Initial Environmental Examination

June 2017

SRI: Second Integrated Road Investment Program

Northern Province

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

CURRENCY EQUIVALENTS

(as of 30 May 2017)

Currency unit	–	Sri Lanka Rupee (SLRl}
SLR1.00	=	$ 0.00655
$1.00	=	Rs 152.63

ABBREVIATIONS

ABC	-	Aggregate Base Course
AC	-	Asphalt Concrete
ADB	-	Asian Development Bank
BIQ	-	Basic Information Questionnaire
CBO	-	Community Based Organizations
CEA	-	Central Environmental Authority
CW	-	Carriage Way
DCS	-	Department of Census and Statistics
DoF	-	Department of Forest
DOI	-	Department of Irrigation
DSD	-	Divisional Secretary Divisions
DWC	-	Department of Wildlife Conservation
EC	-	Environmental Checklist
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EPL	-	Environmental Protection License
ESDD	-	Environmental and Social Development Division
GDP	-	Gross Domestic Product
GEF	-	Global Environment Facility
GND	-	Grama Niladhari Divisions
GoSL	-	Government of Sri Lanka
GRC	-	Grievance Redress Committee
GRM	-	Grievance Redress Mechanism
GSMB	-	Geological Survey and Mines Bureau
IEE	-	Initial Environmental Examination
IEER	-	Initial Environment Examination Report
iRoad	-	Integrated Road Investment Program
LA	-	Local Authority
LAA	-	Land Acquisition Act
MC	-	Municipal Council
NAAQS	-	National Ambient Air Quality Standards
NBRO	-	National Building Research Organization
NEA	-	National Environmental Act
NP	-	Northern Province
NWS&DB	-	National Water Supply and Drainage Board
OPRC	-	Output and Performance - based Road Contract
PIC	-	Project Implementation Consultant
PIU	-	Project Implementation Unit
PRDA	-	Provincial Road Development Authority
PRDD	-	Provincial Road Development Department
PS	-	Pradeshiya Sabha
RDA	-	Road Development Authority

ROW	-	Right of Way
SSEMAP	-	Site Specific Environmental Management Action Plans
TOR	-	Terms of Reference
TEEMP	-	Transport Emissions Evaluation Model for Projects
UNEP	-	United Nations Environment Program

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EXECUTIVE SUMMARY

1. The Government of Sri Lanka (GOSL) places a great emphasis on the improvement of rural road network in the country and to improve transport connectivity between rural communities and socioeconomic centers. In this regard, the Road Development Authority (RDA) under the Ministry of Higher Education and Highways, has proposed Integrated Road Investment Program (iRoad Program) with the aim of developing about 1,000 rural communities as rural hubs according to their population and development potential. This will enhance the connectivity by (i) improving rural access roads linking the rural hubs to trunk road network to all weather standards, and (ii) operating a sustainable trunk road network of at least fair condition. Hence number of social economic and cultural benefits to the rural communities can be achieved through the proposed project.

2. The broad objective of the project is to improve the connectivity within the rural road network with the provincial and national road network and to reduce cost and journey time and improve reliability of access. In this manner it is intended to enhance opportunities for rural population for economic growth and income generation align with the nationwide economic and social development. In order to achieve these objectives, upgrading and maintaining the existing roads to all weather standards, surfacing the existing pavement with Asphalt Concrete (or concrete) if the present surface failures occurs, repair or reconstruct of damaged culverts and other cross drainages, introduce earth drains for all road sections and built up drains where necessary and remove any irregularities that are on the existing vertical profile, there by improve the vehicle operating speeds while ensuring safety of road users will be implemented. The proposed improvement will be limited along the existing Right Of Way (RoW).

3. After the long armed conflict in the country, the GOSL has given special emphasis on economic development in Northern Province (NP) by allocating both national and foreign fund resources under short, mid and long term plans. Therefore under the current program, around 1,300 km of roads maintained by PS, PRDA and RDA located within all five Districts of NP will be upgraded and maintained to all-weather standards. The identified roads have not been rehabilitated properly during the civil war period and afterwards. The existing surface condition, drainage facilities, structures and width of the carriageway are not appropriate for long term usage of roads and create many environmental and social issues such as soil erosion, sedimentation, stagnation of water, temporary flood and pollution of air quality in the area.

4. RDA has discussed with ADB to finance iRoad 2 program under a time slice Multi tranche Financing Facility (MFF) as iRoad. The program will rehabilitate and update selected rural roads in Northern Province (NP), Eastern Province, Uva and Western Province. Rehabilitation and upgrading of PS and PRDA roads will be carried out for a period of two years with a maintenance period of three years. For RDA roads the reconstruction and rehabilitation works will continue for two years followed by a maintenance period of another five (5) years.

5. This report presents the findings of Initial Environment Examination (IEE) of NP and has been prepared based on the field screening process of all identified roads in NP as a requirement of the Preliminary Engineering Work (SAPE work) .Skills International (Pvt) Ltd on behalf of RDA was assigned to carry out all the field work and preparation of Environment Checklists and IEE Report of proposed roads of NP. The main objective of the IEE report is presenting a comprehensive account on existing environment condition of proposed project area in terms of Physical, Ecological, Economical and Social environment. Further, the IEE includes identification of both potential positive and negative environment and social impacts during the pre-construction, construction and operation stages of the project, propose suitable

measures to be implemented against anticipated negative impacts and to enhance the positive impacts. The common Environment Management Plan (EMP) with recommended institutional arrangement for implementation and monitoring throughout the project cycle also includes to the report. In addition, public views and suggestions regarding the proposed project are also included in the IEE report to ensure the concerns of public is included during the detailed design of these roads.

6. The proposed project in NP is categorized as environmental category B based on the ADB Rapid Environmental Assessment checklist for roads and highways. Key national environmental laws and regulations followed during the environmental assessment includes; National Environment Act No. 47, Coast Conservation Act No 57 of 1981, National Environmental (Protection and Quality) Regulation No. 1 of 1990, National Environmental (Ambient Air Quality) Regulations,1994, National Environmental (Noise Control) Regulations No.1 of 1996, Fauna and Flora Protection Act No. 2 of 1937, Forest Act No. 34 of 1951, Felling of Trees Control Act No. 9 of 1951, Soil Conservation Act No. 25 of 1951, Explosives Act No. 36 of 1976, Water Resources Board Act, No. 29 of 1964, Urban Councils Ordinance No. 61 of 1939, Agrarian Development Act No. 46 of 2000 (Section 32). Sri Lanka Land Reclamation and Development Corporation Act 15 of 1968 and National Thoroughfares Act No. 40 of 2008 among many others. Apart from that several International Agreements and Conventions were considered during this investment program.

A. Methodology

7. Initially, the Environmental Checklist (EC) for each road was prepared based on the instructions given in the Environment Assessment Review Framework (EARF). Based on the findings, one Rapid Environmental Assessment (REA) checklist was prepared for the province as required by the ADB SPS and accordingly the proposed project was categorized as environmental category B. This was followed by preparation of IEE.

8. The IEE report was prepared based on the EARF, which is developed based on ADB Safeguard Policy Statement, 2009 (SPS). Field assessment of the proposed roads was carried out during the period from 25th August 2016 up to 15th of October 2016. Under the environmental assessment procedures outlined in the EARF, following environmental criteria were used for road selection: i) no category A project was included; ii) no project roads in part or whole inside a protected area were selected under the program; iii) project roads adjacent to protected areas or sensitive location were only considered if there is no widening of the road ROW; iv) minimal impact of rehabilitation on sensitive ecological habitat.

9. During the field survey both environmentally and public sensitive locations located beside the roads and land use pattern of the project area were recorded. In addition road side utilities and trees with 60cm Girth at Breast Height (GBH) or more located within 2 m corridor from the edge of the carriageway on either side were also documented.

10. Secondary data for the preparation of IEE was obtained from literature survey, information collected from Divisional Secretaries Divisions of NP and relevant government agencies {RDA, CEA, Department of Wildlife Conservation (DWC), Department of Forest (DOF), Department of Irrigation (DOI), Department of Census and Statistics (DCS)}, Department of Coast Conservation (CCD) and their authorized websites.

1. Physical Resources

11. **Climate:** Northern Province of the country is located completely within the low country dry zone, where the climate is characterized by high temperature and low rainfall. The climate is typically tropical with the annual temperature ranges between 19.9 °C to 35.9°C. Relative Humidity varies from 70% during the day to 90% at night.

12. **Rainfall:** Annual rainfall of the NP varies between 696 mm - 1125 mm. The area is influenced by the two rainy season Northeast monsoon from December to February and Second Inter monsoon from October to November.

13. **Terrain and Geology:** Terrain of the region is relatively flat with low elevation towards the coast. The Province has a long coastline, a number of inhabited small islands, and is rich with natural resources particularly the forests, wetlands, mineral deposits and coastal resources. Six major soil groups have been identified in the region.

14. **Hydrology**: Hydrological system of the NP mainly consists of inland water resources such as streams, reservoirs, ponds, irrigation tanks, channels and marine water resources like lagoons and brackish water habitats. Out of these many small to medium scale seasonal streams and tanks are active only during the monsoonal rainy periods. However the Jaffna peninsula does not contain any streams or rivers. A total of 45 medium irrigation schemes and 9 major irrigation schemes are located in the Province which come under the preview of Provincial Irrigation sector. In addition to this, few major tanks are maintained by the central administration. There are 2,066 tanks and ponds also under minor irrigation scheme. Some streams and water sources cross or located near proposed roads within the project area.

15. **Air Quality**: Majority of the identified roads for the project located within rural areas of the NP. No industries or major pollution sources are located within those areas. At present, considerable amount of the land area of the Province is covered with forest and scrublands. Therefore apparently, air quality standards in the area are within the national ambient air quality standards.

2. Protected Areas and Biodiversity

16. NP has extensive areas of protected habitats and secondary forests such as dry monsoon forests, riverine forest and mangrove forest and wetlands which provide various habitats for wild animals and plants. Mainly Mullaitivu (169,303 ha which is 64.1%), Mannar (123,740.1 ha which is over 50%) and Kilinochchi (37,599.8 ha) Districts are extensively covered with forest while Vavuniya (117,050.7 ha) and Jaffna (1354.7 ha) is partially covered with forest. The Province has number of sanctuaries and lagoons which provide breeding, feeding and nursery ground for different birds, reptiles and number of aquatic vertebrates and invertebrates. These coastal and wetland sanctuaries also offer access to fisheries, aquaculture and has good tourism potential.

3. Socio Economic Status

17. **Population and population density**: NP is divided into five administrative Districts namely Jaffna, Mannar, Vavuniya, Kilinochchi and Mullaitivu, , 33 Divisional Secretary's Divisions (DS Divisions) and 912 Gram Niladhari Divisions (GN Divisions). The Province is sparsely populated in comparison with other parts of the country. The total population recorded in the Province is 1,061,300. From the total population of NP, majority (83%) are living in rural areas.

18. **Ethnicity:** According to the distribution of population with respect to the ethnicity in NP, more than 88% belongs to the Sri Lankan Tamil. Two other ethnic groups, Moor and Sinhalese represent the second and third place in the NP, which is 5.26% & 4.72% respectively.

19. **Agriculture:** The agricultural productivity in the area is considerably high with annual crops such as paddy, perennial crops and homesteads cultivation. During the field survey, many agricultural lands including paddy, coconut, Chena cultivation and home gardens with different crops were observed. Except for agriculture, fisheries and animal husbandry are other mainstay of the economy. Apart from that raring cattle, goat & chicken in their home gardens was also a common observation in the area. The large extent of marine and coastline and inland water bodies of the Province provide enormous opportunities for fisheries.

20. **Industries:** Before conflict situation, there were many large-scale industries such as cement, salt, extraction of mineral sands in NP, however those were badly affected during the conflict and were abandoned**.** Currently only few industries such as Palmyra Distillery industry and some small-scale industries are operated in the different areas of the Province. Most of the industrial establishment in the Province is restricted to Jaffna and Mannar Districts. Most of them are small scale industries and the number of employees engage in the industrial establishments is less than 25.

21. **Poverty:** Based on the Household Income and Expenditure Survey 2012/13, the highest monthly mean and median household income of the Province (43,965 and 17,714) was represent by Vavuniya District and the lowest (23,687 and 17,714) by Mullaitivu District. The highest percentage of poor household (24.7%) is represent by Mullaitivu District in Sri Lanka.

22. **Existing Infrastructure Facilities:** Roads are the main transportation mode of all five Districts of the NP. The existing road network of the Province includes 8331km of national, provincial and rural roads which are managed by the RDA, PRDD and Local Authorities. During the conflict situation maintenance work of these roads had not been properly carried out therefore majority of the roads has become highly dilapidated. During the field survey, it was observed that majority of the rural roads in the Province have not been rehabilitated and some roads or sections have been totally abandoned. Currently the condition of these roads for vehicular movement is highly unsatisfactory and according to the public usage of these road is inconvenient for the people.

23. The electricity facilities along the selected roads are apparently good compare to other infrastructure facilities such as telephone and pipe born water supply. The CEB has supplied electricity to most of the people around selected roads. Majority of the household in all five Districts use protected well water both within and outside the premises. Apart from that people in the area depend on pipe borne water, tube wells, rural water supply schemes and inland water sources such as rivers, tanks and streams etc.

24. Majority of households in all five Districts use private toilets. In addition considerable number of people in the Province use shared toilet facilities. However, 21% and 22% of Mullaitivu & Kilinochchi Districts households do not have any private or shared toilets facilities.

25. **Religious, Cultural and Archeological Significance:** There are many areas in NP with exceptional religious, cultural, archaeological values. These include ancient temples (Buddhist and Hindu) and sites mentioned in chronicles, sites of pre-historic significance and old churches and temples of high cultural value to the people. The value addition prospects of these sites to the tourism is immense and attract so many local and international tourists annually. Although,

some of the locally important religious, cultural and archeological significance sites are located beside/at the vicinity of proposed roads in all five Districts, no any impacts will be anticipated due to rehabilitation and maintenance of the proposed roads through the project.

B. Anticipated Environmental Impacts and Proposed Mitigation Measures

26. The proposed work under the project will include rehabilitation and upgrading of existing roads/sections with improvement of road surface, construction of side drains, shoulders & embankments, widening or replacement of culverts, cause ways bridges etc. During the pre-construction period shifting of public utilities and construction stage re-establishment of public utilities, removal of road side trees, extraction and transportation of construction materials, disposal of waste and other unsuitable materials, establishment of construction material processing plants, labour camps etc. are essential. Above construction activities will have negative impacts on physical, biological and social environments in different magnitudes. However most of these negative impacts are temporary, in nature occurring during construction stage. Such negative impacts could be avoided, minimized or mitigated by adopting the mitigatory measures which described in the EMP of this IEER.

27. Apart from the negative impacts, many socio economic positive benefits such as improved connectivity, reduce travel time and cost, proper access to public sensitive locations, poverty alleviation and boost for economic growth etc. will be expected after implementation of the project.

C. Institutional Requirements, EMP and Grievance Redress Mechanism

28. **Institutional Arrangement:** The Ministry of Higher Education & Highways is the Executing Agency and RDA is the Implementing Agency. Within RDA there will be a PIU setup at Provincial level which is responsible for implementing the project. Project Implementing Consultant (PIC) will also be appointed on province basis who will manage detailed design and supervision of the construction works and ensuring that all environmental safeguard requirements in accordance with GoSl and ADB laws, regulations and policies and as stipulated in the EARF. Each province under iRoad 2 will have a PIU under the RDA. PICs set up for each province will supervise the contractor in construction works including managing the environment.

29. **Environment Management Plan:** A general Environment Management Plan (EMP) was prepared as part of this IEE report taking in to account the impacts and mitigation measures discussed in chapter on “Impacts and mitigation measures”. Once the contracts are finalized the contractors will prepare Site Specific Environmental Management Action Plans (SSEMAP) for each package or road cluster with road specific details. The SSEMAPs will be based on the impacts and mitigation measures discussed in the general EMP. SSEMAPs shall include road specific impacts, mitigation measures supported by site plans as indicated in the EARF.

30. Monitoring of EMP implementation will be carried out during the preconstruction, construction, and operation and maintenance stages of the project. Based on the EMP, Environmental Monitoring Checklists (EMC) will be prepared for each road by the contractor under the supervision of PIC for each of these stages. The EMC monitors the degree of compliance of the mitigation measures proposed in the EMP in all three stages. Every road must have at least one EMC completed during pre-construction, one to three during construction depending on the length of the road and one per year during operation and maintenance. Based on these records and site visits monitoring reports will be prepared during

the construction and operation stage on an annual basis per Province and submitted to ADB for disclosure on the ADB website. Furthermore the Contractor will also be responsible for updating SSEMAP if there are any significant changes in the project site conditions or engineering design.

31. Implementation of the mitigation action during the construction stage is a main and total responsibility of the Contractor. As a project proponent RDA holds the responsibility to carry out the mitigation measures during construction and operation stage. ESDD of the RDA will be periodically monitor the implementation of EMP.

32. **Grievance Redress Mechanism:** The Grievance Redress Mechanism (GRM) is necessary to support general public to resolve their problems due to project activities through mutual understanding and consensus reaching process with relevant parties. The EARF also provide guidance to establish GRM to address the affected peoples' concerns, complaints, and grievances about the project's environmental performance. The proposed GRM for this project is of three levels. Level one is at the grassroots level where contractor, PIU and PIC involve in handling grievances. Level two will be Grievance Redress Committee (GRC) which will be headed by Grama Niladhari (GN) or Level three at Divisional Secretariat (DS) level. EARF outlines the system of GRM & GRC.

33. The PIU will be headed by a full time Project Director (PD) and supported by a team of engineers from RDA. Each PIU will have a Safeguards Team with Social and Environment Safeguards Officers and assistants to cover the quantum and geographic distribution of works under the investment program. The PIC will support the PIU for supervision of the design and construction works by the civil works of Contractor. The PIC team will include a team of Environment Safeguards Consultant, Social Gender Resettlement Specialist and Assistants for conduction of regular monitoring of safeguards implementation on site. From Contractor's side, there will be at least one Environment Officer and a Safety Officer per each contract package.

D. Public Consultations and Information Disclosure

34. As per the requirements of SPS and EARF for iRoad 2 program, public consultation process for the project was carried out during the field environment assessment survey along the proposed roads. The aim of the public consultation was to understand the view point of the public about the environmental and social issues of the project roads and respond to their concern and suggestions during the early stage of the project. Incorporation of the environment and social concerns to the decision making process especially for design stage through the public consultation can avoid or minimize adverse impact during the implementation of the project. During the public consultation sessions public were briefed about possible improvement work under the project. Community members including women and vulnerable groups in the project area participated for the public consultation sessions and expressed their views regarding the existing environment, social and economic situation of the proposed roads and expectations through the project.

35. According to the consultation findings, road users and road side communities in the project influence areas are in favor of this project because, most of these are currently in highly dilapidated condition. In addition, these roads serve as important link roads to the other provincial and national roads and provide access to the internal areas; residential, agricultural and other important locations such as inland water resources and coastal areas.
36.

37. All the participants highlighted that upgrading of selected road sections with provision of suitable drainage facilities culverts, cause ways and bridges, increasing of embankment height wherever necessary, and removal of structurally damaged concrete paved sections etc.

E. Conclusion and Recommendations

38. This initial environment examination was carried out to identify the existing environment conditions in Northern Province and to assess the adverse impacts that would arise due to proposed rehabilitation and improvement of existing rural and national roads/ sections selected out of 758 rural and five (5) national roads spread over the five districts in NP. All selected roads (both rural and national) will undergo a rehabilitation and improvement works for a period spanning for two years. PS and PRDA roads which are considered as rural will then be maintained for a period of three years, while RDA roads will be maintained for five years.

39. Almost all the proposed roads (both rural and national) are in highly dilapidated condition. Considerable number of people use these roads for their daily needs. In some cases several proposed roads are the only available convenient and short distance roads that connect with main towns, offices, schools, markets etc. Further people in several areas use alternative long distance roads with high traveling cost to overcome transport difficulties of several proposed roads.

