservation of Nature
MENR	-	Ministry of Environment and Natural Resources
MOH&RD	-	Ministry of Highways & Road Development
MSL	-	Mean Sea Level
NEA	-	National Environmental Act

NGO	-	Non-Governmental Organization
NWSDB	-	National Water Supply and Drainage Board
O&M	-	Operation and Maintenance
PAA	-	Project Approving Agency
PD	-	Project Director
PIC	-	Project Implementation Consultants
PIU	-	Project Implementation Unit
PPE	-	Personal Protective Equipment
RDA	-	Road Development Authority
REA	-	Rapid Environmental Assessment
RoW	-	Right of Way
SAPE	-	Survey and Preliminary Engineering
SPS	-	Safeguard Policy Statement

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EXECUTIVE SUMMARY

1. Background

I. The absence of all-weather road connectivity is a severe problem in Sri Lanka's rural areas, preventing communities from accessing socioeconomic centers. Poor road infrastructure is strongly linked to poverty and affects economic growth in rural areas, agricultural productivity, and employment. The Government of Sri Lanka is addressing this problem through a countrywide rural road investment program aimed at providing all-weather road connectivity to eligible unconnected rural habitations. The country partnership strategy, 2018–2022 of the Asian Development Bank (ADB) for Sri Lanka aims to address the significant constraints to improving quality of growth and is closely aligned with the government's priorities. The country partnership strategy reconfirms continued ADB assistance for developing transport sector, including rural roads, which are critical for rural development in providing access to markets, health, education, and administrative services.

II. The Integrated Road Investment Program (iRoad) supports the government's sector objective to improve connectivity between Sri Lanka's rural communities and socioeconomic centers. The immediate outcome will be increased transport efficiency on project roads. The programme includes two type of civil works contracts as; Conventional Road Contracts (CRC) and Road Maintenance Contracts (RMC). Selected set of national roads are to be rehabilitated and maintained under RMC package. Three road sections in North Central Province have been selected under RMC, these roads are;

(i) B 133: Ganewalpola – Dachchi Hammillewa Road - 45.86 km
(ii) B 212: Kekirawa – Ganewalpola Road - 6.95 km
(iii) B 213: Kekirawa – Thalawa Road - 37.41 km

III. Rapid Environmental Assessment (REA) was carried out for each of these road sections and the project is classified as category B on environment aspects. Therefore an Initial Environment Examination (IEE) needs to be carried out for these three candidate roads.

(i) Rehabilitation and Improvement of Ganewalpola – Dachchi Hammillewa Rd (B 133)

IV. This road (B 133), which is 45.86 km, connects Ganewalpola Junction on A 11 trunk road (A11: Maradankadawala – Habarana - Tirikkondiadimadu) and Dachchi Hammillewa on A12 trunk road (Puttalum – Anuradhapura - Trincomalee).

(ii) Rehabilitation and Improvement of Kekirawa – Ganewalpola Road (B 212)

V. This road (B 212), which is 6.95 km, connects Ganewalpola on A 11 (Maradankadawala – Habarana - Tirikkondiadimadu) and Kekirawa on A 9 trunk road (Kandy - Jaffna).

(iii) Rehabilitation and Improvement of Kekirawa – Thalawa Road (B 213)

VI. This road (B 213), which is 37.41 km, connects Thalawa Junction on A 28 (Anuradhapura - Padeniya) and Kekirawa on A 9 trunk road (Kandy - Jaffna).

2. Category of the project

VII. All the three road rehabilitation and maintenance projects have been categorized as "B" category projects according to the Rapid Environmental Assessment (REA) checklist as provided in the Environmental Assessment and Review Framework (EARF), SRI: Integrated Road Investment Program, May 2014. Therefore, an Initial Environmental Examination (IEE) is required for the three, to be conducted before the commencement of interventions.

3. Need for the Project

VIII. The main purpose of the proposed project is to facilitate the increased mobility of traffic by improving the connectivity and access between A9 and A 28 roads (between Kekirawa and Thalawa by B 213), between A9 and A 11 roads (between Kekirawa and Ganewalpola by B 212) and between A 11 and A 12 roads (between Ganewalpola and Dachchi Hammillewa by B 133). By providing such improved connectivity between these road sections, the access for establishing most essential social and economic centres in identified locations and giving access to primary community centres and villages within the Kekirawa, Thirappane, Galenbindunuwewa, Kahatagasdigiliya, Ipalogama, Eppawala and Thalawa Divisional Secretary Divisions (DSDs) in the Anuradhapura District will be vastly improved.

4. Magnitude of Operations

IX. The project comprises of rehabilitation and improvement works of three B-class roads (B 133, B 212, and B 213) as Road Management Contracts, where the work will be carried out for two (2) years and maintained for another five (5) years. These roads have been proposed to rehabilitate and upgrade to standard two-lane configurations. The project will not involve the acquisition of additional lands, and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of the carriageway (3.5 m x 2), hard shoulder (1.5 m x 2), soft shoulder (1.5 m x 2) and side drain (1.0 m x 2).

4.1 Project activities

X. The scope of work proposed under the RMC include 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.

5. Existing Environment

5.1 Land Use

XI. The road B213, runs through mainly paddy land area of Mahaweli System H. Some scattered locations in the vicinity of the road have been occupied by small townships. About 1 km section of the B 212 road runs through Kekirawa town and paddy land

area of Mahaweli system H. The middle part of the road is located through few villages up to Ganewalpola Township. The vicinity of the road in the middle section is occupied by paddy land under small tank irrigation schemes. The road B 133 falls through paddy land under small irrigation schemes from Ganewalpola town up to the boundary of irrigation command area of Huruluwewa scheme. Paddy land and scatted scrubs can be observed in this section. The rest of the road section traverses for long distance across Huruluwewa command up to Konwewa junction. Some scatted townships such as Yakkalla, Galenbidunuwewa are located in this section of the road. The road from Konwewa junction up to its end also falls in agriculture area under small tank systems.

5.2 Existing condition of the carriageways, pavements, culverts and bridges

XII. The existing carriageway of the three roads varies from 5.0 m to 7.0 m in width within the corridors that generally have adequate width to support some widening where required. For the three roads, existing bridges were found to be in a satisfactory condition from a structural point of view by the field evidence collected (note that this assessment has since been checked visually only, anddetailed structural assessments are needed). A visual inspection showed that most of the existing culverts were deemed to be hydraulically and structurally satisfactory, but many of them were found to be silted and partially blocked.

5.3 Physical Environment

5.3.1 Climate, land use, terrain and soil:

XIII. Based on major climatic zones of the country, the candidate road section of B 133/B 212/B 213 Roads falls within the area classified as the Dry Zone where the annual average rainfall is between 1,200 mm and 1,900 mm. Agro-ecological Zone is DL1b. The proposed candidate road section of B133/B212 or B213 are situated in Anuradhapura District in the North Central Province, lies within the second peneplain/lowermost and the second peneplains.

5.3.2 Water Resources:

XIV. The candidate road section is situated within the Dry Zone of the country and many small to medium/moderate size irrigation reservoirs called as “Tanks” are observed in the region. B 133 crosses Aruvi Ara (Malwathu Oya) and Yan Oya (Stream) river basins, B 212 crosses Kala Oya and Aruvi Ara basins and B 213 crosses Modaragam Ara and Kala Oya river basins. Agriculture is comprehensively practiced in the project area. Therefore, such irrigation tanks are commonly observed which are built to collect rainwater during monsoonal months. Some road sections are in the close proximity of these irrigation tanks and their associated distributor canal networks. Dug wells are commonly observed within home gardens along the road, and shallow groundwater is used to fulfill domestic requirements by the households.

5.3.3 Water Quality

XV. The water quality of the tanks essentially follows that of the activities that place within the watershed and the catchment, which would lead to accumulation of nutrients and fertilizer residues from surface runoff. The water resources of the area are predominantly used for irrigation and domestic purposes. It is apparent that intensive irrigation and comparatively dense habitats in urban settings have resulted in an over-extraction of water and subsequent deterioration of water quality over time. Since most of the agro-wells are not operated in any systematic manner,depletion of the groundwater table may occur.

5.3.4. Air Quality and Noise

XVI. Other than two quarry sites and asphalt plants, the project area has nolarge-scale industries and high emissions of air pollutants could not be observed. However, dust emanation can temporally impact on local air quality. However, since the project area is rich in vegetation; all such emissions will be very well dissipated. A considerable number of vehicles pass these roads mainly during the daytime. Therefore, the noise levels, which were 50 – 65 dB(A) may be higher than the permissible levels during busy hours. Night-time levels were also measured, and the levels were somewhat suppressed (ranged from 40 – 49 dB(A) compared to those of daytime due to the lesser number of vehicles in the road.

5.3.5 Floods

XVII. Major flood-prone locations of Anuradhapura District are not falling within the present project area. However, frequent localized flooding has been recorded in low-lying sections of B133, B212 and B213 especially during inter-monsoon and monsoonal periods.

5.4 Ecological Environment

XVIII. The proposed roads traverse, approximately 90 km in length is entirely laid in the dry zone and belongs to the low country, DL1 agro-ecological zone. Biogeographically, it falls under Floristic Zone; II: Dry and Arid Lowlands (within the dryzone) and spans over a variety of natural and man-made habitat types including terrestrial, aquatic and semi-aquatic systems in the dry and arid lowlands. The tree cover along the road traverses is dominated by *Terminalia arjuna*(Kumbuk), *Manilkara hexandra* (Palu), *Chloroxylon sweitenia* (Burutha), Kon *(Schleichera oleosa),Drypetes sepiaria* (Weera), *Feronia limonia* (Divul), *Vitex altissima* (Milla), *Syzygium spp* (Dan), *Azadirachta indica* (Kohomba), *Chukrasia tabularis* (Hulan Hik), *Bauhinia racemosa* (Maila), *Pterospermum suberifoliu* (W*elang*), *Cassia fistula* (Ehala)*,Tamarindus indica* (Siyambala) and *Delonix regia* (Mara).

XIX. Hurulu wewa, Yan oya, Komarikwala wewa, Hettu wewa, Kon wewa, Italwetunu wewa and Diyamailagas wewa could be observed as aquatic ecosystems, at proximity to the B 133 road traverse. The road traverses close to the Ritigala Strict Natural Reserve at the chainage from 0.0 km to 9.75 km (on B133). It belongs to IUCN

management category of “Ia”. In addition, Labunoruwakanda Forest Reserve is located about 1~2 km distance from the B 133 road which belongs to IUCN management category of “Ib”.

5.4.1 Flora and Fauna of the project area

XX. There are three endangered species (EN); Ebony, (*Diospyros ebenum*), Helmba (*Mitragyna tubulosa*), Kalu mediriya (*Diospyros chaetocarpa*) and six Near Threatened species (NT); Gas penela / Kaha penela (*Sapindus trifoliate)*, Goda Kirilla (*Holoptelea integrifolia*), Mi (*Madhuca longifolia*), Milla/Kahamilla (*Vitex altissima*), Vasa kaduru (*Petchia ceylanica,* Bakmee (*Anthocephalus chinensis*) while two vulnerable species (VU); Burutha tree, (*Chloroxylon swietenia*), Palu tree (*Manilkara hexandra*)are observed in the area. However, these species are not restricted only to the project area but distributed throughout the floristic zone. Present signage along these roads and information from public and officers of DWLC indicate that there are elephant roaming paths across these roads, especially in following chainages at B 133 road; 0.00 km – 0.25 km, 0.75 km – 1.00 km, 7.00 km – 7.25 km and 9.75 km – 10.00 km. Similarly, B213 road; 3.50 km – 3.75 km, 4.50km – 4.75 km and B212 road 1.50 km – 3.70 km

The Asian elephant is considered an endangered species.

5.5 Socio-Economic Environment

XXI. Connectivity of the Roads: The road sections originate from Kekirawa town in Anuradhapura district. These road sections are much significant in terms their connectivity impacts. Kekirawa – Thalawa road is connected to Anuradhapura town via Thalawa and Kakirawe Ganewalpola road section together with Ganewalpola – Dachchi Hammillewa road connects to Trincomalee, Polonnaruwa and Batticaloa Districts. Anuradhapura district can be considered as a larger catchment area of the 3 candidate roads.

XXII. Industries in Anuradhapura District: About 348,262 persons in Anuradhapura district are involved in industry-related income generation activities, andagriculture is the dominant industrial activity of the people in road catchment area, 49% of 248,262 (Resource Profiles, 2017 of relevant DS offices through which the roads are located) people involved in industrial activities are reported from agriculture and its related income generation activities.

XXIII. Population in Road relevant DSDs: The 3 Roads are fallen within Kekirawa, Thirappane, Galenbindunuwewa, Kahatagasdigiliya, Ipalogama and Thalawa Divisional Secretariat Divisions (DSDs). The population in the 6 DSDs is defined as the population in the influential road area. Therefore, the road influential area population is 312,916. This is about 35% of the total population in Anuradhapura district. Thalawa DSD has the highest population of 6 DSDs.

XXIV. **The ethnic diversity of population in DSDs**: Nearly 83% of the population in 6 DSDs is Sinhalese. The Muslim population is next to Sinhalese, and it is 16% of total population. The population under Tamil and others is negligible (1%).

XXV. **Education levels of DSDs population:** Information on education in 6 DSDs shows a low level among the population. The percentage with no formal education ranges from 3 % to 7% among 6 DSDs. The percentage of the population with G.C.E (A/L) qualification ranges from 9% to 16%. The percentage obtained degrees ranges from 1% to 2%.

XXVI. **Employment of the population in DSDs**: The agriculture is the main livelihood activity of the people in the project related 6 DSDs. Apart from agriculture, the persons within employable ages are involved in other income generation activities. The highest percentages of people are involved public sector employment (ranges from 12% to 24% among 6 DSDs).

XXVII. **The project relevant Grama Niladhari Divisions (GNDs):** The 3 roads run across 54 GNDs. The total number of families in road relevant GNDs is 19,783 comprising of 80,320. The people in GNDs can be defined as the population in the road corridors. About 87% of the people are Sinhalese. The percentage of Tamil population is 1%, and the Muslim population is 12%.

XXVIII. **Employment:** Majority of the families in the road corridor area (GNDs) are involved in agriculture activities.

XXIX. **Income levels of the households**: The data on income levels are available only in some GND offices. Data on income are available at grama niladhari which is updated once in two years.

6. Anticipated Environmental Impacts and Proposed Mitigation Measures

6.1 Impacts during Pre-construction phase and Mitigation

XXX. The mitigation measures adopted during design or pre-construction phases are of preventive in nature with two basic objectives:

- Avoiding costly mitigation measures, and
- Increasing awareness among the stakeholders for environmental management of road construction, rehabilitation and operation.

6.1.1 Route selection and alternatives

XXXI. The project involves rehabilitation of three existing roads, and therefore no alternative routes are considered.

6.1.2 Impacts on encroached Land/Temporary Structures

XXXII. The proposed rehabilitation work along the three roads will not involve widening the existing ROW. All the interventions will be carried out within the existing ROW. Therefore, there will be no land acquisition. However, the proposed construction

activities may affect parts of eight structures that are projecting towards the existing ROW. These structures shall be shifted away from the new road reservation.

6.1.3 Shifting of Utility Supply Lines

XXXIII. There are utility supply lines, such as electricity and telecommunication lines, that are located within the existing Row. Some of these utility supply lines which are located close to the existing road pavement edge need to be shifted during pre-construction phase.

XXXIV. Advance notice to the public shall be given, with the details of the time and the duration of the utility disruption to minimize public inconvenience and employing well-trained/experienced operators to reduce accidental risk/damage to public utilities, proper coordination with respective line agencies shall be carried out by RDA for the shifting of these lines.

6.1.4 Mobilization of resources and selection of sites for temporary usage

XXXV. Resources such as material, machinery and labour have to be mobilized before construction commences, which storage need space/yards, land/building for site office, labor camps, and for parking of construction vehicles and storing and sheltering of machinery.

XXXVI. The site selection for temporary usage shall be done in close consultation with village leaders and the local authorities. Such sites shall be located away from waterlogged areas, and flood-prone areas, socially sensitive areas such as schools, temples, kovils, churches and mosques and, governmental offices and establishments. Recruitment of laborers, both unskilled and skilled, from the locality, will reduce the need for having large labor camps and will lead to lesser impacts due to such labour camps during the construction stage.

6.1.5 Flood Impacts to be mitigated during design stages

XXXVII. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and paddy fields.

XXXVIII. Close coordination with Department of Irrigation, Agrarian Services Department, and Disaster Management Center (DMC) shall be maintained in this regard to obtaining high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings.

XXXXI. Sections of B213 road are prone to yearly floods during heavy rain periods and the road gets overtopped at several locations and water is stagnated for several days. Therefore, surface water hydrology along the road with special attention to these flood-prone locations shall be deeply studied during the detailed design stage and pre-construction phase. Possible mitigation for above issues shall be provided, and the type and sizes of cross drainage structures, road finish level (RFL) and the surface treatment shall be decided accordingly in rehabilitating the road.

Road	Chainages	Number of flood-prone locations
B133 (0 km Ganewalpola)	7.0 km, 38.0 km, 12.5 km, 41.2 km, 12.2 km, 43.0 km, 33.5 km, 43.4 km, 36.0 km, 44.5 km, 36.7 km	11
B212 (0 km Kekirawa Town)	2.0 km, 3.7 km, 6.0 km, 6.0 km	4
B213 (0 km Kekirawa Town)	1.1 km, 12.3 km, 2.0 km, 14.7 km, 3.7 km, 18.4 km, 6.8 km, 16.3 km, 8.1 km, 21.2 km, 9.2 km, 23.8 km, 10.7 km, 28.7 km, 11.5 km, 33.7 km	16

6.1.6 Ecological Impacts during the pre-construction phase

XL. Prior to construction, land clearance will be undertaken, and roadside vegetation will be removed. Also, land clearance can be expected in identified locations for labour camps, material storage, equipment, machinery, and vehicle parking. Therefore, pre-construction activities will remove the floral habitats and disturb the fauna, some of which will inevitably be lost which is irreversible. The road section from Ganewalpola - Dachchi Hammillewa (B133), at the chainage between 43.8~44.5 has stretch through a low-lying area, which is marshy. There could be a negative impact on aquatic and terrestrial fauna inhabited in this particular area due to pre-construction activities. Therefore, care shall be taken to avoid/minimize the impact.

6.2 Construction phase

6.2.1 Anticipated impacts due to land preparation activities

XLI. Debris shall be generated due to site clearance, excavation, and dredging activities. If this debris is not properly disposed ofsignificant negative impacts are anticipated on public health and safety and scenic beauty of the project area. If spoil material and vegetation collected during land preparation, construction and demolition waste and other types of waste are accumulated alongside the road, it will cause public inconvenience by dust dispersion, reduced visual quality, and safety and health hazard. Other waste related issues may arise from, (i) municipal solid waste generated from labor camps and offices, and (ii) wastewater that is generated at labor camps and storage yards.

XLII. Such waste shall be removed from the project site immediately after the land clearing and construction work and dumped in an approved site according to the current rules and regulations. The contractor shall identify and select suitable and safest locations for the dumping or landfill sites with sufficient capacity and approvals shall be obtained from relevant Local Authorities and Project Implementing Consultant (PIC). Proper engineering design (including drainage and erosion control facilities) shall be prepared by the contractor, and written approval shall be obtained from the PIC before dumping at the each identified site.Re-use of debris is a good option to reduce the quantity of debris. Metal, soil, and sand are reusable raw materials, which can be

used for backfilling, leveling and amenity planting at intersections. Wood debris can be used as a fuel for worker camps or distributed to local people free of charge. The temporary debris storage sites shall not be located closer to residential or ecologically sensitive areas. MSW shall be properly collected in bins provided with lids and handed over to the garbage collection trucks of the LA. Garbage bins shall be provided to all worker camps, and construction sites, a site inspection by Public Health Inspector (PHI) in the area shall be facilitated. Proper sanitation and sewerage facilities should be provided to all site offices and construction/labor camps.

6.2.2 Road-side landscape

XLIII. Landscape degradation relates particularly to poorly designed or monitored activities resulting from indiscriminate dumping of spoil material, improper cut and fill, borrow and quarrying operations. Road induced activities may lead to the generation and mismanagement of wastes in the roadsides and create scars on the landscape. All debris, piles of unwanted earth, spoil materials, temporally structures shall be cleared away from the roadsides and from other workplaces and disposed at locations designated or acceptable to the PIC.

6.2.3 Impacts on natural flow and existing drainage pattern and hydrology

XLIV. The rehabilitation or reconstruction of culverts may require temporarily diversion of streams, disturbing the natural drainage pattern and it may lead to creating flooding conditions in adjacent areas. Improperly stored construction materials can also block natural drainage pattern. Leveling, filling, excavations and formation of temporarily or permanently raised embankments in the ROW may block natural flow patterns and cause localized flooding effects in the immediate downstream. The contractor will take all measures necessary and as directed by the PIC to keep all drainage paths and always drains clear. Temporary storage of material will be made only in approved sites by the PIC where natural drainage is not disturbed. If flooding or stagnation of water is caused by contractor's activities, the contractor shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.

6.2.4 Impacts on Water Quality

XLV. Soil erosion, sedimentation, and siltation can occur any time during the rainy season due to construction activities such as material extraction and storage, land clearing, cut and fill operation, construction or reconstruction of new culverts, causeways, and construction of earth and line drains

XLVI. Only the shrubs and bushes will be cut, and the wetland habitat will not be disturbed. The cut material during the excavation of drainage canals will be used as fill material at the site. Fills shall be compacted as soon as they are laid to an appropriate degree of compaction. Erosion control practices shall be implemented during construction to limit turbidity and silt transport off the site premises. Temporary barriers such as soil mounds, temporary drains, silt traps will be considered to control soil washing away

to the streams. Suitable local drainage facilities shall be established properly to drain water in the construction areas.

6.2.5 Effect on the local road network and disruption to traffic

XLVII. Construction material sources are located about 15 - 20 km away from the project areas. Transportation through local roads, which are mainly provincial council roads and rural roads (some are gravel roads), will cause inconveniences to other road users and households living in these areas.

XLVIII. The contractor shall be provided with any restrictions related to sizes and lengths of vehicles, allowable axial loads, speed limits, no entry zones and time limits (near schools). The contractor's written consent abiding him to follow these restrictions shall be mandatory. If construction vehicles are likely to cause damage to public roads, provision shall be made for their repair and restoration as part of the contract. Proper signage and advance notice to road users and roadside communities about the schedule of construction activities, provision of safe and convenient passage to the vehicles and passengers especially during construction of culverts, bridges and causeways, implement traffic management plans in construction areas according to the traffic rules and regulations if necessary in close coordination with local communities/authorities and local police by the contractor.

6.2.6 Impacts due to Noise and Vibration, Dust and Air Quality due to construction

XLIX. Dust, noise, and vibrations generated from the project activities will impact the roadside communities and people who inhabit around material extraction sites and other haulage roads. If the work is carried out in dry season dust emission is likely to be significant. The release of air pollutants from vehicular movements, blasting and dust generated from clearing, grubbing, excavating, backfilling, dumping, mixing concrete, transportation of materials, storage of soil and metal piles, etc. can be taken place in the surroundings due to the wind.Vibration during compaction works could easily damage structures close to the roads.

L. Construction-related activities closer to sensitive public locations have to be scheduled in coordination with the relevant authorities (community leaders, school principals, high–priests or other respective officers) to avoid disturbance to day to day activities of the people. No high noise generating machinery is encouraged. All machinery, equipment, and vehicles shall be maintained in good condition by engaging skilled mechanics and regularly maintained in compliance with regulations. The maximum permissible noise levels at boundaries of the land in which the sources of noise is located for construction activities are 75dB (A) L_{eq} and 50 dB (A) L_{eq} during daytime and nighttime respectively (Daytime: 6.00 am – 7.00 pm, night time: from 7.00 pm – 6.00 am). Enforcing speed limits to the vehicles is necessary to control dust emissions during transportation of construction materials. Dust can also be controlled by providing of dust barriers to sensitive public locations, spraying of water to quarry sites, construction sites, roads which will be used for the transportation of construction materials at regular intervals. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials, and all

construction materials (sand, gravel, metal).

LI. The contractor shall conduct a pre-crack survey on all structures along the road on a corridor agreed with PIC. Any complaint from public on development of cracks due to construction works shall be investigated keeping the crack survey records as reference source. If it is concluded that crack damages were caused due to the construction works then the contractor shall rectify the damages through a third party insurance or by repairing the damage on their own cost.

6.2.7 Extraction, Transportation, and Storage of Construction Materials

LII. Construction materials especially sand, gravel, and aggregates for the project activities are available within the close proximity of the project area. Large-scale extraction of such materials can have negative impacts on the environment, notably noise, air, water, soil pollution and reduction of scenic beauty along with causing damage to ecosystems.

LIII. Selection of material suppliers who have proper EPLs will ensure proper environmental safeguards in material extraction. Extraction of construction materials shall only be from the approved mines and quarries by GSMB. Environmental requirements and guidelines issued by the CEA, GSMB, and LAs shall be followed concerning locating material extraction sites and other operations including rehabilitation of the extraction sites at the end of their use. If new material extraction sites need to be located, those shall exclude places which are close to the sensitive public locations (schools, religious places, hospitals) and environmentally sensitive areas.

6.2.8 Ecological Impacts due to loss / destruction / fragmentation of habitats

LIV. The proposed road traverses are rich from vegetation cover except for urban areas. As per to the tree survey it was noted that there are many larger trees located very close to the existing road stretch. Therefore, 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. Based on the preliminary field investigations it is observed that around 80 trees need to be removed in all the three roads. These trees are located close to the edge of the existing carriageway of the three roads. However the exact number of trees to be removed in each road shall be finalized based on the detailed designs. As a norm the designers shall make all possible attempts to avoid/ minimize the number of trees removed.

LV. Moreover, unnecessary removal of vegetation and felling of trees will be prevented by finalizing the tree list with the Environmental Specialist of PIC. Suitable native tree species shall be selected for the replanting purpose at 1:3 ratio.Suitable replanting locations shall be identified by the contractor with assistance from PIC and PIU.

6.2.9 Impact on animal movement pathways

LVI. There are road signs indicated that wild elephants are roaming near to the project area. Also, during field visits, electric fences were observed in some places, for instance, along B 213 road electric fence is at the chainage ~4.4 km. Therefore, there is a possibility of disturbing elephants and other animal's movements and

affecting their natural behavior during the construction stage due to construction noise and other activities. This will be a danger to the particular animals and human safety as well.

LVII. Movement of elephants and other animals in the project area will be confirmed with officers of Department of Wildlife Conservation (DWLC) of the region by PIU, PIC and Contractor. If such movements are notified, construction works will be managed and restricted in the particular areas during identified times 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. Backfilling of such trenches and pits within the shortest possible time will have more advantages in avoiding animals falling into such pits.

6.2.10 Impact on aquatic fauna and flora

LVIII. There will be soil erosion from construction sites, stockpiles 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 an increase in turbidity level lower the water quality. This will lead to a reduction of light penetration and make it an undesirable place for aquatic fauna and flora.

LIX. Locating all stockpiles, hot mix plants, crushing plants, workshops, depots and temporary worker camps and storing of toxic and hazardous materials at least 500 m away from water bodies, preferably, approved locations by the Environmental Specialist of PIC and local authority in the project area shall reduce the impact of such surface water contamination.

6.2.11 Impact on flora and fauna due to local air pollution, noise, and vibration

LX. Construction machinery generates a high level of noise and vibration. Also,movements of vehicles generate the dust. All these activities may have the potential to disturb behavior of faunal species in the project area. Furthermore, deposition of dust and mud on vegetation can interfere with physiological functions of trees.

LXI. Construction vehicles and machinery shall be well maintained to reduce the noise and vibration disturbances. Moving of construction vehicles and machinery will be restricted only to designated areas to save vegetation beyond the proposed project area due to trampling.

6.2.12 Ecological disturbances by workers and their camp operations

LXII. The road traverse from Ganewalpola - Dachchi Hammillewa (B133) runs nearby to the Ritigala strict nature reserve and Labunoruwakanda Forest reserve. The closeset location of the SNR is about 750 m away from the road and about 1.0~1.5 km for Labunoruwakanda Forest reserve. Moreover, the project area comprises of ancient tanks and irrigation canal system. In some places, some irrigation canals (e.g., Jaya

Ganga/ Yoda Ela) cross the existing road traverse. Therefore, the establishment of labour camps may have adverse impacts such as dumping of refuse, sanitary waste, and sewage into waterways, clearance of vegetation for worker campsites, hunting of animal species and collection of firewood from scrub areas may be particularly intense at campsites. 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.

LXIII. Local labour will be recruited as much as possible to minimize this impact. 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 of. Proper sewage disposal facilities shall be provided. Under no circumstances shall such waste be released untreated into the water bodies, near scrub areas.

6.2.13 Social impacts due to Establishment of labour camps

LXIV. The project may not require large-scale labor camps to be established. Majority of the labors work in the construction sites may come from the local area itself and therefore, there will be no need to provide them with accommodation facilities. However, if need emerge to establish labor camps they shall be established in suitable locations away from the houses, business establishments and other sensitive institutions such as schools, religious centers etc. The labors shall be educated to behave in the camps decently without creating disturbances to others in the neighborhood. There can be conflicts between labors from outside areas and the local community members.

6.2.14 Disruption to traffic/transportation

LXV. The three roads are heavily used by public buses and they will have serious disturbances. Regular road users such as school children, employees will have disturbances. The traffic-related disturbances will create specific impacts to the business establishments in the townships located along the roads. This issue shall only prevail during the construction period. Regular/continuous arrangements to manage the traffic near construction sites shall be implemented methodically. Most of the road construction contractors are well experience in these aspects due to their long-term exposure to similar projects on road improvements.

6.2.15 Impacts due to transportation of construction materials

LXVI. Transportation of construction material will create impacts beyond the area of candidate roads. The transportation of material in other roads in the area will contribute for the existing traffic congestion. The impacts can be minimized through decent behavior in driving their vehicles and also the time of transportation. They also shall follow all the rules that are required in transporting construction material to the sites.

6.2.16 Impacts to roadside structures

LXVII. There are eight temporary and moveable structures established adjacent to the road edges. These structures are being used by local community members to sell vegetables, fruits and some other items to the road users. Need may arise to shift these temporary structures for the contractors to attend the required construction activities. The socio-economic study team interviewed all the owners of these structures and they are in agreement to shift the structures if need arises. The RDA will inform them in advance (about 30 day in advance) about the project and its construction schedule and also the needs of the shifting of the structures if required.

6.2.17 Impact to due to obstruction to access

LXVIII. Access to the houses, business establishments, institutions and by-roads will be temporarily disturbed during construction period. The contractors will explore all the possibilities to minimize such disturbances based on the specific situation of the road. The contractor will support to the affected persons to establish temporary access to reach their houses, business locations, institution or by-road. Steel plates can be used to create temporary access. However, the construction contractors of the roads are well experience in handling these types of situations in road construction projects. The most essential need is to monitor whether contractors fulfill these needs with commitments.

6.2.18 Impacts on the development activities in the vicinity

LXIX. The development activities at household or residential level (e.g. Construction of new houses) presently carried in the area adjacent to the roads' edges will have disturbances. Possible disturbances to the access to such development sites would be the most critical impact. The road contractor can provide assistance to establish temporary access to the sites. However, the two parties, road contractor and the implementers of other projects shall get together and work out practical plan depending on the specific condition to create win-win situation. LXV. Other than these residential level constructions, there are no any major infrastructure developments along each road sector.

6.2.19 Safety of Workers and Public

LXX. During construction, workers will be exposed to various risks and hazards. Potential impacts to health are respiration and eye diseases due to exposure to dust, the risk of accident during work. The nature of the work is such that such dangers are not very significant as compared to road construction work which needs heavy machinery.

LXXI. Workers will be provided with first aid and health facilities. First aid training will be provided to field staff and social mobilizers and the foreman. It is mandatory that the Contractor shall comply with requirements for the safety of the workmen as per the ILO convention, the Factory Ordinance of Sri Lanka and IFC EHS. Group accidental insurance shall be considered for the workers.

LXXII. The safety of the public will be ensured by using relevant measures as mentioned in below,

1. The places with deep excavations and hazardous activities will be noticed and such places shall be barricaded to guide public away from such sites.
2. Spraying of water will be done during the construction period in order to minimize the dust generation.

6.3 Operational Phase

6.3.1 Impacts on Water Resources and Hydrology

LXXIII. Improvements to the road drainage will result in improved stormwaterflows 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 an operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

LXXIV. Regular maintenance of all drainage related structures and monitoring especially prior to/in the aftermath of major storm events/monsoonal seasons by the RDA/Local authority will be required to ensure proper functioning of the drainage structures and to avoid blockage to the channels, culverts, roadside drains, tail/leadaway canals due to siltation, debris accumulation, nuisance vegetation growth, etc.

6.3.2 Pedestrian and Commuter safety

LXXV. Inadequate provisions of road safety measures like no provisions of signals and lack of enforcement of traffic rules during operation period may invite accidents. Rehabilitation of the roads will provide easy access to the area, however, will increase the number of vehicles and their speed due to the improved condition of roads.

LXXVI. Enforcement of speed limits, traffic rules and regulations and Installation of the warning signs, regulatory signs and information signs. Applying appropriate road safety measures with the help of 3-Es; i.e., Engineering, Enforcement, and Education is needed.

6.3.3 Noise, Air and Water Pollution

LXXVII. During the operation period, the noise level will increase due to the increased movement of vehicles. It is a general habit that the motorists tend to drive faster when the road condition is good. However, this will cause higher noise levels. The major factor that contributes to poor air quality in the project area at present is dust emission from gravel and sandy roads. Rehabilitation of roads will significantly reduce the existing dust emission after the proper surfacing of the roads. Air pollution due to vehicle movement, especially diesel vehicles will be of concern. The disposal of household waste and wastewater to roadside drains, oil and grease from vehicles into water bodies may cause water pollution. Similarly, with the careless disposal of spoil and other construction material into water bodies during maintenance of road may also degrade the water quality.

LXXIII. Community and road user awareness program will be organized to enhance public

understanding on proper maintenance of roadside drains and importance of proper MSW and wastewater disposal. Maintenance of green corridors and their beneficial impact on air and noise pollution control. Speed limits shall be strictly enforced together with restriction in the use of horns shall be restricted near mosques, hospital, schools and densely populated settlements.

6.3.4 Ecological Impacts and Mitigation

LXXVIII. Due to the improvement of road condition vehicular movement of these roads could be increased and therefore increase of traffic flow at higher speeds is expected. Consequently, there is a potential of collision of animals frequently approaching the roads particular during the nights. Place the warning signs especially within the section of the road that passes along identified animal roaming areas (Please refer 5.4.1) (at least 1 km before approaching the area) located across the road for the drivers to be more vigilant and reduce speed.

6.3.5 Socio-economic Impacts and Mitigation

LXXIX. The potential for an increased accident in the post-project improvement period can be expected. Intensive monitoring of traffic with the active involvement of the traffic police in relevant police stations will have to be carried out at least for about 1-year period in critical locations of each road.

6.4 Climate Change Adoption and Net Carbon Emissions

LXXX. The TEEMP model output showed that the proposed improvement to existing road pavements will bring a reduction in CO_2 emission even with a growth of traffic. The total length of roads to be improved in this project is around 90 km and based on the minimum (0.8 T/km/year) and maximum (1.1 T/km/year) net change in CO2 emissions or CO2 savings of the proposed investment program in NCP will be between 1100 and 1600 Tons/year. However, this analysis is based on the assumption that the roughness of improved road 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).

7. Institutional Arrangements

LXXXI. The Ministry of Highways and Road Development and Petroleum Resource Development is the Executing Agency (EA) and RDA is the Implementing Agency and within RDA there is be a Project Implementation Unit (PIU) for coordinating the iRoad programme. This PIU will be responsible for implementing the project and managing detailed design and supervision of the construction works and ensuring that all environmental safeguard requirements in accordance with this IEER are met. The PIU is to be headed by a full time Project Director (PD) and supported by a team of engineers from RDA. The PIU has a safeguards team with sufficient social and environment safeguards officers to cover the quantum and geographic distribution of works in all provinces under the investment program. The Project Implementation Consultants (PIC) appointed for the RMC 3package will support the PIU for supervision of the design and construction works by the civil works contractor. The

PIC team headed by a Team Leader will include an environment specialist for conduction of regular monitoring of safeguards implementation on site.

8. Environmental Management Plan and Monitoring

8.1 Environment Management Plan (EMP)

LXXXII. 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 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 IEER. SSEMAP shall include site specific impacts related to site specific construction activities and relevant mitigation measures proposed to the particular locations 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 of the three roads. 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 PIC will oversee the effectiveness of the implementation with the assistance of the PIU. 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. 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.

8.2 Environmental Monitoring Plan (EMoP)

LXXXIII. Environmental monitoring is required to make sure that the anticipated adverse impacts are kept minimal with the implementation of mitigation measures as and when required. The monitoring objectives are therefore focused on the mitigation of likely impacts. The EMoP will be a useful tool to monitor the implementation of mitigation measures included to the EMP. Monitoring of the quality of water, air, and noise during the construction stage is a responsibility of the contractor by the approved Government Agency. All the monitoring activities such as site supervision, removal of trees, material extraction, verification of permits, etc. by the contractor will be supervised by the PICs. The environmental monitoring report prepared annually by PIC will be submitted to the PIU. This report shall include the results of environmental monitoring based on the construction activities carried out and this report shall be uploaded in to ADB as well as iRoad web page.

9. Grievance Redress Mechanism

LXXXIV. 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. Different avenues shall be opened to receive suggestions, requests and complaints from public. 10. Policy, legal and administrative framework

LXXXV. The National Environmental Act (NEA) No. 47 of 1980 is the key legislation of the country for matters pertaining to environmental safeguards. 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. While the NEA is the key environmental legislation under GOSL there are a number of 8 other environmental laws and regulations that are also applicable to the investment program (both CRC and RMC packages).

11. Public Consultation

LXXXVI. Public consultations were carried out covering all 6 DSDs falling under the influential road area. The methods used for public consultations include one on one interview with about 125 road users and 10 Focus Group Discussions (FGDs). The main aim of these consultations was to obtain the perception of the community about the project (3 candidate roads), any environmental and social problems prevailing in the project area. It shall be noted that during these interviews equal focus was paid to male and female members. Many suggestions were made by these participants during the discussions. Some of the main key points they have stated are the inadequacy of the road widths, culvert sizes and the improper drainage systems.

12. Disclosure of information

LXXXVII. Based on the EARF approved for the iRoad Programme, the respective draft IEER 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, the name of the contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil, and English). For the national RMC roads, there will be sign boards on the period of works and contact information for reporting complaints or grievances in three languages.

LXXXVIII. During project implementation, annual environmental monitoring reports will be prepared for the entire RMC package of iRoad and submitted to ADB and RDA for disclosure on their websites.

13. Conclusion and Recommendations

LXXXIX. The proposed road rehabilitation and construction activities (on B 133, B 212 and B

213) are restricted to the existing RoW and road reservation boundary lines. There is no need for land acquisition or resettlement of households. Anticipated positive socio-economic impacts of the project include reduction of transport costs and vehicle operation cost due to better road conditions and reduced travel time, an increase in income-generating activities, enhancement of road safety, less noise and air emissions due to improved road condition, reduced soil erosion and improved water quality due to better drainage facilities, etc.

XC. Negative environmental impacts, which are mostly restricted to the construction stage, include extraction of construction materials, transportation, and storage of material, disposal of debris, deterioration of water quality, elevated levels of dust and particulate matter in the air, fumes and smoke and noise and vibration. Temporary blockage or alteration of surface runoff is the other anticipated impacts during the construction of bridges, culverts, and causeways. Realignment of services such as electricity, telecommunication, and water lines would cause inconveniences to the residents. These impacts can mostly be mitigated by following good construction practices and careful planning. The fauna and flora observed are common species that are found in rural and suburban areas. Only a few endemic and threatened species were recorded at the project site. None of the recorded endemic species are restricted to the project area. Measures shall be taken to indicate any animal roaming paths across these roads to worn the drivers about such animal activity which shall reduce the incidences of vehicle-animal collisions. Other than this issue the project will not have major adverse impacts on the habitats or fauna and flora in the proposed project site.

XCI. A long-term maintenance program is essential for sustaining road in good condition. Thus periodic inspection, assessments, and proper maintenances strategies shall be implemented during operation stage. It is recommended that the design team shall be properly coordinated with future schedules regarding infrastructure development of line agencies to minimize structural damages to the road.

XCII. A proper Grievances Redress Mechanism shall be established to receive and resolve any public complaints regarding the project interventions and impacts. An Environmental Monitoring Plan shall be established to assess and evaluate the effectiveness of the mitigation strategies as outlined in the Environmental Management Plan. According to the analysis of existing baseline data and prediction of impacts, the proposed road rehabilitation, and construction activities fall under Environmental Category B based on the ADB Guidelines. Thus, a full Environmental Impact Assessment (EIA) for the project is not required. Concerningthe National Environmental Act No.47 of 1980, amendment No.56 of 1988, and subsequent amendments, the project does not fall under the Prescribed Project Category.

1. INTRODUCTION

A. Background

1. The absence of all-weather road connectivity is a severe problem in Sri Lanka's rural areas, preventing communities from accessing socioeconomic centers. Poor road infrastructure is strongly linked to poverty and affects economic growth in rural areas, agricultural productivity, and employment. The Government of Sri Lanka is addressing this problem through a countrywide rural road investment program aimed at providing all-weather road connectivity to eligible unconnected rural habitations. The country partnership strategy, 2018–2022 of the Asian Development Bank (ADB) for Sri Lanka aims to address the significant constraints to improving quality of growth and is closely aligned with the government's priorities. The country partnership strategy reconfirms continued ADB assistance for developing the transport sector, including rural roads, which are critical for rural development in providing access to markets, health, education, and administrative services.

2. The Integrated Road Investment Program (iRoad) supports the government's sector objective to improve connectivity between Sri Lanka's rural communities and socioeconomic centers. The immediate outcome will be increased transport efficiency on project roads.

3. The iRoad Program is identified as one of the critical components in the development of the road network to support and facilitate the activities in the enhancement of the economic and social status of the people living in rural areas of these provinces. Accordingly, it has received top priority in the development programs of the Government of Sri Lanka (GOSL), and funds are being provided by the Asian Development Bank (ADB). The iRoad program is a novel concept introduced recently into the country by the ADB.

4. The program comprises two types of contracts as; (i) Conventional Road Contracts (CRC) and (ii) Road Maintenance Contracts (RMC). Five projects have been defined under CRC package as project 1 in Southern Province, project 2 in Sabaragamuwa Province and Kalutara District of Western Province, project 3 in Central Province, project 4 in North Central Province, and project 5 in North Western Province. A set of national roads have been selected under RMC packaging.

5. Rehabilitation of roads is followed by mandatory maintenance of the completed Provincial & Rural Roads for three years (under CRC packages) while the selected National Highways will be rehabilitated for two years and maintained and managed over a period of five years through RMC packaging. 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).

6. Three national road sections in North Central Province have been selected to be rehabilitated and maintained under RMC package. These roads are as follows;

(i) B133: Ganewalpola – Dachchi Hammillewa Road - 45.86 km

(ii) B212: Kekirawa – Ganewalpola Road - 6.95 km

(iii) B213: Kekirawa – Thalawa Road - 37.41 km

7. In line with the Environment Assessment Review Framework (EARF) developed for iRoad programmea Rapid Environmental Assessment (REA) was carried out for each of these road sections (See Appendix 1.1, 1.2 and 1.3), and the project is classified as category B on environment aspects. Therefore an Initial Environment Examination (IEE)needs to be carried out for these three candidate roads.

8. This document presents the findings of the Initial Environmental Examination (IEE) conducted for the three roads mentioned above. This IEE report discusses possible impacts (beneficial and adverse) that would arise due to proposed development and maintenance work on selected road sections.

B. Objectives of the proposed project

9. Objectives of this project are:

- Facilitate to increase mobility by improving the connectivity and access to between A 09 Road and A28 (between Kekirawa and Thalawa by B213), between A 09 Road and A11 (between Kekirawa and Ganewalpola by B212) and between A11 Road and A12 (between Ganewalpola and Dachchi Hammillewa by B133), which link up with other these A-class National Roads.
- To facilitate by way of providing access for establishing most essential social and economic centres in identified locations and giving access to primary community centres and villages within the Kekirawa, Thirappane, Galenbindunuwewa, Kahatagasdigiliya, Ipalogama, Eppawala and Thalawa DS Divisions in the Anuradhapura District
- To facilitate by way of providing improved roads in which small vehicles, light trucks, omnibuses and motor cars and other small vehicles can travel to facilitate the transfer of passengers and goods and to restore services as normal
- Improve connectivity between production centres and marketplaces and improve linkages with the other districts and provinces,
- Open up backward areas for development
- Facilitate to 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 producing another round of investments,
- To reduce the structural poverty through (a) creating opportunities for the poor to participate in the development programme, (b) strengthen the social protection system and (c) empower the poor and strengthen the right governance.

10. To achieve these objectives, the roads identified under the iRoad programme will be improved with the following:

- Improve the existing roads with proper two-lane facility
- Resurfacing the existing pavement with Asphalt Concrete (AC) if the present surface is weak
- Improve the horizontal alignment at selected locations to reduce acute curves to provide safe driving conditions
- Widen, repair or reconstruct damaged culverts and bridges and construct new culverts at locations where the road will be placed on new embankments
- Remove any irregularities that are on the existing vertical profile, thereby improve the vehicle operating speeds while ensuring the safety of road users

11. The following secondary objectives are also expected:

- Savings in Vehicle Operating Costs (VOC's) taking into account the speed and travel time in the with- and without-project situations including the potential distance differential, surface quality, road congestion, etc.
- Benefits and costs for diverted traffic would be calculated differently as a percentage compared to the regular traffic.
- Savings of road maintenance costs
- Savings of travel time for passengers and goods in transit
- Reduction in the number as well as the severity of accidents and the related costs, although traffic safety assessment was not part of this evaluation.

C. Objectives of the Initial Environmental Examination

12. The project comprises of carrying out of rehabilitation and improvement works along three B-class national roads (B133, B212,and B213) as Road Management Contracts where the work will be carried out for two (2) years and maintained for another five (5) years. The Environmental Assessments for these three roads are carried out as a requirement of the ADB Safeguard requirements outlined in the EARF[1] prepared for the iRoad. The scope of the study was determined by the specifications given by the ADB for conducting an Initial Environment Examination (IEE), which are outlined below:

- Field data collection regarding physical, social, economic and environmental background of the project area.
- Public consultation with affected people and other relevant authorities.
- Preparation of Basic Information Questionnaire (BIQ).
- Preparation of Rapid Environment Assessment (REA) Checklists for ADB categorization

[1]Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, May 2014

- Assessment of potential environmental impacts and development of preventive and/or mitigation measures for significant impacts.
- Preparation of Environmental Management Plan (EMP) and Environmental Monitoring Plans (EMoP).
- Preparation of institutional requirements and Grievance Redress Mechanism (GRM).
- Preparation of consolidated Initial Environment Examination (IEE) report.

D. Outline of the Assessment

13. This Environmental Assessment report provides general policies, guidelines, and procedures to be integrated into the implementation of all components under the Road Project Preparatory Facility. In preparing this document, following procedure has been adopted, in addition to requirements as specified in the EARF[2] prepared for iRoad:

- Safeguard Policy Framework of ADB[3] has been reviewed to identify environmental safeguard requirements and Policy of the ADB
- The Environmental assessment processes as outlined in the OM Section F1/OP (2013)[4] and the ADB's Environmental Policy (ADB, 2002) and Environmental Assessment Guidelines[5] have been reviewed to determine the environmental category of the proposed project, and the procedure to be adopted for conducting Environmental Assessments.
- Relevant environmental regulations, guidelines, and Policies of Sri Lanka have been reviewed.
- The review also included consultations with the associated technical personnel to identify the components of the proposed project activities.
- The assessment made an effort in identifying potential environmental impacts and proposed strategies to mitigate the potential adverse environmental impacts due to project activities

14. The assessment outlines environmental screening procedures, assessment methodologies, environmental management (mitigation, monitoring, and documentation), and reporting for actions proposed under the Project, and to specify institutional structure and mechanism to carryout compliance to the environmental management plan.

E. Approach, Methodology, and Personnel Involved

15. The approach and methodology in conducting the present study are listed below:

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[2]Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, May 2014

[3] Safeguard Policy Statement, Asian Development Bank, June 2009.

[4] Operations Manual Bank Policies (BP), Asian Development Bank, 2013

[5] Environmental Assessment Guidelines, Asian Development Bank, 2003

i. Liaise with the team of engineers working on the project to develop the understanding of the scope of expected engineering activities that will take place at the site as well as any sites outside by discussing the physical interventions finally proposed to be carried out at the site, construction methodologies, and equipment to be used, pre-construction activities, etc.

ii. Carry out the Screening using the REA Checklist (See Appendix 2.1, 2.2 and 2.3), included in the EARF[6]. The study corridor used for the study is a 50m width section along the existing road.

iii. Carry out a Rapid Assessment to decide on the significant impacts and then to carry out the Environmental Assessment based on the TOR specified in the EARF.

iv. Establish the general baseline conditions of the physical environment, which include a survey of invasive species to identify the potential flora species that can be introduced using borrow material.

v. Carry out a scoping of environmental issues that may arise as a result of project activities: physical, biological/ecological and social impacts. This scoping will also focus on key stakeholders, mainly the CEA, RDA, PRDA, NBRO, Department of Wildlife Conservation and Forest Department, etc.

vi. Prepare a comprehensive Environmental Management Plans (EMP) for each Road, describing the proposed mitigation measures for each impact identified and the phase in which it shall be carried out, appropriate institutional arrangement to implement the proposed measures, reporting procedures and estimated costs for implementing mitigation measures to manage the onsite as well as off-site environmental impacts.

vii. Prepare a comprehensive Environmental Monitoring Plan (EMoP) for each Road, with specifying monitoring indicators to measure the performance of each mitigation measure, monitoring mechanisms and frequency to support EMP. Environmental Monitoring Plan will be therefore separately prepared.

viii. Identify the clearances/approvals needed by the project before its implementation.

ix. Make conclusions and recommendations to the client on the environmental viability of the project based on the findings.

16. To meet the requirements of ADB, the IEE report follows the TOR given in the EARF prepared for the Integrated Road Investment Program. The structure of the IEE report is organized as follows:

- ***Introduction****:* Provides identification of the project and the project proponent, and an explanation of the Objectives of the proposed project. It also presents the Approach and the Methodology adopted by the IEE
- ***Policy, Legal, and Administrative Framework:*** This section summarizes the national and local legal and institutional framework within which the environmental assessment

[6]Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, May 2014

is carried out. It also identifies project-relevant international environmental agreements to which the country is a party. This chapter shall include: Applicable Laws, Regulations, Standards and Requirements, ADB Policy on Environmental & Social safeguards

- ***Description of the Project:*** In accordance with the ADB SPS (2009) and EA Guidelines (2003), this section provides the detailed description of the project, need of the project, project location, and magnitude of the operation, the environmental category of the project and implementation schedule.
- ***Description of the Environment:*** Provides a description of the current environment of the project area. The summary is based on available documentation, statistical data, and meetings with government authorities, APs, field surveys, and investigations.
- ***Screening of the Potential Environmental Impacts and Mitigation Measures*:** Provides an assessment of potential impacts of the proposed road development in light of the existing conditions together with recommended actions to prevent and/or otherwise to mitigate unavoidable impacts.
- ***Information Disclosure, Consultation, and Participation:*** Information on public participatory workshops and consultations with experts and local administrative officers is presented in this section.
- **Grievance Redress Mechanism (GRM):** This section describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.
- ***Institutional Requirements and Environmental Management Plan*:** This section deals with the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts. It also includes management plans and actions. Provides a description of responsible parties to implement, administration and supervision of the project and the procedure to address concerns, complaints, and grievances of the affected population.
- ***Conclusion and Recommendations:*** Findings of the study and recommendations which are finalized by the consultant are stated here with the analysis of currently available data. Conclusions section Outlines of the result of the IEE and justification.

17. This IEE report has been prepared by a team of consultants representing Master Hellie's Engineering Consultants (Pvt) Ltd., led by Eng. Jagath Manatunge (Chartered Civil Engineer, Environmental Engineer) as the team leader and Eng. Tissa Liyanage (Transport and Highway Engineer), together with Mr. K. Jinapala (Sociologist) and Mrs. Ayomi Witharana (Ecologist and Environmental Specialist).Some information related to Socio-economic environment for this IEER has been extracted from the Social Impact Assessment Report, which had been prepared by Mr. K. Jinapala and his team. The consultants of the report acknowledge the support of the staff at Master Hellie's Engineering Consultants (Pvt) Ltd. For their help and making available some information to compile this report. Also, the Consultants also wish to acknowledge the kind assistance of the Director and the Engineers attached to the iRoad Project, Road Development Authority for their support during the field visits and for providing information of the project interventions.

2 POLICY AND LEGAL FRAMEWORK

A. Applicable Laws, Regulations, Standards, and Requirements

A1. National Environmental Act and other applicable regulation

1. Environmental Protection and Management

18. The commitment and responsibility of the Sri Lankan government and its citizens to environmental protection is enshrined in the country's constitution (GoSL 1978[7]). Chapter VI (Directive Principles of State Policy and Fundamental Duties), Sections 27 (14) and 28 (f) declares that: "The State shall protect, preserve and improve the environment for the benefit of the community" and "it is the duty of every person in Sri Lanka to protect nature and conserve its riches".

19. The Central Environmental Authority (CEA) was created in 1982 as the government regulatory and enforcement agency for environmental matters. This was followed by the establishment of a cabinet-level Ministry of Environment in 1990, which became the Ministry of Environment and Natural Resources (MENR) in 2001 and developed the National Environment Policy (NEP) in 2003. The environmental protection mandate passed to a new Ministry of Mahaweli Development and Environment in January 2015, with the mission to "manage the environment and natural resources to ensure national commitment for sustainable development for the benefit of the present and future generation."

20. The basic legislation governing protection and management of the environment is the National Environmental Act (NEA) No 47 of 1980, and its subsequent amendments, No 56 of 1988 and No 53 of 2000. The NEA includes two main regulatory provisions through which the environmental impacts of development are assessed, mitigated and managed:

(i) The Environmental Impact Assessment (EIA) procedure for major development projects - regulations published in Government Gazette Extraordinary No 772/72 of 24 June 1993 and in subsequent amendments;

(ii) The Environmental Protection License (EPL) procedure for the control of pollution - regulations published in Government Gazette Extraordinary No 1533/16 of 25 January 2008.

2. Environmental Impact Assessment

21. The provision for EIA is contained in Part IV C of the NEA, which requires the submission of an IEE or EIA report in respect of certain "prescribed projects." These are specified in Gazette Extraordinary No 772/22 of 24 June 1993 and include the following:

[7] Government of Sri Lanka (1978, as amended): The Constitution of the Democratic Socialist Republic of Sri Lanka (Revised Edition 2015), 221 pp. (http://www.parliament.lk/files/pdf/constitution.pdf)

(i) Construction of national and provincial highways involving a length exceeding 10 kilometers (Note: the proposed project does not belong to this category)

(ii) Projects that fall within sensitive areas as defined in the National Environmental (Procedure for approval of projects) Regulations, No.1 of 1993.

22. The EIA process is implemented through designated Project Approving Agencies (PAA), which are line ministries and agencies with responsibility and jurisdiction over the project. The appropriate PAA is determined by CEA by the following (unranked) criteria (with the proviso that the project proponent cannot also act as the PAA):

- The agency with jurisdiction over the largest area;
- The agency with jurisdiction over diverse or unique ecosystems;
- The agency within whose jurisdiction the environmental impacts (resource depletion) are likely to be the greatest; or
- The agency having statutory authority to license or otherwise approve the prescribed project.

23. The EIA process involves the following steps:

(i) The proponent submits to the PAA preliminary information on the project in the form of a Basic Information Questionnaire (BIQ) provided by CEA;

(ii) The PAA screens the project by the information provided, and informs the proponent within six days whether an EIA or IEE is required[8];

(iii) The PAA then determines the scope of the study, taking into account the views of CEA, and relevant state agencies and the public if appropriate. The PAA devises ToR specifying the nature and content of the IEE or EIA report, and provides these to the proponent in writing within 14 (IEE) or 30 (EIA) days of receipt of the preliminary information;

(iv) If the PAA considers that the preliminary information provided by the proponent is sufficient for the purpose of an IEE report, the PAA proceeds as in (vi) below;

(v) The proponent conducts the studies necessary to fulfill the ToR (or engages consultants to do so) and submits the number of copies of the final IEE or EIA report as may be required by the PAA.

(vi) The PAA conducts a technical review of the report, within 21 days for an IEE and 30 days for an EIA.