40. Improvement of the road network will directly contribute to the poverty alleviation in respect of improving of income generation activities, employments, increase agriculture, fishing and livestock farming, local and foreign investments, tourism etc. Further reduction of travel time, road accidents, traffic and the cost of transportation, vehicle operation cost, environment pollution, increase of the land value, road safety and creation of job opportunities are the other main benefits expect through the proposed iRoad project. Hence improvement of proposed roads through the project is very important.

41. Environment pollution during the construction period (air quality noise, dust, vibration) due to extraction, transportation, storage and processing of the construction materials, depletion of natural resources due to extraction of metal and aggregate, deterioration of water quality due to solid waste disposal, soil erosion, siltation and construction of drains, impact to the aesthetic value of the environment due to construction activities and use of natural resources are the anticipated negative impacts to the environment. Even though some project roads are located close to the wetlands, sanctuaries and other important ecological and biological important habitats, the construction activities associated with subproject will not cause any negative impact to the above habitats since there will be no any land acquisition or removal of trees and green cover vegetation from above habitats.

42. However the above negative environmental impacts are mainly restricted to the construction stage of the project and can be avoided, minimized or mitigated by proper planning of suitable construction practices and adhering to the mitigation measures included in the EMP of the project. In addition to that predicted positive environmental and social impacts clearly outline the negative impacts of the project.

43. Proper maintenance program is essential to maintain long term stability of the selected roads. Periodic assessment of the road surface, edges, drains, shoulders and cross drainages and required maintenance strategies should be implemented to sustain the condition of the rural and national roads which will be rehabilitated and improved. Further the IEE recommends to update EMP and EMC with package specific information and locations before commencement

of construction activities. In addition EMC should be effectively implemented in order to monitor application of the EMP.

I. INTRODUCTION

A. Background

1. Sri Lanka has experienced strong economic growth following the end of civil conflict in May 2009. It is envisaged that an improving external environment, higher investment, and a recovery in domestic consumption will sustain a rapid economic growth during 2014–2015. As a result of the robust growth, the national poverty headcount ratio fell to just below 6.7 % in 2013-2014 from over 8% in 2010 and over 15% in 2006 (Department of Census & Statistics). However, less-developed areas of the country have not shown consistently higher elasticity of poverty reduction. According to the latest Population Census data of DCS, the total population in the country is 20.3 million in year 2012 and about 85% lives in rural and peri-urban areas of the country. The poor transport infrastructure, has hindered the spread of economic activities and access to basic social resources of the rural communities. The main challenges facing road connectivity are that most rural access roads, including provincial and rural roads, cannot provide access during all-weather conditions and part of the trunk road network is highly dilapidated and in a poor condition.

2. The Government of Sri Lanka (GOSL) places great emphasis on the improvement of rural road network in the country to promote poverty alleviation by improving access particularly to transport agriculture product to the economic centers and engage in social activities. In order to address this problem and improve transport connectivity between rural communities and socioeconomic centers, the Road Development Authority (RDA) under the Ministry of Higher Education and Highways, has proposed an Integrated Road Investment Program (iRoad Program). About 1,000 rural communities will be selected as rural hubs according to their population and development potential. As a first step for developing the rural hubs the government will enhance the connectivity by (i) improving rural access roads linking the rural hubs to trunk road network to all weather standards, and (ii) operating a sustainable trunk road network of at least fair condition. Hence number of social economic and cultural benefits to the rural communities can be achieved through the proposed project.

3. Under iRoad program, about 3000 km length rural roads in Southern, Sabaragamuwa, Central, North Central, North Western Provinces and the Kalutara District of the Western Province were studied and are in the process of being rehabilitated. RDA has proposed for the Second iRoad program (iRoad 2) which covers another 3,600 km of rural roads in Northern Province (NP), Eastern Province (EP), Uva and Western Province (WP). RDA has discussed with ADB to finance iRoad 2 under a time slice Multi tranche Financing Facility (MFF) as iRoad. This program will rehabilitate and upgrade selected rural roads in NP, EP, Uva and WP. Rehabilitation and upgrading of PS and PRDA roads will be carried out for a period of two years with a maintenance period of three years. For class A and B roads (roads under the Road Development Authority) the reconstruction and rehabilitation works will continue for two years followed by a maintenance period of another five years.

4. This report focuses on the Initial Environment Examination (IEE) of NP, which is one of the provinces considered under iRoad 2 Program. The proposed roads for improvement are located within all five Districts of NP. As per the long list[1] and covers 1327.797km long rural roads (1186.89 km) and 5 National roads (140.90km). Majority of these roads are currently governed by the Pradeshiya Shaba's (PS) of Local Authorities (LA's) in Jaffna, Mannar,

[1] This is the road list submitted by the respective provincial councils, for which the Memorandum of Understanding has been signed between Chief Secretary and Chairmen, RDA

Vavuniya, Mullaitivu and Kilinochchi Districts. Rest of the roads are governed by the Municipal Councils (MC), Urban Council (UC), PS and Provincial Road Development Department (PRDD) of NP. Number of rural roads located within each District and their total length are presented in table 1.1. In addition 5 National roads of RDA (A & B Class roads) which will be rehabilitated and maintained under the project is shown in table 1.2. The total list of the roads located within different Districts with administrative information is attached in appendix I.1.

Table 1: Total number and length of proposed rural roads of Northern Province

District	Number of roads (including sections)	Length of roads (km)
Jaffna	281	358.437
Mannar	225	176.08
Vavuniya	104	246.251
Mullaitivu	73	177.207
Kilinochchi	75	228.922
Total	**758**	**1186.897**

Table 2: Total number and length of proposed national roads of Northern Province

District	Number of roads	Name of the road	Length of individual roads (km)	Total length of roads (km)
Jaffna	2	AB039 Valukkaiyaru – Punguthivu – Kurikkatuvan Road	24.4	53.40
		B 371 Point Pedro – Maruthankerni Road	29.0	
Mannar	1	A014 Thalaimannar – Mannar Road	30.0	30.00
Vavuniya	2	A030 Vavuniya – Parayanalankulam Road	35.8	57.50
		B 325 Vavuniya – Neriyakulam Road	21.7	
Total	**05**			**140.90**

5. As per the information of Project Implementation Unit (PIU), there will be two to four contract packages per District. The contractors will be responsible for construction of the both rural and national roads over 2 years and performance based maintenance for another 3 years for rural roads and 5 years for national roads.

B. Objective of the Proposed Project

6. The broad objective of the project is to improve the connectivity within the rural road network with the provincial and national road network and to reduce cost and journey time and improve reliability of access. In this manner it is intended to enhance opportunities for rural population for social and economic growth and income generation align with the nationwide economic and social development.

7. Specific objectives of this project are;

- To improve the road condition of the proposed roads and thereby improve connectivity between rural communities and socioeconomic centers of the NP, To rehabilitate and maintain 1327.797km of rural, provincial and national roads in NP connecting rural communities to economic centers;

- To improve connectivity between production centers and market places and improve linkage with the other Districts and Provinces;
- To facilitate the increase of mobility by improving road network which link up with other Provinces;
- To open up rural areas for development;
- To 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 generating another round of investments;
- To reduce rural poverty through improved access to (a) markets and economic centers (b) social infrastructure and (c) new employment opportunities.

8. In order to achieve these objectives, the selected roads in Jaffna, Mannar, Vavuniya, Mullaitivu and Kilinochchi Districts will be rehabilitated and maintained with the following guidelines:

- Upgrade and maintain the selected roads to all weather standards;
- Surfacing the existing pavement with Asphalt Concrete (AC) or Concrete (in special cases such as inundation) if the present surface is weak;
- Repair or reconstruct damaged culverts;
- Introduce earth drains for all road sections and built up drains where necessary;
- Remove any irregularities that are on the existing vertical profile, thereby improving the road conditions for better vehicular movements while ensuring safety of road users.

C. Objective of the Initial Environment Examination (IEE)

9. The IEE report was prepared based on the Environment Assessment Review Framework (EARF), which was developed based on the guidelines of the ADB Safeguard Policy Statement, 2009 (SPS). Skills International (Pvt) Ltd on behalf of RDA was assigned to carry out all the field work and preparation of Environment Checklists and IEE Report of proposed roads of NP. This report has been prepared based on the field screening process of all identified roads in NP as a requirement of the Survey and Preliminary Engineering Work (SAPE work).

10. The main objective of the IEE report is preparation of comprehensive account on existing environment condition of proposed project area in terms of Physical, Ecological, Economical and Social environment. This IEE covers altogether 1327.797 km rehabilitation and maintenance of urban, semi urban and rural roads as well as five National roads. This IEE report includes identification of both potential positive and negative environment and social impacts during the pre-construction, construction and operation stages of the project, propose suitable measures to be implemented against anticipated negative impacts and to enhance the positive impacts and finally preparation of common Environment Management Plan (EMP) with recommended institutional arrangement for implementation and monitoring throughout the project cycle. In addition public views and suggestions regarding the proposed project are also included in the IEE report to ensure the concerns of public during the design of these roads.

11. Further the IEE ensures that public are given early and effective opportunities to participate in the decision making procedures. These information will be essential in order to incorporate necessary safeguard in the design stage, determine appropriate mitigation measures during pre-construction, construction and operation stage of the project and finally to

facilitate decision making of ADB. Accordingly a single consolidate IEE report will be submitted to the NP covering all proposed roads located within all five Districts.

D. Approach and Methodology

12. Initially, the Environmental Checklist (EC) for each road was prepared based on the instructions given in the Environment Assessment Review Framework (EARF). Based on the findings, one Rapid Environmental Assessment (REA) checklist was prepared for the province as required by the ADB SPS and accordingly the proposed project was categorized as environmental category B. This was followed by preparation of IEE.

13. IEE methodology for the project was developed based on the requirements of EARF, which is developed based on the requirements of ADB SPS 2009, National Environment Act (NEA) and also in compliance with Environment and Social Safeguard Manual of RDA (2007), Road and Rail Development in Sri Lanka of Central Environment Authority (CEA, 1997). Field assessment of the projected roads was carried out during the period from 25th August 2016 up to 15th of October 2016.

14. Project roads for inclusion in each province under this investment program were selected based on priorities for connecting selected Grama Niladhari Divisions[2] (GNDs) to the main trunk roads. The project roads were further subjected to the following screening criteria on environment safeguards:

i. Roads that will cause significant and irreversible environmental impacts that would trigger classification as environment 'Category A' in accordance with the SPS will NOT BE INCLUDED in this investment program. A road project improvement work will be classified as environment 'Category A' if the road works are located fully or partially inside a legally protected area or critical habitat area[3] or have direct and irreversible impacts on cultural heritage sites of national and international significance.
ii. Roads falling in part or whole inside or within the buffer zone of a SNR, NP or NR will NOT BE SELECTED under the investment program.
iii. Roads falling adjacent to other protected areas (such as sanctuaries or protected wet lands) or eco-sensitive areas WILL BE INCLUDED only if there is NO WIDENING OF THE ROAD "RIGHT OF WAY" OR ACQUIRING of land from the protected area or eco-sensitive area. For such project roads proper consultations will be held with the Department of Wildlife Conservation, Forest Department, local community and other relevant stakeholders and appropriate clearances or endorsements should be sought if required.
iv. Rehabilitation and improvement work of the any project road must have minimal or no long term impacts on other forms of sensitive ecological habitats such as marshes, natural streams, tanks and related wetland habitats.

[2] Grama Niladhari Division is a subunit of a Divisional Secretariat Division and is the smallest administrative unit of the country. A *Grama Niladhari* or "Village officer" is appointed by the central government to carry out administrative duties.

[3] Critical habitat according to the SPS is an area with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for restricted range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers individuals of congregatory species; areas with unique assemblages of species or that area associated with key evolutionary processes or provide ecosystem services; and areas having biodiversity of significant social, economic or cultural importance to local communities.

15. During the field survey aquatic and terrestrial environmentally sensitive sites such as wetlands, water bodies, forest reserves, sanctuaries, coastal habitats, public sensitive locations and their properties located beside the road and land use pattern were recorded. For this purpose, field observation and public information in a wider corridor was studied. In addition road side utilities and trees with 60cm Girth at Breast Height (GBH) or more located within 2 m corridor from the edge of the carriageway on either side were also documented.

16. Following details were incorporated while summarizing the EC.

- General overview of the road
- Location information; administrative and Global Positioning System (GPS) coordinates
- Climatic conditions of the project area; temperature, humidity and rainfall
- Generic description of the surrounding environment; social, environment and geographic information
- Specific description of the road environment considering location of environmentally protected areas, occurrence of road related natural hazards, locations of road side trees, road side utilities and public properties etc.
- Public consultation; general view of the public and their suggestions
- List of photographs showing road condition, Carriage Way (CW) and Right of Way (ROW), utilities and surrounding environment
- Location maps indicating starting and endpoints, environment and public sensitive locations of the project area (1:50,000 topographic maps of Survey Department and Google maps were used for this purpose).

17. Sample ECs for all five District of NP are attached (Appendix I.2) to this IEE report for reference.

18. IEE Report was prepared for the NP based on the findings of road specific EC. Secondary data for the preparation of IEE was obtained from literature survey, information collected from Divisional Secretaries Divisions of NP and relevant government agencies {RDA, CEA, Department of Wildlife Conservation (DWC), Department of Forest (DOF), Department of Irrigation (DOI), Department of Census and Statistics (DCS), Department of Cost Conservation (CCD)} and their authorized websites.

E. Proposed Schedule for the Implementation

19. SAPE work for iRoad 2 program is in progress and scheduled to be completed in the 1st quarter of 2017. Civil work contracts are scheduled to be awarded by 4th quarter of 2017 including NP contracts.

II. DESCRIPTION OF THE PROJECT

A. Location of the Project

20. The selected roads of NP under iRoad 2 program are located within urban, semi urban and rural areas with the trunk road network in all five Districts of Jaffna, Mannar, Vavuniya, Mullaitivu and Kilinochchi in NP. A total length of 1186.897km of urban, semi urban and rural roads including 358.437km in Jaffna, 176.08km in Mannar, 246.251km in Vavuniya, 177.207km in Mullaitivu and 228.922km in Kilinochchi Districts will be upgraded and maintained under the proposed project. In addition 140.90 km of National roads including 53.40 km in Jaffna District, 57.5 km in Vavuniya District and 30 km in Mannar District will also be upgraded and maintained under the project.

21. The administrative information in all 5 District of NP; category of roads, Divisional Secretariat Divisions (DSD) falling within particular sections are presented in appendix I.1. The respective Grama Niladhari Divisions (GND) crossed by each road are presented in the specific ECs prepared for the project. The location maps attached in the appendix II.1 presents the general location of proposed rural and national roads sited within Jaffna, Mullaitivu, Kilinochchi, Vavuniya and Mannar Districts. The topographic maps of 1:50 000 scale of all project roads are attached to the relevant ECs.

B. Need of the Project

22. Following 30 years of civil war that ended in 2009, Sri Lanka's economy has grown at an average 6.4 percent between 2010-2015, reflecting a peace dividend and a determined policy thrust towards reconstruction and growth. Sri Lanka is currently focused to be a strategically important economic center by means of maritime, aviation, commercial, energy and knowledge hub serving as a link between east and west using its geographical location effectively. Accordingly, an accelerated development program is undertaken by the GOSL by means of socio-economic and social infrastructure development. The economy of the country has grown, the composition of its Gross Domestic Production moving from agriculture to high value added industry and service sector.

23. After the long armed conflict in the country, the GOSL recognized the need of economic development especially in the NP of the country. Accordingly the Government has given priority to rebuild required infrastructure including access roads, electricity, drinking and irrigation water, market facilities, public parks, sewerage and waste disposal systems to boost economic opportunities in the conflict affected areas. The government has also been pursuing large-scale reconstruction and development projects in its efforts to spur growth in war-torn and disadvantaged areas, develop small and medium enterprises and increase agricultural productivity. Emergency Northern Recovery Project, Northern Road Connectivity Project, Northern Road Rehabilitation Project - A9, Northern Road Rehabilitation Project - Contract 11A, 11B, Atchchuvely Industrial Zone Development in Jaffna, Reconstruction of Northern Railway Line Omanthai to Pallai and Madawachchiya to Madu, Assistance for Health Care facilities in Kilinochchi and Mullaitivu, Reestablishment of the Research Institute of Palmyrah Development Board – Kaithady in Jaffna Districts etc., are among such numerous development projects undertaken by the government under foreign financing component for the redevelopment of the NP. These projects helped to meet the basic, immediate needs and the requirement of the people as well as provided sustainable employment opportunities for the affected people in respective areas.

24. Distribution of population by District in year 2012 shows that majority of the northern people (>87%) live in rural area of the Province (Department of Census and Statistics). The District wise population distribution in rural areas in Jaffna District is 80%, in Mannar 75%, in Vavuniya 80% while in Mullaitivu and Kilinochchi it is 100%.To increase the effectiveness of the development, it should be assured that the benefits of such programs should be penetrate to the rural regions of the Province as well as development potentials available in rural areas should be exposed.

25. Reflecting the rapid expansion in income generation activities in the Province, the Gross Domestic Product (GDP) growth rate was highest in the Province at 25.9 % in 2012. It's share of 4% to the national GDP and there is an improvement when compared to 3.7% recorded in 2011. However, Agriculture, including Fisheries and Animal husbandry which is the mainstay of the economy has shown positive growth after 2009. Based on the Labor force survey, DCS, 2014, agriculture is the dominant productive sector and majority of the people in all five Districts engage in agriculture compare to industrial sector. From the total Jaffna 26%, Mannar 39%, Vavuniya 34%, Mullaitivu 45% and Kilinochchi 39% engage pre-dominantly in an agricultural having crops, livestock and fisheries as pivotal sub sectors.

26. In order to obtain a reasonable price for the agricultural products and fisheries of the Northern people, it is necessary to transport them to better markets which are mostly located in urban centers. In this regard, connectivity of these areas with the trunk road network is significant. However it is found that the rural road network is still in highly dilapidated condition with damaged road edges, surface failures and lack of drainage facilities hence not accessible in all weather conditions. This situation fails to facilitate an efficient connectivity. Therefore after identifying the existing situation, the government intends to develop rural areas according to the population, development potentials, and the distance to trunk roads to extend the development benefits to rural areas and to address the connectivity issues for these communities.

27. The proposed iRoad Program of RDA will improve the transport connectivity between rural communities and socio-economic centers. Under the next tranche of the project, 1186.897km rural and 140.9km national roads of NP will be upgraded and maintained to all-weather standard which will serve rural communities. Improved connectivity will ultimately benefit the targeted communities by increased flow of economic opportunities and accessibility to developed markets and therefore it is expected to increase income generation possibilities of rural communities. This will ultimately enhance the socio-economic development of such communities which will be a positive drive to development of the country.

C. Analysis of Alternative

1. No Project Alternative

28. The identified roads have not been rehabilitated properly during the civil war period and afterwards. The existing surface condition, drainage facilities, road edges, structures and width of the carriageways are in a very bad condition and not appropriate for long term usage of these roads. If the roads are being used continuously without any improvement, it will lead further deterioration making these roads impassable. This situation will further harden the lives of the communities in and around the project area and affect the development potential in the NP as a whole.

29. Soil erosion, sedimentation, stagnation of water, temporary inundation and floods are other environment and social issues due to continuous usage of roads without upgrading.

Further poor roads will result in increase in fuel consumption, emission due to fuel combustion and emission of dust which will result in poor air quality in the area. Therefore without construction of rural roads ,there will be physical obstacles to the people to access and ensure safety, which means that people and the environment is not protected against existing social and environment issues.

30. Sustaining and maximizing the socioeconomic benefits from the investments in the Province, is not feasible without connecting of rural agricultural, fishing and livestock farming areas with town centers and other developed areas of the Province and the other parts of the country. Without the iRoad project these flagship projects will not grasp the expected benefits and Province will continue to stagnate. Further from the total population of all five District of NP, majority (83%) are living in rural areas with poor access to infrastructure facilities and other socioeconomic benefits and opportunities. The Poverty Head Count Index of the Jaffna, Mannar, Vavuniya, Mullaitivu and Kilinochchi Districts were 8.3%, 20.1%, 3.4%, 28.8% and 12.7% respectively during year 2012 and 2013 (Household Income and Expenditure survey 2012/2013, DCS). The benefits derived from iRoad program will be multi-fold for the Northern rural communities and create low cost and faster transport facilities and thereby improving their access to economic opportunities and social services.