(vii) An EIA report is also subject to public review. In this case, the PAA submits a copy of the EIA report to CEA, and by the publication of a notice in the Gazette and one daily

[8]An EIA is required for prescribed projects that involve complex environmental issues; and an IEE is required for projects that do not have complex environmental issues.

national newspaper in Sinhala, Tamil and English languages, invites the public to inspect the report and make written comments.

(viii) The public forward any comments to the PAA within 30 working days and these are forwarded by the PAA to the project proponent. The proponent responds to the PAA in writing regarding all comments, within six days of completion of the public inspection.

(ix) After the technical review (IEE/EIA), and within six days of receipt of the proponent's response to public comments on an EIA, the PAA either: a) grants approval for implementation of the project, subject to certain conditions; or b) refuses approval for project implementation, giving reasons for the decision.

(x) Within 30 days of granting approval, the PAA submits to CEA a report containing a plan to monitor project implementation, which is then implemented after approval.

3. Environmental Protection License (EPL)

24. The Environmental Protection License (EPL) scheme was introduced under the NEA in order to: prevent or minimize the release of discharges and emissions from industrial activities in compliance with national discharge and emission standards; provide guidance to industry on methods of pollution control; and encourage the use of new pollution abatement technologies, such as cleaner production, waste minimization, etc.

25. In Gazette Extraordinary 1533/16 of 25 January 2008, industries are classified into three categories (A, B or C) depending on their pollution potential. Part A comprises 80 high polluting industries, such as: Asphalt processing plants, Concrete batching plants having a production capacity of 50 or more cubic meters per day, Mechanized mining activities with multi bore hole blasting or single bore hole blasting activities with production capacity having 600 or more cubic meters per month, Hostels and similar dwelling places where occupancy level is exceeding 200 or more, Any industry where 200 or more workers per shift are employed, etc. Part B includes 33 medium level polluting activities, such as Hostels and similar dwelling places where occupancy level or 25 or more boarders and less than 200 borders, Concrete batching plants having a capacity less than 50 cubic meters per day, Single borehole blasting with industrial mining activities using explosives, having a production capacity of less than 600 cubic meters per month, Granite crushing (Metal crushing) industries having a total production capacity of less than 25 cubic meters per day excluding manual crushing operations using hand tools.; garages for vehicle repair and maintenance; etc. Part C includes 25 low polluting activities, such as vehicle filling stations; Mechanized cement blocks manufacturing industries; hotels and guest houses with 5-20 rooms; etc.

26. Licenses may also be required for some activities conducted on site during the construction period, including concrete batching, stone crushing, vehicle repair/maintenance and the accommodation camp for workers. These activities are classified as Part A or Part

B, depending on their capacity or output. Part A and B licenses are obtained from the relevant Provincial or District Offices of the CEA.

4. A permit from the Geological Survey and Mines Bureau

27. The Mines and Mineral Act No 33 of 1992 requires that mining and exploitation of minerals in Sri Lanka are licensed by the Geological Survey and Mines Bureau (GSMB). This applies to earth and quarry materials excavated for use in construction, for which a permit must be obtained from the GSMB[9], by the project proponent or contractor.

5. Archaeological Impact Assessment

28. The Antiquities (Amendment) Act No 24 of 1998, and the implementing regulations published in Gazette Extraordinary No 1152/14 of 4 October 2000 require that an Archaeological Impact Assessment is conducted about every proposed development project with a land area of over 0.25 ha. The purpose of the assessment is to examine whether there are antiquities in the land, to determine the impact of the proposed development and to provide alternative measures if necessary.

29. The Government's Department of Archaeology (DOA) specifies the projects for which their written permission shall be obtained before implementation, and these include:

(1.a)To develop transport systems: (a) to construct national or provincial roads

(4) Excavations exceeding 500 m in length for laying pipes and conduits for drainage, water, gas, electricity and telephone facilities;

(6.a)To quarrying and blasting stones to leach stone, gravel, minerals, or soil: (a) To identify reserves the exceed 0.25 ha on the crust of the land in the inner part of the country and do mining

6. Labour Laws and Occupational Health and Safety

30. Sri Lankan legislation includes some laws, acts, and regulations designed to prevent the exploitation of workers and to protect their health and safety in the workplace (construction sites and operating facilities). These instruments are identified in the tender documents, and the contractor will be required to comply with all those listed and any others that may be applicable. It is not possible to review this legislation here, so the following sources are recommended for further information: Department of Labour[10]; Salary.lk[11];

[9] For GSMB Licensing procedure, see: http://www.gsmb.gov.lk/web/index.php?option=com_content&view=article&id= 100&Itemid=68&lang=en

[10]http://www.labourdept.gov.lk/index.php?option=com_content&id=65&Itemid=59&lang=en&limitstart=1

[11]http://www.salary.lk/home/labour-law

National Institute of Occupational Safety and Health[12]; and for an international perspective, the World Bank's guidelines on Occupational and Community Health and Safety[13].

7. Other Relevant Environmental Regulations, Guidelines and Policies of Sri Lanka

31. The present Constitution of Sri Lanka came into operation in 1978 and also provides the basic principles of environmental protection and preservation through Chapter 4, Section 27, and Item 14; "*The State shall protect, preserve and improve the environment for the benefit of the community*." Based on above principles, Government of Sri Lanka has laid down various Acts including National Environmental Act No. 47 of 1980, to ensure environmental perseverance and protection.

Table 2-1. Laws and regulations applicable for the project activities

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
National Environmental Act, No. 47 of 1980 National Environmental (Amendment) Act, No. 56 of 1988 National Environmental (Amendment) Act, No. 53 of 2000 and other Amendments	The NEA is a framework environmental statue that makes provision for the protection, management and enhancement of the environment, for the regulation, maintenance and control of the quality of the environment, and for the prevention and control of pollution by implementing the subproject.	Following Regulations related to NEA is applicable to all project components.
National Environment (Noise Control) Regulations 1996. Gazette Notification Number 924/12 dated 23rd May 1996. National Environmental (Vehicle Horns) Regulations, No. 1 of 2011	Regulates maximum allowable noise levels for construction activities during subproject activities	Noise levels shall be strictly monitored for conformity, especially during excavations and backfilling.
National Environmental (Protection & Quality) Regulations, Gazette Notification No. 1534/18 dated 01.02.2008.	This regulates the discharge and deposit of any kind of waste or emission into the environment.	Any effluent discharges and waste discharges (scheduled waste) shall conform to the Standards.

[12]http://www.niosh.gov.lk/

[13]http://www.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
The activities for which Environmental Protection License (EPL) is required: Gazette Notification No. 1533/16 dated 25.01.2008	The prescribed activities for which a license is required are set forth.	Certain project-related activities may need an EPL such as asphalt processing plant, concrete batching plants, treatment plants, sewerage networks, mechanized mining activities etc.
National Environment (Air Emissions, Fuel & Vehicle Importation Standards) Amended Regulations, No. 1 of 2003. Gazette Notification Number 1295/11 dated 30th June 2003.	This sets out the Vehicular Exhaust Emission limits for every motor vehicle in use in Sri Lanka.	All the project vehicles, machinery and equipment shall conform to the emission standards.
National Environment (Ambient Air Quality) Regulation 1994 and Amendment of Gazette Notification Number 1562/22 dated 15th August 2008.	Establishes permissible ambient air quality standards during proposed project activities	Ambient air quality shall be established prior to construction and be monitored during construction especially activities involving earthwork.
National Thoroughfares Act, No. 40 of 2008 Motor Traffic (Speed Limits) Regulations, No. 1 of 2012	The Act provides a framework for planning, design, construction, maintenance and public roads. Section 26 prohibits any government department or local authority carry out any services on a road, public road or a national highway without proper permissions	Permission of shall be obtained from RDA, PRDA, and LAs for rehabilitation and closure of roads. Speed limits of all vehicles shall conform to speed limit regulations.
Motor Traffic Act, No. 14 of 1995, Amended by Act, No. 05 of 1998 The Motor Traffic (Construction of Vehicles) Regulations 1983 as amended in the Gazette Extraordinary No. 1842/32 of 29.01.2014	Establishes a regulatory framework for ownership, transfer and use of vehicles within Sri Lanka and defines the dimensions of any motor vehicle	All the project vehicles shall conform the provisions of the Act and shall not exceed the dimensions specified, especially heavy vehicles which transport equipment, machinery and materials.

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
Fauna and Flora Protection Ordinance, 1937 (Chapter 469); Fauna and Flora Protection (Amendment) Act, No. 49 of 1993 and Fauna and Flora Protection (Amendment) Act, No. 22 of 2009)	Provide for the protection and conservation of the fauna and flora and their habitats; for the conservation of the biodiversity and to provide for matters connected there with or incidental there to.	Rehabilitation and construction work of the roads, quarrying and borrowing activities he roads, machinery and materials yards, can have negative impacts on flora and fauna.
Felling of Trees Control Act, No. 09 of 1951 as Amended by Act No. 30 of 1953	This Act sought to prohibit and control the felling of specified trees.	No commercially and/or ecologically valuable tree species will be cut without proper approvals.
Geological Survey and Mines Bureau (GSMB) Act No. 33 of 1992 Removal of Sand Regulations, No. 1 of 2007 Regulation for Prohibition of use of Equipment for exploration, mining and extraction of Sand & Gems, Gazette Notification Number 1454/4 dated 17th July 2006 Explosive Act, No. 36 of 1976	Regulates the exploration for minerals, mining, transportation, processing, trading in export of mineral products and usage of quarries and sand mines in the country. To provide the control of explosions and regulations of matters connected with explosive activities.	These are applicable for material suppliers for project activities.
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	MSW that arise during the project activities has to be properly collected, stored and disposed.
Water Resources Board Act, No. 29 of 1964, Amendment No.42 of 1999 and Amendments made on 2017.03.16 by Gazette Notification No.2010/23) Irrigation Act, No. 23 of 1983 Agrarian Services Act, No.	Control, regulation and development (including the conservation and utilization) of the water resources; the prevention of the pollution of rivers, streams and other water resources; the formulation of national policies relating to the control and use of the water	Approval from Water Resources Board is needed for use of groundwater resources for project activities (if any). Approvals from Irrigation Department/

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
58 of 1979	resources.	Provincial Irrigation Department/Agrarian Services Department are needed for use of surface water resources for project activities (if any)
Soil Conservation Act, No. 25 of 1951 Amended in 24 of 1996	An act to make provisions for the enhancement and substances of productive capacity of the 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 and drought and to provide for matters connected there with or incidental there to.	Approvals from Natural Resource Management Centre are needed if any borrow areas or any other project activities lead to soil erosion.
Flood Protection Ordinance, No. 4 of 1924 and No 22 of 1955	An ordinance for the 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.	Approvals and consents from the Irrigation Department, Agrarian Services Department are needed if project activities lead to flooding.
Crown Land Ordinance Act No. 1947 Land Settlement Ordinance, No. 20 of 1931; Land Development Ordinance, No. 19 of 1935 as amended by land development (amendment) Act, No. 16 of 1969, No.27 of 1981, No, 22 of 1998, No, 22 of 1995; State Land Ordinance, No. 08 of 1947; Land Acquisition Act, No. 09 of 1950; State Land (Recovery of possession and divesting of State Land) Act, No. 07 of 1979; Land Grants (Special Provisions) Act, No. 43 of	The act dealing with allocation and control of Crown lands In Sri Lanka for private and government activities.	Approvals and consents are needed from Commissioner General of Lands, District Secretary, Divisional Secretary or any other government institutions for acquisition/lease of lands

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
1979; Title Registration Act, No. 21 of 1998		
The Antiquities (Amendment) Act No 24 of 1998, and regulations published in Gazette Extraordinary No 1152/14 of 4 October 2000	This require that an Archaeological Impact Assessment (AIA) to be conducted about every proposed development project with a land area of over 0.25 ha. The purpose of the assessment is to examine whether there are antiquities in the land, to determine the impact of the proposed development and to provide alternative measures if necessary.	Approval of the Department of Archaeology is needed (after conducting an Archaeological Impact Assessment (AIA).
Municipal Council Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the Pradeshiya Sabha Act No. 15 of 1987	These outlines the procedures in approval of building plans, approval of drainage management plans, etc., and regulations for disposal of municipal solid waste. In addition to environmental clearance, obtaining Trade license and Machinery Permits, involvement of MOH/PHI in matters related to public health and other approvals from the local authorities for site clearance; and consent from all relevant Pradeshiya Sabhas, Provincial Councils, and Divisional Secretaries shall be obtained before construction begins.	Approvals for building plans, drainage management plans, and disposal of municipal solid waste are needed. Trade license and Machinery Permits shall be obtained prior to commencement of any operations. Approvals of the MOH/PHI in matters related to public health are needed.
Labour Laws and Occupational Health and Safety Legislation in Sri Lanka relating to Industrial, Employment and Labour relations included in the Labour Code of Sri Lanka	Sri Lankan legislation includes some laws, acts, and regulations designed to prevent the exploitation of workers and to protect their health and safety in the workplace (construction sites and operating facilities). The project proponent and all the subordinates including sub-contractors will be required to comply with all such laws and	Compliance required during pre-construction, construction and decommissioning stages The following sources provide further information: Department of Labour; National

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
	provisions that may be applicable.	Institute of Occupational Safety and Health; and for an international perspective, the IFC guidelines on Occupational and Community Health and Safety.

32. Some of above legislations may not necessarily or directly be relevant to the road sector. The National Environmental Act No.47 of 1980, amendment No.56 of 1988, and subsequent amendments provide a framework environmental statute for any components that are implemented under the proposed project. National Environmental (Protection & Quality) Regulations, No. 01 of 1990 provides standards for discharging effluents into the inland surface water during proposed project activities. National Environmental (Ambient Air Quality) Regulations (1994) establishes permissible ambient air quality standards during proposed project activities, and National Environmental (Noise Control) Regulations No.1 of 1996 regulates maximum allowable noise levels during construction activities and during operations of proposed project activities.

A2. Project-relevant International Agreements and Conventions

33. Sri Lanka has acceded to or ratified around 40 Multilateral Environmental Agreements and those that are relevant to this project are shown in Table 1.

Table 2-2: Project-related international agreements to which Sri Lanka is a party

Agreement	Ratification Date	Objectives
Atmosphere		
Vienna Convention for the Protection of the Ozone Layer (1985)	15 December 1989	Protection of the Ozone Layer through international cooperation in the areas of scientific research, monitoring and information exchange
Montreal Protocol on Substances That Deplete the Ozone Layer (1987)	12 December 1989	Reduction and the eventual elimination of the consumption and production of Un-anthropogenic Ozone Depleting Substances
United Nations Framework Convention on Climate Change (UNFCCC-1992)	23 November 1993	Stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic systems
Kyoto Protocol (1997)	3 October 2002	The Annex 1 parties (Developed Countries) to reduce their collective emissions of greenhouse gases by at least 5% of the 1990 level by the period 2008 –2012

Agreement	Ratification Date	Objectives
Biodiversity and Cultural Heritage		
International Plant Protection Convention (1951)	12 February 1952	To maintain and increase international cooperation in controlling pests and diseases of plants and plant products, and in preventing their introduction and spread across national boundaries
Plant Protection Agreement for Asia and Pacific Region (1956)	27 February 1956	To prevent the introduction into and spread within the region of destructive plants
Convention concerning the protection of the World Cultural and Natural Heritage (1972)	6 June 1980	To establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value organized on a permanent basis and by modern scientific methods
CITES - Convention on International Trade in Endangered Species of Wild Fauna & Flora (1973)	4 May 1979	To protect certain endangered species from being over-exploited by adopting a system of import/export permits, for regarding the procedure
Convention on the Conservation of Migratory Species (1979)	6 June 1990	To protect those species of wild animals which migrate across or outside national boundaries
The Convention on Wetlands (Ramsar Convention) (1971)	15 October 1990	This is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
Convention on Biological Diversity (CBD-1992)	23 March 1994	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including appropriate access to genetic resources and by appropriate transfer of relevant technologies and appropriate funding
The UNESCO World Heritage Convention (1972)	06 June 1980	Convention concerning the protection of the World Cultural and Natural Heritage
Land		
United Nations Convention to Combat Desertification (UNCCD- 1994)	09 December 1998	To combat desertification and to mitigate the effects of drought in countries experiencing severe droughts and/ or desertification with the final aim being to prevent land degradation in the hyper-arid, arid, and semi-arid, dry subhumid areas in the countries that are parties of the Convention
Chemicals		
Basel Convention on the Control of Trans-boundary	28 August 1992	To reduce transboundary movements of hazardous waste; to dispose of hazardous and other waste as

Agreement	Ratification Date	Objectives
Movements of Hazardous Wastes and Their Disposal (1989)		close as possible to the source; to minimize the generation of hazardous waste; to prohibit shipments of hazardous waste to countries lacking the legal, administrative and technical capacity to manage & dispose of them in an environmentally sound manner; to assist developing countries in environmentally sound management of the hazardous waste they generate
Rotterdam Convention (1998)	19 January 2006	To promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals, to protect human health and the environment; to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange, providing for a national decision-making process on their import/export
Stockholm Convention on Persistent Organic Pollutants (POPs) (2001)	22 December 2005	To protect human health and the environment from persistent organic pollutants (POPs)

B. ADB Policy on Environmental & Social safeguards

34. ADB's Environment Policy requires that environmental issues are considered in all aspects of the Bank's operations. The detailed requirements are defined in the Safeguard Policy Statement (2009), which builds upon the three previous policies on the environment, involuntary resettlement, and indigenous peoples, and brings them into a consolidated policy framework that enhances their effectiveness and relevance. The SPS affirms that ADB considers environmental and social sustainability as a cornerstone of economic growth and poverty reduction in Asia and the Pacific and is committed to ensuring the social and environmental sustainability of the projects it supports.

35. In this context, safeguards are operational policies that seek to avoid or reduce to acceptable levels adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. The objectives of ADB's safeguards are to:

(i) avoid adverse impacts of projects on the environment and affected people, where possible;

(ii) minimize, mitigate and/or compensate for adverse project impacts on the environment and affected people where avoidance is not possible; and

(iii) help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

36. The Safeguard Policy Statement applies to all projects or components financed, administered or otherwise supported by ADB, regardless of whether ADB is the funder; and

ADB will not finance projects that do not comply with the SPS and the host country's social and environmental laws and regulations.

37. Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts, and the objectives are to ensure the environmental soundness and sustainability of projects and support the integration of environmental considerations into the project decision-making process. The principal tool for achieving these aims is an environmental assessment, which is a process of environmental analysis and planning to avoid or reduce the environmental impacts associated with a project. The nature of the assessment required depends on the significance of the environmentalimpacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures.

38. **Screening and Categorization:** ADB screens a project in the preparation stage to (i) reflect the significance of potential impacts or risks that the project might present; (ii) identify the level of assessment and institutional resources required for the safeguard process; and (iii) determine the requirements for public disclosure. Screening reviews basic information on project design and operation, the proposed project site/s, and the general environmental/social features, and is aided by ADB's Rapid Environmental Assessment (REA) checklists. By the significance of the potential environmental impacts and risks, projects are assigned into one of the following four categories:

(i) **Category A:** projects likely to have significant adverse environmental impacts that are irreversible, diverse or unprecedented, and which may affect an area larger than the location subject to physical works. An Environmental Impact Assessment (EIA) is required.

(ii) **Category B:** projects with potential adverse impacts that are less significant than those of Category A. Impacts are site-specific, few are irreversible, and in most cases, impacts can be mitigated more readily than those for Category A projects. An Initial Environmental Examination (IEE) is required.

(iii) **Category C:** projects likely to have minimal or no adverse environmental impacts. No environmental assessment is required, although environmental implications are reviewed.

(iv) **Category FI:** projects where ADB funds are invested in or through a Financial Intermediary (FI). ADB conducts safeguard due diligence of the FI's portfolio and requires an appropriate environmental and social management system (ESMS) in place, to address environmental or social risks.

39. **Environmental Assessment** conducted under the SPS is governed by a series of policy principles, which define the scale, content, and approach to the study. The specific requirements of the Environment Safeguard Policy are given in Appendix 1 of the SPS; and the Annex to Appendix 1 provides an outline of an EIA report, which includes guidance on the overall layout and the content of each section. Guidance on the practical approach to conducting the environmental assessment is provided in the Environment Safeguards Good Practice Sourcebook (ADB, 2012). EIA and IEE studies follow the same general approach as prescribed in these documents; and the SPS states that the level of detail and comprehensiveness of the study shall be commensurate with the significance of

environmental impacts and risks, so an IEE may have a narrower scope. These documents were all consulted extensively in conducting this study and preparing this report.

40. **Public Consultation:** The SPS requires the borrower/client to carry out meaningful consultation with affected people and other stakeholders to facilitate their informed participation. This should: (i) begin early during project preparation and continue throughout the project cycle; (ii) provide timely disclosure of adequate, relevant and understandable information; (iii) be free of intimidation and coercion; (iv) be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enable incorporation of all relevant views into decision-making, including project design, impact mitigation, and sharing of project benefits and opportunities. The SPS specifies that for a Category A project, at least two consultation exercises are needed: the first at the early stage of EIA fieldwork; and the second when the draft EIA is available. The results of the consultation process are documented in the environmental assessment report.

41. **Information Disclosure:** The SPS requires the borrower to make relevant environmental information available to affected people and other stakeholders promptly, in an accessible place and in an understandable form and language(s). This normally involves providing the draft, and final IEE/EIA reports in public buildings in the study area, but for complex studies, brochures, leaflets, etc. can also be used, along with non-written communication methods if any stakeholders are illiterate. ADB also requires the borrower to provide the following for dissemination to a wider audience via the ADB website:

(i) The final EIA or IEE;

(ii) New or updated EIA/IEE, supplementary reports and/or corrective action plans, if prepared during project implementation;

(iii) Environmental monitoring reports, also during project implementation.

(iv) In the case of a Category A project, the draft EIA (including the draft EMP) must be provided at least 120 days before ADB Board consideration.

3 DESCRIPTION OF THE PROJECT

A. Location of the project

41. The following three roads have been proposed to rehabilitate and maintain under the Integrated Road Investment Program – Road Management Contract (RMC) package.

1. Rehabilitation and Improvement of Ganewalpola – Dachchi Hammillewa Rd (B133)

43. This road section (B 133), which is 45.86 km in length, connects Ganewalpola Junction (8° 5'22.82"N 80°38'16.13"E) on A 11 trunk road (A11: Maradankadawala – Habarana - Tirikkondiadimadu) and Dachchi Hammillewa (8°28'2.98"N 80°44'4.69"E) on A12 trunk road (Puttalum – Anuradhapura - Trincomalee).

Table 3-1: The administrative location of the B133 Road

Province	District	DS Division	GN Division	Local Authorities
North Central Province	Anuradhapura	Kekirawa	Ganewalpola, Maminiya Rambewa	Suhadagama
		Thirappane	Uttupitiya, Sadapagama, Muriyakadawala, Alagollewa, Moragoda, Nawakkulama	Kaluvila North
		Galenbindunuwewa	Yakalla, Ihala Galkulama, Hurulu Jayapura, Sunanda Mawatha, Gomarankalla, Ilukbadayagama, Galenbiduniwewa, 21 Colony East, Ella wewa	Sucharithagama
		Kahatagasdigiliya	Punchi Halmillewa, Konwewa, Sampathgama, Dachchi Hammillewa	Keenikkulama

44. The location map of the road is shown in Figure 3.1 and Annex 1.

4. Rehabilitation and Improvement of Kekirawa – Ganewalpola Road (B 212)

45. This road section (B 212), which is 6.95 km in length, connects Ganewalpola Junction (8° 5'22.82"N 80°38'16.13"E) on A 11 trunk road (Maradankadawala – Habarana - Tirikkondiadimadu) and Kekirawa (8° 2'23.44"N 80°35'54.06"E) on A 9 trunk road (Kandy - Jaffna).

Table 3-2: The administrative location of the B133 Road

Province	District	DS Division	GN Division	Local Authorities
North Central Province	Anuradhapura	Kekirawa	Ganewalpola, Ebulgaswewa, Mankadawela, Maldenipura, Kuda Kekirawa, Kekirawa	Suhadagama Pawakkulama Kaluvila North

46. The location map of the road is shown in Figure 3.2 Annex 1.

3. Rehabilitation and Improvement of Kekirawa – Thalawa Road (B213)

47. This road section (B 213), which is 37.41 km in length, connects Thalawa Junction (8°14'11.84"N 80°21'2.86"E) on A 28 trunk road (Anuradhapura - Padeniya) and Kekirawa (8° 2'23.44"N 80°35'54.06"E) on A 9 trunk road (Kandy - Jaffna).

Table 3-3: The administrative location of the B133 Road

Province	District	DS Division	GN Division	Local Authorities
North Central Province	Anuradhapura	Kekirawa DS	Kekirawa town, Malawa, Neekiniyawa, Mailagaswewa, Shasthrawelliya, Ihalagama, Mudapaperumagama Grama Niladhari Divisions	Hidogama
		Ipalogama DS	Hiripitiyagama, Kunchikulama, Ganthriyagama, Ipalogama, Kadiyangalla, Gonapathirawa, Sangattewa, Mahailuppallama	Hidogama
		Thalawa DS	Kiralogama	Kudanelubewa

48. The location map of the road is shown in Figure 3.3 Annex 1.

B. Category of the project

49. Overall the iRoad program is categorized as an Environmental category B project. The Rapid Environmental Assessment (REA) of the present study reconfirms this categorization for this sub-project, too, which *includes* the three road rehabilitation and maintenance projects– See Appendix 1.1, 1.2 and 1.3 for the REAs completed for each road section. Therefore, an Initial Environmental Examination (IEE) is required for this sub-project of RMC, to be conducted before the commencement of interventions.

C. Need for the Project

50. A 09, A11, A12 and A28 are the four main highways connecting the North, North-Central and Eastern Provinces with other parts of the country. Considerable traffic including public transport buses, heavy vehicles which transport goods and traffic which bring pilgrims/tourists to Anuradhapura, Polonnaruwa, Habarana, Trincomalee sacred city could be observed. On the other hand, lorries and trucks carrying agricultural produce, material such as sand, gravel and rubble, which is mined from Manampitiya area (where A11 Road crosses Mahaweli River), mostly use the the road sections of A 09, A11, A12 and A28 highways to access other parts of the country. The connectivity between these four main highways does not occur smoothly as inferior conditions of inter-connection roads, especially narrow andlow-grade sections of the roads do not support the steady flow of the traffic through these B-class roads. These inter-connection roads will be further degraded if not rehabilitated and maintained urgently.