2. With Project Alternative

31. Under the proposed iRoad program, about 1186.897km of rural, provincial as well as 140km of National roads in NP will be upgraded. This will improve surface conditions and other required facilities of the above roads which will reduce travel time and cost, helping to regenerate transport in the Northern area. Improvement of the rural, provincial and national roads will help to increase connectivity within the Province as well as other areas of the country. Further the project will improve accessibility of rural communities to socioeconomic centers and will influence new economic opportunities with income generation activities. Improvement of the road with surfacing, slightly adjustments of bends to improve road user safety, drainage facilities and erosion control measures will have positive environment benefits with smooth traffic flow.

D. Magnitude of the Operation

1. Project Activities

32. The iRoad 2 program will rehabilitate and maintain selected roads/sections in NP to all weather standards. Selected rural roads for the improvement are currently governed by the LA's (Municipal Councils, UC and PS), of Jaffna, Mannar, Vavuniya, Mullaitivu and Kilinochchi Districts, PRDD of NP and Road Development Authority (RDA) of the Ministry of Higher Education and Highways. A total of 358.437km of rural roads in Jaffna, 176.08km rural roads in Mannar, 246.251km rural roads in Vavuniya, 177.207km rural roads in Mullaitivu and 228.922km rural roads in Kilinochchi Districts will be rehabilitated and maintained under the proposed project. In addition total of 53.40 km of National roads in Jaffna, 30 km National roads in Mannar, 57.50 km National roads in Vavuniya will also be upgraded and maintained under the proposed project.

33. The identified roads for the improvement are varying in length, Right of Way (RoW), width of the Carriage Way (CW), surface conditions and material type of the surface. The details of these roads are given in the ECs and the Information Booklets prepared for each road section. Existing road surfaces of the selected roads in Jaffna, Mannar, Vavuniya, Mullaitivu

and Kilinochchi Districts will be improved to suit all-weather conditions under iRoad 2 program. At the SAPE level, several typical cross sections (TCS) have been developed and are attached in appendix II.2. Under the road information booklet, the SAPE team will propose suitable TCS for a given road. During level 2 design (Detail Design), based on these initial TCS the contractor will develop road specific TCS incorporating the findings of Transect walk surveys and ECs to the extent possible. All rehabilitation and improvement work will be carried out mainly within the available Right of Way (ROW) of the proposed roads. For PS and PRDA roads the improved carriageway width will be from 2.5 m to 5.5 m, while carriageway of RDA roads will be improved up to 5.5 m to 8.0 m. The improved pavement will be of AC or Concrete which is comparatively a long lasting treatment.

34. The proposed improvement of selected roads are as follows.

- Clearing of overgrown vegetation
- Clearing of existing roadside drainage
- Shoulder and embankment work
- Repairing and reconstruction of culverts and bridges
- Construction of road side drainage
- Sub-base work
- Pavement work
- Road marking & installation of sign board

35. Improvements to road side and cross drainage of a particular road will be considered in locations where structures have been damaged or rectification of the drainage is significantly required. Several road sections as listed in Chapter IV of this report are prone to flood during rainy seasons. The proposed road design in these sections will be modified based on the several TCS proposed to withstand frequent inundations (please refer to appendix II.2).

36. The proposed improvement will be limited along the existing ROW, no building or temporary structure will be fully or partially affected by the Program. However temporary lands for setting labour camps, yards, plants and disposal sites will be selected with the help of LA and DS of the area based on the availability of public lands and on requests received from the residences in the area.

37. The rehabilitated and improved roads will be further maintained by the contractor/s to a period of three (3) years in the case of rural roads and five (5) years for national roads. The maintenance work will essentially include;

- Maintaining the road side vegetation;
- Cleaning of road side drains and structures;
- Maintaining the shoulders and attending to any repairs on the pavement.

2. Requirement of Construction Material

38. Material required for construction will be explored from the project area of NP. Existing sites which are operated with relevant licenses and approvals will be used especially for extraction of gravel, metal and sand. Offshore sand could also be used for construction subjected to confirmation of quality. At present construction materials for the project are available within two Districts of the NP, Vavuniya and Mannar. A map presenting the existing

material extraction sites in NP is presented in appendix II-3. Metal for the proposed construction could also be brought from Medawachchiya area within Anuradhapura District of North Central Province as a measure to address the scarcity of construction material in NP. If new material extraction sites will be opened for this project, necessary licenses and approvals will be obtained from relevant agencies.

39. Table II.I shows the approximate quantities of construction materials required for proposed NP roads.

Table 3: Approximate quantities of construction materials
Summary of Engineer's Estimate Northern Province

No	District	No of Roads	Length of Roads (km)	Soil (m^3)	Sand (m^3)	Aggregate (m^3)	Bitumen (MT)
1	Mannar	226	180.09	94,600.00	2,400.00	52,000.00	4,500.00
2	Vavuniya	104	247.581	130,100.00	3,200.00	71,600.00	6,190.00
3	Mullaitivu	58	190.471	100,100.00	2,500.00	55,000.00	4,760.00
4	Kilinochchi	63	204.984	107,700.00	2,700.00	59,200.00	5,125.00
5	Jaffna	280	318.866	167,500.00	4,200.00	92,200.00	7,970.00
Total		**731**	**1141.992**	**600,000.00**	**15,000.00**	**30,000.00**	**8,545.00**

40. Associated facilities for the project activities include water supply, operation of quarries, sand mines, use of borrow pits and disposal sites etc. Approval for the above activities will be obtained from relevant government agencies with the help of LAs during the pre-construction stage.

III. LEGAL AND POLICY FRAMEWORK

A. Legal Framework

1. National Environmental Act and other Applicable Regulations

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

42. The environmental clearance process should be initiated by submitting the completed Basic Information Questionnaire (BIQ) to CEA with preliminary information about the project including exact locations of the project components, extent and environmental sensitivity related to project activities. Based on this CEA decides whether the project is a “Prescribed Project”4 or not and who the PAA will be for administering the IEE or EIA process to obtain environmental clearance if the proposed project is a prescribed project. For Prescribed project CEA or the designated PAA will issue a TOR for the IEE or EIA required.

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

44. Roads which are located within Wildlife parks, Sanctuaries and designated Forest areas have not been selected for improvements under this program. However if a project road falls adjacent to the boundary of a protected area or a designated area of Forest Department, necessary clearance will need to be sought from the Department of Wildlife Conservation (DWC) and Department of Forest (DoF) even if there will be no widening of the road ROW. Depending on the sensitivity of the protected area, the DWC may require conduction of an IEE or EIA study for the respective road.

2. Coast Conservation Act

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

45. Most of the proposed roads in Jaffna, and few roads in Kilinochchi and Mullaitivu are located inside or close to the Coastal Zone which come under the legal framework of the Coast Conservation Act No. 57 of 1981 (CCA). Provisions with regard to regulation and control of un authorized development activities within the coastal zone and mandatory requirements to obtain permits for any development activity falling within the coastal zone are stated in this act. The Coast Conservation and Coastal Resources Management Department) is the Government Agency for the implementation of CCA, and administration, control, custody, management of the coastal zone have been vested with Director, Coast Conservation. Amendments to the Act were passed in 1988 as the Coast Conservation (Amendment) Act No. 64 of 1988 and in 2011 through Coast Conservation (Amendment) Act, No. 49 of 2011 (Coast Conservation and Coastal Resource Management Act). Through this amendment the scope of CC & CRMD extended from conservation to management of coastal resources.

46. Apart from NEA and CCD there are a number of other environmental laws and regulations under GOSL that are applicable to the investment program as given in Table III.1 below.

Table 4: Applicable national laws and regulations for the investment program

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

Legislation	Relevance and main content	Authorizing Institution
National Environmental (Vehicle Horns) Regulatior of 2011	Regulates maximum allowable noise emanating from vehicular horns on a highway or road any motor vehicle use during project construction activities.	CEA
National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	Regulates dumping municipal solid waste along sides of any national highway or at any place other than places designated for such purpose by the relevant LA's during proposed project activities.	CEA
Fauna and Flora Protection Act (FFPO) No.2 of 1937 amended in 1993 and 2009	The act specifies that any development activity taking place within one mile from the boundary of a National Reserve declared under the Ordinance requires an EIA/IEE which provide for the protection and conservation of fauna and flora of Sri Lanka and their habitats; for the prevention of commercial and other misuse of such fauna and flora and their habitats for conservation of biodiversity of Sri Lanka; and to provide for matters connected there with. The Act was originated as an Ordinance in year 1937 (Ordinance No. 2 of 1937) with the objective of providing protection to fauna and flora of the country. The Ordinance was amended by Act No. 49 of 1993 and No. 22 of 2009 to enhance the scope of Fauna and Flora Ordinance in the areas of Protection, Conservation and Preservation of fauna and flora of Sri Lanka	Department of Wildlife Conservation
Forest Act No. 34 of 1951	This act is to consolidate and amend the law relating to the conservation, protection and management of forest and forest resources for the control of felling and transport of timber and Forest and for matters connected therewith or incidental thereto.	Department of Forest Conservation
Felling of Trees Control Act No. 9 of 1951 as amended through Act No. 30 of 1953	This Act sought to prohibit and control felling of specified trees (mainly intended to stop indiscriminate felling of specified trees) in the country.	Department of Forest Conservation
Water Resources Board Act, No. 29 of 1964 and (Amendment) Act, No.	The act controls and regulates developments (including conservation and utilization) of water resources;	Ministry of Irrigation and Water

Legislation	Relevance and main content	Authorizing Institution
42 of 1999	prevention of pollution of rivers, streams and other water resources; formulation of national policies relating to control and use of water resources.	Resources Management
Soil Conservation Act, No. 25 of 1951 and Amended No. 24 of 1996	This Act makes provisions for the enhancement of productive capacity of soil; to restore degraded land for the prevention and mitigation of soil erosion; for the conservation of soil resources and protection of land against damage by floods, salinity, alkalinity, water logging; and to provide for matters connected therewith or incidental thereto.	Department of Agriculture
Explosives Act No. 36 of 1976	To provide control of explosions and regulations of matters connected with explosive activities related with the project.	Ministry of Defense
Municipal Councils Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the Pradeshiya Sabha Act No. 15 of 1987 as amended in 2010	Regulates and control actions pertaining to socioeconomic development such as roads, culverts, bridges, ferries, waterways and other means of local transport and related site clearance for constructing worker camps, site offices etc. and methods taking place within the command area relevant to government laws and regulations.	Ministry of Local Government And Provincial Council
Flood Protection Ordinance No. 04 of 1924, No 22 of 1955	An ordinance for protection of areas subjected to damage from floods. This includes declaration of flood areas, preparation of schemes for flood protection and other rules and regulations regarding flood in the country.	Irrigation Department
Crown Land Ordinance Act No. 1947	An ordinance to make provision for the grant and disposition of crown lands in Sri Lanka; for the management and control of such lands and the foreshore; for the regulation of the use of the water of lakes and public streams; and for other matters incidental to or connected with the matters related to proposed project.	Land Commissioners Department
Agrarian Development Act No. 46 of 2000 (Section 32)	This act regulates using paddy land for a purpose other than agricultural cultivation without the written	Agrarian Services Department

Legislation	Relevance and main content	Authorizing Institution
	permission of the Commissioner General.	
Sri Lanka Land Reclamation and Development Corporation Act 15 of 1968 as amended by Act No 52 of 1982	This act established Sri Lanka Land Reclamation and Development Corporation which grants permission for the public to fill marshy land subject to provision of storm water drainage.	Sri Lanka Land Reclamation and Development Corporation
National Thoroughfares Act, No. 40 of 2008	This act is known as RDA act which provide for planning, design construction, development, maintenance and administration an integrated public road network in Sri Lanka.	Road Development Authority
Urban Development Authority (UDA) Law No 41 of 1978 and Urban Development Projects (Special Provisions) Act No 2 of 1980	This law provides for the establishment of an UDA to promote integrated planning and implementation of economic, social and physical development of certain areas as may be declared by the minister to be urban development areas and for matters connected with the relevant project activities. Urban Development Projects (Special Provisions) Act No 2 of 1980 is an act to provide for the declaration of lands urgently required for carrying out urban development projects and to provide for matters connected there with relevant project activities.	Urban Development Authority (UDA) under the ministry of Mega Polis & Western Development
Town and country planning ordinance No. 13 of 1946 and The Town & Country Planning (Amendment) Act, No. 49 of 2000	This regulates the National Physical Plan with transport as the main component.	National Physical Planning Department (NPPD) under the Ministry of Mega polis & Western Development
Buddhist Temporalities Ordinance No. 19 of 1931	This act provides necessary assistance to administer and protect the property of Viharas, interventions to settle disputes regarding property of Viharas and makes recommendations to release money to be paid as compensation in respect of property of Viharas acquired by government for any development project.	Department of Buddhist Affairs
Cemeteries and burial grounds	The act regulates any disturbance,	Local

Legislation	Relevance and main content	Authorizing Institution
ordinance No. 9 of 1899 and amendments	removal of burial, monuments and use of such areas for development project	Government Authority
Antiquities Ordinance No. 9 of 1940 and amendments	The act regulate activities of projects located in close proximity of any archeological reserves.	Department of Archaeology

47. Under the NEA (No). 47 and some of the laws and regulations listed in Table III.1 above, there are specific requirements for clearances, permits and licenses required for road projects as listed in Table III.2 below.

Table 5: Applicable approvals required for the investment program

Project stage	Approvals	Project Related Activity	Relevant Agency
Pre- Construction Stage Note: Although clearances and approval should be obtained during preconstruction stage it is valid throughout the project cycle. However this should be renewed before expiry date	Environment clearance	Implementation of the project activities	Central Environment Authority
	Clearance from Coast Conservation and coastal resources management department	Development activities in coastal areas	Coast Conservation and coastal resources management department
	Industrial Mining License (IML)	Operation of quarries, borrow areas and other material extraction sites	Geological Survey and Mines Bureau
	Environmental Protection License (EPL)	Operation of material extraction site including operation of asphalt plants, treatment plants etc.	CEA
	Local Government Authority Trade license and machinery permits	Deciding waste disposal sites, material storage and sites for worker camps and other project stations Trade license should be obtained for asphalt plants, batching plants, quarries etc.	Respective Provincial Council, LA's and respective Pradeshiya Sabha
	Explosive Permits	Blasting activities	Ministry of Defense
	Approval for removal of trees	Road clearance for construction	Forest Department, CEA and Local Authorities
	Disturbance to Paddy	Ground preparation	Commissioner of

	Lands	for ROW and side drains	Agrarian Services
Construction stage	Consent from relevant government agencies	Construction of bridges, culverts and other drainage systems, land filling, dredging activities	Department of Irrigation, Department of Agrarian Services, Local Government Authority, Land Reclamation and Development Cooperation
	Approval from relevant state /local agencies for the removal/ temporary disturbances for existing utilities	Surfacing, construction of bridges and side drains, embankment filling works	NWSDB for water lines, Ceylon Electricity Board for Electric cable/poles, Sri Lanka Telecom for land line telephone cables, poles, Pradeshiya Sabha, other LA's for drainage, sewer systems etc.

3. Environmental Protection License (EPL)

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

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

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

51. **Objectives of the EPL**

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.

- To ensure that the system responds flexibly both to changing pollution abatement technology and to new knowledge such as cleaner production, waste minimization etc.

4. International Agreements and Conventions

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

- Conventions on Wetlands of international importance especially as waterfowl habitats/ Ramsar (entered into force in Sri Lanka in 1990).
- Convention concerning the protection of the World Cultural and Natural Heritage (Sri Lanka accepted the Convention in1980)
- Convention on International Trade in Endangered Species of Wild Fauna & Flora/ CITES (entry into force in Sri Lanka in 1979)
- Convention on the conservation of Migratory Species of Wild Animals/ CMS (1990)
- United Nations Framework Convention on Climate Change/ UNFCCC (Sri Lanka ratified it in November 1993)
- UN Convention on Biological Diversity/ CBD (Sri Lanka ratified in 1994).
- Plant Protection Agreement for Asia and the Pacific region (Sri Lanka ratified in 1994).

B. Policy Framework

1. ADB Safeguards Policy Statement, June 2009

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

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

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

56. From the environment perspective projects are classified into the following four categories:

- **Category A.** A proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an EMP, is required.
- **Category B.** The proposed project's potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.
- **Category C.** A proposed project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.
- **Category FI.** A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the financial intermediary's business activities have minimal or no environmental impacts or risks.

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

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

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

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

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

Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.

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

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

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

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

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

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

IV. DESCRIPTION OF THE EXISTING ENVIRONMENT

68. Identified roads to be upgraded under the iRoad Investment Program are located within all Districts of NP namely, Jaffna, Mannar, Vavuniya, Mullaitivu and Kilinochchi. Jaffna is the capital of NP and it is the commercial and cultural center of the Province. The Following section describes the current situation of Physical, Ecological, Social and Economic background of the project affected areas of the NP and respective Districts in brief. In addition ECs prepared for individual road sections provide environment and social background of each road section with location information, photographs, public utilities, road side trees, public and environmental sensitive locations etc.

A. Physical Environment

1. Climate, Land Use and Terrain

69. NP of the country falls within the low country dry zone and the climate is characterized by high temperature and low rainfall compared to other regions of the country. The climate is typically tropical with the annual average temperature between 19.9°C to 35.9°C of the year. Relative Humidity varies from 70% during the day to 90% at night. Annual rainfall of the Province varies between 696 mm - 1125 mm. The area influence by the two rainy season North East monsoon from December to February and Second Inter monsoon from October to November of which most of the rainfall occurs during North East monsoon.

70. Total land area of the Province covers an area of 8,848.21 sq.km including inland water bodies. The land area of the Province represent 13.22% of the total land area of the island. The Province is divided into two distinct geographic areas: Jaffna peninsula and the Vanni. The Jaffna peninsula is surrounded by sea in three sides and is connected to the rest of the island by a small strip of land which is locally named “Elephant Pass”. The terrain of the region is flat and undulating with low elevation towards the coast. However in some locations around Tellippalai, the elevation rises to 10.5 m above sea level. The Province has a long coastline, and majority of the islands around Sri Lanka are located around NP.

2. Soil and Mineral Resources

71. Six major soil groups have been identified in NP and are Reddish Brown Earths (RBE), Low Humic Gley soils (LHG), Regosol, Grumusol, Non-Calcic Brown Soils (NCB) and Alluvial Soils. Out of these RBE is the dominant group in the Province. These soils are reddish to reddish brown in Colour and found in the upper and mid slopes of the landscape in the dry zone. The normal depth is about 1.0-1.2 m and the water holding capacity ranges from 100-140 mm/meter depth of soil. The steady infiltration rate ranges from 1 to 5 cm/hr. The percolation rates of the wet puddled soils for the first time exceeds 100 mm/d and remains at a higher value of 10-20 mm/d even after 6 years of continuous puddling. Table 6 shows the Agro Ecological characteristics of the proposed roads.