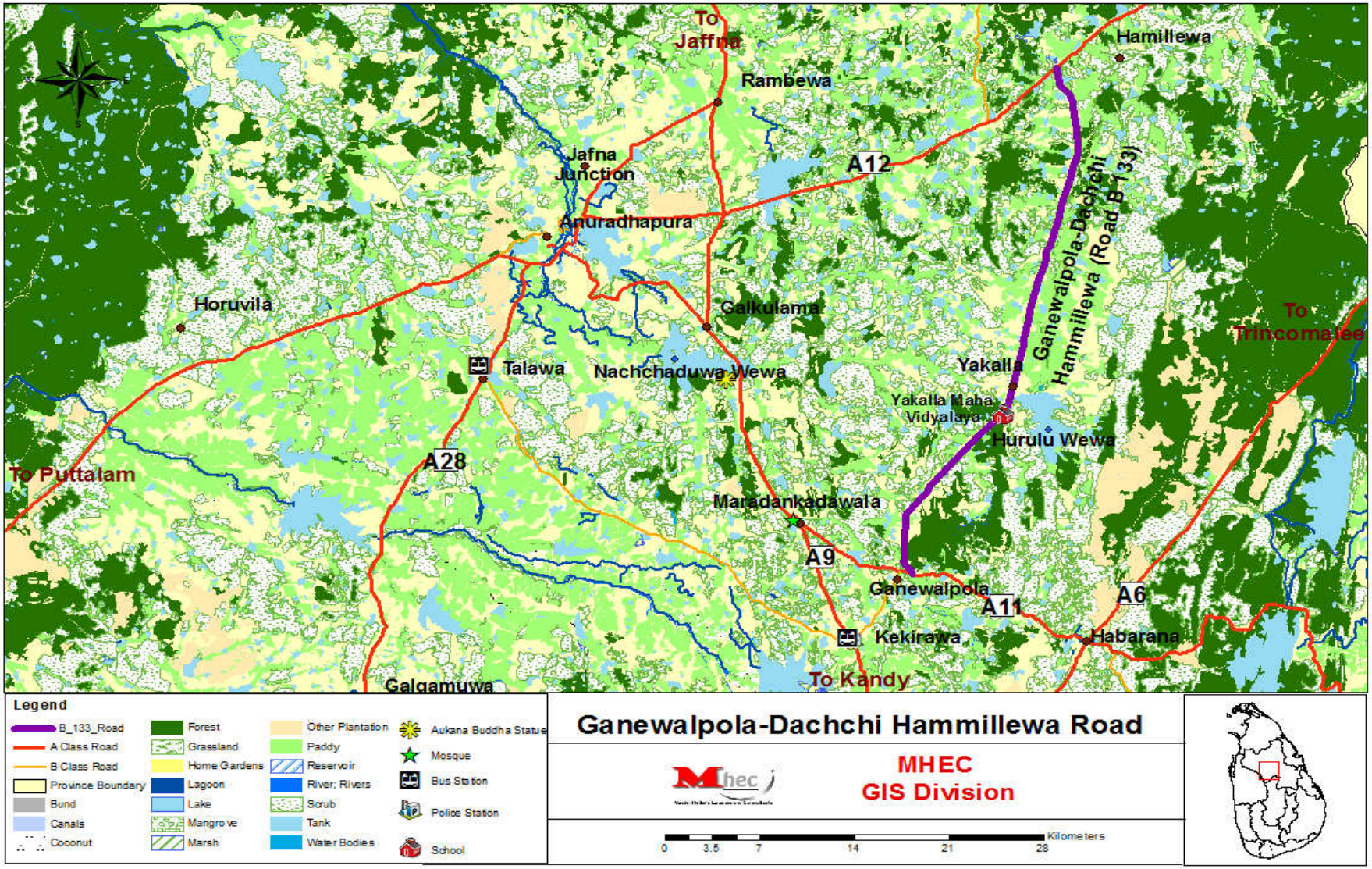

Figure 3-1. Location Map of Ganewalpola – Dachchi Hammillewa Rd (B 133)

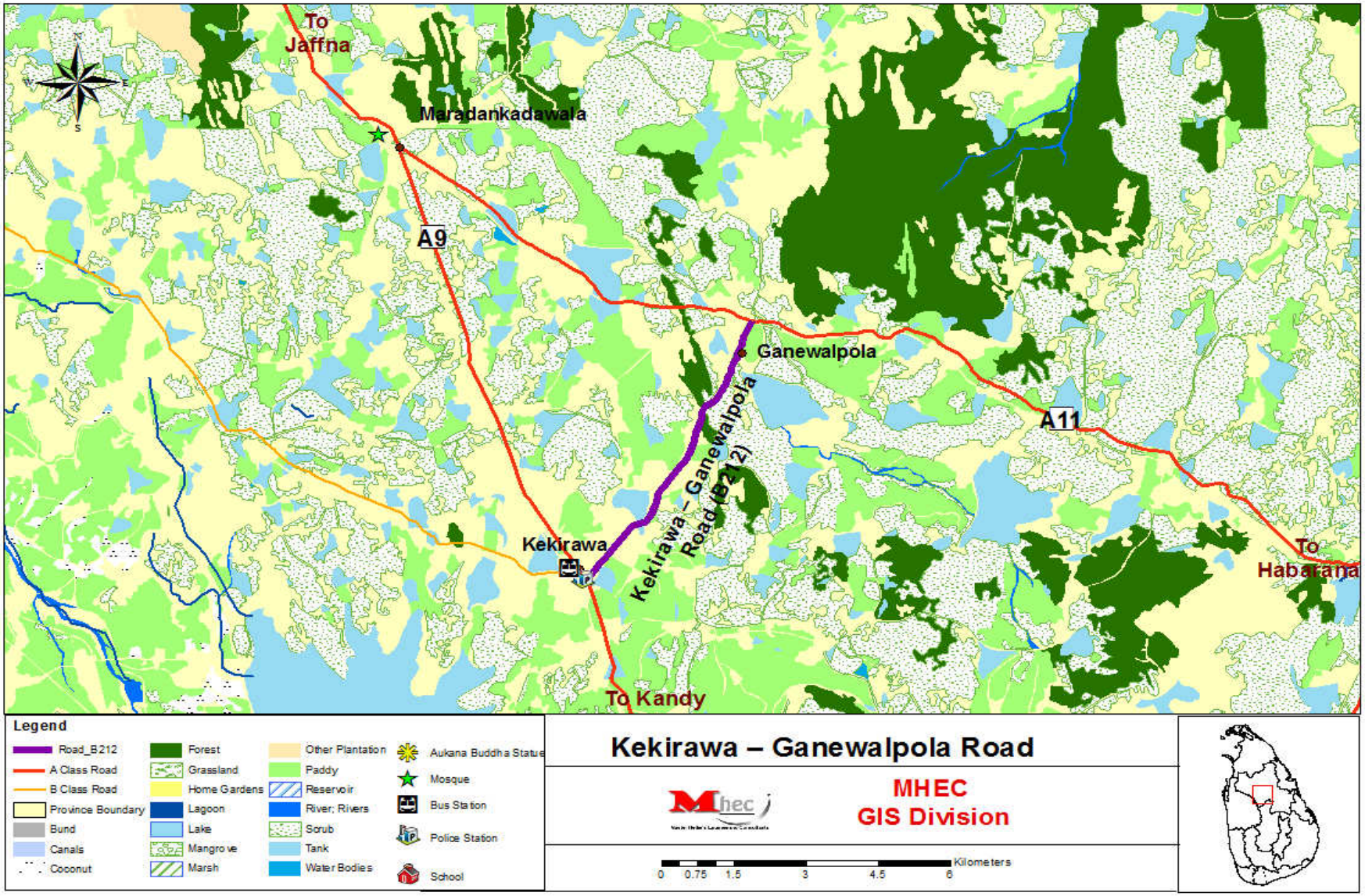

Figure 3-2. Location Map of Kekirawa - Ganewalpola Road (B 212)

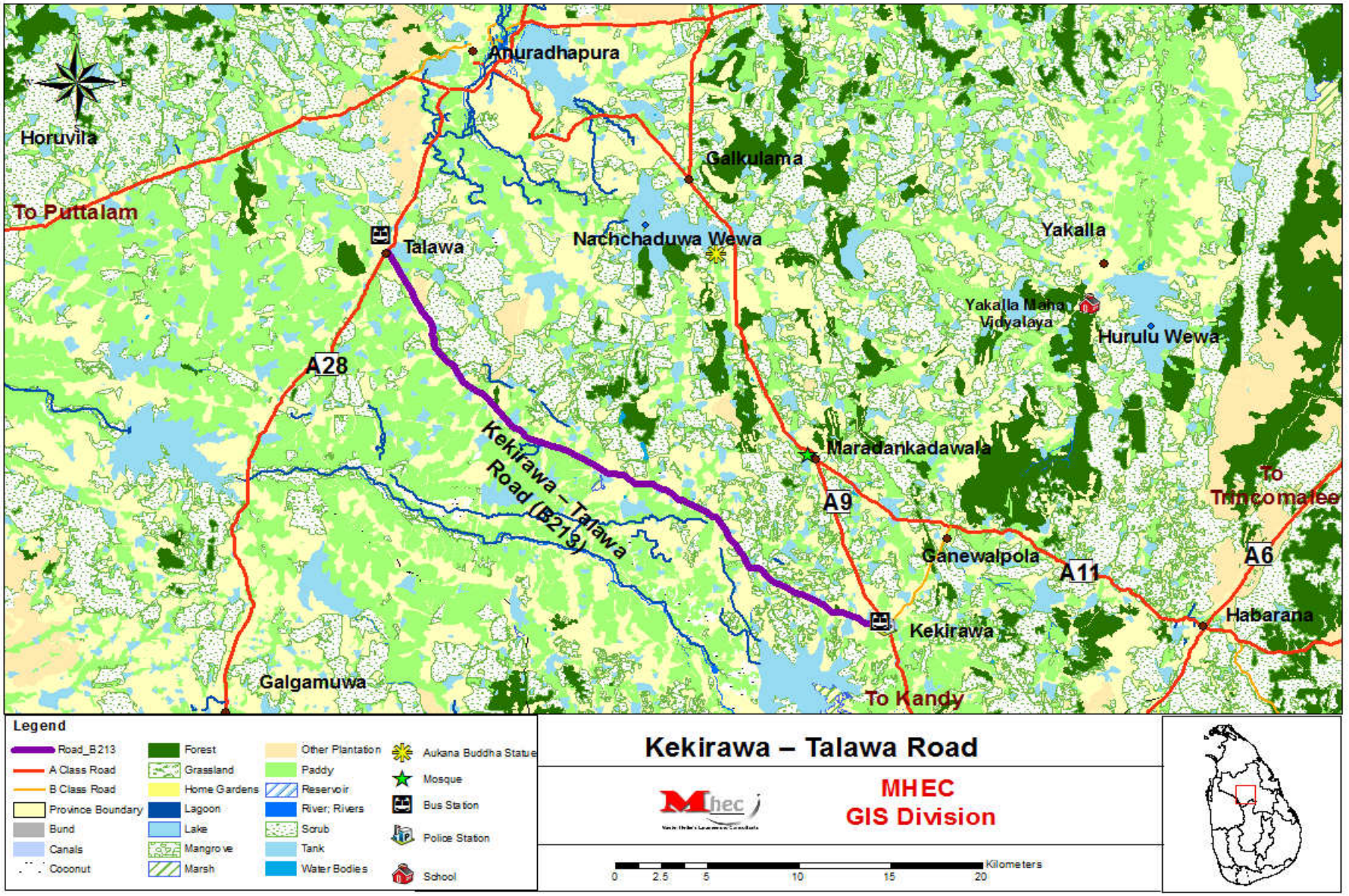

Figure 3-3: Proposed Cross Sections of the Rehabilitated Roads

51. The main purpose of the proposed project is to facilitate the increased mobility of traffic by improving the connectivity and access between A9 and A28 highways (between Kekirawa and Thalawa by B213), between A9 and A11 highways (between Kekirawa and Ganewalpola by B212) and between A11 and A12 highways (between Ganewalpola and Dachchi Hammillewa by B133), which link up with other these three A-class National Roads.By providing such improved connectivity between these road sections, the access for establishing most essential social and economic centres in identified locations and giving access to primary community centres and villages within the Kekirawa, Thirappane, Galenbindunuwewa, Kahatagasdigiliya, Ipalogama and Thalawa DS Divisions in the Anuradhapura District will be vastly improved.

D. Analysis of Alternatives

D1. No Project Alternative

52. The present sub-standard conditions of the three roads will worsen with the increased traffic flow with time if the selected three roads are not be rehabilitated without further delay and maintained. The efficiency of transportation between the four A-class Roads, which are connected by the three B-class Roads proposed for rehabilitation, will be severely hampered without the project. Moreover, the safety of road users will continue to be at risky levels with structural damages which are very common along the three road stretches. These three under-developed roads, which traverse through rural communities, will not support socio-economic development of the area as it disturbs livelihood activities of the project area, especially transport of agricultural produce for markets, tourism, conveyance of construction material, etc. 'No project alternative', therefore, is not a feasible solution with respect to regional and socio-economic development of these seven divisional secretary areas of the North Central Province..

D2. With Project Alternative

53. The project proposes to rehabilitate B133 (Ganewalpola – Dachchi Hammillewa Road - 37.41 km), B212 (Kekirawa – Ganewalpola Road - 6.95 km) and B213 (Kekirawa – Thalawa Road - 37.41 km). These three roads will be rehabilitated to standard two lanes configurations and subsequently be maintained for five years. Under the proposed development hard shoulders, roadside drains and parking facilities will be provided, where necessary. There are sections of these three roads which are subjected to seasonal flooding, and special consideration will be paid for such sections which are prone to inundation. Improvements of roadside drainage facilities will be enhanced the quality of road by reducing the existing inundations in the area. Also, necessary mitigation measures will be incorporated into the design to prevent such natural occurrences which will disturb the flow of traffic from time to time during inclement weather. Also, the improvements and rehabilitation works will provide safe driving conditions and road safety for other road users such as cyclists, motorcyclists,and pedestrians. School children and other people using public transport can benefit from the provision of bus bays and bus shelters improving the safety and comfort. The unemployed people living in the subproject area will have the construction-related job opportunities during project implementation, and subsequently, they will have employment opportunities in the expanded commercial/industrial sectors.

Development of the roads will provide better transport facilities for the people to access markets. The land value will also be increased due to the proposed road project.

54. The main purpose of iRoad program is to improve the rural villages having potential of economic growth with socio-economic centres. Therefore, the proposed rehabilitation and maintenance, will positively contribute to the enhancement of transport efficiency between the four A-class roads and along the three connection roads and better transport efficiency will be a catalyst for regional development and the socio-economic well-being of the people living along the three roads project area and finally of the North Central Province.

E. Magnitude of Operations

E1. Proposed improvement

55. The project comprises of carrying out of rehabilitation and improvement works along three B-class national roads (B133, B212, and B213) as Road Management Contracts (RMC) where the work will be carried out for two (2) years and maintained for another five (5) years. The rehabilitationof B133 (Ganewalpola - Dachchi Hammillewa Road) involves 37.41 km, B212 (Kekirawa – Ganewalpola Road) involves 6.95 km and B213 (Kekirawa – Thalawa Road) involves 37.41 km. These roads have been proposed to rehabilitate and upgrade to standard two-lane configurations. The project will not involve the acquisition of additional lands, and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of the carriageway, hard shoulder, soft shoulder and side drain where necessary as given below:

- Carriage Width: 3.5 m x 2
- Hard Shoulder: 1.5 m x 2
- Soft Shoulder: 1.5 m x 2
- Drain: 1.0 m x 2
- Total ROW: 15.0 m

56. The proposed typical cross-section is shown in Annex 2. However, the typical cross section will be modified based on the location specific contexts keeping the major components unchanged.

E2. Project activities

57. 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, desalting, and repairing of culverts.

58. The improvement works for selected roads under iRoad Project will be as follows:

- The widening of roads will be carried out only if there is sufficient ROW.
- If the existing surface is asphalt; it will be overlaid with the AC.

- The base correction will be carried out if base failures are found along the road.
- If the existing surface is macadam based it will be overlaid by Aggregate Base Course (ABC) and asphalt as per the pavement design is given by the Engineer.
- The buildup drain provided for town areas or other requested areas. Otherwise, the earth drain will be provided.
- The earthwork will be carried out in required areas.
- Finally, road marking will be carried out.

(Source: PIU, iRoad Program, RDA)

59. Further, an improvement on the cross- and side-drainage of the particular roads will be considered in locations where structures have been badly damaged, or rectification of the drainage is significantly required. The civil works will entail the repair and extension of existing cross drainage structures to accommodate the new road cross section/the construction of replacement and additional culverts and bridges as detailed in the construction drawings. (Refer: Figure 3.4: Typical Cross-Sections). The components of RMC are described in Table 3.4.

Table 3-4: Typical interventions proposed in RMC contract of iRoad Project

Type of Intervention	Description	Items*
Rehabilitation	Maintenance aimed at restoring the deteriorated road surface to its original condition	Patching, maintenance of hard shoulders, double bituminous surface treatment, asphalt concrete treatment, re-surfacing, continuous maintenance of hard shoulders, painting traffic signs and guard railings, maintenance of side ditches, etc.
Periodic Maintenance	Maintenance aimed at restoring the condition of partially deteriorated pavement to a certain level	
Routine Maintenance	Maintenance work performed on a daily basis to maintain the condition of road surfaces and delay their deterioration	Cutting back foliage along hard shoulders, patching cracks, laying earth on hard shoulders, repairing potholes, using the sand sealing method to repair pavement, etc.

* There is no clear distinction among the three types of maintenance, and details of the work involved vary only marginally between projects.

60. In addition, road furniture and markings will also be appropriately provided where necessary. At present, such furniture and markings are lacking in most parts of the three roads.

61. The general scope of work for the roads includes:

- **Initial repairs to the existing road surface**: This is carried out to prepare the road surface for resurfacing or overlay: these repairs may include bituminous patching, crack sealing, carriageway edges and shoulder repairs where traffic damage or erosion has occurred, cleaning of side drains and road culverts.
- **Overlay:** In all cases, the recommended improvements entail overlaying the existing pavement with a base or leveling course, designed for the projected number of Equivalent Standard Axles (ESA's) over the design life of the road, and resurfacing. Where a pavement is found to be severely deteriorated, broken or uneven, the existing surface would first be scarified and reshaped before applying the pavement surface.
- **Construction/widening of pavements**: This will involve earthworks, pavement construction, overlaying of the existing pavement and bitumen surfacing. Work will also include cleaning of roadside drains; culverts; cleaning of outlet drains and repairs to road furniture. Road pavements are constructed by 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.
- **Road Alignments:** In general, minor realignment may be made to alleviate small curves in the existing horizontal and vertical alignments. The widening will be carried out on the insides of curves for the roads. 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 localize sections of the road alignments. In densely populated areas, roads, bridges, and associated sidewalks are made accessible for all, including the disabled. Known black spots will be alleviated, and in some cases, minor adjustments may be made to the vertical alignment if visibility is considered a problem. This will include approaches to bridges and railway crossings on embankments.
- **Correction of undulations in the longitudinal profile**: Improvement work will include where technically appropriates the correction of irregularities in the road cross-section and severe undulations in the longitudinal profile.
- **Road Side Drains:** To minimize stormwater 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 suburban areas and for rural areas, earth drains are provided. For existing built-updrains, which can be retained with minor repairs (retained or repaired), the waterways are restored by removing sediment materials and debris.
- **Culverts and Bridges:** Improvement will be carried out to roadside drains, culverts, and bridges. Where existing structures are sound, then culverts will be lengthened, and bridges widened to suit the new road width. Where the condition of culverts and or bridges is poor, the structure will be replaced. Repairs, re-decking, widening and in some cases replacement of the structure of a bridge/culvert are the main rehabilitation activities concerning structural modifications. 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 by 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 the 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 by Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **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.

62. The following specific design standards and guidelines applicable to the interventions proposed by the RMC of the iRoad Project:

Roads:

i. Road Design Manual and Bridge Design Manual - RDA's standard

ii. AASHTO – Geometric Design of Highways and Streets 5th edition (2004)

iii. TRL – Overseas Road Note 6, A Guide to Geometric Design (1988), and

iv. Austroads –Rural Road Design (2003)

Bridges:

i. RDA's Sri Lanka Bridge Design Manual of 1997, based on the British Standards Code of Practice for Bridge Design (BS5400:1990)

Road Pavements:

i. Transport Research Laboratory's Road Note 31, 4th Edition (TRL-RN31), basis of RDA's pavement design process

ii. AASHTO Pavement Design Guide, and

iii. Design life for new pavements: 10-year life with a provision for overlays during or at the end of that period to extend the life to 15-20 years

Drainage:

i. RDA's standards incorporating relevant standards from AASHTO and the British Standard Design Manual for Roads and Bridges

E3. Extraction of Construction Material

63. Depending on Contractor's preference, construction material will be sourced from various locations to reduce haulage costs. The mainmaterials required for construction of the roadworks are soil and gravel and aggregates. The soil is used for embankment construction. Gravel is used for sub-base construction. Aggregates, which are crushed stone, requiring blasting, crushing, screening, and at times blending, is used for base-course construction and for bituminous surfacing. Sand, aggregates, cement, and steel are needed for structural work, such as culverts and repair work of bridges, and for drainage canals and concrete embankments if any. Approximate material quantities required for the civil works of all there roads are presented below.

Table 5: Estimated quantities of material required for RMC package in NCP

Type of material	Unit	Estimated quantity
Sand	Cu.m	20,495.00
Earth	Cu.m	670,515.00
Cement	Mt	9,556.50
ABC	Cu.m	317,585.00
Rubble	Cu.m	95.00
Metal	Cu.m	159,750.00
Bitumen	MT	10,975.00
Steel	MT	2,018.00

Source: Project Implementing Unit, RDA

64. The existing borrows pits, quarry sites, and availability of other material is given in Table 3-5.

Table 3-6: Possible sources for material sourcing

Material	Possible Location
Soils and Gravel	Kossawakanda, Maradankadawala Palugaswewa (at 128.5 km on A 09 Road) Katukeliyawa (at 128.5 km on A 09 Road Left) Siyambalewa (at 9.5 kmon A20 Road)
Asphalt	Maganeguma - Ganewalpola ICC – Ganewalpola CEC – Medawachchiya KDAW – Medawachchiya
Aggregates, rubble and quarry dust	Southern Group, Kanadarawa Siridantha M/C, Ruwangama, Katukeliyawa Mahagalkadawala M/C, Maradankulama

4 DESCRIPTION OF EXISTING ENVIRONMENT

A. Existing land use along the road

A1. Land Use

65. The road B213, Kekirawa - Thalawa runs through mainly the paddy land area of Mahaweli System H. Some scattered locations in the vicinity of the road have been occupied by small townships such as Kekirawa, Andagala, Eppawela, and Thalawa. These townships mainly consist of different scales of shops. Similarly, to townships located along the road scattered human settlements can also be seen in interior locations in-between paddy land areas.

Figure 4 : Existing land use along the B213 road

66. About 1 km section of the Kekirawa - Ganewalpola road runs through Kekirawa town and paddy land area of Mahaweli system H. The middle part of the road is located in ancient villages up to Ganewalpola Township. The vicinity of the road in the middle section is occupied by paddy land under small tank irrigation schemes. Some land cultivated under rainfed condition also can be seen in this area. The small section of the road in the beginning and end are occupied by shops in Kekirawa and Ganewalpola townships.

Figure 5: Existing land use along the B212 road

67. The road B 133 falls through paddy land under small irrigation schemes from Ganewalpola town up to the boundary of irrigation command area of Huruluwewa scheme. Paddy land and scattered located scrubs can be observed in this section. The rest of the road section traverses for a long distance across Huruluwewa command up to Konwewa junction. Some scattered townships such as Yakkalla, Galenbidunuwewa are located in this section of the road. The road from Konwewa junction up to its end also falls in agriculture area under small tank systems.

Figure 6: Existing land use along the B133 road

68. A pictorial description of land-use of the Roads is provided in Appendix 3.1, 3.2 and 3.3.

A2. Existing condition of the carriageways and the pavements

69. The existing carriageway of the three roads varies from 5.0 m to 7.0 m in width within the corridors that generally have adequate width to support some widening where required. B 212 and B213 routes generally followgood horizontal and vertical alignments and havegood drainage provision. Along the B 212, the carriageway, pavements and the drainage provisions have recently been rehabilitated, and no further interventions are needed for a stretch of about 10 km from Kekirawa towards Thalawa. However, along with B 133, the vertical and horizontal alignments are not very satisfactory at certain locations, and drainage canals are not sufficient. Moreover,along the B 133, the shoulders are 'soft' which has resulted in pavement edge erosion presenting a safety hazard to traffic and to pedestrians who must use the shoulder as a walkway.

70. In all the three roads, outside of the developed areas, traffic speeds are of the order of 50 - 60 km / h, as the pavement, is narrow and only considered to be in 'fair' condition overall. Footpaths, pedestrian barriers and off-road trishaw parking areas are clearly needed at the Dachchi Hammillewa, Galenbindunuwewa, Ganewalopola, Kekirawa, Maha Iluppallama, and Thalawa areas, especially near junctions. Improvements are needed which are associated with road markings and signage.

71. The conditions of the roads are provided in detail in Appendix 3.1, 3.2 and 3.3.

Table 7 : The conditions of the roads

No	Road Section Name	Route No.	Existing **Carriage Width(m)**	Proposed **Carriage Width(m)**	**Section length (km)**
1	Kakirawe- Thalawa	B 213	7.0-8.0 4.0 – 5.5	7.5	00.00 to 10.00 27.41 to 37.41
2	Kakirawe Ganewalpola	B 212	3.9 – 4.5	7.5	6.95
3	Ganewalpola-Dachchahalmillewa	B 133	4.0 - 5.5	7.5	45.86
Sub Total					**90.22**

A3. Existing condition of culverts and bridges

72. For the three roads, the inventory of existing bridge structures (bridges being defined as any structure with a span >3 m) are given in Appendix 6.1, .6.2 and 6.3; Table 4.2a, 4.2b,and 4.2c. Almost all of them were found to be a satisfactory condition from a structural point of view by the field evidence collected – this assessment has since been checked visually only, and detailed structural assessments are needed.

73. The existing cross culverts were identified within the subject corridor and assessments made of present conditions and improvements needed at each site are provided in Annex Appendix 6.1, 6.2 and 6.3.

74. Details of the hydraulic condition and of the recommended treatments at each location to address both reported and perceived problems shall be contained in Engineering Assessment Reports. A visual inspection showed that the majority of the existing culverts were deemed to be hydraulically and structurally satisfactory, many of them were found to be silted and partially blocked. Most inlet/outlet openings need to be cleared. It was also observed that most of the lead away drains of the culverts were similarly affected by silt deposits, vegetation or otherwise restricted by encroachments – most of them being in need of at least, clearing and cleaning.

B. Physical Environment

B1. Climate, land use, terrain and soil

75. Based on major climatic zones of the country, the candidate road section of B133/B212/B213 Road falls within the area classified as the Dry Zone where the annual average rainfall is between 1200 mm and 1900 mm.

76. The climate of the project area is further categorized into Agro-ecological Zones (AEZ) which are categorized based on climate, soil, natural vegetation and land use pattern of an area. 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*.

77. The general climate that prevails in Anuradhapura area in the North Central Province where the proposed candidate road B133/B212/B213 is situated is characterized by hot and dry weather for the most part of the year. The region's rain climate follows the typical pattern that is found in the Dry Zone of Sri Lanka. The region remains dry from March to September except for a short spell of rain in April. Heavy rains occur during the inter-monsoon months of October and November followed by Northeast monsoon rains from December to February. Rainfall distribution is influenced by monsoon winds from passing over the Indian Ocean and the Bay of Bengal.

78. The general topography of Sri Lanka comprises of three distinctive peneplains or erosion plains made up of a central highland massif rising above 2,500 m in altitude and a low gently undulating plain surrounding it and extending to the sea. The lowest peneplain extends from the coastline to approximately 20 ~ 30 km inland in a steep step of about 300 m above mean sea (MSL). The middle peneplain is characterized by rising undulating terrain and isolated hills with a maximum elevation of about 800 m above MSL. Located within it and rising from it in another step of 1000 m to 1,300 m is the highest peneplain at a general level of about 2,000 m above MSL, but rising in places to 2,300 m to 2,700 m in the form of isolated hillocks and mountain ranges towards further inland.

79. The proposed candidate road section of B133/B212 or B213, situated in Anuradhapura District in the North Central Province, lies within the second peneplain/lowermost and the second peneplains.

80. The specific agro-ecological zones (AEZ) and other characteristic land use, terrain and soil details related to candidate road section and their characteristics are presented in the following Table 4.1.

Table 4-8: Climatic characteristics of candidate roads

Section of the Road	Agro-ecological Zone	75% Expectancy Value of Rainfall (mm)	Description		
			Land-use	Terrain & Peneplane	Soil Groups
Ganewalpola – Dachihalmillawa Road (B133)	DL_{1b}	762	Irrigated paddy, lowland crops, rain-fed crops, scrub, mixed, home gardens	Undulating Second Peneplane	Reddish Brown Earth and Low Humic Gley Soils
Kekirawa – Ganewalpola Road (B212)	DL_{1b}	762	Irrigated paddy, lowland crops, rain-fed crops, scrub, mixed, home gardens	Undulating Second Peneplane	Reddish Brown Earth and Low Humic Gley Soils
Kekirawa – Thalawa Road (B212)	DL_{1b}	762	Irrigated paddy, lowland crops, rain-fed crops, scrub, mixed, home gardens	Undulating First & Second Peneplanes	Reddish Brown Earth and Low Humic Gley Soils

81. Monthly average rainfall and temperature variation over the year in Anuradhapura is presented in Figure 4.1 below.

B2. Hydrology

82. **Surface Water Resources:** Figure 4.2 illustrates the location map of the candidate roads B133/B212/B213 with their hydrological setting including the location of major river basins, rivers/streams, and reservoirs. The candidate road section is situated within the Dry Zone of the country and many small to medium/moderate size irrigation reservoirs called as "Tanks" are observed in the region.

83. The candidate road, Ganewalpola – Dachihalmillawa Road (B133) crosses Aruvi Ara (Malwathu Oya/Stream) and Yan Oya (Stream) river basins.

84. The candidate road, Kekirawa – Ganewalpola Road (B212) crosses Kala Oya (Stream) and Aruvi Ara (Malwathu Oya/Stream) river basins.

85. The candidate road, Kekirawa – Thalawa Road (B213) crosses Modaragam Ara (Stream) and Kala Oya (Stream) river basins.

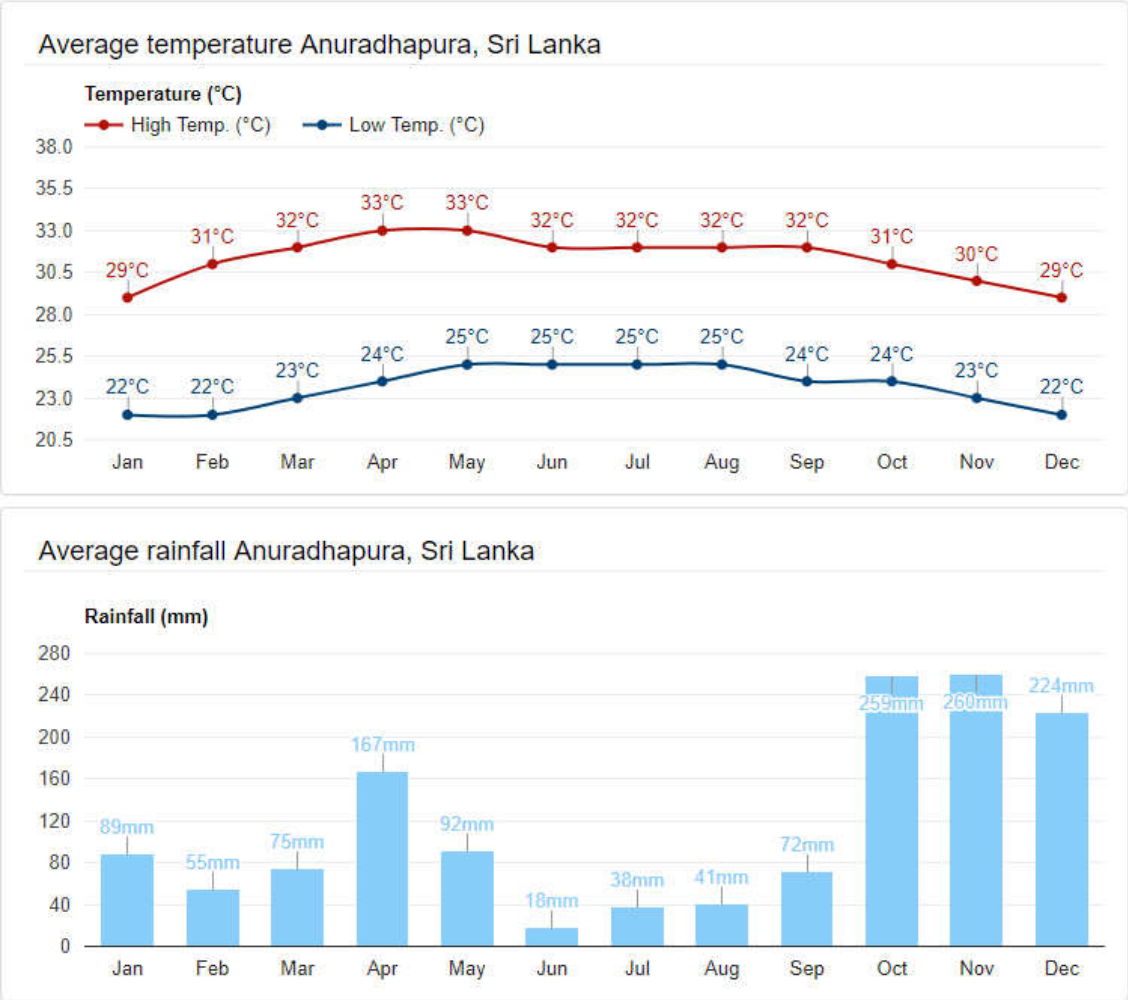

Figure 4-4: Rainfall and temperature variation of Anuradhapura District (Source: Meteorological Department, Sri Lanka)

86. Agriculture is comprehensively practiced in the project area. Therefore, such irrigation tanks are commonly observed which are built to collect rainwater during monsoonal months. Some road sections are located in the close proximity of these irrigation tanks and their associated distributary canal networks. The particular locations at which stream tributaries are crossed by the road are given in Table 4.2 below.

87. **Groundwater Resources**: Dug wells are commonly observed within home gardens along the road, and shallow groundwater is used to fulfill domestic requirements by the households.

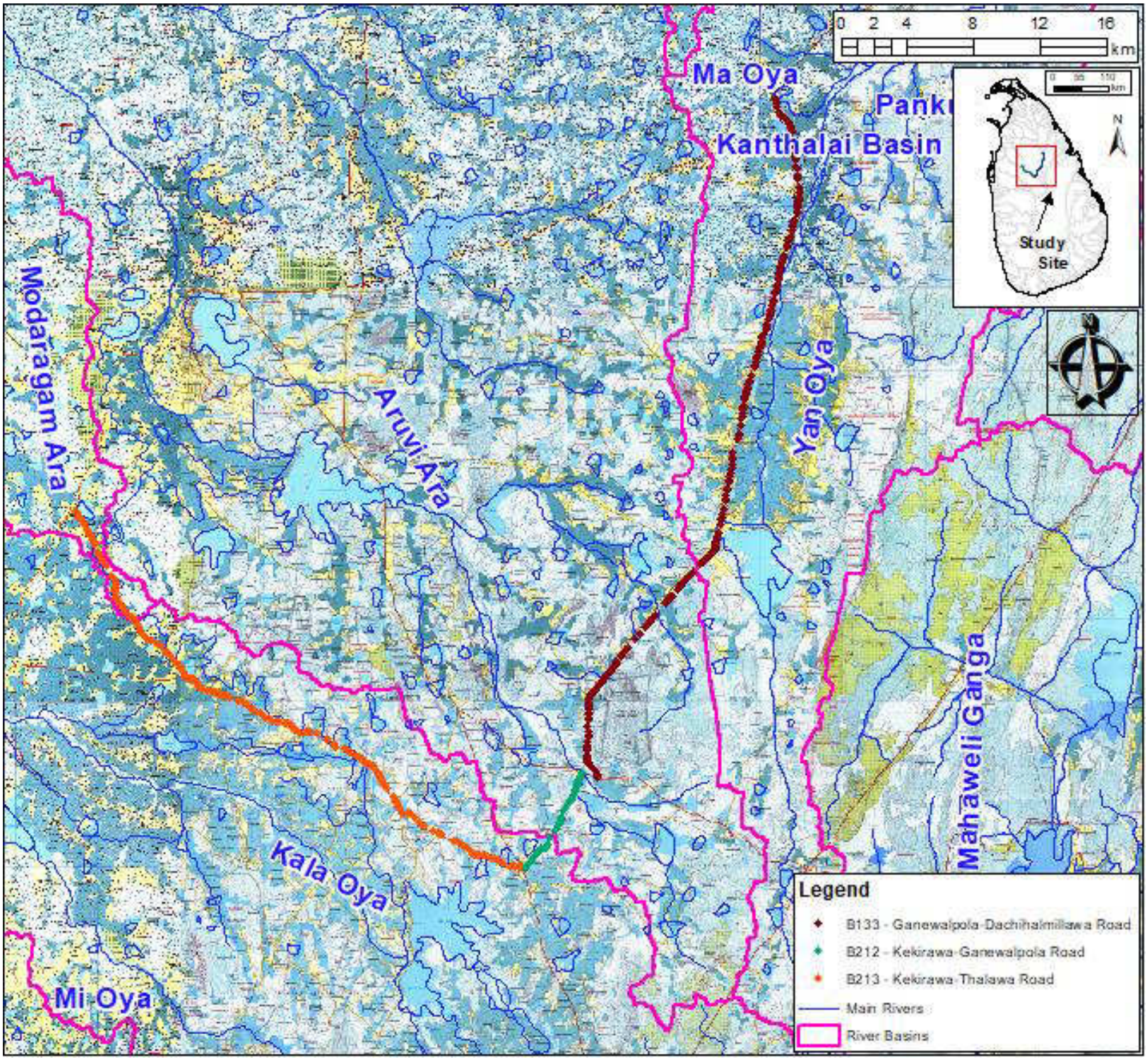

Figure 4-5:Location Map of candidate road sections with their hydrological setting (Base Map: 1:50,000 Topographical Maps, Survey Department, Sri Lanka)

Table 4-9a: Location of water bodies along B 133 Road

No.	Water Body/Stream	Location with respect to the road	Structure available and its present condition
1	Alagollewa Wewa (Tank)	Road crosses the catchment area around 7 km	Bridge/Culverts (3 Culverts) is in unacceptable condition.
2	Manakattiya Wewa	Road crosses the catchment area around 12.5 km	Culverts (2 Culverts) are in unacceptable condition and the road section need to be raised.
3	Hurulu Wewa	Road crosses the catchment area around 12.2 km	Culverts (2 Culverts) are in unacceptable condition and the road section need to be raised.
4	Yan Oya	Road crosses the catchment area around 33 km	A small bridge is in unacceptable condition.
5	Hettu Wewa	Road crosses the catchment area around 36.7 km	Narrow bridge is in unacceptable condition.
6	Kon Wewa	Road crosses the catchment area around 38 km	Culverts and Bridge is in good condition but need to be raised.
7	Ithalwetunu Wewa	Road crosses the catchment area around 41 km	Culvert is in unacceptable condition and rod need to be raised in this section.
8	Welana Wewa	Road crosses the catchment area around 42 km	Culverts (2 Culverts) are in unacceptable condition and the road section need to be raised.
9	Diyamailagaswewa	Road crosses the catchment area around 43 km	Culverts (3 Culverts) are in unacceptable condition and the road section need to be raised.
10	Mahahalmillewa Wewa	Road crosses the catchment area around 44.5 km	Culverts (2 Culverts) are in unacceptable condition and the road section need to be raised.

Table 4-2b: Location of water bodies along B212 Road

No.	Water Body/Stream	Location with respect to the road	Structure available and its present condition
1	Mankadawala Wewa	Road crosses the catchment area around 2.0 km	Culverts (2) are in unacceptable condition.
2	Ganewalpola Tank	Road crosses the catchment area around 6.0 km	Bridge is in good condition.
3	Maha Mankadawala Wewa	Road crosses the catchment area around 6.0 km	

Table 4-2c: Location of water bodies along B213 Road

No.	Water Body / Stream	Location With Respect to the Road	Structure Available and Its Present Condition
1	Malawa Wewa	Road crosses the catchment area around 1.1 km	Culverts (2) are in unacceptable condition.

No.	Water Body / Stream	Location With Respect to the Road	Structure Available and Its Present Condition
2	Nikiniya Wewa	Road crosses the catchment area around 2.0 km	Culverts are in unacceptable condition.
3	Maylagas Wewa	Road crosses the catchment area around 3.7 km	Culverts are in unacceptable condition.
4	Muduperugama Wewa	Road crosses the catchment area around 6.8 km	Culverts are in unacceptable condition.
5	Kumbuk Wewa	Road crosses the catchment area around 8.1 km	Culvert(Spill Out) are in unacceptable condition
6	Hiripitiyagama Wewa	Road crosses the catchment area around 9.2 km	Narrow bridge and culvert are in unacceptable condition.
7	Kunchikulama Wewa	Road crosses the catchment area around 10.7 km	Culvert in good condition
8	Yodha Ela	Road crosses the catchment area around 11.5 km	Irrigation canal and the bridge is in good condition
9	Ganthiriyagama Tank	Road crosses the catchment area around 12.3 km	Culvert in good condition
10	Gonapathirawa Tank	Road crosses the catchment area around 14.7 km	Culverts are in unacceptable condition
11	Keledivulwewa Tank	Road crosses the catchment area around 18.4 km	Culverts are in unacceptable condition
12	Galmaduwa Wewa	Road crosses the catchment area around 16.3 km	Culverts are in unacceptable condition
13	Eppawala Tank	Road crosses the catchment area around 21.2 km	Bridge in good condition
14	Eliyadivulwewa Tank	Road crosses the catchment area around 23.8 km	Bridge in good condition
15	Kiralogama Tank	Road crosses the catchment area around 28.7 km	Bridge in good condition
16	Ihalathalawa Wewa	Road crosses the catchment area around 33.7 km	Culvert in good condition

B3. Water Quality

Surface Water Quality

88. The water quality of the tanks essentially follows that of the activities that place within the watershed and the catchment, which would lead to accumulation of nutrients and fertilizer residues from surface runoff. Water data is very scarce and generally inadequate to construct base maps. However, the water samples were collected during the field visits, and the quality parameters are shown in Table 4.3.

Table 4-10: Surface water quality of selected water bodies along the three roads (date of sampling: 21/01/2018)

Parameter	Standard Level[1] for Class III waters	Ganewalpola - Dachchi Hammillewa Rd (B 133)		Kekirawa - Ganewalpola Rd (B 212)	Kekirawa - Thalawa Road (B 213)	
Location		8°13'13.37"N 80°42'38.51"E	8°26'33.70"N 80°44'44.91"E	8° 3'18.82"N 80°36'38.03"E	8° 5'44.58"N 80°30'45.31"E	8° 4'24.24"N 80°31'46.31"E
Temp. (°C)	-	29.8	29.9	28.7	28.9	30.0
pH	5.5 - 9.0	6.91	6.50	7.29	6.85	7.95
Turbidity (NTU)		16.2	18.3	26.3	24.4	38.5
Conductivity (mS/m)	-	92.4	23.9	50.6	19.5	79.5
DO (mg/l)	3.0	5.0	6.3	6.7	5.7	5.9
TDS (mg/l)	-	296	169	384	447	554
BOD (mg/l)	5.0	4.2	6.6	8.0	16.4	24.1
COD (mg/l)	40.0	32.4	53.9	40.6	39.5	79.5
Nitrates (NO_3-N) (mg/l)	5.0	3.7	5.2	8.0	4.6	7.0
Total Phosphate (PO_4-P) (mg/l)	0.7	0.5	0.7	0.6	0.9	0.8
Oil & Grease (mg/l)	-	0.0	0.006	0.273	0.001	0.007
Total Coliforms (MPN/100 ml)	-	500	5,000	50	3,000	50
Fecal Coliforms (MPN/100 ml)	-	80	230	8	230	13

[1] Standard limits as specified for Class III Waters in the Proposed Inland Water Quality Standards of Sri Lanka (Source: Central Environment Authority)

GroundwaterQuality

89. The water resources of the area are predominantly used for irrigation and domestic purposes. The ever-increasing extraction of groundwater poses a threat to the aquifer and ultimately to the livelihood patterns of the people. No reliable longer-term data are available for changes in water quality in the north-central aquifers. It is apparent that intensive irrigation and comparatively dense habitats in urban settings have resulted in an over-extraction of water and subsequent deterioration of water quality over time. Since most of the agro-wells are not operated in any systematic manner,depletion of the groundwater table may occur.Groundwater samples were collected during the field study,and the quality parameters are shown in Table 4.4.

Table 4-11: Groundwater quality of selected water bodies along the three roads (Date of sampling: 21/01/2018)

Parameter	Ganewalpola - Dachchi Hammillewa Rd (B 133)		Kekirawa - Ganewalpola Rd (B 212)	Kekirawa - Thalawa Rd (B 213)	
Location	8°26'13.75"N 80°44'45.50"E	8°11'24.75"N 80°40'47.53"E	8° 3'15.76"N 80°36'39.66"E	8° 4'31.68"N 80°31'40.62"E	8° 4'59.63"N 80°31'22.52"E
Temp. (°C)	26.3	27.5	26.5	28.0	26.3
pH	5.37	6.67	7.20	7.29	7.21
Turbidity (NTU)	2.1	36.2	4.0	1.9	5.4
Conductivity (mS/dm)	71.8	79.0	70.8	75.9	79.5
TDS (mg/l)	92	365	264	279	491
Alkalinity (mg/l)	30	150	210	280	280
Hardness (mg/l)	661	198	282	195	247
TN (mg/l)	0.4	1.0	0.1	0.5	4.7
TP (mg/l)	0.3	<0.1	<0.1	0.6	0.8
Total Coliforms (MPN/100 ml)	23	7	23	17	130
Faecal Coliforms (MPN/100 ml)	8	<2	2	2	17

Note: There are no Standards in Sri Lanka for comparison purposes.

B4. Air Quality and Noise

90. No baseline survey has been carried out to measure air quality in the areas recently. According to available information in 1999, the concentration of ambient air quality parameters in the project area are well below National Ambient Air Quality Standards (NAAQS) (See Table4.5). Since the project area is free from large-scale industries, high emissions of air pollutants could not be observed. However, there are two quarry sites in Ganewalpola and their asphalt plants which are currently operating. But they manage their

emissions well. Further, dust emanation from gravel roads during the dry season, the operation of vehicles, burning of forest patches for chena cultivation, wood and kerosene burning stoves can temporally impact on local air quality. However, since the project area is rich in vegetation; all such emissions will be very well dissipated.

91. Sri Lanka is a signatory to the Malé Declaration on control and prevention of air pollution and its likely transboundary effects for South Asia. The Sri Lankan monitoring site was located at Dutuwewa, Galenbindunuwewa (N 08 20.952; E 80 45.751) and parameters such as O_3, PM_{10}, TSPM, SO_2 and NO_2, NO and NO_x were measured. Some data from that station is the closest to this site as per Air Quality. Figures 3 show some of the data collected from the monitoring station.

92. According to the information available at the National Building Research Organization, the concentration of the particulate matters (particle size is less than 10 micron – PM_{10}) in the ambient air at Anuradhapura area in 1999, shows that the measured values are well below the NAAQS (Table 4.6). However, there is no recent data available. It is important to note that the current situation, after nearly 20 years, the present situation must be different from than that of the available data. Therefore, it is recommended that the present air quality of the project area (appropriate locations in or around Dachchi Hammillewa, Huruluwewa, Galenbindunuwewa, Ganewalpola, Kekirawa, and Thalawa) is monitored before the construction begins, which can be left as monitoring stations during construction, if any further measurements are needed.

Table 4-12: 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)

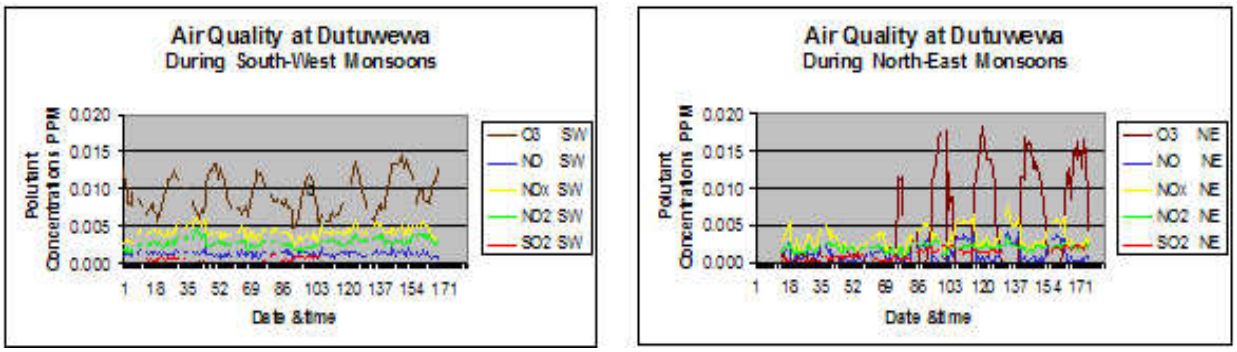

Figure 4-9: Observations at the Air Quality Monitoring Station at Dutuwewa, Galenbindunuwewa in the Year 2005

(Source: RNR Jayaratne, Central Environmental Authority)

93. The CEA has measured levels of few air quality parameters during 1999, of which the values are presented in table 4.6. An extract from the National Environmental (Ambient Air Quality) Regulations, declared in 1994 is presented in Table 4.6.

Table 4-13: Air quality measurements as at 1999 in Anuradhapura

Parameter Value	Value
CO	3 ppm
PM_{10}	45 μgm^{-3}
NO_2	0.01 ppm
SO_2	0.02 ppm

Source: Environmental Atlas (2005), Central Environmental Authority; ISBN: 9559012312

94. The three road sections proposed for rehabilitation are located mainly within semi-urban and rural residential and agricultural areas. A considerable number of vehicles pass these roads mainly during the daytime. Therefore, the noise levels may be higher than the permissible levels during busy hours. The exact noise level measurements within the project area were not available in any of the respective Government Institutes, and Noise level measurements were taken for the present study (Table 4.7). Therefore, it is recommended that the presentnoise levels of the project area (appropriate locations in or around Dachchi Hammillewa, Huruluwewa, Galenbindunuwewa, Ganewalpola, Kekirawa,and Thalawa) is measured before the construction begins, which can be left as monitoring stations during construction, if any further measurements are needed.

Table 4-14: Measured ambient noise levels (day-time)(date of sampling: 21/01/2018)

Location	Coordinates	Noise level Leq in dB(A)[1]	Time of measurement	Remarks
Ganewalpola - Dachchi Hammillewa Rd (B133)				
Alagollewa	8° 8'36.24"N 80°38'29.84"E	54	12.21 p.m.	Sunny
Yakalla	8°13'34.37"N	52	11. 58 a.m.	Sunny

Location	Coordinates	Noise level Leq in dB(A)[1]	Time of measurement	Remarks
	80°42'18.22"E			
Galenbindunuwewa	8°17'27.10"N 80°43'3.54"E	61	10.47 a.m.	Sunny, moderate traffic
Mahapotana	8°23'20.20"N 80°44'41.26"E	56	08.57 a.m.	Cloudy
Dachchi Hammillewa	8°28'1.67"N 80°44'5.90"E	58	08.02 a.m.	Cloudy
Kekirawa - Ganewalpola Road (B 212)				
Ganewalpola	8° 5'23.28"N 80°37'41.50"E	60	13.12 p.m.	Sunny
Mankadawala	8° 3'16.12"N 80°36'38.85"E	58	13.58 p.m.	Sunny
Kekirawa	8° 2'27.12"N 80°35'56.85"E	62	14.21 p.m.	Sunny, moderate traffic
Kekirawa - Thalawa Road (B 213)				
Kekirawa	8° 2'26.69"N 80°35'44.82"E	65	14.28 p.m.	Sunny, moderate traffic
Gonapathirawa	8° 6'19.56"N 80°29'51.51"E	60	15.48 p.m.	Sunny
Maha Iluppallama	8° 6'53.20"N 80°28'21.25"E	59	15.59 p.m.	Sunny
Endagala	8° 8'8.41"N 80°25'46.13"E	57	14.41 p.m.	Sunny
Thalawa	8°14'11.11"N 80°21'3.44"E	61	17.55 p.m.	Cloudy, moderate traffic

[1]Duration of measurement: 360 secs.

95. All noise measurements were carried out about 5 m away from the road,and high noise levels were predominantly due to the vehicular movement along the road in front of the proposed premises. Night-time levels were also measured (not shown above),and the levels were somewhat suppressed (ranged from 40–49 dB(A) compared to those of daytime due to the lesser number of vehicles in the road.

96. According to Schedules I and II of National Environmental (Noise Control) Regulations, No.1 of 1996 (924/12), the study area belongs to Low noise area, as all the three roads are located within Pradeshiya Sabha Areas. Therefore, the maximum permissible noise levels at the boundary of the land in which any source of noise is located, shall not exceed (in L_{Aeq}, T) of the area can be considered as 55 dB(A) during daytime (06.00 hrs-18.00 hrs) and 45 dB (A) night time (18.00 hrs - 06.00 hrs). For construction activities, the maximum permissible noise levels at boundaries of the land in which the source of noise is located (in L_{Aeq},T), are 75 (daytime) and 50 (night time).However,

measured noise levels sometimes exceed the maximum noise levels, which is mainly due to the continuous traffic movement along these three roads during the period of measurement.

97. With reference to the National Environmental (Noise Control) Regulations, No.1 of 1996, noise sensitive areas include: an area in which a courthouse, hospital, public library, school, zoo, a sacred area, and areas set apart for recreation or environmental purposes. An area covered by a distance of 100 m from the boundary of these sensitive areas are referred to as Silent Zone, where the maximum permissible noise levels at the boundary of the land in which any source of noise is located, shall not exceed (in L_{Aeq}, T) of the area can be considered as 50 dB (A) during daytime (06.00 hrs-18.00 hrs) and 45 dB (A) night time (18.00 hrs-06.00 hrs).Noise sensitive receptors along the three roads are given in Table 4.8.

Table 4-15: Noise sensitive Receptors along the three roads

Chainage (m)	Noise Sensitive Receptor	Side of the road
Ganewalpola - Dachchi Hammillewa Rd (B133)		
3,690	Mosque	LHS
5,350	Muriyakadawala Mithree College	LHS
6,490	Church	RHS
6,540	School	LHS
11,140	Moragoda Shadhar College	LHS
11,280	Moragoda Police Station	LHS
16,250	Isipathana Meheni Aramaya	LHS
16,780	Yakalla Maha Vidyalaya	RHS
17,600	Yakalla Hospital	LHS
18,530	Sri Whardhanaramaya Temple	LHS
25,500	Galenbidunuwewa Hospital	LHS
27,420	Thakshila Maha Vidyalaya	LHS
42,170	Ithanwetunawewa Muslim School	LHS
43,340	Sri Dhamma Rakkitharamaya Temple	LHS
44,250	Diyamailagaswewa School	RHS
45,480	Temple	LHS
Kekirawa - Ganewalpola Road (B 212)		
3,080	School	LHS
5,110	Kovil	RHS
6,220	School	RHS
Kekirawa - Thalawa Road (B213)		
1,250	Kekirawa School	LHS
7,180	Murarumagama School	LHS

Chainage (m)	Noise Sensitive Receptor	Side of the road
8,930	Sri Dinendraramaya	RHS
9,420	Hiripitiyagama School	LHS
17,070	Mahallukpallama Maha Vidyalaya	LHS
19,410	Kale DiulWewa Maha Vidyalaya	RHS
28,470	Galkanda Purana Viharaya	LHS
31,640	Subodhi Maha vidayala	LHS
31,980	Temple	RHS
34,260	Galnewa Anandhodaya vidyalaya	LHS
35,820	Mobile Shop/Kovil	LHS

B5. The occurrence of Natural Disasters in the Project Area

98. **Floods**:Anuradhapura District was affected recently due to extreme weather events in 2011, 2012, 2014 and 2016 and resultant floods. Based on records, over 125,000 ~ 250,000 people have been affected due to floods in Anuradhapura during these events. Low lying areas of Galnewa, Ipalogama, Thalawa, Tambuttegama, Kalaoya and YanOya are inundated while Horowpathana town is reported to be heavily flooded in the year 2011 flood and other similar flood events in the aftermath

(Source: http://www.onlanka.com/news/floods-hit-over-1-2-million.html and http://www.redcross.lk/news/over-675000-affected-in-inclement-weather-in-sri-lanka/).

99. However, above mentioned major flood prone locations of Anuradhapura District are not falling within the present project influential area but severe localized flooding has been observed in B133-Ganewalpola – Dachihalmillawa and B212-Kekirawa – Ganewalpola road segments.

C. Ecological Environment

1. General description of the project area

100. The proposed road traverses (B 212, B213 and B 133), approximately 90 km in length is entirely laid in the dry zone and belongs to the low country, DL_1 agro-ecological zone. Biogeographically, it falls under Floristic Zone; II: Dry and Arid Lowlands (within the dryzone) according to the floristic regions of Sri Lanka (Ashton and Gunatilleke, 1987). The vegetation cover generally comprises of dry mixed evergreen forest type (Arjuna's Atlas of Sri Lanka, 1997). In general, the study area is attributed to rural/semi-urban agricultural set-up, which governs by the northeast monsoon and irrigation canals system.

2. Major Habitat Types

101. The proposed road traverses (B 212, B213 and B 133) 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, crop cultivations, roadside vegetation

Aquatic Habitats

Water tanks and irrigation canals

102. The study area is comprised of a number of water tanks and irrigation canals, which has been built in the ancient past of Sri Lanka. These water tanks supply the water for agricultural lands via canals. Meantime, it provides habitats for fish and other aquatic fauna such as amphibians, terrapins and other aquatic invertebrates. Also, these streams and tanks are used for fishery purposes, and harvested fish is a nutritional supplement for the rural communities. Many of these tanks also have aquatic vegetation. However, during field visit, it was noted that some of them are dried-up due to drought.

Terrestrial habitats

Paddy fields

103. Paddy fields are attributed to the presence of stagnating water, which is temporary and seasonal in nature. Therefore, flooded rice fields are considered as agronomical managed marshes, and the main crop of the rice field is *Oryza sativa.* It provides temporary/seasonal aquatic habitats depending on the rain intensity and wetter period. Also, paddy fields provide regulating services by increasing water storage of the catchment, trapping of sediments, percolation from rice field help to recharge groundwater. Moreover, paddy fields are valued for their scenic beauty. These paddy fields are fed by the irrigation canal system and Northeastern Monsoon rain. However, cultivated and abandoned paddy lands could be observed in the project area. Some abandoned paddy fields serve as grazing grounds for cattle.