Table 6: Agro Ecological characteristics of the proposed roads

District	Agro Ecological zone	Roads that (ID) falls in to Agro Ecological zone	75% expectancy value of rainfall (MM)	Description (Land use, terrain, soil group)
Jaffna	DL4	115, 116, 117, 118, 120, 121, 122, 122.1,125, 126, 128, 129, 129.1,	>750	Scrub, paddy, Rained, Upland

District	Agro Ecological zone	Roads that (ID) falls in to Agro Ecological zone	75% expectancy value of rainfall (MM)	Description (Land use, terrain, soil group)
		129.2, 130, 131, 132, 133, 134, 134.1, 134.2, 134.3, 134.4, 134.5, 134.6, 135, 137,138, 139 ,139.1, 141, 143, 144, 145,145.1, 146, 146.1, 147, 148, 149, 150, 151, 152, 154, 155, 253, 253.1, 253.2, 253.3, 254, 255, 255.1, 255.2		Crops, plant, Solodized- Solonetz, Solonchaks, & Grumusol soil.
	DL3 & DL4	1, 1.1 , 2 , 3, 9, 10, 11, 12, 13, 15, 16 ,16.1, 17, 19, 20, 21, 22 ,24 ,26, 27, 29, 29.1, 30.1, 30.2, 31, 32, 33, 34, 36, 37, 38, 39, 39.1, 41, 42, 44, 45, 45.1, 45.2, 46, 46.1,47,48 ,49, 49.1, 50, 50.1, 51, 51.1, 52, 53, 54,55, 56, 57, 57.1, 58, 59, 60, 60.1, 61, 62, 70, 71, 71.1, 71.2, 71.3, 71.5, 71.6, 81, 82, 83, 86, 87, 88, 89, 90, 91, 92, 93,93.1, 94, 94.1, 95, 95.1, 95.2, 96, 97, 98, 99 ,99.1, 100, 101,102 ,103, 104, 105, 106, 107, 107.1, 107.2, 107.3, 108,108.1, 109, 109.1,110,114,157,158,159,161,162, 162.1,163, 164, 165,166,167, 168, 168.1, 170, 170.1,171, 172, 172.1, 173, 174,176,176.1,177, 178, 179, 179.1, 180, 182, 183, 184,185, 186, 187, 187.1, 188, 188.1, 189, 189.1, 190, 191, 192,193, 194,195, 196, 197, 198, 199, 200, 201, 204, 205, 205.1,214, 215, 216, 216.1, 217, 217.1, 217.2, 218, 219, 220, 221, 222, 222.1, 222.2, 223, 224, 225, 225.1, 226, 226.1, 226.2, 227,228,230, 230.1, 231, 232, 233, 233.1, 235, 236, 237, 238, 239,239.1, 240, 241, 242, 242.1, 243, 244, 244.1, 245, 246, 247, 248, 250, 251, 251.1, 251.2,252, 252.2, 256, 257, 257.1, 257.2, 258, 259, 260, 261, 262, 263, 263.1, 264, 265, 265.1		
Mannar	DL1f	1, 20, 21, 22, 87.	>800	Rain fed upland Crops, paddy, scrub, natural Forest undulating RBE, LHG& Grumusol soil.
	DL3	2, 5, 14, 18, 18.1, 18.2, 18.3, 18.4, 25, 27, 28, 28.1, 28.2, 29, 30, 31, 31.1, 32, 33, 34, 35, 35.1, 35.2, 35.3, 36, 37, 37.1, 38, 39, 40, 41, 43, 44, 44.1, 44.3, 44.4, 44.5, 45, 45.1, 48, 49, 49.1, 49.2, 49.3, 49.4, 50, 51, 51.2, 51.3, 52, 53, 53.1, 53.2, 54, 56, 56.1, 58, 59, 60, 62, 63, 63.1, 63.2,	>800	Cashew, Coconut, Condiments, Scrub, Natural forest, Flat& slightly undulating RYL & Grumusol soils

District	Agro Ecological zone	Roads that (ID) falls in to Agro Ecological zone	75% expectancy value of rainfall (MM)	Description (Land use, terrain, soil group)
		63.3, 63.4, 63.5, 63.6, 63.7, 63.8, 64, 65, 65.1, 66, 67, 67.1, 68, 68.1, 68.2, 68.3, 69, 69.1, 69.2, 69.3, 69.4, 70, 71, 71.1, 72, 72.1, 73, 73.1, 73.2, 73.3, 73.4, 74, 74.1, 74.2, 74.3, 74.4, 75, 75.1, 75.2, 75.3, 76, 76.1, 76.2, 77, 78, 78.1, 79, 79.1, 79.2, 79.3, 79.4, 98, 98.1, 110, 124, 138, 138.1,139, 140,140.1		
	DL4	1, 3, 4, 5, 6, 7, 7.1, 8, 8.1, 9, 9.1, 10, 11, 12, 12.1, 12.2, 12.3, 13, 13.1, 15, 16, 17, 17.1, 19, 19.1, 19.2, 24, 26, 80, 80.1, 81, 81.1, 82, 83, 85, 86, 91, 91.1, , 92, 92.1, 93, 94, 95, 95.1, 95.2, 95.3, 96, 97, 99, 99.1, 100, 101, 101.1, 101.2, 102, 103, 103.1, 104, 106, 107, 108, 109, 113, 114, 115, 116, 116.1, 117, 118, 119, 120, 121, 121.1, 123, 125.1, 125.2, 126, 127, 128, 129, 130, 131, 131.1, 132, 133, 136, 136.1, 136.2, 134, 134.1, 134.2, 134.3, 135, 135.1, 135.2, 137, 137.2.	>750	Scrub, paddy, Rained, Upland Crops, plant, Solodized- Solonetz, Solonchaks, & Grumusol soil.
Vavuniya	DL1e.	1, 2, 4, 6, 10, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 37.1, 37.2, 38, 39, 41, 60, 60.1 , 60.2.	>900	Rain fed upland Crops, paddy, scrub, undulating RBE &LHG soils
	DL1f	03, 05, 51, 70, 71, 73, 74, 75, 83	>800	Rain fed upland Crops, paddy, scrub, natural Forest undulating RBE , LHG& Grumusol soil.
	DL1b	01, 05, 07, 08, 09, 11, 12, 13, 14, 15, 15.1, 15.2, 16, 17, 18, 19, 20, 21, 22, 40, 42, 43, 43.1, 44, 44.1, 45, 46, 46.1, 46.2, 46.3, 46.4, 47, 48, 49, , 50, 52, 53, 51, 54, 55, 56, 57, 58, 58.1, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 71, 75, 76, 77, 78, 79 to 79.9, 80, 81, 82	>900	Rain fed upland Crops, paddy, Scrub, Mixed home gardens, Forest plantations undulating RBE &LHG soils
Mullaitivu	DL1d	3, 4, 72	> 900	Rain fed upland Crops, paddy, scrub, undulating & flat RBE, Regosol & LHG soil
	DL1f	46, 47, 50, 50.1, 56, 57, 58, 59, 60, 62, 64, 65, 66, 67, 68	>800	Rain fed upland Crops, paddy, scrub, natural Forest undulating RBE, LHG& Grumusol soil.

District	Agro Ecological zone	Roads that (ID) falls in to Agro Ecological zone	75% expectancy value of rainfall (MM)	Description (Land use, terrain, soil group)
	DL1 e	1, 6, 7, 7.1, 8, 38, 38.1, 38.2, 39, 39.1, 40, 41, 42, 43, 44, 69, 70, 71	>900	Rain fed upland Crops, paddy, scrub, undulating RBE &LHG soils
	DL3	1, 5, 9, 10, 11, 12, 13, 13.1, 14, 15, 17, 18, 19, 20, 20.1, 21, 21.1, 23, 24, 25, 26, 27, 28, 29, 29.1, 30, 31, 32, 33, 34, 35, 36, 37, 37.1, 38, 38.1, 38.2, 39.1, 46, 55, 55.1, 55.2, 56, 63	>800	Cashew, Coconut, Condiments, Scrub, Natural forest, Flat& slightly undulating RYL & Grumusol soils
Kilinochchi	DL3 & DL4	20 , 22, 23, 28, 34, 35, 36, 37, 38, 39, 39.1, 40, 42, 43, 51		
	DL3	1, 2 , 3, 4, 5, 6, 7, 8, 9 , 10, 11, 11.1, 12, 13, 13.1, 14, 15, 15.1, 16, 17, 18, 19 , 32, 47, 54, 55, 57 , 59 ,60 ,61 , 61.1 ,62, 63	>800	Cashew, Coconut, Condiments, Scrub, Natural forest, Flat& slightly undulating RYL & Grumusol soils
	DL4	21, 24, 25, 26, 27, 29, 29.1, 29.2 ,30, 31, 33 ,33.1 ,46, 46.1 ,48, 49, 50 ,50.1 ,52, 53, 56, 58, 58.1, 58.2 , 58.3 ,58.4 ,58.5	>750	Scrub, paddy, Rained, Upland Crops, plant, Solodized-Solonetz, Solonchaks,& Grumusol soil.

Source: Environment Atlas of Sri Lanka, Second edition, 2007

72. The province has different types of mineral resources such as limestone deposits, beach mineral sand and clay. The Miocene limestone of the Jaffna peninsula have been very famous in the country which termed “the Jaffna limestones”. These Miocene limestones are very pure from Calcium carbonate and extends hundred meters from southwards along the north-west coastal belt to Puttalam on the west coast. The thickness is also believed to be several hundred meters. Outcrops of Miocene deposits are also found in the Parappukkadantan and Adampan area on the mainland, near Mannar Island.

73. Apart from limestone, there are some deposits of silica (Glass sands) in Chavakachcheri in the Jaffna peninsula, and along the eastern margin of the peninsula as a dune formation. Silica in later deposits is used for glass manufacturing. Apart from limestone and silica, Manalkadu sand dune located at the Point Pedro is a small desert with vast expansion of sand dune. The clay is used for bricks and tiles manufacturing industry in the province. Further there are some indications about the possible oil deposit off the Gulf of Mannar however it has not been fully explored yet.

3. Hydrology

74. Surface hydrological system of the NP mainly consists of inland water resources such as streams, reservoirs, ponds, irrigation tanks, channels and marine water resources like lagoons and brackish water habitats. Out of these many small to medium scale seasonal streams and tanks are active only during the monsoonal rainy periods. A total of 45 medium irrigation schemes and 9 major irrigation schemes are located in the Province which come under the preview of Provincial Irrigation sector. The existing major irrigation tanks in the Province include

Iranamadu, Giant Tank, Pavakkulam, Kalmadu etc. In addition to this, few major tanks are maintained by the central administration. There are 2,066 tanks and ponds also under minor irrigation scheme.

75. The Jaffna Peninsula does not contain any streams or perennial rivers. However a seasonal river named Valukkai Aru is present in the District. It rises from Vasavilan and runs along many areas (Tellipalai, Ambanai, Alaveddy, Kandaroddai, Uduvil, Sandilipai, Navali) and ends at Arali barrage in Vali West division.

76. Mannar District is located within the Northern river basin region and the Mahaweli inter basin region of the country. The major reservoirs in the District are Gaint tank, Akaththimuippu, Viyadikulam, Mullikulam, Periyapandivirichan, Chenamaruthamadu tanks and Maruthamadhu Anicut etc. Giant's Tank is an important water storage area in the District and supplies water to some 160 smaller tanks in the District. The water flows center to the minor rivers of the Mannar District from Kanakarayan Aru, Parangiyen Aru and Pali Aru. Major rivers of the area include, Akkarayan Aru, Aruvi Aru, Kanakarayan Aru, Kodalikkallu Aru, Mandekal Aru, Nay Aru, Netheli Aru, Pali Aru, Pallavarayankaddu Aru, Parangi Aru, Per Aru, Piramenthal Aru and Theravil Aru.

77. The hydrological system of the Mullaitivu area consists of marine, lagoons, small to medium scale streams and tanks. Kokkilai, Nayaru, Nanthikadal and Maththalan are the major four lagoons in the area which also have high ecological value. The majority of the streams in the area drain towards the Northeast direction and connect with the sea between Kokkilai and Mullaitivu. In addition, some of the streams drain towards the Northwest and flow through the Mannar District before reaching the sea.

78. There are no major river systems within the Kilinochchi District, however, there are a number of small to medium scale intermittent streams and considerable number of water storages and large areas of irrigation.

79. Details about all the water resources including major, medium & minor tanks, rivers, streams, canals and lagoons observed during the field survey are included in each ECs. The major water sources cross or located near proposed roads are summarized in the following table.

Table 7: Road sections that cross or located near water sources.

Road ID	Sections that cross or located near water sources
Mannar District	
NMA002	Thevampity lake (0+400km+), Lagoon (2+000km+)
NMA003	Tank located at RHS (3+500km+),
NMA004	Nediwarambukulam tank at LHS at 1+900km.
NMA010	flood plain of the Pali ara (natural stream)] located at 0+400-1+200km
NMA017	Tank located at 0+300-0+597km on RHS in the section ii
NMA018	A river across the road at 0+200km of road section v
NMA020	A tank located at RHS of the road from starting point to 1+500km.
NMA024	A lagoon located beside the road from 0+400km to end.
NMA024	A Lagoon located at (1+900km+) beside the road.
NMA030	A marshy land with salt water tank was observed at 0+950-1+100km.
NMA034	Douche canal is located at 0+000-0+787km on RHS.
NMA036	Dutch canal is parallel to the road at 0+350-0+469km
NMA038	Marsh land area is located between the road sections of 0.45-1.00km on LHS.
NMA040	Marsh land area was observed at 0+450-1+000km of LHS.
NMA073	Erukkilampiddi lagoon is at LHS of the section v

Road ID	Sections that cross or located near water sources
NMA085	Nagathalvu tank observed at the end of the road.
NMA087	Sinnawarasa kulam at 1+100km, Irranaiaaepaikulam at 2+800km, Medium tanks at, 3+400km and 10+000km.
NMA091	Section i - A tank on RHS - 0+500-0+650km Tank 1 on RHS - 0+200-0+300km, Tank 2 on LHS - 3+200-3+300km
NMA100	A Wetland area with seasonal tanks were observed at LHS at 0+200-0+300km and 1+200-1+300km
NMA107	Katkadanthakulam at (0.100km+), Irrigation canal cross the road (1+000km -1+100km and 1+100km +)
NMA108	A tank was observed at (0+300km+)
NMA110	Poomanathankulam tank (0.600km+)
NMA124	A major tank (Viyadikulam) was located at the starting point and three small tanks were observed beside the road (1.0-1.4km, 3.0-3.1km & 3.6-3.7km).
NMA125	Marsh area was located in the section between 0+000-0+300km. Two seasonal tanks were located at 0+280-0+650km and 1+000-1+534km in LHS of the road. An irrigation canal was located at 1+000km parallel to the road.
NMA128	Podkernykulam tank was observed at (0+900km+) LHS. Irrigation canal across the road at (0+900KM+)
NMA130	A medium size tank was observed at 0+800-1+400km.
NMA131	A medium size tank beside the road at 0+500-0+640km in section i.
NMA132	A tank was located at 0+170-0+700km on RHS. The spill canal of the tank crosses with a causeway at 0+600km
NMA135	Marsh area was located on RHS of the section i at 0+230-0+300km.
Vavuniya District	
NVA001	The “Ara” with cause way is located at 6.8km. River crosses at 8.9km.
NVA002	Mariaditha kulam tank at 6+600km LHS. Natural canal crosses at 6+600km LHS. Medium size tank at 7+200km LHS. Irrigation canal crosses at 8+400km.
NVA003	Kunchikulam tank at 0+600km to 2+900km change RHS.
NVA004	Maraiyadithakulam tank at 3+600km to 3+800km RHS.
NVA006	Malikaikulam tank between 0+200km and 0.800km RHS
NVA008	Mathavuvaitha kulam tank at 0+600+km to 0+700+km LHS. Thawasikulam tank and canal at 1+400km to 1+600km. Thulawalkulam tank at 2+800km to 2+900km at RHS.
NVA009	Sinnakulam and Rajendrankulam tanks at 0+200km+ and 1.800km+ LHS.
NVA011	PeriyaKalnatinakulam tank at 1+800km and 2+000km LHS. Komarasan kulam tank at 3+200 to 3+400km and medium size tank at 3+400 to 3+700km beside of the road.
NVA023	Nochikulam tank at 5+000km LHS, Kanagraya river at 12+100km.
NVA024	Otamotai kulam tank at LHS of the road at 10+000km, Weddiwattchakulam at 13+600 .
NVA027	Katkulam tank at 1+000km+, Thuwaranakulam tank 1+700km and Thanikulam tank at 6+600km RHS. Iyargankulam tank at 2+600km LHS of the road
NVA036	A Tank at 0+000 -0+100km section.
NVA053	Pampaimadhu tank RHS of the starting section.
NVA070	Medium tank at 3+300km on RHS. two streams (Aru) at 5.1km & (Ara) at 5.7km
Mullaitivu District.	
NMU 004	Two small tanks are located beside the road (1. 0+100-0+200km on LHS and 2. 0+500-0+600km).
NMU 015	Tank at starting point (0+000km)
NMU 023	The roads locates close to the costal belt
NMU 024	A Lagoon and marshland was observed at RHS of the road
NMU 044	Per Aru was observed at (1+700km-2+200km)
NMU 046	Three tanks were located 8.0-8.2km on RHS, 17.7-17.9km on LHS and 20.7-
NMU 047	A minor tank (0.3km - 0.4km on RHS), and a medium tank (2.3km - 2.5km) were observed on RHS.
NMU 056	A medium tank was located 6.0km-7.8km.

	Spill of a tank is crossed at 6.26km - 6.47km.
NMU 057	Two tanks were located 9.3-9.6km and 10.1km-10.9km on RHS.
NMU 069	Katkidardu kulam Tank (2+500km+), Tank (4+600km+),
NMU 071	A small tanks located between 4.2-4.3km on LHS and a medium tank was located between between 5.2km-5.6km on LHS. The road is parallel to the tank bund from 5.2 to 5.6km.
NMU 072	A river called Mee Oya crossed between 1.5km to 1.6km. A tank is located between 3.5-4.3km on LHS.
NMU 070	Tank (1+800km+) LHS, Thaasikulam lake (2+900km+) RHS,)
Kilinochchi District	
NKL001	Akkarayakula lake (9+900km+)
NKL006	Vannerikulam Lake and pond 6+400km+.
NKL019	Marippu Kulam 0+000km+, Causeway 0+100km+
NKL020	Lagoon 9+600km+10+500km, 17+300km- 22+00km+, Lake 15+800km+
NKL024	Lagoon/ coastal zone at the initial section of the road
NKL 027	0+900 Erethawalkviti Kulam
NKL 031	Ellaikkal Lake (1+000km+) was located LHS of the road
NKL 035	Road starts near to Kilali lagoon
NKL 037	Mattikuttai kulam Tank was observed at (0+800km+) RHS.
NKL 038	Nochchi kulam was observed at (0+300km+) LHS of the road
NKL 042	Navanivali kulam was observed at (0+300km+) LHS of the road.
NKL 062	Arumukulam Tank observed at (0+500km+) LHS of the road.
Jaffna District	
NJF001	Road traverses adjacent to the Jaffna lagoon from 3 – 5km and around 8 – 9km which is on LHS
NJF001.1	Jaffna lagoon is located on LHS to the road.
NJF015	Road traverses adjacent to the Jaffna lagoon from start to end which is on 100m to RHS
NJF016	Road ends near to Jaffna lagoon
NJF047	The road ends at the Coastal Zone
NJF049.1	Water tank can be observed at 0.100km
NJF057	belong to coastal conservation Zone
NJF081	Tank under construction at 0.250 RHS for agricultural purpose
NJF091	Water tank can be observed at 0.500km LHS
NJF093	Minor water tank can be observed at 0.700km RHS
NJF115	The road runs closer to the Jaffna Lagoon from 2.4 – 3.5km which is on RHS.
NJF118	Road traverses adjacent to the Jaffna lagoon from 0.6 – 1.1km which is on LHS. From 0.6 – 1.1km the road runs near to the sea and located within the coastal zone
NJF122.1	Road 10th Lane ends at the sea.
NJF125	Last 300m of the road is located within the Coastal Zone and ends at sea.
NJF130	Final 400m section of the road runs along the beach.
NJF132	Road traverses across the Melinchimunai lagoon within first 1km and the lagoon is dried during dry spells of the year.
NJF133	Road traverses across a lagoon which is connected to Jaffna Lagoon within first 0.4km.
NJF134	This road is located within the coastal zone and ends at the coastal line.
NJF 134.1,2, 3,4,5, 6	These road sections are located within the coastal zone
NJF 135	Road traverses adjacent to the Jaffna lagoon from 0.2 – 0.97km which is on LHS.
NJF137	The road is located parallel and closer to sea which is observed on LHS within the section of 0.0 – 0.13km.
NJF138	The road is located parallel and closer to Jaffna Lagoon which is observed on Right Hand Side (RHS) within sections from 3.4 – 4.4km and around 4.4 - 4.8km both sides.
NJF147	A Road traverses near to Vedduk Kulam a seasonal water tank at 3.5km of the road.