Home gardens

104. Home gardens found along the study routes are comprised of fruits, vegetable crops (*Zea mays, manioc*) cultivations, ornamental plants, medicinal plants, fuelwood and timber trees. Among them, coconut, jack, neem, and mango were commonly observed. Also, commercially valuable exotic timber species such as teak and mahogany were also observed in home gardens. These home gardens provide important habitats for flora and fauna and are valuable as habitat links providing connectivity between natural habitats.

Roadside vegetation

105. The roadside vegetation improves air quality, enhance the aesthetic beauty of the area, provide shade, retain soil moisture and conserve soil. The tree cover along the road traverses is dominated by *Terminalia arjuna*(Kumbuk), *Manilkara hexandra* (Palu), *Chloroxylon sweitenia* (Burutha), Kon *(Schleichera oleosa),Drypetes sepiaria* (Weera), *Feronia limonia* (Divul), *Vitex altissima* (Milla), *Syzygium spp* (Dan), *Azadirachta indica* (Kohomba), *Chukrasia tabularis* (Hulan Hik), *Bauhinia racemosa* (Maila), *Pterospermum suberifoliu* (W*elang*)*, Cassia fistula* (Ehala)*,Tamarindus indica* (Siyambala) and *Delonix regia*

(Mara).Please refer to Appendix 4.1, 4.2 and 4.3 for the list of roadside trees which are located within 2m corridor from the edge of the existing RoW. The detail description of each road transect (B212, B213 and B133) along the road transects discussed separately in sections below.

I. Kekirawa- Thalawa (B213)

106. The project road spans between A9 Road at Kekirawa and A28 Road at Thalawa. The Road is having a length of 37.41 km. The road is in a flat terrain passing through water tanks, irrigation canals, paddy fields, crop cultivations, shrublands/scrub forest, home gardens, moderate residential and commercial land use. The details of flora and list of trees with 600 mm of girth (at breast height) are given in Appendix 4.3.

II. Kekirawa – Ganewalpola (B212)

107. The road is having a length of 6.95 km road traverse passes through the hassle-free rural segment (Figure 4.4). It includes paddy field, home gardens, scrub forest, Mankadawala wewa (which has been dried). The details of flora and list of trees with 600 mm of girth (at breast height) are given in Appendix 4.2.

Figure 4-10: Some road segment of Kekirawa-Ganewalpola road

III. Ganewalpola –Dachchi Hammillewa (B133)

108. This road occupies approximately 46 km and spread over the agricultural land, semi-urban and residential areas. The road traverse comprises of the low-lying area (chainage 43.75 km to 44.5 km with narrow road width (approx..5–6 m) (Figure 4.5). The low-lying area consists of stagnated water, which could be considered as a part of an abandoned lake. However, this particular road stretch provides habitat for aquatic flora, fauna and terrestrial fauna such as butterflies, dragonflies, and birds. The Kumbuk (*Terminalia arjuna*) tree belts could be observed along the road stretch at the chain edge (5.0 km – 5.25 km), (32.75 km – 33.0 km), (44.0 km – 44.5 km), (42.5 km – 43.0 km) and (40.5 km – 40.7 km). Also, some larger trees above 600 mm dbh have located very close to the existing road traverse (Figure 4.6**)**. The details of flora and list of trees with 600 mm of girth (at breast height) are given in Appendix 4.1.

Figure 4-11: Low-lying area with the narrow road stretch

Figure 4-9: Kumbuk tree belts found along the B133 road stretch

109. Hurulu wewa, Yan oya, Komarikwala wewa, Hettu wewa, Kon wewa, Italwetunu wewa and Diyamailagas wewa could be observed as aquatic ecosystems, at proximity to the B133 road traverse.

110. The road traverses close to the Ritigala Strict Natural Reserve (1,528 ha) at the chainage from 0.0 km to 9.75 km (nearest location of the SNR is about 750 m away from the road). It belongs to IUCN management category of Ia and managed by Department of Wildlife and Conservation. The Ritigala is a mountain forest, and its highest point of elevation is Kodigala (766 m MSL) (Priyadarshna and Fernando, 1996). There are few streams flow down during the rainy season and dried-up during the dry season.

Figure 4-13: Ritigala Strict Nature Reserve is situated close to B 133

111. The Ritigala forest is the watershed of the Malwatu Oya which feeds the Nachchaduwa tank and Kalueba Ela which feeds Huruluwewa. This seasonal change and the topography result in a unique habitat of the wet and dry zone. Therefore, dry mixed forest type of vegetation such as *Manilkara hexandra* (Palu), *Chloroxylon sweitenia* (Burutha), *Vitex altissima*(Milla), *Berryasp* are dominant in Ritigala mountain area. An ancient Buddhist monastery situated within the SNR date back to 1st century BC. This area is inhabited by wild elephants.

112. The avifauna present in this area comprises of, Black-capped Bulbul, Black Bulbul, Brown-capped Babbler, Malabar Pied Hornbill, Ceylon Grey Hornbill, Black-naped Flycatcher, Thick-billed Flowerpecker, Black Eagle, Crested serpent, Crested Hawk Eagle, Common Hill Mynah, Indian Pitta, White-rumped Shama, etc.

113. Labunoruwakanda forest reserve occupies 10.84 km^2 and is located close proximity to B133 road stretch at the chainage from ~ 8.5 km to 11.5 km. It belongs to IUCN management category “Ib” and managed under the Forest Department.

Figure 14: Labunoruwakanda Forest reserve

1. Flora and Fauna of the project area

114. The total species list of flora and fauna are listed in Appendix 7.1 and 7.2. There are three endangered species (EN); Ebony, (*Diospyros ebenum*), Helmba (*Mitragyna tubulosa*), Kalu mediriya (*Diospyros chaetocarpa*) and six Near Threatened species (NT); Gas penela / Kaha penela (*Sapindus trifoliate)*, Goda Kirilla (*Holoptelea integrifolia*), Mi (*Madhuca longifolia*), Milla/Kahamilla (*Vitex altissima*), Vasa kaduru (*Petchia ceylanica,* Bakmee (*Anthocephalus chinensis*) while two vulnerable species (VU); Burutha tree, (*Chloroxylon swietenia*), Palu tree (*Manilkara hexandra*)are observed in the project area. However, these species are not restricted only to the project area but distributed throughout the floristic zone.

115. The information provided by DWLC officers and the local people, herds of elephants from nearby scrub areas and they cross the existing road traverses in the project area. The Asian elephant is considered an endangered species (National Red List 2012 of Sri Lanka). Elephants are attracted to the water tanks as the water levels drop in the dry season, the tank beds become lush grassland, providing the animals with fodder.

116. Also, several other small mammals (e.g., fox) were observed in the project area. Freshwater fish species inhabit in the inland tanks of the project area. In the association of water bodies, several species of wetland birds such as storks and egrets are present. Please refer Appendix 7.2 for the list of fauna species observed in the project area.

Elephants passing corridors

i. **Kekirawa- Thalawa (B213)**

3.50 km – 3.75 km

4.50km – 4.75 km

ii. **Kekirawa – Ganewalpola (B212)**

1.50 km – 3.70 km

iii. Ganewalpola –Dachchi Hammillewa (B133)

0.00 km – 0.25 km

0.75 km – 1.00 km

7.00 km – 7.25 km

9.75 km – 10.00 km

D. Socio-Economic Environment

117. Population in Anuradhapura District: The 3 road sections selected for improvements originate from Kekirawa town in Anuradhapura district. These road sections are much significant in terms their connectivity impacts. Kekirawa – Thalawa road is connected to Anuradhapura town via Thalawa and Kekirawa Ganewalpola road section together with Ganewalpola – Dachchi Hammillewa road connects to Trincomalee, Polonnaruwa and Batticaloa Districts. Anuradhapura district can be considered as a larger catchment area of the 3 candidate roads. Some people in Anuradhapura district use these road sections to reach Colombo and Kandy. The population in Anuradhapura district is 918,000 comprising 448,000 males and 470,000 females.

118. Industries in Anuradhapura District: About 348,262 persons in Anuradhapura district are involved in industry-related income generation activities, andagriculture is the dominant industrial activity of the people in road catchment area, 49% of 248,262 people involved in different industrial activities are reported from agriculture and its related income generation activities.

119. Population in Road relevant DSDs: The 3 Roads are fallen within Kekirawa, Thirappane, Galenbindunuwewa, Kahatagasdigiliya Ipalogama and Thalawa Divisional Secretariat Divisions (DSDs). The population in the 6 DSDs is defined as the population in the influential road area. Therefore, the road influential area population is 312,916. This is about 35% of the total population in Anuradhapura district. Thalawa DSD has the highest population of 6 DSDs. The details on the road influential area population are shown in Table 4.9.

Table 4-16: The population in DSDs with Gender segregation

DS Division	Male		Female		Total
	No	%	No	%	
Kekirawa	32,752	49	34,115	51	66,867
Thirappane	15,100	48	16,358	52	31,458
Galenbindunuwewa	28,031	51	26,980	49	55,011
Kahatagasdigiliya	23,358	48	24,899	52	48,257
Ipalogama	20,093	47	22,230	53	42,323
Thalawa	33,710	49	35,290	51	69,000
Total	153,044	49	159,872	51	312,916

Source: Resource profiles of relevant DSDs

120. **The ethnic diversity of population in DSDs**: Nearly 83% of the population in 6 DSDs is Sinhalese. The Muslim population is next to Sinhalese, and it is 16% of total population. The population under Tamil and others is negligible (1%). The population with ethnic-related information in 6 DSDs is shown in Table 4.10.

Table 4-17: Population with ethnic diversity

DS Division	Ethnicity								Total Population
	Sinhala		Tamil		Muslim		Other		
	No	%	No	%	No	%	No	%	
Kekirawa	51,214	77	1,591	2	14,047	21	15	0	66,867
Thirappane	29,396	93	44	0	2,018	6	-	0	31,458
Galenbindunuwewa	53,120	97	1,808	3	69	0	14	0	55,011
Kahatagasdigiliya	37,598	78	267	1	10,392	22	29	0	48,257
Ipalogama	35,153	83	80	0	6,850	16	240	1	42,323
Thalawa	68,015	99	207	0	747	1	31	0	69,000
Total	**274,496**	**88**	**3,997**	**1**	**34,123**	**11**	**300**	**0**	**312,916**

Source: Resource profiles of relevant DSDs

121. **Education levels of DSDs population:** Information on education in 6 DSDs shows a low level of education among the population. The percentage with no formal education ranges from 3 % to 7% among 6 DSDs. The percentage of the population with G.C.E (A/L) qualification ranges from 9% to 16%. The percentage obtained degrees ranges from 1% to 2%. The data on the education of the project influential area population is shown in Table 4.11.

Table 4-18: Education levels of the population in project influential area

DSD	Pre-School %	No formal Education %	Grade 1-5 %	Grades 6-10 %	G.C.E. (O/L) %	G.C.E (A/L) %	University Degree %	Post-Graduate %
Kekirawa	8	3	18	32	22	12	2	2
Thirappane	7	3	21	26	25	16	1	0
Galenbindunuwewa	10	3	19	28	24	15	2	0
Kahatagasdigiliya	5	3	19	32	26	13	1	0
Ipalogama	7	7	22	30	22	11	2	0
Thalawa	8	6	14	41	21	9	2	0

Source: Sample survey conducted in 2018

122. **Employment of the population in DSDs**: The agriculture is the main livelihood activity of the people in the project related 6 DSDs. Apart from agriculture, the persons within employable ages are involved in other income generation activities. The highest percentage

of people is involved in public sector employment (ranges from 12% to 24% among 6 DSDs). The information related to different employments of people in 6 DSDs is shown in Table 4.12.

Table 4-19: Employment categories of the people in 6 DSDs

DSDs	Government %	Private %	Labor %	Business %	Self-Employment %	Abroad %	Other %
Kekirawa	19	16	16	30	6	7	8
Thirappane	14	6	8	51	6	0	15
Galenbindunuwewa	12	3	13	53	3	0	16
Kahatagasdigiliya	24	13	11	34	7	4	7
Ipalogama	18	14	19	28	7	9	5
Thalawa	16	7	14	43	2	3	14

Source: Sample survey conducted in 2018

123. Nearly 28% to 44% of households in the sample are involved in the agriculture activities. The second highest income generation source is Public and Private sector Employment (18-33%).

124. Composition of income generation of sample households is shown in the table below.

Table 4-20: Employment categories

Employment	Percentage ranges of Male HHs	Percentage ranges of female HHs
Farmers	28-44	1-5
Public sector/private sector	18-33	1-2
Skilled labor	2-5	0-0.5
Business	11-15	0.09-2
Self-employment	3-20	0.5-1.4
Wage labor	0.9-4	0.09-0.5
Fishermen	0.7-5.5	0-09
Foreign Employment	0.5-0.0.8	0.09-0.2
Dependents	1-3	0.09-1.5

Source: Sample survey conducted in 2018

Infrastructure Facilities

Roads

125. The 3 roads proposed for improvement are connected to main national roads running across Anuradhapura district towards other districts of the country. The first road, Kakirawe-Thalawe, B 213 is connected to A 28 road running from Padeniya to Anuradhapura through several main town ships. This same road is also connected to A 9 road running towards Jaffna through several townships. The second road, Kakirawe –Ganewalpola B 212 is connected to A9 road and also to A 11 running from Maradankadawala towards Batticaloa. The 3rd road section proposed for improvement, Ganewalpola - Dathchihalmillawe is connected to A 12 road that runs towards Anuradhapura. The details of the 3 roads with their connectivity to other national roads are shown in shown in table below.

Table 4-21: Connectivity of the three roads to the national roads

Road Name	A09(Connected Location & chainage)	A11(Connected Location & chainage)	A12(Connected Location & chainage)	A28(Connected Location & chainage)
B133		Ganewalpola(9.71km)	Halmillewa(117.97km)	
B212	Kekirawa(92.54km)	Ganewalpola(8.72km)		
B213	Kakirawe(92.54km)			Thalawa(70.284km)

Sources of Energy

126. The percentage of households with no electricity facilities is negligible in the entire sample (less 4%). More than 90% of the households in Kakirawe, Thirappane, Galenbidunuwewa and Kahatagasdigiliya DSDs have obtained electricity from the national grid. Solar power is also becoming popular among households in DSDs such as Thalawa and Ipalogama. This is because some public awareness programs conducted by solar power suppliers in these areas. About 29.37% and 66.43% sample households in Thalawa and Ippologama DS Divisions have obtained electricity from the main grid respectively. The information on sources of electricity of the sample households is shown in table below.

Table 4-22: Source of electricity

District	DSD	Source of electricity		
		National Grid	Solar Power and other Sources	No Electricity
Anuradhapura	Kakirawe	99.62%	0.13%	0.25%
	Ipalogama	99.54%	0.46%	0%
	Thalawa	99.39%	0.17%	0.44%
	Thirappane	99.29%	0.00%	0.71%
	Galenbindunuwewa	99.56%	0.00%	0.44%
	Kahatagasdigiliya	99.56%	0.44%	0.00%

Source: Sample survey conducted in 2018

Water

127. More than 80% of sample households in Kakirawe, Ipalogama and Thalawa DSD areas have access to pipe born water provided by the National Water Supplies and Drainage Board (NWSDB). Tube wells and Shallow wells are the main sources for drinking water in households located in Thirappane, Galenbidunuwewa and Kahatagasdegiliya. Community water supply schemes are also becoming popular in some areas of these DSDs. The data on sources of drinking water is shown in table below.

Table 4-23: Source of Water

District	DSD	Source of Water			
		NWS & DB	Well/ Tube Well	Community Well	Community Water Supply
Anuradhapura	Kakirawe	72.65%	23.66%	1.15%	2.54%
	Ipalogama	99.54%	0.46%	0.00%	0.00%
	Thalawa	99.39%	0.18%	0.44%	0.00%
	Thirappane	6.34%	79.58%	4.23%	9.86%
	Galenbindunuwewa	17.14%	65.13%	2.38%	15.35%
	Kahatagasdigiliya	1.76%	90.31%	4.41%	3.52%

Source: Sample survey conducted in 2018

Sanitation

128. Except negligible percentage of sample houses in Kakirawe and Galenbidunuwewa DSDs all others have access to sanitary latrine facilities. More than 80% of the households in all the project relevant DS divisions have water sealed latrines in their households (water sealed latrines include flush type latrines as well). According to the interviews with community members during the socio-economic survey it was found that establishment of water sealed latrine is considered as an essential need of the households. Therefore, in near future most of the households in the area will have water sealed latrines. The data on sanitary latrine facilities available in sample households is shown in table below.

Table 4-24: Type of Sanitary system available

District	DSD	Type of Sanitary system available			
		Flush	Water sealed	Pit latrine	None
Anuradhapura	Kakirawe	23.21%	62.35%	14.30%	0.13%
	Ipalogama	17.39%	75.15%	7.47%	0.00%

District	DSD	Type of Sanitary system available			
		Flush	Water sealed	Pit latrine	None
	Thalawa	15.72%	82.70%	1.58%	0.00%
	Thirappane	5.04%	94.96%	0.00%	0.00%
	Galenbindunuwewa	14.99%	84.11%	0.60%	0.30%
	Kahatagasdigiliya	3.52%	96.48%	0.00%	0.00%

Source: Sample survey conducted in 2018

Health

129. The communities in the road catchment area have access to rural hospital in Kekirawa for their rutting needs. They also have facilities to be reached in Anudhapura well equipped teaching hospital is available. Apart from these two hospitals people in each road catchments have access to rural hospitals available in the local area eg. Thalawa, Yakalla, Galenbindunuwewa etc.

Historical Significance (Physical cultural resources)

130. It is identified these selected roads provide access to many places which contributes a religious and archeological importance. Major religious and archeological places are listed in the table below.

Table 4-25: Religious Place/ Archeological Places in the vicinity of the roads (within 100m)

Number	Road Name	Religious Place/ Archeological Places (within 100m)
1	Ganewalpola-Dachchahalmillewa Road (B133)	Mosque(Ethal watununu Wewa), Church, Statue, Isipathana Meheni Aramaya, Small Statue, Sri Whardhanaramaya Temple, Small Statue, Access Road for archeological place, Sri Dhamma Rakkitharamaya Regional Temples
2	Kekirawa-Thalawa(213)	Sri Dinendraramaya, Galkanda Purana Viharaya, Regional Temples, Hindu Kovil

131. **The project relevant Grama Niladhari Divisions (GNDs):** The 3 roads run across 54 GNDs. The total number of families in road relevant GNDs is 19,783 comprising of 80,320 populations. The people in GNDs can be defined as the population in the road corridors. About 87% of the people are Sinhalese. The percentage of Tamil population is 1%, and the Muslim population is 12%.

132. **Education levels**: The following data on education levels of people in 54 GNDs indicates a low level of education in the road corridor area.

- Pre-schools – 1% to 15%
- No formal education – 1% to 26%
- Grades 1 to 5 – 6% to 32%

- Grades 6 to 10 – 14% to 58%
- G.C.E (O/L) – 2% to 41%
- G.C.E (A/L) – 5% to 21%
- University Degree – 1% to 7%
- Post graduate qualification – 0% to 1%

133. **Employment:** Majority of the families in the road corridor area (GNDs) are involved in agriculture activities. The data in Table 4.13 includes the employment of people in road-related GNDs involved in other non-agriculture categories.

Table 4-26: Employment of people in GNDs in other non-agriculture categories

Employment Category	No	%
Government Sector	6,541	18
Private	3,504	10
Labor	6,830	19
Business	12,392	34
Self-employment	1,382	4
Foreign employment	907	2
Other	4,844	13

134. **Income levels of the households in project related GNDs**: The data on income levels are available only in some GND offices. According to the observations of the Field data collection team of the Social Assessment survey, the data available on income levels in GND offices is not so accurate. The data on income levels are recorded based on the figures provided by the householders of the families. The data available in 9 GND offices is shown in Table 4.14.

Table 4-27: Households income in the GNDs relevant to the roads

Income Category	Average monthly Income (SLR)	Average monthly Expenditure (SLR)
5000<	6.59%	3.99%
5001-15000	11.42%	21.76%
15001-30000	41.34%	51.85%
30001-50000	29.31%	14.91%
50001-75000	7.71%	2.47%
75001-100000	2.43%	1.04%
100000>	1.20%	3.99%

Source: Sample survey conducted in 2018

5 ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

A. Identification of Potential Environmental Impacts and Mitigation of such Impacts

135. Identification and assessment of impacts have been carried out by considering the proposed activities during pre- and construction and operational stages. Such impacts have been identified based on site observations, field surveys; information obtained from the stakeholders and also has been identified based on a value judgment. The impacts of the activities will be described separately on physical, biological, socio-economic and cultural resources within the zone of impact. Impacts that may result from proposed road sub-projects can be both beneficial as well as adverse.

136. Mitigation refers to the measures that are designed to cope with adverse consequences and to enhance the positive impacts on the environment as a result of the sub-project implementation. Effective implementation of benefit maximization measures and adverse impacts mitigation measures would optimize the benefits expected from the sub-project and avoid/minimize the adverse impact from the sub-project. The impacts have been predicted regarding their magnitude (minor, moderate and high), extent (site-specific, local and regional) and duration (short, medium and long-term) and appropriate benefit enhancement and mitigation measures are suggested in following sections.

B. Impacts during Pre-construction phase and Mitigation

137. The mitigation measures adopted during design or pre-construction phases are of preventive in nature with two basic objectives:

- Avoiding costly mitigation measures, and
- Increasing awareness among the stakeholders for environmental management of road construction, rehabilitation and operation.
- By designing the culverts, drains and other hydraulic structures to withstand appropriate storm events will reduce the risk of an operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

1. Route selection and alternatives

138. The project involves rehabilitation of three existing roads, and therefore no alternative routes are considered.

2. Acquisition of Encroached Land/Temporary Structures

139. The proposed rehabilitation work along the three roads will not involve widening the existing ROW. All the interventions will be carried out within the existing ROW. Therefore, there will be no land acquisition.

140. However, the proposed construction activities will involve readjusting eight temporary structures which projects towards the existing ROW. The summary of these structures is provided in Table 5.1.

Table 5-1: Temporary structures within 2 m of either side of the existing RoW for each of the three roads

/ B133 Ganewalpola Dachchi Halmillawa

Type of structure	No of structures in LHS	No of structures in RHS	Total affected structures
Food stalls	1	0	**1**
Fruit stalls	0	0	**0**
Vegetable stalls	0	0	**0**
Lottery selling stalls	1	0	**1**
Temporary aquariums	0	0	**0**
Boutiques	1	1	**2**
Total	**3**	**1**	**4**
B212 Kakirawe Ganewalpola			
Boutiques	0	0	**0**
Food stalls	1	0	**1**
Fruits stalls	0	0	**0**
Total	**1**	**0**	**1**
B213 Kakirawe Thalawa			
Hardware's	0	1	**1**
Vegetable stalls	0	1	**1**
Fruit stalls	0	1	**1**
Total	**0**	**3**	**3**

Source: IR DDR survey 2018 ----

Mitigation of negative impacts

141. The following measures shall be taken to mitigate impacts associated with readjusting such encroached structures.

- Providing labourfor shifting and resettling the structures outside the ROW.
- All occupants of these structures are willing to readjust with their own resources and they do not anticipate any income loss due to such shifting. Moreover they welcome the project and expect that their income shall increase once the roads are improved.

3. Relocating Utility Supply Lines

142. There are utility supply lines, such as electricity and telecommunication lines, that are located within 2 m of the proposed RoW (See Table 5.2 for a summary and Appendix 5.1, 5.2 and 5.3 for details). Some of these utility supply lines need to be shifted during pre-construction phase. Electricity poles, pylons, and telecommunication poles which are erected within the proposed RoW have to be removed before handing over the work to the contractor/s. It is important that shifting of these utilities shall be done with minimum damage to the existing poles, towers as well as lines, and wires. Utility institutions such as the Ceylon Electricity Board and Sri Lanka Telecom shall be informed as early as possible, and there shall be proper coordination with the respective line agencies to minimize the impacts.

143. Drinking water distribution lines are not available in most of the sections of the three roads. In B213 the section close to Kekirwa and Thalwa has drinking water supply lines. In

other roads drinking water supplies are not available. The people in road catchment in these areas depend on ground water and locally implemented community water supply schemes.

Table 5-2: Utility Poles within 2 m of the RoW for each of the three roads

Road	Number of Utility Poles			
	Electricity		Telecommunication	
	LHS	RHS	LHS	RHS
B133: Ganewalpola–Dachchi Hammillewa Rd	258	785	317	94
B212: Kekirawa - Ganewalpola Rd	130	161	189	144
B213: Kekirawa -Thalawa Rd	487	568	564	623

Mitigation of negative impacts

144. The following are the measures to mitigate possible impacts:

- Advance notice to the public shall be given, with the details of the time and the duration of the utility disruption to minimize public inconvenience
- Proper coordination with respective line agencies is essential, and the schedules shall be prepared with their consent and approvals, especially during the removal of and reestablishment of the services to avoid accidental damage, unnecessary delays and thereby lessen the inconveniences to the general public. Locations and access to these utilities shall be clearly marked (possibly on ground) within the RoW during detailed design to avoid structural damage to the carriageway, shoulders, and drains in future.
- Provision of alternate sources and other utilities during the disruption period and re-establish the utilities as soon as practicable to overcome public inconvenience.

4. Mobilization of resources and selection of sites for temporary usage

145. Resources such as material, machinery and labour have to be mobilized before construction commences, which storage need space/yards, land/building for site office, labor camps, and for parking of construction vehicles and storing and sheltering of machinery. Proper planning can mitigate much of the impacts described in subsequent sections.

Mitigation of negative impacts

146. The site selection for temporary usage has to be done in close consultation with village leaders and the authorities of the LA. Such sites shall be located away (at least 500 m) from waterlogged areas, and flood-prone areas. Also, such sites shall be ideally located by the roadside, but clearly away from the proposed carriageway and the shoulders.

147. Such sites shall be located sufficiently away from socially sensitive areas such as schools, temples kovils, churches and mosques and, governmental offices and establishments.

148. Recruitment of laborers, both unskilled and skilled, from the locality, will reduce the need for having large labor camps and will lead to lesser impacts due to such labour camps during the construction stage. Also, approvals from relevant authorities must be obtained to use temporary lands to comply with National laws and regulations. Preparation of the temporary lands and access road must be carried out in a way to minimize disturbances to natural vegetation cover.

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

Flood Impacts

Ganewalpola – Hammillewa Road (B133)

149. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and paddy fields.

150. The road is located adjacent to Alagollewa Wewa (7.0 km), Hurulu Wewa (12.2 km), Manakattiya Wewa (12.5 km), Yan Oya (33.0 km), Komarikawala Wewa (36.0 km), Hettu Wewa (36.7 km), Kon Wewa (38.0), Ithalwetunu Wewa (41.2 km), Welana Wewa (43.0 km), Diyamailagas Wewa (43.4 km), and Mahahalmillewa Wewa (44.5 km).

151. As mentioned above, sections of B133 road such as areas of Alagollewa Wewa, Hettu Wewa, Kon Wewa, Diyamayilagas Wewa downstream are prone to yearly floods during heavy rainy periods 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 shall be deeply studied during the detailed design stage and pre-construction phase. Possible mitigation for above issues shall be provided, and the type and sizes of cross drainage structures, road finish level (RFL)), adequacy of leadaway / tail canals, flow connectivity issues and the surface treatment shall be decided accordingly in rehabilitating the road.

152. Close coordination with Department of Irrigation, Department of Agrarian Services and Disaster Management Center (DMC) shall be maintained in this regard toobtaining high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings.

Kekirawa - Ganewalpola Road (B212)

153. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and paddy fields.

154. The road is located adjacent to Mankadawala Wewa (2.0 km), Ganewalpola Tank (4.0 km) and Maha Mankadawala Wewa (6.5 km).

155. As mentioned above, sections of B212 road are prone to yearly floods during heavy rain periods 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 shall be deeply studied during the detailed design stage and pre-construction phase. Possible mitigation for above issues shall be provided, and the type and sizes of cross drainage structures, RFL, adequacy of lead away / tail canals, flow connectivity issues and the surface treatment shall be decided accordingly in rehabilitating the road.

156. Close coordination with Department of Irrigation, Department of Agrarian Services and Disaster Management Center (DMC) shall be maintained in this regard toobtaining high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings.

Kekirawa – Thalawa Road (B213)

157. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and paddy fields.