NJF163	Lagoon is located from 3 – 5km and 8 – 9km on LHS.
NJF167	Lagoon is located from 1.1 – 2.9km on LHS and around 4.5 – 5.8km on both sides.
NJF180	end point of the road is located near to the lagoon
NJF183	Road crosses the Jaffna Lagoon from 2.5km to the end point of the road
NJF255-I, II,III	Road ends near to the coastal area

Source: Field survey, Northern province, iRoad project

4. Air Quality, Noise and Vibration:

80. Majority of the identified roads for the project located within rural areas of the NP. No industries or major pollution sources are located within those areas. At present, considerable amount of the land area of the Province is covered with forest and scrublands. Although there are a few small scale industries in the Province, effect of them on air quality is very low. Therefore apparently, air quality standards in the area are within the national ambient air quality standards. Table IV.3. Presents the National Environmental (Ambient Air Quality) Standards, declared in 1994 by the CEA, while table IV.4 presents the 2005 "World Health Organization Air Quality Guidelines" which offers a global guideline on thresholds and limits for key air pollutants that pose health risks[5]. However vehicular traffic found within town areas can affect air quality and noise to some extent.

Table 8: National Ambient Air Quality Standards

Parameter	Average time (hrs)	NAAQS (mg/m^3)	NAAQS (ppm)
Carbon Monoxide	8	1	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)
Note: PM 10- Particulate matter<10 µm
NAAQS- National Ambient Air Quality Standards

Table 9: WHO Ambient Air Quality Guidelines, 2005

Parameter	Averaging Period	Guideline value in mg/m^3
Sulphur Dioxide (SO_2)	24 hour	125 (Interim target 1) 50 (Interim target 2) 20 (Guideline)
	10 minute	500 (Guideline)
Nitrogen Dioxide (NO_2)	1 year	40 (Guideline)
	1hour	200 (Guideline)
Particulate Matter (PM_{10})	1 year	70 (Interim target 1) 50 (Interim target 2) 30 (interim target 3) 20 (Guideline)
	24 hour	150 (Interim target 1) 100 (Interim target 2)

[5] These guidelines are adopted by the Word Bank under their General EHS Guidelines

Parameter	Averaging Period	Guideline value in mg/m^3
		75 (Interim target 3) 50 (Guideline)
Particulate Matter ($PM_{2.5}$)	1 year 24 hour	35 (Interim target 1) 25(Interim target 2) 15 (Interim target 3) 10 (Guideline) 75 (Interim target 1) 50 (Interim target 2) 37.5 (Interim target 3) 25 (Guideline)
Ozone	8 hour, daily maximum	160 (Interim target 1) 100 (Guideline)

5. Occurrence of Natural Disasters in the Project Area

81. **Floods**. According to the reports of Disaster Management Centre Sri Lanka (DMC), from year 1974 to 2014, thousands of people in NP have effected in various ways (deaths, injured, property loss, displaced) several times due to floods. Flood caused severe damage to the life and their properties due to heavy rainfall during monsoon and inter monsoonal periods especially in Jaffna districts. Compared to the other seasons, the North East Monsoon season has the highest number of flood (1983, 1984, 1993, 1998, 2000, 2001, 2011 and 2012) occurrence. During the North East Monsoon season of 1984 extreme flood identified in all stations of NP. South West Monsoon period has the lowest number of flood occurrence and it severity is also low. Apart from the human losses, economic losses including housing damages, crop damages and commercial sector losses were recorded in the low-lying areas of the Northern region due to these flood.

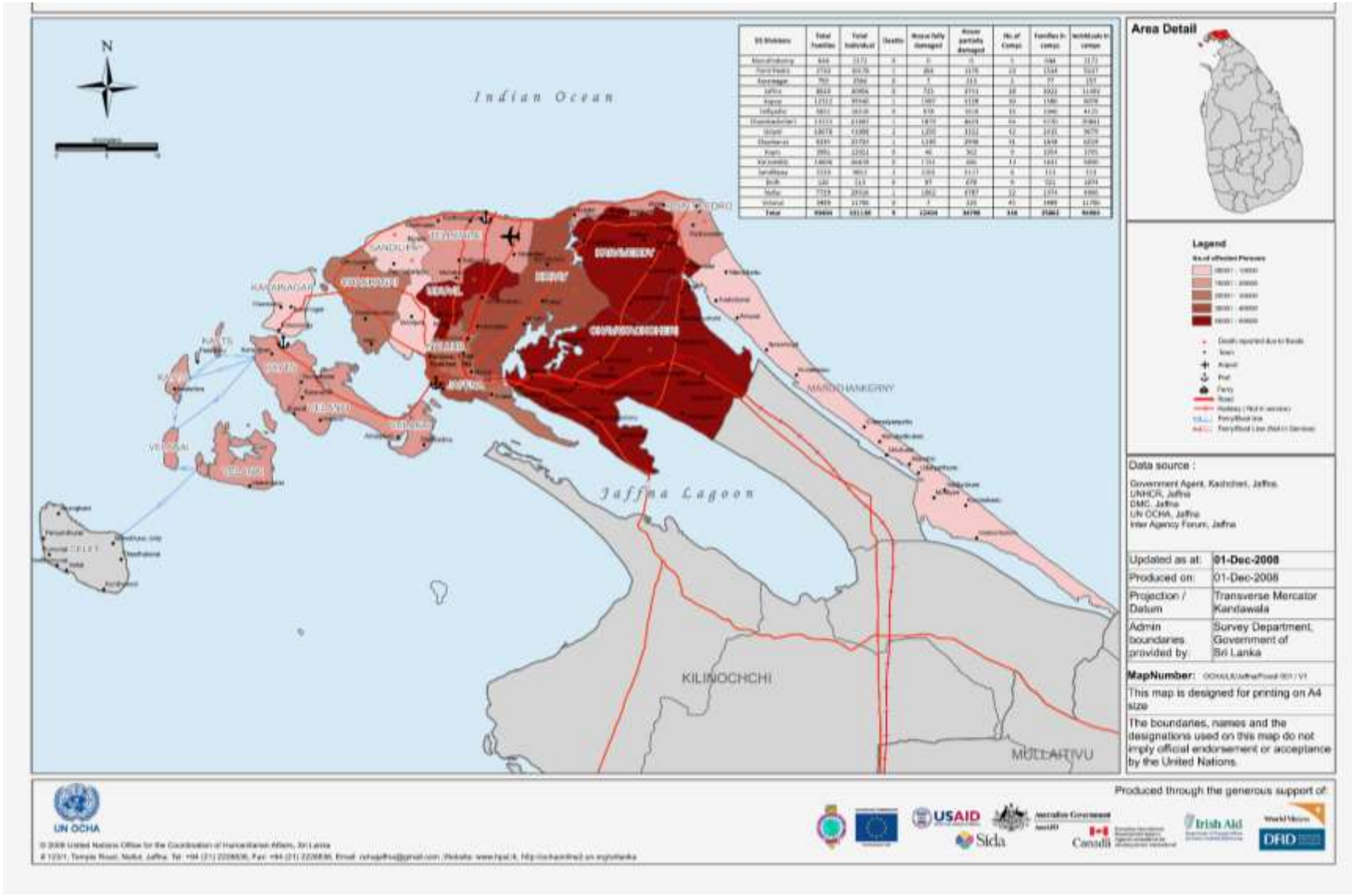


Figure 1: Number of families effected by floods in Jaffna District in 2008

Source: UN Office for the Coordination of Humanitarian Affairs, 2008

82. According to the public view, most of the proposed roads located around river catchments, tanks, marshlands and low-lying areas are vulnerable to flood especially during heavy rainy seasons. Table 10 presents identified roads which are prone to floods in different Districts of the Province.

Table 10: Flood prone areas along project roads

No	Road ID	Flood prone area
Jaffna District		
5	1	The road is inundated closer to the lagoon during rainy season
6	1.1	The entire section goes under water during rainy season and water retain about one month period
7	2	The road is mainly inundated where it traverse from the 0.400km to 0.500km during the rainy season
8	15	The road is inundated where it traverse closer to the lagoon during rainy season.
9	16	The road is inundated during rainy season
10	19	latter part of the road get inundate during the rainy days
11	20	The road get flooded during rainy season. The water comes to house around 2 feet and water remains for 2-3 month.
12	26	The road get flooded during rainy season especially at the starting point.
13	27	The road get flooded during rainy season
14	32	Segment of the road inundate during the rainy season
15	34	flooding at rainy season
16	39.1	Floods in October to December
17	41	Flood on rainy season
18	45.i	The road is get inundate during the rainy season.
19	57.i	During rainy period flooding occur 2, 3 feet height
20	57.ii	During rainy period flooding occur 2, 4 feet height
21	60	During raining time storm water running through the road
22	60.1	During raining time storm water running through the road
23	62	During raining time storm water running through the road
24	71- 71 Vi	Storm water stagnate 2 to 3 ft height during rainy season
25	93	The road is totally inundated during rainy season.
26	93.1	The road is totally inundated during rainy season.
27	94	During raining time storm water running through the road
28	94.1	During raining time storm water running through the road
29	95	During raining time storm water running through the road
30	101	Several places of the road get inundate during the heavy rain.
31	117	Road traverses adjacent to low-lying areas within first 0.5km and 2 – 2.4km which is inundated during rainy period.
32	118	The road section from 0.6 – 1.1km is affected by tides and rainwater accumulation and this area is prone to inundation
33	122.1	End point of the section I and entire section II are inundated during heavy rain period due to lack of drainage to the sea
34	130	First 0.2km section lies on a low lying area and is inundated during rainy periods as rain water is not drained off to the sea. Water retains for about 3 months.
35	131	Road section near the lagoon gets inundated during heavy rainfalls.
36	132	The entire road is inundated for about 0.3m during rainy season
37	133	The road is inundated where it crosses the lagoon during rainy season.
38	135	The road is mainly inundated where it traverse closer to the lagoon during rainy season. Starting point is also flooded with the water passed through the culvert of the AB019 due to absence a proper lead away canal
39	139.i	Most of the sections of the road getting inundated during rainy period
40	144	Several sections of the road get inundate during heavy rains due to the lack of drainages

41	147	rainy season the road is flooded
42	157	The road section from 2.2 – 5km, 7.6 – 7.9km, 13 – 14.5km and around 16.3km are particularly vulnerable for floods during heavy rainy periods.
43	164	0.8km is prone to floods
44	170 - I	The road get flooded during rainy season
45	170 - II	The road get flooded during rainy season
46	172	The road get flooded during rainy season.
47	172	The road get flooded during rains
48	174	Starting section gets flood.
49	177	the road get flooded for about ½ feet during rainy season
50	183	The road section within the Jaffna lagoon (2.5km to 4.1km) is prone to flooding during rainy seasons.
51	185	The road get flooded around 3km section
52	220	There's water stagnation around 0.4km during rainy season
53	227	Road get flooded for about 1 ½ feet for rainy season.
Vavuniya District		
1	001	Road section from7+200 to 7+300 inundate during heavy rainy periods.
2	003	locations from 4+600 to 4+900km inundate during heavy rains periods
3	005	The road at 5.1km inundates during the rainy season.
4	009	Road section from 1+200km+ to 1+500km is prone to inundation during rainy seasons.
5	012	During heavy rains the last section of the road get inundated. (4.0km)
6	020	End section of the road get flooded during rainy period (0.698km)
7	021	End section of road section I (0.300+) and end section of road section II (0.100+) of the road get inundated during rainy period.
8	023	some previous incidences have been recorded in the project area from 7+400km to 8+700km
9	025	Floods have been recorded from 0+200km to 1+400km and 2.500km+
10	026	End section (8.63km) of the road gets inundated during rainy period.
11	027	End section (1+000km- 1+100km, 4+000km+) of the road gets inundated during rainy period.
12	028	End section of the road gets inundated during rainy period.
13	030	End section (0+600km -0+700) of the road gets inundated during rainy period.
14	031	3+800km+, of the road gets inundated during rainy period.
15	032	End section (2.100 km) of the road gets inundated during rainy period.
16	033	End section (0+000km to 0+853) of the road gets inundated during rainy period.
17	034	Section of (0+600km+,1+600km+) gets inundated during rainy period.
18	035	Entire section (0+000km to 0+700km) of the road gets inundated during rainy period. Water stagnation and Mud were observed in some sections.
20	036	Starting to end 0.000km-3+700kmof the road gets inundated during small rain and monsoon period.
21	069	Some locations (4.450+, 4.600km, 8.00,- 8.200km) inundate during rainy season.
22	075	1.678km of the road section inundates during heavy rains.
23	076	1.957km & 4.975km locations inundate during heavy rains.
24	082	Mid-section and several points close to the end section inundate during the heavy rains
25	083	Flooding in some sections of the road in heavy rainy season
Mannar District		
1	003	End section (0+000km -1+300) of the road gets inundated during rainy period.
2	004	End section from (2+000 - 2+100km) section gets inundated during rainy season. Section (0+300km- 1+900km) of the road gets water stagnation
3	003	End section (3+100 – 3+300km, 9+400km – 11+000km, 16+500 -16+900km) of the road Inundated during rainy period.
4	011	End section (0+600km+) of the road gets inundated during rainy period.

5	012	road section iii at (0+000km – 0+140km) section gets inundated during rainy period
6	016	Section from (0+300km to end) gets inundated during rainy season.
7	018	Some sections of the roads get inundated during rainy period.
8	019	Sec I (0+000km to end) Sec ii (0+000km to 0+400km) get inundated during rainy period.
9	020	Section (0+200 - 0+600km), (1+700km - 2+200km) of the road gets inundated during rainy period.
10	022	Section (0+300- 0+800km) of the road gets inundated during rainy period.
11	022	0+000-0+100km of the road gets inundated during rainy periods.
12	028	some sections of the road get inundated during rainy periods
13	029	(0+000-0+573km) section of the road gets inundated during rainy period.
14	030	(0+700-1+100km) section of the road gets inundated during rainy periods.
15	032	Several sections of the road gets inundated during rainy period.
16	033	Several sections of the road gets inundated during rainy period.
17	034	Several sections of the road gets inundated during rainy period.
18	035	Several sections of the road gets inundated during rainy period.
19	036	0+200-0+300km section of the road gets inundated during rainy period.
2	037	0+040-0+140km section of the road gets inundated during rainy periods.
21	038	0+200-0+300km section of the road gets inundated during rainy periods.
22	039	0+200-0+300km and 0+700-0+800km of the road gets inundated during rainy period
23	041	0+400km of the road gets inundated during rainy season.
24	044	Some sections of the road get inundated during rainy periods.
25	045	Some sections of the road get inundated during rainy periods.
26	049	Some sections of the road get inundated during rainy periods.
27	051	Several sections get inundated during rainy periods.
28	053	Several sections get inundated during rainy periods.
29	056	0+050-0+100km of the section i gets inundated during rainy period.
30	063	Some sections of the road gets inundated during rainy period.
31	066	whole road section gets inundated during rainy season
32	067	some sections of the road gets inundated during rainy period as follows Sec I (0+100km+) to end
33	068	Road section ii at (0+000km – 0+064km) and section iii (0+000km – 0.174km) gets inundated during rainy period.
34	069	Entire road section get inundated during rainy period.
35	071	Some sections of the road Sec I (0+500km) to end and Sec ii (0+200km+) gets inundated during rainy period.
36	072	Road sec I (0+500km) gets inundated during rainy period
37	073	Some sections of the road gets inundated during rainy period.
38	074	Road sections iii gets inundated during rainy period.
39	075	End point of the road section i gets inundated during rainy period.
40	076	Road Sec I (0+300 - 0+400km) gets inundated during rainy period
42	079	Road sections (1-4 km)
43	080	The end section of the section i gets inundated during rainy periods
44	083	Whole road section flood during rainy season.
45	086	0+550-0+600km and 0+720-0+760km inundated during rainy season
46	087	0+400km to 1+700km, 2+800km-3+300km, 3+400km – 3+500km locations inundate during heavy rain periods.
47	092	Section – II: 0.0 - 0.1km, 0+400 - 0+650 km and 1.35 - 1.65 km inundate during rainy season
48	093	Povasankulam tank spill during rainy periods causes inundation of the road.
49	096	First 300m of the road section get inundated during the rainy season.
50	101	road sections lll inundated during rainy period (0+050km – 0+100km)

51	105	The road is prone to flooding.
52	106	Road section (1+000km -1+100km) gets completely inundated during rainy period.
52	109	The tanks are overflowing during rainy season through the road at 0+000-0+050km.
53	110	Road sections between (0+300km -End) fully inundated during rainy period.
54	116	Whole road inundated during rainy season. Seasonal water logging areas were observed at (0+200km+) both sides of the road
55	117	Whole road section gets flooded during rainy season.
56	123	The entire road gets inundated during the rainy seasons
57	124	3+400-3+500km of the road gets inundated during rainy periods.
58	125	Some sections of the road get inundated during rainy periods.
59	128	Road sections between 0+200km – 0+600Km fully inundated during rainy period.
60	131	Section i, 0+500-0+640km of the road trace gets inundated during the rainy seasons.
61	134	Some sections of the road get inundated during rainy periods.
62	135	Some sections of the road get inundated during rainy periods.
63	136	Some sections of the road get inundated during rainy periods.
64	137	Some sections of the road get inundated during rainy periods.
Mullaitivu District		
	01	According to public consultations, some sections get inundated due to the poor drainage system.
	010	0+300-0+480km of the road gets inundated during rainy periods.
	018	Road gets fully inundated during rainy period. (0+000km -End)
	021 I & ii	Road sections one to four get fully inundated during rainy period. Section 01: - 0+100 - 0+200, Section 02: - 0+000 - 0+100
	026	Road gets fully inundated during rainy period.
	030	Road get fully inundated during rainy period.
	033	Road get fully inundated during rainy period.
	037 i & ii	Following sections get inundated during rainy period, Sec i: 0+000km-0+200km and 1+100km-1+300km, Section ii: 0+200km – 0+400km
	039 i & ii	Road sections i and ii get inundated during rainy period. Section i:- (0+400km -0+600km), Section ii:- (1+200km -1+400km)
	040	Road section gets inundated during rainy period. (0+300km – 0+400km)
	044	Road section (1+700km – 2+200km) get fully inundated during rainy period.
	046	Chainage between 21+100 - 21+200km get inundated during rainy periods.
	057	Chainage between 3+600km to 3+700km gets inundated due to the poor drainage system.
	062	End point of the road gets inundated.
	064	sections get inundating (0.54-0.57km and 1.60-1.70km) during rainy season.
	065	chainage between 2+100 - 2+200km is gets inundating during rainy periods
	068	Chainage between 0+760-0+850km gets inundated during rainy period.
	069	(1+400 -2+000km) flooding have been recorded in the project area.)
	072	Some sections gets inundated due to overflowing of the Padaviya Reservoir.
	070	some sections get inundated due to the poor drainage system.
Kilinochchi District		
	NKL001	road sections(2+600km -2+900km and 6+800km -7+600km) get fully inundated during rainy period at
	NKL004	8+00km – end section fully inundated during rainy period.
	NKL005	following sections get fully inundated during rainy period. (2+200km - 2+2500km, 4+000km -5+100km, 5+900km -6+100km)
	NKL009	0+200km -0+700km road section fully inundated during rainy period.
	NKL011	(0+000km – 0+400km, 1+800km – end) road sections fully inundated during rainy period.

	NKL011	The road inundate during rainy period
	NKL012	Road section 0+300km -0+400km inundated during rainy period.
	NKL013	Road fully inundated during rainy period.
	NKL013	Road fully inundated during rainy period.
	NKL014	0+000km -0+600km section inundated during rainy period.
	NKL020	Following sections fully inundated during rainy period. (9+600km – 10+500km, 13+600km -15+400km)
	NKL022	Road section (0+200km -0+600km) inundates during rainy period.
	NKL024	Road section (0+900km -1.500km) fully inundated during rainy period.
	NKL025	Road section (0+000km -2+600km) fully inundated during rainy period.
	NKL 027	Road sections fully inundated during rainy period.
	NKL 029	Road sections get fully inundated during rainy period. Chainage; Section I 0+000 – end. Section iii; 0+000 – end.
	NKL 031	Road section get fully inundated during rainy period. Chainages;0+100km-0+300km, 1+000km-1+400km, and 1+900km- end point
	NKL 032	Road sections fully inundated during rainy period. Chainage; 1+900km – 2+200km
	NKL 033	Road sections fully inundated during rainy period. Section I : 0+000 – end. Section ii: 0+000 – end.
	NKL 034	Section (0+600 -0+900) and (3+100–3+900km) gets inundated during rainy season.
	NKL 042	Road section from 0+400km to endpoint gets inundate during rainy season.
	NKL 049	End point of the road gets inundated during rainy period because of the spillage and overflow from Iranamadu tank.
	NKL 050	Starting point to 100m of the road gets inundated during rainy season in section i
	NKL 053	From starting point to 0+700km section gets inundated during rainy period
	NKL 054	Section (0+700km–1+000km) gets inundated during rainy season.
	NKL 055	Road section (0+500–0+700km) get inundated during rainy season.
	NKL 056	According to the public view, From 1+000 to 1+200km section gets inundated during rainy season.
	NKL 057	According to public, section from (0+000–0+100km) gets inundated during rainy season
	NKL 059	According to public view from (1+000–1+600km) section gets inundate during rainy season.

Source: Field survey, Northern Province, IRoad project .

83. **Droughts.** According to the Drought Hazard map of DMC, Northern Province experience very high drought hazards especially during May to September (South West monsoon period). This is particularly evident in Mannar, Vavuniya and Kilinochchi

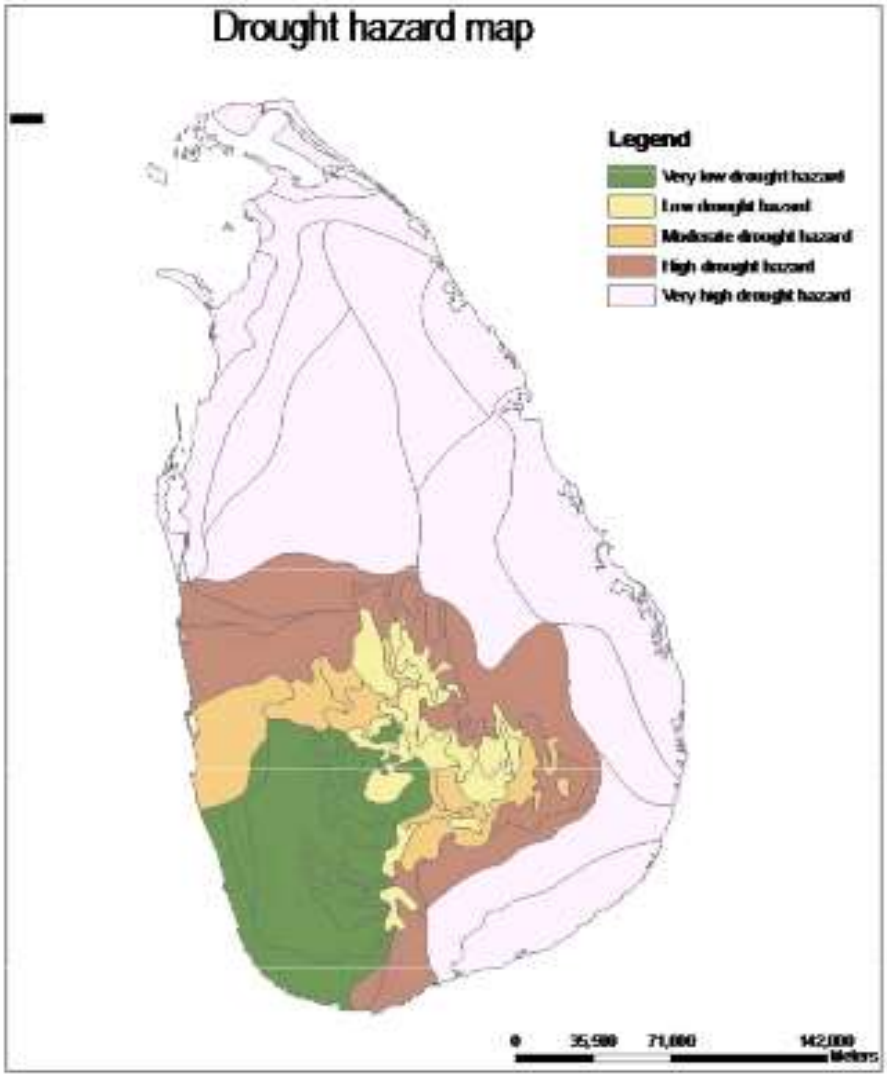


Figure 2: Drought Hazard Map

84. Droughts have caused severe damages to income generation activities of the people in the area agriculture in the area including paddy cultivation, cash crops, vegetable crops and fisheries etc. For example, during the last ten years, 5304 hectares of paddy crops was damaged, due to the drought hazards in the Vavuniya district. Following tables show the amount of paddy crops damaged due to droughts in Kilinochchi, Mannar and Vavuniya district from year 2002- 2012.

Table 11:. Crop Damages of Drought in Kilinochchi District from 2002 to 2012

Year	Paddy Crop (Ha)	Subsidiary Crops(Ha)	Cash Crops (Ha)	Vegetables Crops (Ha)
2002	1351	100	34	19
2010	1120	512	421	218
2010	569	151	90	23
2011	972	77	23	24
2012	1753	90	43	9

Source: District Agriculture, Agrarian Departments and Divisional Secretariats Divisions of the Kilinochchi District

Table 12:. Crop Damages of Agriculture in Vavuniya from 2002 to 2012

Year	Paddy Crops (Ha)	Subsidiary Crops (Ha)	Cash Crops (Ha.)	Vegetable Crops (Ha.)
2003	90	67	10	0
2005	1090	120	19	27
2011	1309	100	40	35
2012	1853	217	23	12
2003	676	69	39	23
2010	1278	1556	51	14

Source: Department of Agriculture, District Agrarian Service Center, Vavuniya, 2002-2012

Table 13: Crop damages of flood and drought in Mannar District from 2002 to 2012

Year	Paddy Crops (Ha)	Subsidiary Crops (Ha.)	Cash Crops (Ha)	Vegetable Crops (Ha.)
2008	1085	310	300	369
2002	781	47	9	18
2006	662	21	12	9
2010	824	0	0	0
2004	290	19	11	4
2008	421	130	60	0

Source: Department of Agriculture, District Agrarian Service Center, Mannar, 2002-2012

85. **Cyclones and Wind** Majority of cyclones and storms pass through the northern and north-central parts of the island which originate from the Bay of Bengal during the northeast monsoon. The northeastern seaboard has high cyclone hazard and 80 percent of all cyclones and storms occur in November and December. These hazards have effected on lives, destroying properties and income activities like fishing. The tropical cyclone Nilam occurred in 2012, originated near the country's northern coast and effected Jaffna, Mullaitivu and Mannar districts. In Mullaitivu district only the heavy rains and strong winds have affected 23,638 people. In Kilinochchi district, 4,446 persons in the Pachchilaipalli, Kandavalai, Poonakary and Karachchi DS divisions have been affected, and 654 houses have been damaged. In Jaffna district, 17, 968 persons have been affected by floods in 14 divisional secretariat. In Vavuniya, 610 houses have been damaged. Apart from that, deaths by drowning, lightning, electrocution, were reported during this period.

86. **Tsunami.** The tsunami that struck the coastline of Sri Lanka in December 2004, resulted in loss and displacement of thousands people in Sri Lanka. Approximately 800 km of the coastline was affected by the tsunami with northeast region of the country being the hardest. The northern Districts of Jaffna and Mullaitivu were significantly impacted by the tsunami especially in Jaffna there were 2076 deaths and in Mullaitivu it was1700. Apart from that, the waves also caused extensive damage to the infrastructure, fishing, tourism, agriculture and small-scale industries in the area. Tsunami is widely acknowledged as the most devastating natural catastrophe happened in the history of the country so far. However based on the past records of the Disaster management Center, the occurrence of Tsunami disasters in the country is very rare.

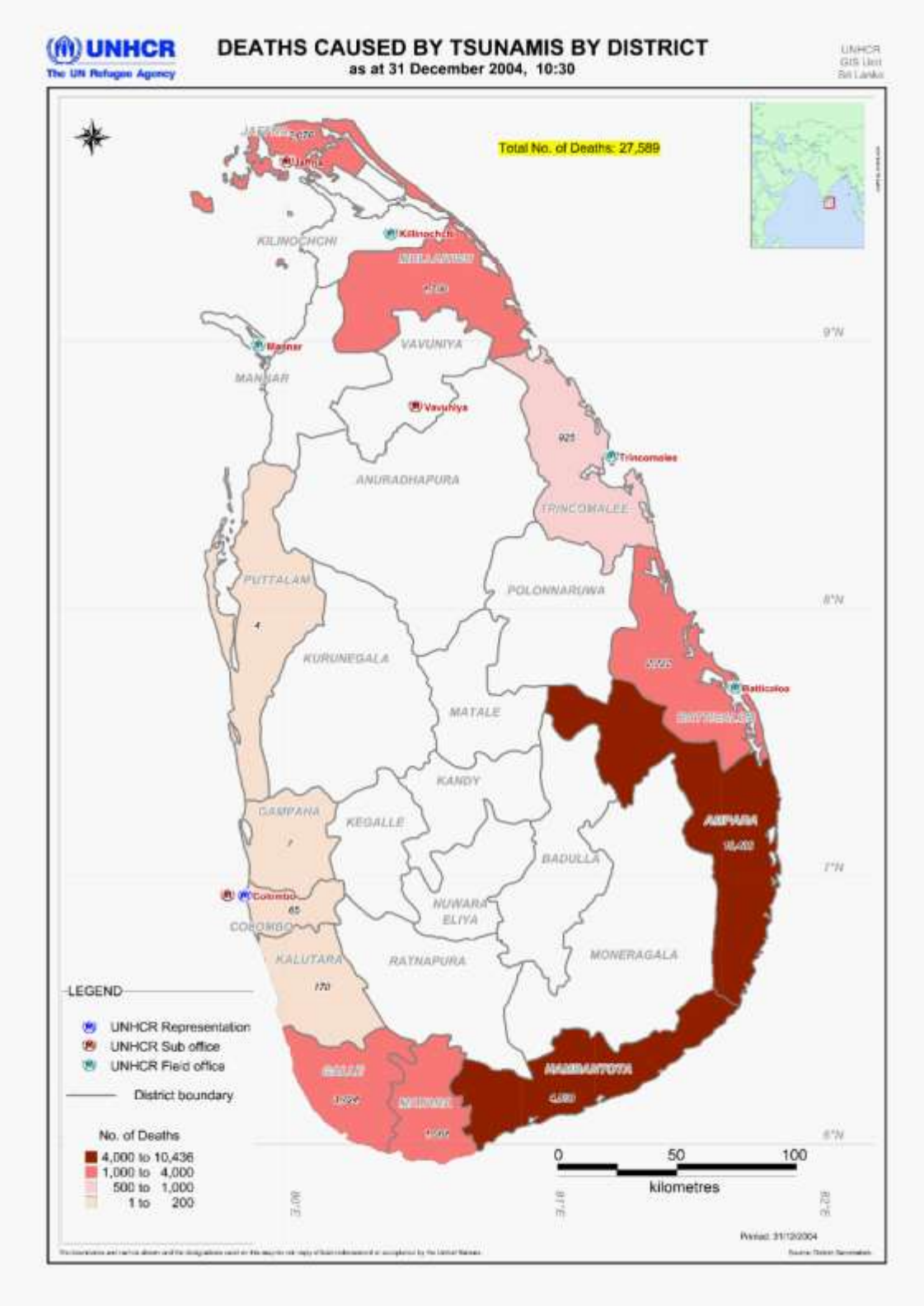


Figure 3. Tsunami Hazard map

6. Improvised Explosive Device (IED) and Unexploded Ordnance (UOX)

87. Due to the long armed conflict occurred in the area, several Improvised Explosive Devices (IEDs) and Unexploded Ordnance (UXO) had been used extensively by armed forces in NP. UXO such as bombs, shells, grenades, land mines etc. from the war effected area of the NP have been cleared by the military experts from 2009 up to date, but suspected areas for UXO can be seen beside the several candidate roads. During the field survey it was observed that surrounding area of some candidate roads (Kachchi- Ketplei Elephant pass road, Vempodukerni- Kurudikkadu road etc.) have been barricaded by military professionals. Those UXO which have not been explode yet can still pose a risk of explosion, sometimes many years after they were used or discarded. During the proposed construction and other construction related activities IED & UXO can be particularly dangerous and will pose a risk to normal safety measures in the area. Information land areas cleared from IEDs and UXOs could be obtained from relevant Divisional Secretary Offices and Military Establishments.

B. Ecological Environment

1. Existing Habitats with Respect to Flora, Fauna and Protected Areas

88. NP has extensive areas of protected habitats and secondary forests such as dry monsoon forests, riverine forest and mangrove forest (which are usually associated with river mouths and lagoons) and wetlands which provide various habitats for wild animals and plants. Mainly Mullaitivu (169,303 ha which is 64.1%), Mannar (123,740.1 ha which is over 50%) and Kilinochchi (37,599.8 ha) Districts are extensively covered with forest while Vavuniya (117,050.7 ha) and Jaffna (1354.7 ha) is partially covered with forest. Forest type located within the Jaffna district is Dry Monsoon Forest and consists with semi deciduous vegetation. Mangrove forests are also present along intertidal sheltered coastlines, usually associated with river mouths and lagoons. Vegetation usually consists of Rhyzophora species. Two major Forest Reserves (FR) are governed by the Forest Department, called Neenthavil and Mavillu FR are located within the Mannar District. Mullaitivu District consists of different ecosystems such as forest lands, scrub lands, water bodies and manmade habitats such as coconut plantations, Chena cultivations and agricultural lands etc.

89. The Province has number of sanctuaries and lagoons, the largest being Jaffna lagoon. Jaffna, Nanthi Kadal, Chundikkulam, Vadamarachchi, Uppu Aru, Kokkilai, Nai Aru and Chalai lagoons, sanctuaries of Madu, Vankalai and Wilpattu National park belongs to bird migratory pathway and number of winter and summer migrants arrive during end of August and from March to April. Both rare and common bird species including Indian Spot-billed Duck, Eurasian Widgeon, Avocet, Common Teal, Northern Shoveller, Pintail, Gargeni, Greater Flamingo, Crab Plover, Oystercatcher, Red Knot, Great Knot, Ruff, Indian Grey Partridge, Lesser Crested Tern, Great Crested Tern, Caspian Tern, White-winged Black Tern, Little Tern, Great Black-headed Gull, Heuglin's Gull, Brown Headed Gull, Common Coot, Bar-tailed Godwit, Kentish Plover, Black Drongo, Rufous Rumped Shrike, Collared Dove, Hoopoe, Montague's Harrier, Pallid Harrier, Peregrine Falcon, Golden-backed Woodpecker etc. could be observed within the province. Above habitats provide breeding, feeding and nursery grounds for different birds, reptiles and number of aquatic vertebrates and invertebrates.

90. In addition both ecologically and economically important locations including freshwater inland tanks, marshy areas, ponds, streams river catchments, salt marshes, lagoons and estuaries, islands, wetlands, coral reefs, arid zones of Mannar etc. also housed for many

aquatic floral and faunal species. These coastal habitats and wetland sanctuaries also offer access to fisheries, aquaculture and has good tourism potential. Mullaitivu District has a coastal belt of 70 km and four key lagoons namely Mathalan, Nanthikadal, Nayaru & Kokulai. These lagoons are famous for prawn & crab cultivation and freshwater fishing. The Jaffna lagoon belongs to a bird migratory pathway and is also famous for several commercially important fish species. Most of the proposed roads in Jaffna, and few roads in Kilinochchi and Mullaitivu are located in or close to the Coastal Zone (i.e. 24 ,47, 57, 87 , 91, 93 I, 93 ii, 108, 115, 121, 125, 130, 131, 134 i, 134 iv, 134 vi, 137 vii, 138, 147, 155, 157, 158, 162,163, 164, 168, 180, 183, 184, 255 I, 255 ii, 255 iii).

91. The important wetlands within the District include Adams Bridge, Palk bay, Vankalai and Giant tank. Giant's Tank is an important sanctuary declared as a sanctuary to protect this important water source within the area. Vankalai Bird Sanctuary and villus of Wilpattu National Park is an important Ramsar sites for migratory birds and was declared a sanctuary in 2008.

92. Chundikkulam sanctuary was designated as a bird sanctuary on 25 February 1938 under the Fauna and Flora Protection Ordinance (No. 2) of 1937 and is considered as one of the first sanctuaries gazetted in the country. After the civil war, the area of the sanctuary was upgraded to a national park on 22 June 2015 by the GoSL.by extending the area westwards towards Elephant Pass and south-eastwards towards Chalai and Pallamatalan. The chundikkulam Lagoon is partly surrounded by mangrove swamps, sea grass beds, scrub forests and a variety of dry zone flora, hence provides home to different water and wader birds. Further the dry zone forest cover is home to the larger mammals such as the sloth bear, jackal, sambur and deer, while smaller mammals such as mongoose, otter, ring tail civet, fishing cat, and jungle cat, can also be seen. Further the lagoon is home for different types of fish species, therefore provide income generation for fishing communities.

93. Wilpattu National Park is most important wildlife area located within the Mannar district. Large numbers of mammalian species including several species of threatened mammals such as elephants (Elephas maximus), sloth bear (Melursus ursinus), water buffalo (Bubalus bubalis) and leopard (Panthera pardus kotiya) can be observed within the park. In addition other species of mammals such as spotted dear, sambhur, mongoose, wild cats as well as different species of reptiles, amphibians and butterflies also live within the park. Wilpattu National Park is also famous for avifaunal species. Other than that both terrestrial and aquatic species including cormorants, egrets, ibis, owls, terns, gulls, eagles are common within the park. Painted stork, peacock, jungle foul, open bill, spoonbill, whistling teal are also common siting within the national park. The protected areas found within the NP is given in figure III.4.

94. As mentioned above, since considerable amount of forested areas including National Parks and Sanctuaries are located within Mullaitivu, Vavuniya and Mannar districts wild elephant habitats is a common incidences. Since home range of the elephants is considerably high, elephant movements and crossings is also a common issue around most of the roads located around forested areas of the province. This was also observed in roads which are located close to the forest areas during the field survey.

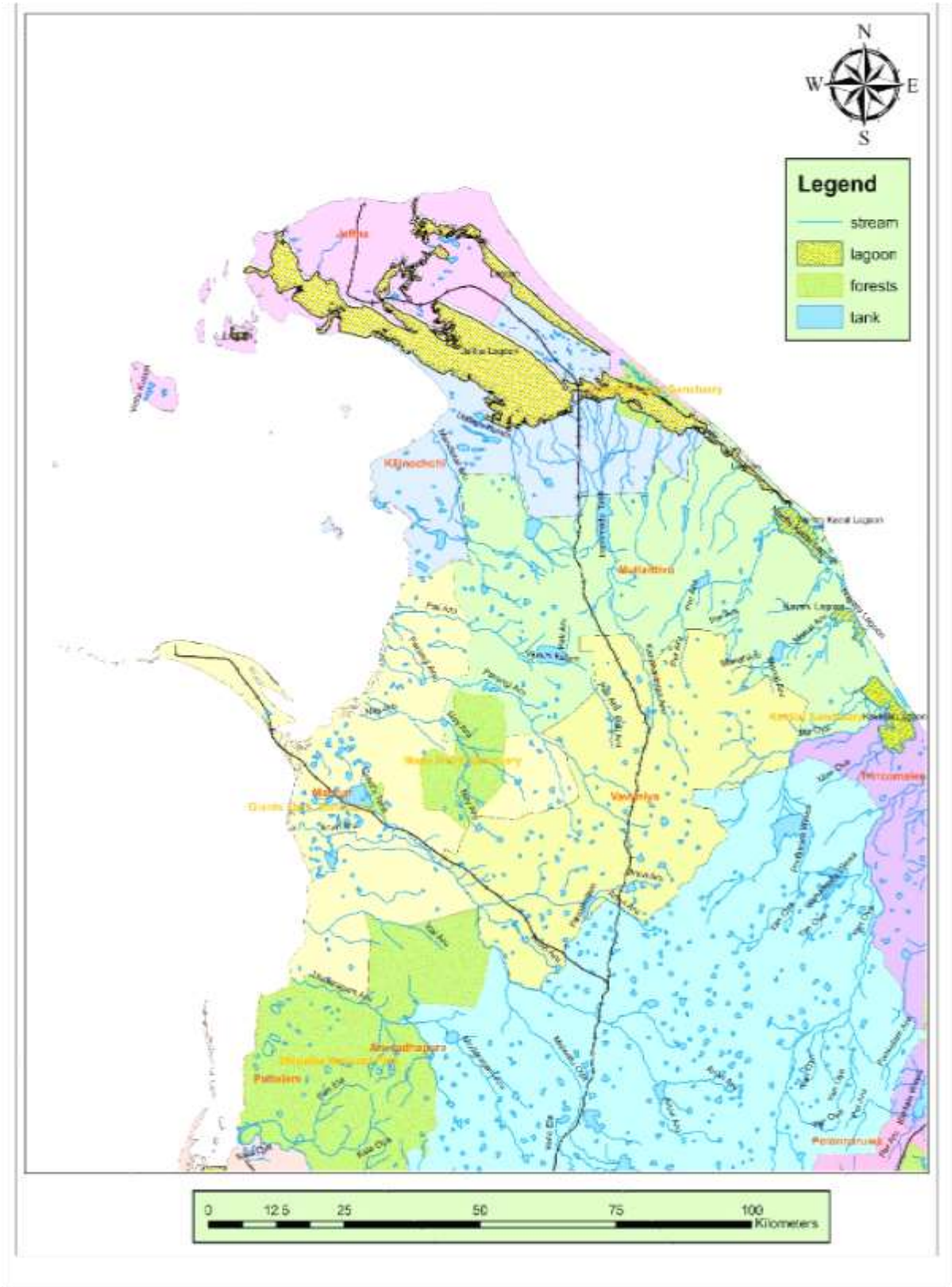


Figure 4: Protected areas found within NP.