158. The road is located adjacent to Malawa Wewa (1.1 km), Nikiniya Wewa (2.0 km), Maylagas Wewa (3.7 km), Muduperugama Wewa (6.8 km), Kumbuk Wewa (8.1 km), Hiripitiyagama Wewa (9.2 km), Kunchikulama Wewa (10.7 km),Galmaduwa Wewa (16.3 km), Ihalathalawa Wewa (33.7 km) & bordering Ganthiriyagama Tank (12.3 km), Gonapathirawa Tank (14.7 km), Keledivulwewa Tank (18.4 km), Eppawala Tank (21.2 km), Eliyadivulwewa Tank (23.8 km), Kiralogama Tank (28.7 km), and Yodha Ela at 11.5 km.

159. As mentioned above, several sections of B213 road are prone to yearly floods during heavy rain periods 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 shall be deeply studied during the detailed design stage and pre-construction phase. Possible mitigation for above issues shall be provided, and the type and sizes of cross drainage structures, road finish level (RFL)), adequacy of leadaway/tail canals, flow connectivity issues and the surface treatment shall be decided accordingly in rehabilitating the road.

160. Close coordination with Department of Irrigation, Department of Agrarian Services and Disaster Management Center (DMC) shall be maintained in this regard toobtaining high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings.

6. Ecological Impacts during the pre-construction phase

161. In pre-construction stage, land clearance will be undertaken,and roadside vegetation will be removed. Also, land clearance can be expected in identified locations for labour camps, material storage, equipment, machinery,and vehicle parking. Therefore, pre-construction activities will remove the floral habitats and disturb the fauna, some of which will inevitably be lost which is irreversible.

162. The road traverse from Ganewalpola – Dachchi Hammillewa (B133) has narrow road stretch with the low-lying area, which is marshy. There could be a negative impact on aquatic and terrestrial fauna inhabited in this particular area due to pre-construction activities such as clearing vegetation along the shoulders. Therefore, care shall be taken to avoid/minimize the impact by incorporating design modifications to avoid any unnecessary damage to these marshy lands.

C. Construction phase

C1. Physical Impacts and Mitigation

1. Anticipated impacts due to land preparation activities (removal of vegetation, land clearing, residue disposal, dredging, filling, etc.)

163. During the construction period, especially during, excavation and dredging a large amount of debris or wreckage will be generated. If this debris is not properly disposed ofsignificant negative impacts are anticipated on public health and safety and scenic beauty of the project area. If spoil material and vegetation collected during land preparation, construction and demolition waste and other types of waste are accumulated alongside the road, it will cause public inconvenience by dust dispersion, reduced visual quality, and safety and health hazard.

164. Other waste related issues may arise from, (i) municipal solid waste generated from labor camps and offices, and (ii) wastewater that is generated at labor camps and storage yards.

Mitigation of negative impacts

165. To avoid these impacts, such waste shall be removed from the project site immediately after the land clearing and construction work and dumped in an approved site according to the current rules and regulations. The contractor must identify and select suitable and safest locations for the dumping or landfill sites with sufficient capacity and approvals shall be obtained from relevant Local Authorities (also from CEA if applicable according to the Gazette notification No 772/22 of 24th June 1993). Proper engineering design (including drainage and erosion control facilities) shall be prepared by the contractor, and written approval shall be obtained from the PIC before dumping at the each identified site. Dumping shall be done only after receiving approvals from the necessary authorities and obtaining the PIC approval on the proposed engineering design of the site.

166. Construction debris and spoil disposal: Spoils shall be safely disposed and managed with minimum environmental damage re-using excavated materials and minimum quantity of earthworks. The following mitigation measures will be adopted:

- Re-use of debris is a good option to reduce the quantity of debris. Wherever possible, surplus spoil will be used to fill eroded gullies, quarries, and depressed areas, etc. Metal, soil, and sand are reusable raw materials, which can be used for backfilling, leveling and amenity planting at intersections. Wood debris can be used as a fuel for worker camps or distributed to local people free of charge.
- Excess spoils will be disposed ofat specified tipping sites in a controlled manner, and the tipping sites shall be covered by vegetation through bio-engineering techniques after the surplus material is tipped.
- Spoils shall not be disposed on sloping areas, farmland, marshy land, forest areas – especially Ritigala SNR, Labunoruwakanda FR, natural drainage path, canals and other infrastructures. The temporary debris storage sites shall not be located closer to residential or ecologically sensitive areas.
- Necessary toe and retaining walls will be provided to protect the disposal of soil.
- Topsoil will be protected as far as possible. Excess soil will be stockpiled and will be used to fill in farmland for maintaining land productivity and also used during bioengineering for plantation and in fresh-cut slope.
- The remaining non-reusable construction debris shall be dumped properly in approved dumping sites. Prior approval for the disposal site shall be obtained from the LAs via Grama Niladhari of the area. After the disposal, the site will be provided with proper drainage, vegetation and adequate protection against erosion.

167. Municipal solid waste: The contractor shall make every effort to handle and manage waste generated from the construction/labor camps without causing a nuisance to the neighborhood. MSW shall be properly collected in bins provided with lids and handed over to the garbage collection trucks of the LA. Garbage bins be provided to all worker camps, and construction sites, site inspections by Public Health Inspector (PHI) in the area shall be facilitated. Proper collection and disposal of waste will ensure avoidance of negative environmental and social impacts, apart from ecological impacts, public health and negative impacts on scenic beauty. Degradable wastes also attract pests such as rats and flies which become unhealthy, dirty, and unsightly places to reside in. Labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases like mosquitoes and rats. Contamination of water bodies with wastewater, construction debris, and spoil will create a significant impact on the aquatic lives and people inhabited in the area.

168. Wastewater disposal and proper sanitation: Proper sanitation and sewerage facilities (drinking water, urinals, toilets and washrooms) shall be provided to all site offices and construction/labor camps. Selection of the location for labor camps shall be approved by the Engineer and comply with guidelines/recommendations issued by CEA and LAs. To avoid waste generation and sanitation problems from labor camps, the majority of skilled and unskilled workers shall be selected from the project influence area. If migrant labor is brought for construction activities from different areas, there may also be conflict situations

among the workers and settlers near worker camps. Spreading of communal diseases is also possible due to migrant labors.

2. Road-side landscape

169. Landscape degradation relates particularly to poorly designed or monitored activities resulting from indiscriminate dumping of spoil material, improper cut and fill, borrow and quarrying operations. Road induced activities may lead to the generation and mismanagement of wastes in the roadsides and create scars on the landscape.

Mitigation of negative impacts

170. All debris, piles of unwanted earth, spoil materials, temporally structures shall be cleared away from the roadsides and from other workplaces and disposed at locations designated or acceptable to the PIC. Road landscape activities have to be done as per either detailed design, or typical design guidelines are given as part of the bid documents. Road furniture items are provided as per the design given in the bid documents. The following mitigation measures will be adopted:

- Indiscriminate dumping of spoil material will be discouraged
- After the extraction is completed, the quarry sites and borrow pits will be rehabilitated to suit the local landscape.

3. Impacts on natural flow and existing drainage pattern and hydrology

171. The rehabilitation or reconstruction of culverts(as indicated in table 4.2.a,b,c) may require temporarily diversion of streams, disturbing the natural drainage pattern and it may lead to creating flooding conditions in adjacent areas. Improperly stored construction materials can also block natural drainage pattern. Leveling, filling, excavations and formation of temporarily or permanently raised embankments in the ROW may block natural flow patterns and cause localized flooding effects in the immediate downstream.

172. The contractor shall 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, the contractor shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.

173. The Contractor shall take precautionary measures to avoid any negative impacts on existing irrigation and drainage paths due to temporary coffer damming at constructional sites. Direct pumping out of the water into nearby marshy lands including paddy lands, blockage of irrigation canals crossed by the roads, stream bank erosion (increased) and collapsing of stream embankments shall be avoided.

174. Severe rain intensities are observed during inter-monsoon and monsoon seasons and thus timing of construction during dry flow period as a mitigation measure is highly recommended.

175. No material including excavated soil will be allowed to be disposed near water bodies or in paddy lands, even on a 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 ona temporary basis. If blocked, the contractor will remove such debris without any delay. Also, 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.

176. Therefore, contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drain. 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 aggravating floods when working in flood-prone areas. Further, any recommendations laid down by the hydrological studies shall be adopted at flood-prone areas. Contractor shall not select land within flood-prone areas to dispose of excavated and unsuitable material, locations for material stockpiles, yards and other locations where chemicals and other construction material are stored.

4. Impacts on Water Quality due to Silt Runoff, Emissions and Spoil from Construction Related Activities

177. The North Central Province, in general, receives a considerable amount of rainfall during the Northeast monsoon. Therefore, soil erosion, sedimentation, and siltation can occur any time during the rainy season due to construction activities such as material extraction and storage, land clearing, cut and fill operation, construction or reconstruction of new culverts, causeways, and construction of earth and line drains. The decrease of infiltration of rainwater, acceleration of surface runoff, lowering of the river beds and destruction of the river banks are the main impacts associated with soil erosion.

Mitigation of negative impacts

- Construction activities including turfing, earthwork and construction of cross drainages shall be conducted during the dry season (May to September).
- Only the shrubs and bushes will be cut, and the wetland habitat will not be disturbed.
- The cut material during the excavation of drainage canals will be used as fill material at the site. Fills shall be compacted as soon as they are laid to an appropriate degree of compaction
- Erosion of the soil brought for filling shall be controlled during rainfall and surface runoff. The soil heaps can be appropriately covered using tarpaulin sheets. They shall never be stored close to the watercourses and lagoon banks. Topsoil generated from the construction sites (not exceeding 150 mm) shall be stored properly (height not exceeding 2m) and reused for turfing activities.

- Erosion control practices shall be implemented during construction to limit turbidity and silt transport off the site premises. Temporary barriers such as soil mounds, temporary drains, silt traps will be considered to control soil washing away to the streams. Suitable local drainage facilities shall be established properly to drain water in the construction areas.

5. Effect on the local road network

178. Construction material sources are located about 15 - 20 km away from the project areas. Transportation through local roads, which are mainly provincial council roads and rural roads (some are gravel roads), will cause inconveniences to other road users and households living in these areas. Moreover, the carrying capacities of these rural roads are barely sufficient to cater to increased vehicular traffic and increased axial loads that can damage the roads, bridges, and culverts. Provincial council and rural roads, once damaged will need rehabilitation or immediate maintenance; however, lack of financial and other resources will be a constraint.

Mitigation of negative impacts

179. The contractor shall be provided with any restrictions related to sizes and lengths of vehicles, allowable axial loads, speed limits, no entry zones and time limits (near schools). The contractor's written consent abiding him to follow these restrictions shall be mandatory. If construction vehicles are likely to cause damage to public roads, provision shall be made for their repair and restoration as part of the contract.

180. The contractor shall obtain a permit from LAs to use local roads before the transportation of construction materials, machinery,and equipment. Construction materials shall not exceed the carrying capacity of the local road network. The contractor shall maintain all roads, which are used for transportation of construction materials and other activities in proper order.

181. Proper signage and advance notice to road users and roadside communities about the schedule of construction activities, provision of safe and convenient passage to the vehicles and passengers especially during construction of culverts, bridges and causeways, implement traffic management plans in construction areas according to the traffic rules and regulations if necessary in close coordination with local communities/authorities and local police by the contractor.

182. The signage used for traffic management shall follow accepted Standards and approved by the engineer/ police. Construction sites and excavated areas shall be barricaded with warning tapes, painted barriers or traffic cones. Use of flagmen and/or temporary traffic signs for construction sites or temporally diversions, allocation of properly trained personnel provided with proper gear including communication equipment and luminous jackets for night use are other measures that have to be undertaken during the construction period.

6. Impacts due to Noise and Vibration, Dust and Air Quality due to construction

182. At present, other than two quarry sites and asphalt plants, there are no any activities related to air pollution such as industrial, transportation, deforestation, mining and quarrying in the road corridor**.** Therefore, it was presumed that project area represents ambient air quality (as specified in Ambient Air Quality Standards of the CEA). But during the construction stage of road, dust, noise, and vibrations generated from the project activities will impact the roadside communities and people who inhabit around material extraction sites and other haulage roads. Vibration during compaction works could easily damage structures close to the roads.

183. Furthermore, if construction work is carried out in dry season dust emission is likely to be significant. Release of Volatile Organic Compounds, emission of small amounts of Carbon monoxide, Nitrogen dioxide and particulates from vehicular movements, blasting and dust generated from clearing, grubbing, excavating, backfilling, dumping, mixing concrete, transportation of materials, storage of soil and metal piles, etc. can be taken place in the surroundings due to wind.

Mitigation of negative impacts

184. Construction-related activities closer to sensitive public locations have to be scheduled in coordination with the relevant authorities (community leaders, school principals, high–priests or other respective officers) to avoid disturbance to day to day activities of the people. Such work has to be completed as soon as possible.

185. No high noise generating machinery is encouraged. All machinery, equipment, and vehicles shall be maintained in good condition by engaging skilled mechanics and regularly maintained in compliance with National Emission Standards (1994). Noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinance, No. 924/12) shall strictly be implemented for crushers, hot mixed plants, construction vehicles, and equipment.

186. If the contracts decide to operate crushers and hot mixed plants, they shall be placed with the approval of Engineer, CEA, and LAs and shall be located at least 500 m away from residential and environmentally sensitive areas or other public sensitive locations. Dust extraction units, exhaust silencers and noise reduction devices can be fitted to the roadside crushers, construction vehicles and hot mixed plants to reduce dust emissions.

187. All the neighbors will be informed of noise generating activities, times of operation, duration, etc. The maximum permissible noise levels at boundaries of the land in which the sources of noise is located for construction activities are 75dB (A) L_{eq} and 50 dB (A) L_{eq} during daytime and nighttime respectively (Daytime: 6.00 am – 7.00 pm, night time: from 7.00 pm – 6.00 am). However, the contractor shall limit working time for activities that create noise from 6.00 am to 6.00 pm. Enforcing speed limits to the vehicles is necessary to control dust emissions during transportation of construction materials. Dust can also be controlled by providing of dust barriers to sensitive public locations (such as schools and houses located very close to the road), spraying of water to quarry sites, construction sites, roads

which will be used for the transportation of construction materials at regular intervals. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials, and all construction materials (sand, gravel, metal, cement) shall be stored with proper covering.

188. The contractor shall conduct a pre-crack survey on all structures along the road on a corridor agreed with PIC. Any complaint from public on development of cracks due to construction works shall be investigated keeping the crack survey records as reference source. If it is concluded that crack damages were caused due to the construction works then the contractor shall rectify the damages through a third party insurance or by repairing the damage on their own cost.

189. Water sprinkling will be necessary for any activity that causes generation of dust particles within the proposed site Suitable actions shall be taken to minimize or avoid dirt and mud being carried to the road surface. The contractor shall also take actions to prevent bad odor and offensive smells emanating from chemicals, construction material processing or other construction activities.

7. Extraction, Transportation, and Storage of Construction Materials

190. Construction materials especially sand, gravel, and aggregates for the project activities are available within the close proximity of the project area. Large-scale extraction of such materials can have negative impacts on the environment, notably noise, air, water, soil pollution and reduction of scenic beauty along with causing damage to ecosystems. Sand mining causes bank erosion, lowering of river bed levels, destruction of riverine ecosystems, during the dry season. Metal quarrying causes nuisance from fugitive dust emissions, noise, and vibrations which will lead to health-related impacts apart from severe social disturbance to the households living close to quarry sites. Quarrying can also lead to cracking of structures (houses and other buildings).Stagnation of water in borrows pits (and metal quarries) that provide breeding grounds for mosquitoes. Such pits also pose a danger to people and wild animals who roam in such areas.

191. Transportation of construction materials from areas such as Katukeliya, Paugaswewa, Siyambalewa, Maradankadawala, Hallmillewa (where gravel borrow sites, and aggregate quarries are located) and Mahaweli River (for sand) may cause disturbances to other road users. Thus, loading and unloading together with transportation of construction materials can significantly cause disturbance to the general public, increase dust and noise nuisance and damages to the minor roads. Storage of material, especially gravel can erode away with surface runoff causing siltation of drainage paths. Also, storage of material will block drainage paths, hindrances to traffic and pedestrian movements, and damage road-side structures. Storage of material for longer periods will create aesthetically unpleasing surroundings.

<u>Mitigation of negative impacts</u>

192. Selection of material suppliers who have proper EPLs will ensure proper environmental safeguards in material extraction. Extraction of construction materials shall

only be from the approved mines and quarries by GSMB. Environmental requirements and guidelines issued by the CEA, GSMB, and LAs shall be followed with respect to locating material extraction sites and other operations including rehabilitation of the extraction sites at the end of their use. If new material extraction sites need to be located, those shall exclude places which are close to the sensitive public locations (schools, religious places, hospitals) and environmentally sensitive areas.

193. Machinery operators and drivers shall have obtained proper licenses for the category of machinery/vehicles they operate/drive. Drivers shall abide by the speed limits on roads based on the traffic rules and regulations. The quantities of material to be transported shall not exceed allowable axial loads along the roads, and especially when they are transported along bridges. Loading and unloading of construction materials and transport shall not cause a minimum nuisance to the people by way of noise, vibration, and dust. Trailers and trucks shall be covered properly with tarpaulin sheets, which will prevent dust emissions and slip away from the material, which will otherwise cause damage to pedestrians and other vehicles. Materials shall be piled sufficiently away from environmental (away from water sources, wetlands, etc.) and sensitive public locations (schools, mosques, offices, etc.). Sand, rubble, metal, bitumen, and cement shall be properly covered to ensure no dust is emitted and to avoid erosion and contamination. Construction materials shall not store around canals, cross drainage, and natural flow paths. All cement, bitumen (barrels), oil and other chemicals shall be stored and handled on an impervious surface above ground level (e.g., concrete slabs) and shall be enclosed ensuring that no stormwater flows into the structure. Adequate ventilation shall be kept to avoid accumulation of fumes and offensive odor that could be harmful.

194. A site restoration plan must be submitted by the Contractor to the PIC. Any retention of payments shall be released once the sites and yards are properly restored.

C2. Ecological Impacts and Mitigation

195. During construction stage, soil erosion, water and air pollution, noise and vibration could be expected at the levels of low, medium and high; therefore, negative impact on both flora and fauna in aquatic and terrestrial is anticipated. However, the exact impact could be varying and depending on the construction plan.

1. Ecological Impacts due to loss / destruction / fragmentation of habitats

196. The proposed road traverses are rich from vegetation cover except for urban areas. Home gardens in the area also rich with domestic fruits, vegetable and native tree species to the dry zone. As per to the tree survey (Please refer Appendix 4.1, 4.2 and 4.3), it was noted that there are many large trees located very close to the existing road stretch. Therefore, clearing of vegetation, felling and/or trimming of trees will be required. Based on the preliminary observations during this study it is expected that around 80 number of trees shall need to be removed in the three road sections. This may, in turn, result in loss of soil moisture and soil, reduction of aesthetic value and loss of shade. Moreover, some native flora and fauna species in the project area will be destroyed due to construction and land preparation activities. Also, some fauna species inhabited in these larger trees will move to

the surrounding area during the construction phase. However, large-scale fragmentation or modification of habitats is not expected due to the proposed development.

Mitigation measure to loss of vegetation

197. The following are the mitigation measures:

- The unnecessary removal of vegetation and felling of trees will be prevented by finalizing the tree list with the Environmental Specialist of PIC. Joint inspections by the contractor, design team together with the PIC are needed to take decisions as to what trees are cut, felled or trimmed.
- All trees to be felled will be marked and handed over to State Timber Corporation for cutting and removal.
- Moving of construction vehicles and machinery will be restricted only to designated areas to avoid the loss of vegetation due to squash.
- Suitable native tree species such as Palu (*Manilkara hexandra*), Kumbuk (*Terminalia arjuna),* Kon *(Schleichera oleosa),Drypetes sepiaria* (Weera), *Feronia limonia* (Divul), *Vitex altissima* (Milla), *Syzygium spp* (Dan), etc., could be selected for the replanting purpose at 1:3 ratio.Moreover, priority shall be given to replant with endangered species (EN) such as Ebony, (*Diospyros ebenum*), Helmba (*Mitragyna tubulosa*), Kalu mediriya (*Diospyros chaetocarpa*) ; Near Threatened species such as (NT); Gas penela / Kaha penela (*Sapindus trifoliate)*, Goda Kirilla (*Holoptelea integrifolia*), Mi (*Madhuca longifolia*), Milla/Kahamilla (*Vitex altissima*), Vasa kaduru (*Petchia ceylanica,* Bakmee (*Anthocephalus chinensis*) and vulnerable species (VU) such as Burutha tree, (*Chloroxylon swietenia*), Palu tree (*Manilkara hexandra*) observed in the project area.
- The tree 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. Fruits and medicinal plant species which are native to the project area will be selected if replanting to be undertaken outside the ROW. The continuous supervision and maintenance during the operational stage are essential to ensure the survival of trees. Planting of 1:3 of trees as suggested in the EARF shall be carried out.

2. Impact on animal movement pathways

198. There are road signs indicated that wild elephant is roaming near to the project area. Also, during field visits, electric fences were observed in some places. Therefore, there is a possibility of disturbing elephants and other animal's movements and affecting their natural behavior during the construction stage due to construction noise and other activities. This will be a danger to the particular animals and human safety as well.

Elephants passing points

Kekirawa - Thalawa (B 213)

3.50 km – 3.75 km

4.50 km – 4.75 km

Kekirawa – Ganewalpola (B 212)

1.50 km - 3.70 km

Ganewalpola – Dachcha Hammillewa (B133)

0.00 km – 0.25 km

0.75 km – 1.00 km

7.00 km – 7.25 km

9.75 km – 10.00 km

Figure 15 : Electric fence observed along B 213 road

Measure to minimize/avoid the impact on animal movement pathways

199. The following are proposed as mitigation measures:

- 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 are notified, construction works will be managed and restricted in the particular areas during identified times 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. These barricades can be fences constructed with timber and/or steel suitably erected to prevent animals from falling into them.
- Backfilling of such trenches and pits within the shortest possible time will have more advantages in avoiding animals falling into such pits.

3. Impact on aquatic fauna and flora

200. There will be soil erosion from construction sites, stockpiles 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 an increase in turbidity level lower the water quality. This will lead to a 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. Also, when these particles

settle on the bottom, it will affect the breeding ground of aquatic animals. Pollution of water bodies will also adversely impact the inland fishery.

Measure to avoid/minimize the impact on aquatic fauna and flora

201. The following are proposed as mitigation measures:

- Locate all hot mix plants, crushing plants, workshops, depots and temporary worker camps and storing of toxic and hazardous materials at least 500 m away from water bodies, preferably, approved locations by the Environmental officer of the local authority in the project area. Also, scheduling work during the dry season (or avoiding rainy days) is one of the methods to avoid soil being washed off on to water bodies.
- Recycling and dumping of solid waste matter at locations approved by the local authority.
- Maintenance of vehicles and equipment in good operable condition, ensuring no leakage of oil or fuel and the fitting of proper exhaust baffles.
- Awareness programmes shall be carried out for workers on solid waste management shall not be dumped into water bodies.

4. Impact on flora and fauna due to local air pollution, noise, and vibration

202. In general, construction machinery generates a high level of noise and vibration. Also,movements of vehicles generate dust. All these activities may have the potential to disturb behavior of faunal species in the project area particularly during transport of material, asphalting, quarrying and borrowing. Furthermore, deposition of dust and mud on vegetation can interfere with physiological functions of trees.

Measure to mitigate the impact on flora and fauna due to noise, vibration, and dust

203. The following are proposed as mitigation measures:

- Construction vehicles and machinery shall be well maintained to reduce the noise and vibration disturbances.
- Moving of construction vehicles and machinery will be restricted only to designated areas to save vegetation beyond the proposed project area due to trampling.
- Specific mitigation plans shall be prepared for borrows sites and quarry operation.

6. Ecological disturbances by workers and their camp operations

204. The road traverse from Ganewalpola – Dachcha Hammillewa (B133) runs nearby to the Ritigala strict nature reserve and Labunoruwakanda Forest reserve. Moreover, the project area comprises of ancient tanks and irrigation canal system. In some places, some irrigation canals (e.g., Jaya Ganga/Yoda Ela) cross the existing road traverse. Therefore, the establishment of labour camps may have adverse impacts such as dumping of refuse, sanitary waste, and sewage into waterways, clearance of vegetation for worker campsites, hunting of animal species and collection of firewood from scrub areas may be particularly intense at campsites. 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.

Measures to mitigate ecological disturbances by workers and their camp operations

205. The following are proposed as mitigation measures:

- Local labour will be recruited as much as possible to minimize this impact.
- Strict labour supervision, provision of labour camps with electricity or LP gas for cooking, to eliminate them using the firewood 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 of.
- Accepted sanitation methods (e.g., mobile toilets) with proper sewage disposal facilities shall be provided. Under no circumstances shall such waste be released untreated into the water bodies, near scrub areas.

C3. Socio-economic Impacts and Mitigation

1. Positive impacts of iRoad project

206. All three roads proposed for rehabilitation are presently dilapidated expect small section of B213. Improvements these dilapidated roads would bring obvious positive impacts for the road user community. All these three roads are connected to the road network in North central province. There for connectivity impacts of the roads are significant. Apart from local agricultural community frequently using the road significant number of passengers travelling in public and private busses travel through these candidates' roads to reach their desired destination in North Central Province.

2. Social impacts due to Establishment of labour camps

207. The nature of the proposed project may not require large-scale labor camps to be established in the road area. Majority of the labors work in the construction sites may come from the local area itself, and therefore, there will be no need to provide them with accommodation facilities. However, if the needemerges to establish labor camps, they shall be established in suitable locations away from the houses, business establishments and other sensitive institutions such as schools, religious centers, etc. The labors shall be educated to behave in the camps decently without creating disturbances to others in the neighborhood. There can be conflicts between labors from outside areas and the local community members. This issue also shall be carefully handled by the contractors. The hiring of local people would be the most effective solution to avoid possible conflicts between external labors and the local community members.

3. Disruption to traffic/transportation

208. This is the most possible and obvious negative impact during construction. All 3 roads are heavily used by public buses,and they will have serious disturbances. Kekirawa–Thalawa road would be the most vulnerable road regardingtraffic-related disturbances during the construction phase. Regular road users such as school children, employees will have disturbances. The traffic-related disturbances will create specific impacts to the business establishments in the townships located along the roads. Management of construction sites would be the most effective and pragmatic solution to the traffic problem. One side of the road may be used for construction at a time while the other side is kept for the road users. Regular/continuous arrangements to manage the traffic near construction sites shall be implemented methodically. Most of the road construction contractors are well experience in these aspects due to their long-term exposure to similar projects on road improvements.

4. Impacts due to extraction and transportation of construction materials

209. Transportation of construction material will create impacts beyond the area of candidate roads. The transportation of material in other roads in the area will contribute to the existing traffic congestion. The nature of construction activities in the 3 roads will not require huge quantity of material to be transported. The roads will be rehabilitated, and they are not new construction. However, the transportation of material will contribute to the traffic congestion in the candidate roads. This situation is well known to the contractors and to the material transporters. The most essential needs are the commitments to minimize the traffic through their decent behavior in driving their vehicles and the time of transportation. They shall be advised to avoid peak hours of the roads during transportation. They also shall follow all the rules that are required in transporting construction material to the sites.

5. Impacts to roadside structures

210. Other than the eight structures projecting towards the existing road edge, there are about 80 temporary and moveable structures established adjacent to the existing ROW. These structures are being used by local community members to sell vegetables, fruits, and some other items to the road users. The socio-economic study team interviewed all the owners of these structures, and they are in agreement to shift the structures if the need arises. The RDA will inform them in advance (about 30 days in advance) about the project and its construction schedule and also the needs of the shifting of the structures if required.

211. Heavy vehicle movements, material sourcing (borrow material and quarrying operations) can lead to cracking of structures, especially old houses and buildings. If such a situation is anticipated, the contractor has to carry out a crack survey and subsequent monitoring.

6. Impact to due to obstruction to access

212. Access to the houses, business establishments, institutions and by-roads will be disturbed during the construction period. The contractors shall be instructed by the PIC to explore all the possibilities to minimize such disturbances based on the specific situation of the road. The contractor shall be instructed by the PIC to support to the affected persons to establish temporary access to reach their houses, business locations, institution or by-road. Steel plates can be used to create temporary access. However, the construction contractors

of the roads are well experience in handling these types of situations in road construction projects. The most essential need is to monitor whether contractors fulfill these needs with commitments.

7. Impacts on the development activities in the vicinity

213. The development activities such as construction of new houses presently carried in the area adjacent to the roads' edges will have disturbances. Possible disturbances to the access to such development sites would be the most critical impact. The road contractor can provide assistance to establish temporary access to the sites. However, the two parties, road contractor and the implementers of other projects shall get together and work out practical plan depending on the specific condition to create a win-win situation.

Figure 16: Development activities in the vicinity

C4. Other Impacts and Mitigation

1. Safety of Workers and Public

214. During construction, workers will be exposed to various risks and hazards. Potential impacts to health are respiration and eye diseases due to exposure to dust, the risk of accident during work. Extraction of construction materials, loading, transportation & unloading, construction of, culverts, bridges, causeways, surfacing, roadway excavation, removal of roadside structures, public utilities, use of hazardous substances (such as bituminous products) are the main causes associated with accidental risk.

<u>Mitigation of negative impacts</u>

215. Workers will be provided with first aid and health facilities. First aid training will be provided to field staff and social mobilizers and the foreman. The contractor shall organize awareness programs about the personal safety of the workers and the general public in the area with proper briefing and training on safety precautions, their responsibilities for the safety of themselves and others.

216. It is mandatory that the Contractor shall comply with requirements for the safety of the workmen as per the International Labor Organization (ILO) convention No. 62, Safety

and Health Regulations of the Factory Ordinance of Sri Lanka and IFC EHS Guidelines on Occupational Health and Safety to the extent that applies to the contract. Other than that, the contractor has to comply with regulations regarding safe scaffolding, ladder, working platforms, gangway, stairwells, excavations, trenches and safe means or entry and egress.

217. Use of licensed and trained plant and vehicle operators, provision of protective footwear, helmets, goggles, eye-shields, face masks, ear plugged and clothes to workers depending on their duty (mixing asphalt, blasting, handling equipment) are the major steps that can be taken to reduce accidental risk. Provision of high visibility jackets to the workers when construction activities are taking place at night with necessary lighting arrangement, allocation of flagmen during the daytime and provision of two red lamps at night are also necessary. Provision of first aid facilities and emergency transport facilities to the construction sites and labor camps is also an important responsibility of the contractor.

218. Excavated areas for construction shall be barricaded using barricading tapes and signboards. Quarry operations, roadway excavations and blasting shall be carried out and supervised by trained personnel.

219. Arranging regular safety checks for vehicles and equipment's, allocation of responsibility to the relevant personnel, prohibition of alcoholic drinks and other substances which may impair the judgment of workers engaged in construction activities, installation of warning signs, speed limits and signals to particular locations of the road.

220. Group accidental insurance shall be considered for the workers. In addition, conducting regular safety awareness toolbox meetings at least once in two weeks is needed.

D. Operational Phase

D1. Physical Impacts and Mitigation

1. Impacts on Water Resources and Hydrology

221. Improvements to the road drainage will result in improved stormwaterflows 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.

222. Also, improper handling of chemicals used for maintenance works such as paints, 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.

Mitigation of negative impacts

223. By designing the drains to withstand appropriate storm events will reduce the risk of an operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

224. Regular maintenance of all drainage related structures and monitoring especially prior to/in the aftermath of major storm events/monsoonal seasons by the RDA/Local authority will be required to ensure proper functioning of the drainage structures and to avoid blockage to the channels, culverts, roadside drains, tail/leadaway canals due to siltation, debris accumulation, nuisance vegetation growth, etc.

2. Pedestrian and Commuter safety

225. Inadequate provisions of road safety measures like no provisions of signals and lack of enforcement of traffic rules during operation period may invite accidents. Rehabilitation of the roads will provide easy access to the area, however, will increase the number of vehicles and their speed due to the improved condition of roads. These conditions will raise the issues of road safety for both pedestrians as well as for vehicular traffic. It is essential that enforcement of the speed limits, traffic rules, and regulations as well as the installation of warning signs, marking of center lines, pedestrian crossings, bus halts, etc. shall be incorporated to minimize road accidents and enhance the safety of the vehicles and road users.

Mitigation of negative impacts

226. The following are proposed as mitigation measures:

- Enforcement of speed limits, traffic rules and regulations and Installation of the warning signs, regulatory signs and information signs
- Applying appropriate road safety measures with the help of 3-Es; i.e., Engineering, Enforcement, and Education.
- Appropriately designated locations for bus stops, zebra crossings, vehicle parking and curbedfootpaths within urban areas, etc. to ensure the safety of both pedestrians and other road users including drivers. Maintenance of road furniture and markings is important during the operational period.
- Designated locations for garbage collection, so as not to disturb pedestrians and vehicle movements.

3. Noise, Air and Water Pollution

227. During the operation period, the noise level will increase due to the increased movement of vehicles. It is a general habit that the motorists tend to drive faster when the road condition is good. However, this will cause higher noise levels. Movement of three-wheelers and motorcycles are relatively higher than other vehicles, and these two types of vehicles emit more noise than bigger vehicles. Higher levels of noise will be a disturbance to the household, especially for vulnerable persons such as babies, children and elderly. Schools, religious places, and offices will also be disturbed by such high levels of noise and vibration.

228. The major factor that contributes to poor air quality in the project area at present is dust emission from gravel and sandy roads. Rehabilitation of roads will significantly reduce

the existing dust emission after the proper surfacing of the roads. Air pollution due to vehicle movement, especially diesel vehicles will be of concern. However, as compared to the present number of vehicles, the incremental numbers will not be significant even after rehabilitation. Therefore, air pollution due to vehicle emissions cannot increase after the project. On the other hand, rehabilitation work such as alignment of roads, widening and re-surfacing will allow considerably higher speeds for vehicles with minimum accelerations and decelerations which in turn reduce the vehicular emissions and sound pollution compare to the current situation. Therefore, quality of air in the area will improve due to less dust and fugitive particles, which will cause positive impacts on human health in the area. Introducing green areas and corridors and tree plantation will also help to curtail both dust and noise as experienced by households living along the roadside.

229. The disposal of household waste and wastewater to roadside drains, oil and grease from vehicles into water bodies may cause water pollution. Similarly, with the careless disposal of spoil and other construction material into water bodies during maintenance of road may also degrade the water quality. However, enforcement of strict control on wastewater disposal and proper collection of MSW will alleviate the problems associated with water pollution.

Mitigation of negative impacts

230. The following are proposed as mitigation measures:

- Community and road user awareness program will be organized to enhance public understanding on proper maintenance of roadside drains and importance of proper MSW and wastewater disposal.
- Maintenance of green corridors and their beneficial impact on air and noise pollution control
- Speed limits shall be strictly enforced together with restriction in the use of horns shall be restricted near mosques, hospital, schools and densely populated settlements.

D2. Ecological Impacts and Mitigation

231. Due to the improvement of road condition vehicular movement of these roads could be increased and therefore increase of traffic flow at higher speeds is expected. Consequently, there is a potential of collision of animals such as small mammals, reptiles, amphibians, and birds. Moreover, there are some feral cattle, buffalos, cats, and dogs frequently approaching the roads during the nights. This will result in the increasing number of animal accidents and disturb their natural movement.

Impacts near road section close to Ritigala SNR and Labunoruwakanda FR

232. In addition, the road traverse near to Ritigala SNR and Labunoruwakanda FR may have an impact especially on elephants when crossing the road. However, the exact impacts will depend on the nature and extent of the existing road network. Even when roads do not directly destroy habitat, the noise and disturbance associated with them may impact significantly on those species that require an undisturbed and/or interior habitat.

Measures to avoid accidents at animal/ elephant corridors

233. To reduce the frequency of accidents in this road section where elephant are being used as corridors, it is recommend reduce the speed of vehicles, limiting the construction activities during at night, and fencing the working road except for corridor areas. In addition as mitigation measures, solar power fence, fodder development and creation of sufficient water resources inside the forests can be considered.

Measures to mitigate ecological impact during operation

234. Place warning signs especially within the section of the road that passes along identified animal roaming areas (at least 1 km before approaching the area) located across the road for the drivers to be more vigilant and reduce speed.

E. Positive Impacts of the Project

E1. Socio-economic benefits

235. The following are proposed as mitigation measures:

- The improvements to these roads would bring a contribution to the local economy, especially for the agriculture community.
- Availability of roads without dust and mud during dry and rainy seasons.
- Possible enhancement of time efficiency of transportation.
- The potential increase in property value.
- Remarkable reduction of vehicle maintenance cost

6 CLIMATE CHANGE ADOPTION (IMPACT AND MITIGATION)

236. Growth in vehicular traffic and energy use are considered as main contributors of 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.

237. 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.

238. Improving the surfaces (pavements) of existing rural roads in Eastern Province may increase the traffic volume in these roads. However changes in vehicle operation speeds with respect to present conditions will have an impact on emission levels of the gases emitted by such vehicles. Most common types of vehicles that would move on these roads are bicycles, bullock carts, motor cycles, three wheelers, cars, vans, buses and light commercial vehicles. Thus emission of Carbon Dioxide (CO_2) 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 CO_2 emissions.

239. The EKB has developed a set of spreadsheet-based models to evaluate the CO_2 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 CO_2 efficiency (intensity), and fuel type, validated by more detailed emission factor models. The models directly estimate CO_2 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.

240. The TEEMP model for rural 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 roads in North Central Province. A summary of these input parameters are presented below.

Table 6-1: Input parameters for TEEMP model for roads in NP

Parameter	Input value
Occupancy/loading	
Two wheeler	1.7
Three wheeler	2.0
Passenger car	3.0
Light Commercial Vehicle	2.5 Ton
Bus	30.0
Heavy Commercial Vehicle	7.5 Ton
Bullock cart	0
Bicycle	1.0
Roughness	
Before improvement	8.0 m/km
After improvement	3.0 m/km
Lane configuration	
Before	Single lane @ 2.5 m pavement
After	Single lane @ 3.0 m pavement

Model predicted CO_2 emission levels

241. Three case scenarios were analyzed using the model based on the traffic analysis in North Central Province which categorized the traffic levels as rural, urban and provincial. Model output includes CO_2 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: CO_2 emission for Project & induced traffic and Project without induced traffic with compared to BAU

	Net Change in Emission of CO_2 in Ton/km/year
	Rural
Project with induced traffic	–1.1
Project without induced traffic	– 0.9

242. As indicated in the model output and summarized in above table the proposed improvement to existing road pavements will bring a reduction in CO_2 emission even with a growth of traffic. However, this analysis is based on the assumption that the roughness of improved road 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). The total length of roads to be improved in this project is around 90 km

and based on the minimum (0.8 T/km/year) and maximum (1.1 T/km/year) net change in CO_2 emissions or CO_2 savings of the proposed investment program in NCP will be between 1100 and 1600 Tons/year.

Mitigation measures for floods

243. 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 on these roads will be of reinforced concrete. Estimated construction cost for Kekirawa - Ganewalpola - Dachchihalmilewa road is about 6% of the total allocated fund for the iRoad project. 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 in the three selected roads for RMC in NCP.

7 INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

A. Institutional Arrangements

244. The Ministry of Highways & Road development and Petroleum Resources Development is the Executing Agency (EA) for the project and the RDA is the Implementation Authority (IA) who has the responsibility of implementing the overall EMP. The Project Implementation Unit (PIU) will be established by the RDA. The PIU will be responsible for overall contract administration and the supervision of the contractor regarding the implementation of environmental specifications and special environmental safeguard provisions included in the Contract Document. In practice, the detailed implementation of EMP will involve EA, IA, PIU, PIC and Contractors.

245. The PIU will be headed by a full time Project Director (PD) and supported by a team of engineers from the RDA. The PIU will have a safeguards team with sufficient social and environment safeguards officers to cover the quantum and geographic distribution of works in all provinces under the investment program. The Project Implementation Consultants (PIC) will support the PIU for supervision of the design and construction works by the civil works contractor. The PIC team will include an environment specialist for conduction of regular monitoring of safeguards implementation on site.

246. 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 three candidate roads. Their specific roles and responsibilities of each party are given in chapter VI of the EARF.

B. Environmental Management Plan and Monitoring

B1. Environment Management Plan (EMP)

247. The Environmental Management Plan (EMP) was developed to avoid/ minimize the adverse impacts to the physical, biological and social environments during pre-construction, construction and operational stages of the project. EMP, prepared as a matrix, is attached as Appendix 8.1, 8.2 and 8.3. This was developed based on best practices for environmental management. The EMP includes the potential impact as a result of project activities, proposed mitigation measures, the responsible party to implement and supervise those impacts and the feasible cost measures to be taken to reduce the potentially significant adverse impacts in an acceptable level.

248. 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.

249. 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 EMPs prepared for the three roads are attached in Appendix 8.1, 8.2 and 8.3.

250. 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) shall 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 shall be completed during pre-construction, bi-annually during operation and maintenance period. 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.

B2. Environmental Monitoring Plan (EMoP)

251. There will be an Environmental Monitoring Plan (EMOP) based on the project cycle to monitor EMP implementation by measuring environmental parameters. Environmental monitoring is required to make sure that the anticipated adverse impacts are kept minimal with the implementation of mitigation measures as and when required. The monitoring objectives are therefore focused on the mitigation of likely impacts. Also, compliance with the existing regulations and legislation is also guaranteed.

252. 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 9 presents the EMOP prepared for the three Roads. Based on the EMOP, the contract will be required to prepare contract package specific EMOPs.

253. 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.

254. The EMoP (Appendix 9) includes information on:

- Parameters to be monitored
- Proposed locations of sampling points
- Frequency of monitoring
- Responsible agency / agencies
- Facilities available with such agencies
- Availability of funds, expertise, and facilities

255. The EMoP will be a useful tool to monitor the implementation of mitigation measures included to the EMP. Monitoring of the quality of water, air, and noise during the construction stage is a responsibility of the contractor by the approved Government Agency. All the monitoring activities such as site supervision, removal of trees, material extraction, verification of permits, etc. by the contractor will be supervised by the PICs. The environmental monitoring report will be submitted to the PIU, which will include the results of environmental monitoring into its environmental report that will be reported to the PD of the iRoad Project.

B. Grievance Redress Mechanism

256. A project-specific grievance redress mechanism will be established to receive, evaluate and facilitate the resolution of affected persons (AP) concerns, complaints and grievances about the social and environmental impacts at all levels of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. Expected issues from these sub-projects (3 Roads) are mostly from the construction activities which can be amicably settled by both parties. In the case of grievances that are immediate and urgent in the perception of the complainant, the contractor and supervision personnel from the PIC on site will provide the most easily accessible contact for quick resolution of such grievances. Contact phone numbers and names of the PIU Social Development/Safeguards and contractor's site engineer will be posted at all construction sites in visible locations.

257. Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the existing local administrative system. Depending on the nature and significance of the grievances or complaints, grievances will be addressed at three levels. The first will be at the grassroots 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 grassroots 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.

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

(i)	The Grama Niladari of the area	Chairman
(ii)	A representative of PIU	Secretary
(iii)	A representative of Supervision Consultant	Member
(iv)	A representative of Contractor	Member
(v)	A community member/religious leader	Member
(vi)	A woman representative from the local community	Member

259. At the DS Level GRC members will be:

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

260. 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.

261. Recommended steps with a timeline on the operation of the GRM are provided in Figure 7.1. 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.

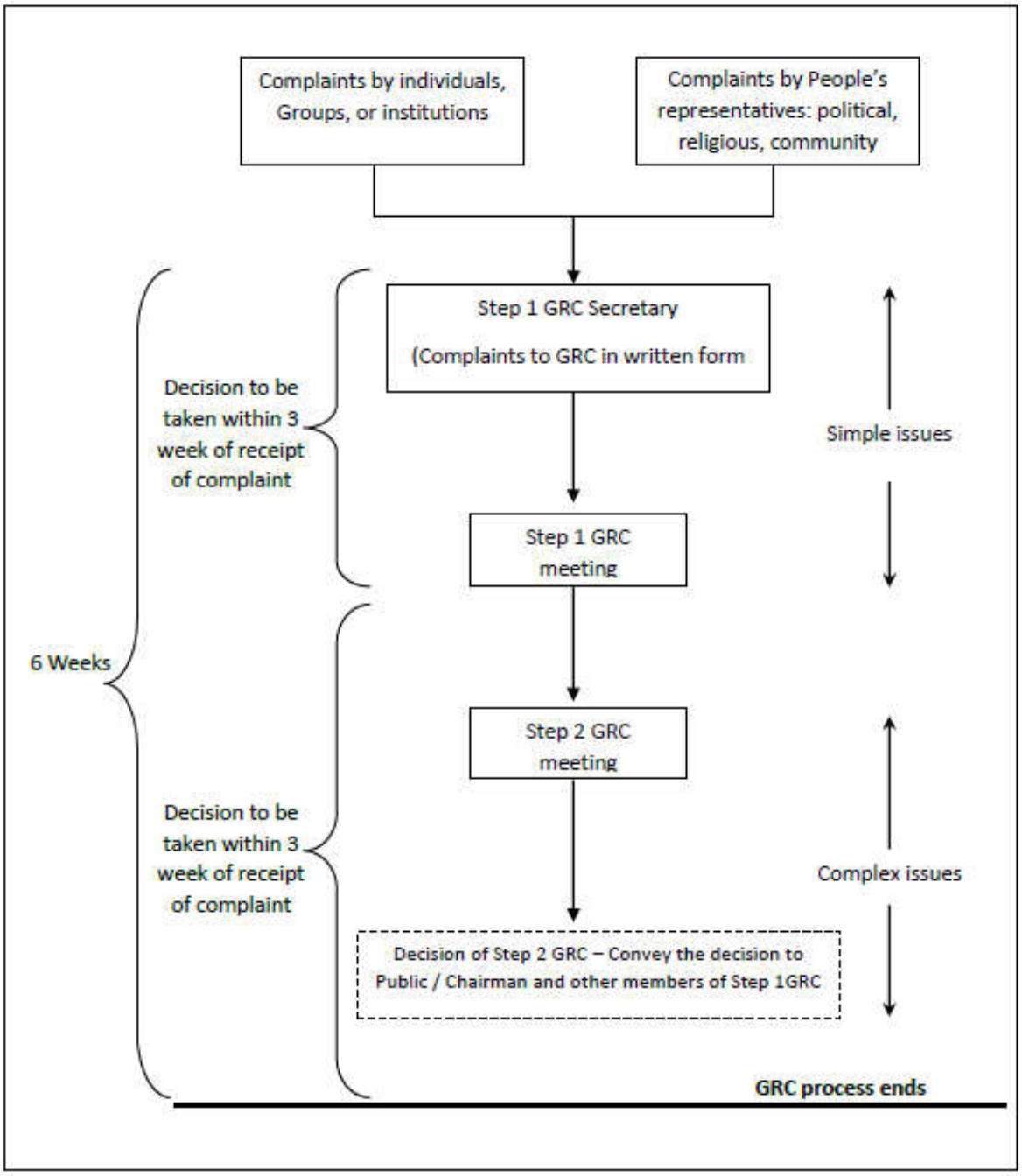

Figure 7.1: Summary of GRM procedures (Source: EARF: SRI: Integrated Road Investment Program submitted by the RDA to the ADB, May 2014)

8 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Public Consultation

262. Public consultations were carried out covering all 6 DSDs falling under the road influenced area. The methods used for public consultations include one on one interviews with about 125 road users and 10 Focus Group Discussions (FGDs). The main aim of these consultations was to obtain the perception of the community about the project (3 candidate roads), any environmental and social problems prevailing in the project area. It shall be noted that during these interviews equal focus was paid to male and female members.

Key comments and suggestions made during above meetings are listed below.

B. Focus Group Discussions (FGDs)

263. The following descriptions are the summary reports for the Focus Group Discussions conducted during the field visits.

1. Kekirawa –Thalawa Road (B233)

264. The details of the Focus Group Discussions are provided below.

Table 8-1: FGDs carried out with communities living along the B 213 Road

Road	Relevant DS Division	Date	Venue	Participants		Total
				Male	Female	
B 233-Kekirawa – Thalawa	Thalawa	5/3/2018	Community Hall – Kiralogama	8	3	11
	Thalawa	5/3/2018	Keththarama Temple – Eppawala	10	2	12
	Ipalogama	6/3/2018	Community Hall – Punchikulama	11	1	12
	Ipalogama	6/3/2018	Bimalpa Meeting Hall – Gonapathirawa	8	2	10

265. Summary of the issues discussed:

- About 10 km from Kekirawa Junction to Hiripitiyagma is improved with carpet. The section from Hiripitiyagma to Thalawa is dilapidated. The road gets submerged in some sections of the road run through paddy land area in Mahaweli System H.
- Operators of hiring vehicles such as three-wheelers and other good transporters are reluctant to drive due to dilapidated sections of the road. This road is used to reach the economic center in Dambulla by farmers and transporters of vegetables. Agriculture goods especially vegetables get damaged during transportation.
- This road is heavily used by SLTB and private buses.

- The Road Development Authority is involved in maintenance, but the participant of 4 FGDs expressed their dissatisfaction with the maintenance program.
- The sections of the road fallen within paddy land area shall be raised. The features such as stormwater drainage system and culverts need to be improved. Construction site shall be managed to minimize the possible difficulties to the road users during the construction period.

FGD at Community Hall – Kiralogama

FGD at Keththarama Temple – Eppawala

FGD at Community Hall – Punchikulama

FGD at Bimalpa Hall –Gonapathirawa

Figure 8-1: Photographs taken during the Focus Group Discussions of B 213

2. Kekirawa - Ganewalpola road (B212)

266. The details of the Focus Group Discussion

Table 8-2: FGDs carried out with communities living along the B212 Road

Road	Relevant DS Division	Date	Venue	Participants		Total
				Male	Female	
B 212- Kekirawa – Ganewalpola	Kekirawa	2/3/2018	GN Office – Embulgaswewa	12	6	18
	Kekirawa	8/3/2018	Farmer Organization Office – Ganewalpola	9	2	11

267. Summary of the issues discussed

- The uneven surface of the road is observed. There is no established stormwater drainage canal system. Several sharp bends are observed. Time taken to reach desired destinations through this road is a serious difficulty.
- This short road section is used to reach different destinations covering larger catchment area.
- The road users are not happy about present maintenance activities. Patchwork is carried out in scattered locations to fill some potholes.
- This is the road connect to A11 road which runs from Maradankadawala to Batticaloa. This road is also connected to A9 at Kekirawa even though it is an important road section regarding connectivity it has not been rehabilitated in the last 30 to 40 years.

FGD at GN Office – Embulgaswewa

FGD at FO Office – Ganewalpola

Figure 8-2: Photographs taken during the Focus Group Discussions of B 212

3. Ganewalpola – Dachchi Hammillewa Road (B133)

268. The details of the Focus Group Discussion are given below.

Table 8-2: FGDs carried out with communities living along the B 133 Road

Road	Relevant DS Division	Date	Venue	Participants		Total
				Male	Female	
B 133- Ganewalpola – Dachchi Hammillewa	Kahatagasdigiliya	26/2/2018	Mosque- Ithalwetunuwewa	20	5	25
	Kahatagasdigiliya	26/2/2018	GN Office – Koon wewa	13	3	16
	Galenbidunuwewa	27/2/2018	Administrative Service Centre	17	5	22
	Galenbidunuwewa	27/2/2018	Ellawewa Community Hall	16	5	21

269. Summary of issues discussed

- Narrow road in some sections is a problem for traffic in certain townships. The road surface is uneven. There is no properly established drainage system and existing culverts, and small bridges are dilapidated and under capacity.
- In certain sections narrow road is a problem for overtaking. It takes a longer time to reach desired destinations. Public transporters are reluctant to increase their frequency of running. The road is used for transporting agriculture products to Dambulla market. Damages to the agri-products especially vegetables is an issue for the transporters. Private transporters tend to charge more than expected fees due to the dilapidated condition of the road.
- The participants of the FGDs express their serious dissatisfaction with the available maintenance system. Even the pothole filling is not done methodically. Some sections of the road are partially improved occasionally but not at satisfactory level.
- This is an important road section which is connected to Anuradhapura - Trincomalee road and Maradankadawala -Batticaloa road. The townships such as Horowpothana, Kahatagasdigiliya, Galenbidunuwewa, and Ganewalpola are connected by this road. This is a shortcut to reach Anuradhapura Padeniya road for the Commuters coming from Trincomalee area. The farmers in Huruluwewa Agricultural Scheme use this road to reach Dambulla Economic Center.

FGD at Mosque – Ithalwetunuwewa

FGD at GN Office – Koon wewa

FGD at Administrative Service Centre

FGD at Ellawewa Community Hall

Figure 8-3: Photographs taken during the Focus Group Discussions of B 133

C. Disclosure of information

270. 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, the name of the contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil, and English) for rural roads. In addition an information flyer could be distributed among residents who live along the route providing information on how they could assist the project. For the national RMC roads, there will be sign boards on the period of works and contact information for reporting complaints or grievances in three languages.

271. 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.

9 CONCLUSION AND RECOMMENDATIONS

A. Findings and Recommendations

272. The proposed road rehabilitation and construction activities on B 133, B 212 and B 213roads shall be carried out within the existing RoW and road reservation boundary lines to avoid any land acquisition and/or resettlement of households. Anticipated positive socio-economic impacts of the project include reduction of transport costs and vehicle operation cost due to better road conditions and reduced travel time, an increase in income-generating activities and enhancement of road safety. With proper implementation of the EMP and the EMoP, environmental benefits include less noise and air emissions due to improved road condition, reduced soil erosion and improved water quality due to better drainage facilities, etc. Facilitating better drainage (cross drainage and along the road) and raising the road surface to levels above frequent flood levels would ensure continuous, uninterrupted road use. Proper drainage will alleviate problems of flood inundation of road surfaces thereby avoiding damage to the roads, thus ensuring the continued structural strength of the road and other structures.

273. Negative environmental impacts are mostly restricted to the construction stage. Extraction of construction materials, transportation, and storage of material and disposal of debris needs careful planning and to follow good practices to avoid environmental impacts. Deterioration of water quality is possible due to washing away of material, especially soil and gravel, with surface runoff and wastewater discharges. Nuisance caused by way of high levels of dust and particulate matter in the air due to material extraction, transportation and storage, and construction activities is another negative environmental impact. Also, fumes and smoke from vehicles and machinery are identified as negative impacts. Noise and vibration can be expected from vehicular movements and construction activities which needs mitigation. Vehicle fumes, black smoke, vibration, etc. Temporary blockage or alteration of surface runoff is the other anticipated impacts during the construction of bridges, culverts, and causeways. Realignment of services such as electricity, telecommunication, and water lines would cause inconveniences to the residents.

274. The fauna and flora observed are common species that are found in rural and suburban areas. Only a few endemic and threatened species were recorded at the project site. None of the recorded endemic species are restricted to the project area. Therefore, the project will not have major adverse impacts on the habitats or fauna and flora in the proposed project site.

275. Establishing baseline environmental parameters is necessary to implement the Environmental Monitoring Plan. Monitoring of baseline quality of water, air and noise/vibration levels is recommended to carry out at sampling locations as outlined in the Environmental Monitoring Plan during the pre-construction stage. Establishment of baseline parameters is essential to monitor changes in the quality of water, air, and noise during the construction and operation periods. Repeated sampling during the construction and operational periods shall be done at the same locations which were used to establish

baseline parameters. Thus, changes can be easily compared to assess and evaluate the effectiveness of the mitigation strategies as outlined in the Environmental Management Plan.

276. A long-term maintenance program is essential for sustaining road in good condition. Thus periodic inspection, assessments, and proper maintenances strategies shall be implemented during operation stage. It is recommended that detailed design team shall be properly coordinated with future schedules regarding infrastructure development of line agencies to minimize structural damages to the road.

H. Conclusions

277. The proposed activities involve rehabilitation of three existing roads (B 133, B 212 and B 213) and other road-side-structures. The proposed project will not cause significant negative impacts on the existing socio-economic environment in the area (project-affected area and its immediate vicinity). The potential environmental impacts that have been identified during the study are temporary, manageable and will occur only during pre-construction and construction stage of the project. The proposed road rehabilitation and construction activities shall be carried out within the existing RoW and road reservation boundary lines. There is no need for land acquisition or resettlement of persons. Therefore, the proposed rehabilitation work activities of the three provincial council roads are environmentally acceptable.

278. According to the analysis of existing baseline data and prediction of impacts, the proposed road rehabilitation, and construction activities fall under Environmental Category B based on the ADB Guidelines. Thus, a full Environmental Impact Assessment (EIA) for the project is not required. Concerningthe National Environmental Act No.47 of 1980, amendment No.56 of 1988, and subsequent amendments, the project does not fall under the Prescribed Project Category, and therefore may not need an EIA or an IEE to be carried out. However, it is advisable to seek the advice of the Central Environmental Authority and confirm this, and further obtain any guidelines that must be adhered to.