2. Forest Areas Located Within/Adjacent to the Roads of NP

95. Since large extent of forested areas are located within the NP, some of the long distance roads runs through or close to the forested areas. None of the proposed roads run through national parks. However sections of two roads are located close or within sanctuaries (NMA087.1- Madhu road sanctuary, NVA001-Semamadu Forest, NKL 046 Sec i & II-Chundikkulam Sanctuary**).** Table IV.8 and figure III.5 present the details of roads which runs through or adjacent to the gazetted Wildlife areas and forest with necessary information.

96. Roads falling in part or whole inside or within the buffer zone of a SNR, NP or NR will not be selected under the investment program. Roads falling adjacent to other protected areas (such as sanctuaries or protected wet lands) or eco-sensitive areas will be included only if there is no widening of the road "right of way" or acquiring of land from the protected area or eco-sensitive area. For such project roads proper consultations will be held with the Department of Wildlife Conservation, Forest Department, local community and other relevant stakeholders and appropriate clearances or endorsements should be sought if required.

97. Department of Forest granted a general approval for improvement of all roads under this project which are falling within or adjacent to sensitive forest areas through letter No. EMD/EIA/RD/rural roads/2014 dated 27 Aug 2014 (attached in appendix IV.1). However for any roads or section of roads falling within Forest Reserves, road specific approval should be obtained before construction.

Table 14: Roads located within/adjacent to gazetted forest / Wild life areas of NP

Road ID	Road length	Name/Type of the forested area	Length of the road within/adjacent to the roads
Jaffna District			
NJF183	4.113km	Nagar Kovil Nature Reserve	from 2.5 to 3.5km RHS of the road
Mannar District			
NMA010	1.335 km	Scrub Forest belongs to the Forest Department	0+770-1+200km on both sides
NMA087.1	11.18 km	Madhu road sanctuary	At 4+700km-7+100km, 8+700km – 10.9km both sides of the road.
Vavuniya District			
NVA001	8.922 km	Semamadu Forest	5+400km-8+500km both sides of the road.
NVA023	12.56 km	Nainamadu Forest Reserve	0+000km - 2+000km both sides of the road.
		Sinnapurasarakulam Forest	2+000km – 3+700km beside the road
		Sammalam Kulam Forest and Nochikullam Forest Reserve	(8+700+) 8+700Km RHS of the road
NVA024	14.98 km	Ninamadhu Forest area Olumadhu Forest	1+500km RHS, 3+600km. both side
NVA028	1.54 km	Kulavisitan Forest	
NVA029	1.81 km	Kulavisuddan Forest	Some sections of the road
NVA031	4.75 km	Samalankulam Forest	0+300km RHS, 0+500km both side of the road., 1+700km RHS of the road 2+800km+
NVA034	2.37 km	Nainamadu Forest	0+400km - 0+600km both side of the road
NVA054	3.00 km	Salampaikulam	0.500km 3.000km
Mullaitivu			
NMU028	2.03 km	Teravil Oddusudan Forest	0+000km -0+800km

Road ID	Road length	Name/Type of the forested area	Length of the road within/adjacent to the roads
		Reserve	
NMU036	1.48 km	Teravil Oddusudan Forest Reserve	(0+000km -0+800km) in LHS.
Kilinochchi District			
NKL 046	sec. i – 2.644km sec. ii - 2.186 km.	Chundikkulam sanctuary	Sec i: at (0+000 -0+100km) RHS of the road. Sec ii : Beside the road from starting point to end point.

Source: Field survey, Northern Province, IRoad program

Figure 5: Details of roads which runs through or adjacent to the Gazetted Forests and Wild life areas

C. Socio Economic Environment

1. Population and Population Density

98. NP is divided into five administrative Districts, 33 Divisional Secretary's Divisions (DS Divisions) and 912 Grama Niladhari Divisions (GN Divisions). The Province is sparsely populated in comparison with other parts of Sri Lanka. From the total population of all five District of NP, majority (83%) are living in rural areas. Jaffna and Mullaitivu Districts show the highest & lowest population density of the Province respectively, 629 persons per Km^2 and 38 persons per Km^2. Table IV.9 shows that, distribution of population by sector and population density. Most of the population in NP was badly affected due to the conflict in the past including physical and economic displacement. Out of these five districts, the entire population of Mullaitivu District were displaced, however the resettlement activities have almost completed by now.

Table 15: Distribution of population by district (2012)

District	Total population	Population by District		Population density (Persons/Km^2)
		Urban	Rural	
Jaffna	583900	117600	466300	629
Mannar	99600	24400	75200	53
Vavunia	172100	34800	137300	92
Mullaitivu	92200	-	92200	38
kilinochchi	113500	-	113500	94

Source: Department of Census and Statistics, 2015

99. **Population by Ethnicity.** According to the distribution of population with respect to the ethnicity in NP, more than 93 % belongs to the Sri Lankan Tamil. Two other ethnic groups, Moor and Sinhalese represent the second and third place in the NP, which is 3.1 % & 3.0 % respectively. Table IV.10 indicates the population of NP with respect to the ethnic group. Tamil is the principal language spoken by the population.

Table 16: Distribution of population by ethnicity (2012)

District	Sinhala		Sri Lankan Tamil		Indian Tamil		Moor		Burger		Malay		Other	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Jaffna	2284	0.4	577338	98.9	1807	0.3	2162	0.4	126	0.0	23	0.0	142	0.0
Mannar	2305	2.3	80103	80.4	692	0.7	16436	16.5	12	0.0	11	0.0	11	0.0
Vavuniya	17138	10.0	141144	82.0	1979	1.1	11748	6.8	58	0.0	8	0.0	40	0.0
Mullaitivu	8927	9.7	79107	85.8	2281	2.5	1821	2.0	49	0.1	11	0.0	42	0.0
Kilinochchi	1331	1.2	110491	97.3	846	0.9	629	0.6	1	0.0	2	0.0	23	0.0

Source: Department of Census and Statistics, 2015

2. Main Economic Activities

100. Majority of the Northern people belong to different livelihood categories such as farmers, fisherman and professionals in the civil and business sectors (Table IV.11). According to the Labor force survey,(DCS, 2012), a rapid expansion in income generation activities in the Province was recorded in 2012 where the GDP growth rate was highest in the Province at 25.9 % when compared to 2011 (3.7%). The GDP share in the Province is 4% to the national GDP.

Table 17: Percentage distribution of employment population by major industry group- 2014

District	Total		Agriculture		Industry		Service	
No	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Jaffna	201,662	100.0	51,955	25.8	48,194	23.9	101,513	50.3
Mannar	28,185	100.0	11,013	39.1	3,158	11.2	14,014	49.7
Vavuniya	61,64	100.0	20,856	33.8	15,063	24.4	25,725	41.7
Mullaitivu	27,561	100.0	12,305	44.6	6,129	22.2	9,127	33.1
Kilinochchi	33,816	100.0	13,133	38.8	7,594	22.5	13,089	38.7

Source: Labour force survey, Department of Census & Statistics, 2014

101. **Agriculture.** Based on the Labor force survey, DCS, 2014, majority of the people in all Districts of NP engage in agriculture compare to industrial sector. Table IV.11 presents details of employment distribution in NP. The area is predominantly agricultural having crops, livestock and fisheries as key sub sectors. The agricultural productivity in the area highly effective and it shows that paddy harvesting reached the level of 217,149 Mt in 2013 and the Province was able to supply its surplus to other parts of the country. The total of 56,277 ha highlands had been cultivated under annual crops, perennial crops and homesteads cultivation in 2013. Agriculture, including fisheries and animal husbandry which is the mainstay of the economy has shown positive growth after 2009. Therefore, the agricultural sector contributed 19.6% of GDP composition to the provincial economy in 2012. In addition to the paddy, perennial crops, vegetables and fruits are cultivated during the whole year using surface and underground water. Beans, Tomato, Brinjals, Cabbage, Beetroot, Bitter Gourd, Snake Gourd, Okra, Pumpkin, and subsidiary food crops such as Gingerly, Chili, Green gram, Onion, Groundnuts, Cowpea, Kurakkan are cultivated during Maha and Yala season. Out of these, Jaffna District has high potential for red onion cultivation. In general these subsidiary crops are cultivated in the paddy land after harvesting period.

102. Livestock industry is becoming an important field for entrepreneurs in the NP for the farming society. This industry generates additional income, employment opportunities and high nutritious food (milk, milk products and meat) for the poor people of this area. Several stakeholders including government sector, private sector and NGOs are involved to strengthen the sector through various projects and programs. Average milk production of the area reached 70,063 liters/day, milk collection reached 27,150 liters/day in and the egg production reached 85,760 nos/day. Further production of chicken reached 11,287 kg/day, beef reached 7,836 kg/ day and mutton reached 1,887 kg/day (DCS, 2015) . Agriculture – Livestock integrated farming system is very famous in the northern area from ancient time. During the field survey, many agricultural lands including paddy, coconut, Chena cultivation lands and home gardens with different crops were observed. Apart from that raring cattle, goat & chicken in their home gardens was also a common observation in the area.

103. **Industry.** Apart from agriculture, fishing industry plays a major role in the economy and provides many employment opportunities to the people living in the Districts (Table IV.12). The large extent of marine and coastline of the Province provide enormous opportunities for fisheries. In addition irrigation tanks, existing marine and lagoon-based fishery industry also provide benefits to the fishing community. Potential for aquaculture is great in these areas as well as Vavuniya and Kilinochchi, with a number of reservoirs available for inland fisheries. The main marine fishery areas of the Province include Jaffna, Mullaitivu and Mannar Districts. In addition Iranamadu and Giant's Tank are important freshwater fishing habitats in the Province.

The existing fisheries harbors of the Province are located in Jaffna, Mullaitivu and a gateway commercial port at Mannar.

Table 18: Statistics on fisheries in NP -2014

District	No of fishing families	Fresh fish production in coastal fisheries (Mt)	Dried fish production
Jaffana	20,356	31,767	1,556
Kilinochchi	3,817		726
Mannar	11,079	25,938	7,780
Mullaitive	4,210	7,845	2,271
Vavuniya	681	1,241	

Source: Statistical information, Northern Provincial Council, 2015

104. **Manufacturing Industries**. Several big scale industries including cement factory at Kankasanthurai, chemical industry at Parantan, Palmyra Distillery industry, Saltant Industry at Elephant Pass and large number of small industries (Tile, boats, fishing equipment, Ice plants etc.) were operated in the area before the conflict situation. However currently only few industries such as Palmyra Distillery industry and some small scale industries are operated in the different areas of the Province. Most of the industrial establishment in the Province is restricted to Jaffna and Mannar Districts where number of employees engage in the industrial establishment over 25 or more people is significantly low in the area. Table IV.13 presents the industrial establishments with 25 or more persons engaged in the Province.

Table 19: Principle indicators of industrial establishments: 2012 – {establishment with 25 or more persons engaged (manufacturing sector)}

District	No of industrial establishments	No. of employees
Jaffna & Mannar	14	782
Vavuniya & Mullaithive	4	131

Source: Household Income and Expenditure Survey 2012/13, Final Report, Department of Census and Statistics

3. Household Income

105. Based on the Household Income and Expenditure Survey 2012/13, it is clearly indicate that highest monthly mean and median household income of the Province (Rs. 43,965 and 30,967) represent by Vavuniya District. The lowest monthly mean and median household income of the Province Rs. 23,687 and 17,714 represent by Mullaitivu District (Table IV.14)

Table 20: Mean and median monthly household income by sector, Province and District – 2012 - 2013

District	Mean (RS)	Median (RS)
NP	34,286	23,571
Jaffna	34,788	23,446
Mannar	28,535	24,200
Vavuniya	43,965	30,967
Mullaitivu	23,687	17,714
Kilinochchi	30,643	20,614

Source: Household Income and Expenditure Survey 2012/13, Final Report, Department of Census and Statistics

4. Poverty Situation

106. Poverty head count index is the percentage of population below the poverty line in Sri Lanka. Based on the results of year 2012/2013, 5.3% household are poor in the country. The result also indicate that highest percentage 24.7% of poor household represent from Mullaitivu District in Sri Lanka 2012/2013 as shown in following table.

Table 21:: Percentage of Poverty Headcount Index (HIC) and poor household of Province and Districts

Province/District	Year 2012/2013	
	Poverty Headcount Index (%)	Percentage poor household (%)
NP	10.9	8.8
Jaffna	8.3	6.6
Mannar	20.1	15
Vavuniya	3.4	2.4
Mullaitivu	28.8	24.7
Kilinochchi	12.7	10.7

Source: Household Income and Expenditure Survey 2012/13, Final Report, Department of Census and Statistics

5. Education

107. The educational levels of the people in Jaffna, Mannar and Vavuniya Districts are comparatively high compare to other two Districts in NP. Most of the government and private schools and higher educational centers & institutes are located within Jaffna District of NP. The Government University of Jaffna and its departments are located in Vavuniya & Kilinochchi Districts respectively. The literacy rate of the Province is 97.8%. The education level of the people within the Province is shown in table IV.16.

Table 22: Distribution of population by educational attainments

District	Educational Attainments (%)							
	No schooling	Primary	Secondary	G.C.E (O.L)	G.C.E (A.L)	Degree and above	Literacy	Computer literacy
NP	1.9	26.5	44.5	15.3	9.2	2.5	97.8	19.5
Jaffna	1.5	24.5	43.8	16.6	10.5	3.2	98.2	22.8
Mannar	2.1	29.7	44.2	12.9	9.4	1.8	97.6	16.6
Vavuniya	3.0	26.1	43.0	16.3	9.2	2.4	97.1	18.9
Mullaitivu	2.4	31.5	48.1	11.7	5.2	1.2	97.3	8.4
Kilinochchi	2.2	31.4	47.6	12.3	5.6	1.0	97.7	13.7

Source: Census of Population and Housing of Sir Lanka – 2012

* General Certificate of Education (G.C.E), Ordinary Level (O/L) & Advanced level (A/L) examinations.

6. Existing Infrastructure Facilities

108. **Condition of Road Infrastructure.** Roads are the main transportation mode of all five Districts of the NP. The existing road network of the Province includes 8331km of national, provincial and rural roads. A total of 1271km, A and B class roads are managed by the RDA under the Ministry of Higher Education and Highway and 1960km provincial roads belong C and D class category are managed by the PRDD of NP. Majority of the roads under category of class E, 5600km (63%) are managed by the Local Authorities. In addition to the road network,

rail transport (both passengers and freight) is common and very popular mode of transportation from south to North and within North Province. New Northern railway line from Thandikulam up to Jaffna (Kankasanturi) and Medawachchiya up to Thalai Mannar has been reconstructed by the Department of Railway through funds under Government of India. This reconstruction program included construction of all stations and other related facilities including signaling and rail gates.

109. Prior to the conflict situation, the road network in the Province was maintained well due to access and proper functioning of RDA and PRDA. However during the conflict situation maintenance work of these roads had not been properly carried out therefore majority of the roads has become highly dilapidated. After conflict prevailed in the area, the GoSL recognized that development of road transportation network as the key factor to promote regional development of the Province with upgrading life standards of people and reduction of poverty. Under number of foreign funding as well as government projects considerable length of national and provincial roads has been rehabilitated from 2009 up to date. Construction work of some of these roads is still on going under both local and forging funded projects.

110. Although number of road development projects have been undertaken by the government, provincial council of NP and local authorities, the existing condition of the rural road network is not satisfactory level. During the field survey, it was observed that majority of the rural roads in the Province have not been rehabilitated and some roads or sections have been totally abandoned. Currently the condition of these roads for vehicular movement is unsuitable and according to public the said conditions of these roads is an inconvenience to the people.

111. **Energy Sources and Household**. The electricity facilities along the selected roads are apparently good compare to other infrastructure facilities such as telephone and pipe born water supply. The Ceylon Electricity Board has supplied electricity to most of the people around selected roads. Table IV.17 indicates that electricity is the main source of lightning where 46.12% of the household in the Province. From the total household in Jaffna and Vanuniya 72% and 69% use electricity from the national grid. Kerosene is the second main source of lightning 49.46 % of the household in the Province and accounts 72% and 78% household of Mullaitivu and Kilinochchi District respectively.

Table 23: Standard type of lighting source – 2012

District	Total household	Electricity from national grid	Electricity hydropower project	Kerosene	Solar power	Bio gas	Other
Jaffna	140,323 (100%)	101,541 (72.36%)	-	38,374 (27.34%)	333	6	69
Mannar	23,976 (100%)	13,967 (58.25%)		9,550 (39.83%)	443 (1.84%)	6	9
Vavuniya	41,908 (100%)	29,230 (69.74%)	-	12,079 (28.82%)	589 (1.40%)	1	9
Mullaitivu	24,986 (100%)	5,106 (20.43%)	-	18,117 (72.50%)	1,648 (6.59%)	2	23
Kilinochchi	28,369 (100%)	2,790 (9.83%)	-	22,371 (78.85%)	3,147 (11.09%)	5	66

Source: Census of Population and Housing of Sir Lanka – 2012

112. **Drinking Water**. As shown in the table IV.18 majority of the household in all five Districts (Jaffna 71%, Mannar 52%, Vavuniya 67%, Mullaitivu 66%, Kilinochchi 66%) use protected well water both within and outside the premises. From the total 16% of the household in Mannar District obtained tap water within unit and 17% of the household in Vavuniya District take water from tube wells. Rural water supply schemes & bowsers also provide some amount of water while very small % of households depends on natural water sources such as rivers, tanks and streams etc.

Table 24: Number of household in occupied housing units by main source of drinking water and District

Total households	**Jaffna**	**Mannar**	**Vavuniya**	**Mullaitivu**	**Kilinochchi**
	140,323	23,975	41,908	24,896	28,369
Protected well within premises	54,642 (39%)	5,700 (24%)	19,540 (47%)	8,153 (33%)	9,033 (32%)
Protected well within outside	44,554 (32%)	6,644 (28%)	8,517 (20%)	8,242 (33%)	9,652 (34%)
Un protected well	1,255 (1%)	661 (3%)	1,623 (4%)	6,462 (26%)	7,029 (25%)
*Tap within unit	2,407 (2%)	1,192 (5%)	880 (2%)	60 (0.2%)	32 (0.1%)
*Tap within premises but outside it	2,963 (2%)	3,834 (16%)	1,171 (3%)	100 (0.4%)	87 (0.3%)
*Tap outside premises	14,251 (10%)	1,302 (5%)	1,522 (4%)	141 (1%)	43 (0.2)
Rural water supply	-	-	275 (1%)	-	-
Tube wells	15,607 (11%)	1,666 (7%)	7,256 (17%)	1,088 (4%)	1,481 (5%)
Bowsers	3,142 (2%)	2,785 (12%)	134	210 (1%)	835 (3%)
River/tank/streams/spring	13	32	8	48	12
Rain water	3	2	38	-	1
Bottled water	53	42	912	4	3
Other	1,433 (1%)	115	32	388 (2%)	161 (1%)
Note* Refers for piped born water distributed through pipe lines by NWS&DB or the Local Government Institution					

Source: Census of Population and Housing of Sir Lanka – 2012

113. In Jaffna Peninsula, the water is mainly extracted from open dug wells. There are approximately 28,000 wells which use for both domestic and agricultural water requirements however water availability and its quality varies from place to place. In some areas of the district, the depth of deep wells varies from 20 to 25 feet (7.6 m). Therefore water for irrigation could be obtained throughout the year (i.e Valikamam division). The wells available in other areas are shallow and varies from 10 to 15 ft.

114. Further there are important aquifers located extensively in the NP due to the underline Miocene formations which extends large areas in the Jaffna Peninsula. During the rainy season the fresh water collects in these aquifers over the dense salt water and this water has been utilizing by farmers in Jaffna for centuries for cultivation without pumping excess water. According to GSMB records the availability of fresh water in a number of observation wells

especially in the Kondavil area has been up to 40 years .There is also fresh water in a spring at Keerimalai for cultivation and domestic use.

115. **Sanitary Facilities**. According to the table VI.18 majority of house hold in all five Districts (Jaffna 81%, Mannar 73%, Vavuniya 76%, Mullaitivu 63%, and Kilinochchi 62%) use private toilets. In addition considerable number of people in the Province use shared toilet facilities (Jaffna 12%, Mannar 15%, Vavuniya 12%, Mullaitivu 15%, and Kilinochchi 16%). However, 21% and 22% of Mullaitivu & Kilinochchi Districts households do not have any private or shared toilets facilities as shown in table IV.19.

Table 25: Household in occupied housing units by type of toilet facility and District

District	Total household	Type							
		Exclusive		Shared		Common		Not using a toilet	
		No.	%	No.	%	No.	%	No.	%
Jaffna	140,323	114,174	81	17,033	12	1,866	1	7,250	5
Mannar	23,976	17,471	73	3,657	15	342	1	2,505	10
Vavuniya	41,908	31,860	76	5,133	12	1,898	5	3,017	7
Mullaitivu	24,986	15,764	63	3,844	15	148	1	5,140	21
Kilinochchi	28,369	17,560	62	4,539	16	64	.2	6,206	22

Source: Census of Population and Housing of Sri Lanka – 2012

D. Religious, Cultural and Archeological significance

116. There are many areas in NP with exceptional archaeological values. These include ancient temples and sites mentioned in chronicles, sites of pre-historic significance and old churches and temples of high cultural value to the Northern people. Nallur Kovil is a very famous religious and cultural site located in Jaffna district. Nagadeepa is probably recognize as a landmark in Jaffna peninsula for Buddhist as they believe Lord Buddha visited this site during his second visit to the Sri Lanka. Kadurugoda Temple /Kandadorai Temple is another ancient Buddhist historical place situated close to Jaffna Town. It has 61 small dagabas scattered over about 1/2 acre land which believed to belong in the 1st and 2nd centuries.

117. The Madu church is one of the ancient churches in Asia and is located near Murukan. Kilinochchi is famous for consisting the remarkable historical renowned worship places such as Uruthi rapuram Sivan Kovil, Puliampokkanai Nagathambiran kovil, Mannithalai St. Anthony's church, Palaitivu St. Anthonys Church, Ponnaveli Sivan Temple and Dutch fort (Figure III.6).

118. Some of the locally important religious, cultural and archeological significance sites are located beside/at the vicinity of the proposed roads in all five Districts. Locations of these locally important sites are depicted in maps attached to each ECs which are prepared for each road considered under SAPE works. However, no any impacts will be expected due to upgrading of these roads through the project.

Figure III.6: Details of religious, Cultural and Archeological significance places of NP

E. Tourism

119. The value addition prospects of several religious significance sites located in NP to the local tourism is immense and attract so many local and international tourists annually. Few of these sites include famous Dutch church, Nagadeepa temple, Paralai Vinayagar temple, Vaddukkoddai church, Nallur & Chulipuram Paralai Pillaiyar kovil of Jaffna District, Thiruke theeswaram hindu temple and Madu church of Mannar District etc. Nallur festival in Jaffna itself is one of the major cultural festival which attracts so many local and international tourist to the country.

120. Apart from the religious sites, this area shows signs of unique culture blend with colonial influences of Portuguese, Dutch, and British period with the remains of huge churches, ancient Dutch and British residences sites etc. Jaffna fort and Hammen hiel fort are two such examples with intense Archaeological and structural revamp located in the NP.

121. Natural ecosystems like National parks such as Wilpattu, wetlands such as Adams Bridge, Palk bay, Vankalai and Giant tank, lagoons like Jaffna, Nanthikadal, Nayaru & Kokulai and sanctuaries like Vankali, Madu attract so many nature tourists to the Province. Apart from that beaches such as Casuarina Beach in the Jaffna peninsula and several islands situated in the Palk Strait towards India such as Kayts and Karaitivu are the other tourist attraction sites located in the Province. Further shallow and clean beaches such as Casuarina beach in Jaffna Peninsula and Charty beach in Allaippiddy, Jaffna believed to be best beaches in the country which attract tourist especially for safe sea bathing.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

122. The proposed work under the project will include rehabilitation and upgrading of existing roads/sections with improvement of pavements, road surface, construction of side drains & embankments, widening or replacement of culverts, cause ways bridges etc. In addition during the construction period, construction related activities will involve removal and re-establishment of public utilities, removal of road side trees, extraction of construction materials and transportation, disposal of waste and other unsuitable materials, establishment of construction material processing plants, labour camps etc. These activities may cause negative impacts to the surrounding environment of the project area during the construction stage.

123. The anticipated environment impacts during the preconstruction, construction and operation periods of the project and feasible mitigation measures to the impacts identified during the Environment Assessment process are described in this chapter. Since the propose project involve in rehabilitation of all types of roads including national, urban, semi urban and rural roads, the given impacts and proposed mitigation measures are common for construction activities of all types of above roads.

A. Pre-Construction Stage

1. Shifting of Public Utilities

124. Public utilities closer to the CW of proposed roads/sections include electric posts, power supply lines, pipe born water supply facilities, telephone post and transmission lines. Electricity is available in many subproject roads while telecommunication and pipe borne water supply facilities are also available in some road sections. The utility facilities located within proposed road sections are given in each EC. Depending on the requirement some of these utility lines will need to be shifted. Such shifting operations will affect the communities as there will be disruptions to the supply (especially electricity and water). Even if this is a temporary impact it could be significant since disruptions will affect day to day activities of people.

125. Prior to proposed improvement work proper coordination and consent will be taken from service providers if utility lines are to be shifted. Advance notice to the public about the time and the duration of utility disruption will reduce public inconvenience and provide time to adjust the situation and obtain alternative facility. Use of experience and well-trained machinery operates will reduce accidental damage and ensure reestablishment of utilities with minimum time period.

2. Requirement of Lands for the Project

126. The existing ROW of the majority of the proposed roads/sections is adequate for the proposed construction activities. Therefore acquisition of lands will not be carried out for this project. However if lands are required for activities such as realignment of bends or construction of cross drainages in some road sections, that has to be undertaken by negotiation with property owners and involvement of a third party. Although people in the project area are willing to give their lands for such special cases, specified process for land donation in Resettlement Framework of iRoad program should be followed for taking lands. Further the necessary actions to secure lead-away canals beside the road will be done by Local Authority with the assistant of contractor and RDA /PRDA.

127. Further some construction related activities such as stockpiling, disposal sites, material processing plants, labour camps, vehicle parking yards etc., will require temporary lands within the project affected areas of the Province. Selection of lands for such purposes has to be carried out in a way that reduce the social and environmental impacts. Further an agreement will be signed with the Local Authority and land owners. Conflict between workforce and villagers, removal of green cover vegetation from private lands, impact to the natural ecology, inconvenience due to dust, noise and vibration, disposal of solid waste, contamination of water and soil etc. are the expected social and environmental issues due to use of temporary lands.

128. Best construction management practices would be in place to ensure the protection of environment and public around temporary use lands for the construction related activities. Removal of soil, vegetative cover should be kept at minimum and should only be carried out if there is absolute necessity. To avoid contamination of soil, oil contaminant into water bodies, a system for the proper collection and disposal of lubricants at sites should be maintained. In the absence of a sewage system, septic tanks or pit latrines should be located away from ground water sources.

3. Construction in Flood Prone Areas and Areas inundated by high tide

129. Some of the proposed roads/sections in all five Districts are located within flood prone areas and areas prone to flooding due to high tides. No proper earth or line drains beside the roads causes water to flow over the road surface and stagnate beside the roads. During the Northeast monsoon (December-February) period those areas get inundated and the situation is vital to the development activities in the area. Some of the road sections close to shore line gets affected from high tide waves damaging the road surface.

130. Design of culverts, causeways and bridges based on the existing hydrological values in the exact locations of the roads, erection of embankment and design of new cross drainages to the flood prone areas in consultation with Department of Irrigation are essential.

131. Hydrological structures and the design for the road will be carried out during detailed design phase based on the findings of the SAPE work reports including Environmental Checklists, Transect walk reports etc. since comprehensive assessments such as hydrological studies are not available for this project. Therefore the design engineer is supposed to go through the above documents and he should incorporate relevant findings if found feasible. For this purpose, design engineer will conduct field verification together with a relevant team of experts from PIU, PIC and the contractor which is essentially supported by information extracted from the public. Therefore the output will be highly location specific which should match to solve the issue observed in the particular location. The “Context Sensitive Design” or CSD approach will be extensively used to determine and design these structures. Based on the frequency of inundation and duration of inundation such road sections will be completed as concrete sections for better lifespan of the rehabilitated road section.

B. Construction Stage

1. Extraction Transportation and Storage of Construction Materials

132. Construction materials for the project are available within two Districts of the NP, Vauniya and Mannar. Metal for the proposed construction are available Medawachchya area within Anuradhapura District of North Central Province. Extraction of material for the construction works will have a permanent- irreversible impact to the natural resources.

Modification of natural drainages, increase soil erosion, siltation, destabilization of slops, habitat loss, loss of potential productivity of lands etc., are the negative impacts related to extraction. In general extraction, transportation, loading, unloading and storage of construction materials on a large scale, will cause negative impacts to the environment due to dust, noise and vibration, water and soil pollution, reduction of scenic beauty, impact to the human health and impact on the natural ecosystem. Stagnation of water in material extraction sites (borrow pits and quarries) create breeding sites for mosquitoes and cause accidental damage to the people and wild animals. Soil erosion, lowering of river beds, damage to the river banks, reduction of sand replenishment of coastal beaches, coastal erosion and salt water intrusion during dry season are the main consequences due to sand mining.

133. The impact could be mitigated by extraction of construction materials from approved quarries and mines by GS&MB, use of existing sites for the material extraction, avoiding wastage of construction materials at sites, identification of alternative sources, selection of new material extraction sites away from public and environment sensitive locations with the approval of GS&MB, following of rules, regulations and requirements issued by CEA, GS&MB and LAs, transportation of construction materials with proper covering, loading of the construction materials according to carrying capacity of the trucks, rehabilitation of the material extraction sites at the end of the use, stock piling of materials away from environment and public sensitive locations, covering of sand, rubble, mettle bitumen and cement to ensure protection from dust and other emissions.

2. Effect on Water Resources

134. Coastal habitats, seasonal tanks, streams, irrigation canals, and community water supply facilities are located adjacent/across the proposed project roads. Therefore, excessive use of water for construction activities may impact on aquatic ecology and water resources especially during the dry season. Construction of cross drainages may temporarily block or divert streams, disturbance to the natural drainage pattern and create flooding and will affect the water sources use by the local community. Surface water runoff and ground water close to construction sites can be polluted with various materials such as cement, bitumen and chemicals etc.

135. In such situation the method statement with mitigation action for anticipated impacts should be submitted by the contractor and approval should be obtained prior to construction activities. Since water related issues are significant during the construction activities of roads, priority should be given for the community requirements. Construction work affecting surrounding water bodies by erosion, silting and sedimentation should be prevented using silt traps, sedimentation basins and work should be scheduled during the dry season. Necessary steps should be taken to avoid entering waste water directly in to water bodies. Contractor will organize awareness program for employees regarding water conservation, pollution and minimization of water usage.

136. Excavation of beds of any streams, irrigation systems and other water resources should be avoided by the Contractor. If temporary flooding or stagnation of water is caused due to negligence of Contractor, the Contractor should take total responsibility and rectify all the damages with his own cost.

137. Contractor shall not divert, close or block existing canals and streams in a manner that adversely affect downstream intakes without approval from the Engineer and relevant

government agencies or Farmer Organizations (FO). Contractor shall restore the water sources to its original status once such diversion or closer or blockage occur during the site.

138. Temporary storage of material should be done in approved sites by the Engineer where natural drainage is not disturbed. All toxic and hazardous materials required for construction should be as much as possible sited away from water bodies with the instruction of engineer and should prevent their entering into such places. Water that contaminate with fuel, oil and grease shall not be directly released to storm water or natural water drainage system. Cement, bitumen, grease, lubricant and chemicals should be stored on an impervious surface above the ground level and should be handled without contamination of soil and water.

139. Vehicles and equipment used for the construction activities should be maintained in good condition, ensuring no undue leakage of fuel and lubricants is released to water sources. Servicing and repairing of vehicles, machineries and equipment should be carried out only in designated locations and service stations with the approval of Engineer. Equipment and vehicles should not be allowed to wash with drinking water wells or streams. Waste oil, petroleum products and untreated wastewater shall not be discharge to the ground without proper treatment.

3. Safety of Workers and General Public

140. Construction activities may lead to accidental damage to the general public and work force. Construction of earth drains, culverts, causeways, bridges, and removal of road side structures, trees etc., as well as use of heavy equipment, machineries, extraction and transportation of construction materials will increase the accidental risk.

141. Contractor shall comply with requirements for safety of the workers as per the International Labour Organization (ILO) convention No. 62, Safety and Health regulations of the Factory Ordinance of Sri Lanka to the extent that are applicable to his contract. Contractor should organize awareness programs about personal safety of workers with proper briefing and training on safety precautions.

142. Use of well experienced, licensed and trained operators for plants, machineries and heavy vehicles, use of flagmen and supervisors for construction sites and other necessary locations, provision of Personal Protective Equipment (PPE) protective footwear, helmets, goggles, eye-shields and jackets specially high visibility jackets for night time work with necessary lighting arrangements, if construction activities are taking place at night. Contractor should also provide necessary equipment; safe scaffoldings, ladders, working platforms etc., for the construction sites to make convenient to the workforce.

143. Excavated areas for construction should be barricaded using barricading tapes. Installation of sign boards and placement lights where necessary are recommended to avoid accident. Quarry operations, roadway excavations and blasting should be carried out and supervised by trained personnel. Explosives for the project activities should be stored in a secure location in a protected way.

144. Arranging regular safety inspection of construction sites and other related locations, prohibition of alcoholic drinks and other substances which may impair judgment of workers engaged checks for vehicles and equipment, allocation of responsibility to relevant personnel, arrangement of proper first aid facilities with trained paramedical personnel and transport

facilities for injured people to the nearest hospital, provision of fire extinguishers and appropriate positions for required locations for both safety of work force and properties, installation of warning signals in both local languages and in English to the construction sites and other particular locations are the important actions that need to practice during the construction stage.

4. Effect from Improvised Explosive Device (IED) and Unexploded Ordnance (UOX)

145. Surrounding environment of the all candidate roads/sections located within NP has been significantly affected during the period of civil war in the country. Still there is no proper protection for surrounding environment of several project roads due to incomplete or inadequate removal of UXO from the suspected areas. The main issue with UXO is that over the years the detonator and main charge of the UXOs will deteriorate, making them more sensitive to disturbances, and more dangerous to handle. It has been reported from the NP that people interfering with UXO have often faced with fatal accidents. For this reason it is universally recommended that UXO should not be touched or handled by unqualified persons. Therefore, if the workforce found a doubtful item, that may be UXO, following actions should be taken to avoid any accidents.

146. At the initial stage of the project, the contractor should organize awareness programs about IED & UXO with the help of local police or bomb disposal or Explosive Ordnance Disposal (EOD) professionals with proper briefing and training on safety precautions. Information on land areas cleared of IEDs and UXOs and areas that have not been cleared shall be obtained through respective Divisional Secretaries and military establishments before commencement of civil works.

147. If any suspected IED or UXO item is found within the site or outside the project area (construction area, road side environment, mettle quarry, temporary use labour camps, burrow pits, disposal site etc.) it shouldn't be touched, disturbed or tampered with any other items. The contractor should inform it to the Police immediately through the Engineer or directly. Once informed, the police will arrange suitable measures to dispose those items through military experts. In the meantime, removal of workforce from the location immediately, marking the location with barricading tapes to identified location easily with a way to the suspicions item (if possible) and preventing entry of any person to the suspected area will reduce the risks. Further project activities should be carried out according to the instruction given by military experts at the particular locations.

5. Disruption of Traffic

148. The proposed construction activities such as improvement of the road surface and pavements, reconstruction of culverts, bridges and causeways etc. may cause accidental risk and disturbance to the current traffic flow in the project affected areas of the Province.

149. Transportation of construction materials from outside, phase construction, temporally diversion, loading and unloading of construction materials etc., will increase traffic congestion especially around urban centers, public sensitive locations and construction sites of culverts bridges and causeways. This will negatively impact to the road users and cause delays in travel time, increase noise and exhaust emissions too.

150. Advance notice to the public regarding the schedule of construction, providing of safe and convenient passage to vehicles and passengers away from construction sites, implementation of traffic management plan close coordination with local police, use of flagmen and/or temporary traffic signs for construction sites are important measures that have to be undertaken during construction period to minimize the impact on traffic.

6. Impact from Dust, Noise and Vibration

151. Generation of dust, noise and vibration from construction activities, material extraction and processing plants etc., will negatively impact to the surrounding communities and their properties by means of creating respiratory problems, nuisance and structural damages to properties respectively. In general emission of dust, Volatile Organic Compound (VOC) and gases, particulate matter, smokes/fumes are most immediate pollution effect experienced from the construction machineries, vehicles and equipment, blasting sites material extraction and processing plants. The impact of dust noise, vibration and emissions will be mitigated by following measures.

152. Construction activities shall be scheduled closer to public sensitive locations (Schools, hospitals, religious places, urban centers and residential areas) should schedule in close coordination with relevant authorities to avoid continuous disturbances. Contractor should limit working time that create noise from 6.00 am to 6.00 pm.

153. Machinery, equipment, vehicles and material processing plants should be maintained in a good condition with regularly maintenance. Crushers, hot mix and batching plants should be established away from residential and environment sensitive areas with the approval of Engineer, CEA and LAs. Dust extraction units, exhaust silencers and noise reduction devices should be fitted to the material processing plants, construction vehicles and other machineries and equipment to reduce noise, vibration and dust emissions. Such devices shall be properly serviced and maintained.

154. Emission of dust due to transportation of construction materials and other construction operations can be controlled by enforcing speed limits to the vehicles, providing of dust barriers to the public sensitive locations, sprinkling of water along the transportation roads, construction sites and material processing yards at regular intervals. Tarpaulin covering is mandatory on trucks/lorries which are used for the transporting of construction materials.

155. Along the rural roads, possibility of living differently abled persons, children who need special attention is high therefore due consideration should be paid if any of such location is found.

7. Ecological and Biological Impacts

156. Selected roads for the improvement runs through urban, semi urban, rural residential & agricultural, coastal and forested areas of the Province. Majority of the roads identified for the improvement runs mainly through rural residential and agricultural areas. Therefore common home garden species as well as wild species including terrestrial and aquatic flora and fauna are distributed in project affected area. Most of the forests located beside the roads include secondary or scrub vegetation. Some identified roads run close or through the several protected forest and is given in Chapter IV.

157. Endangered mammals like elephants which have large area of home range crosses several project roads. Construction activities will potentially cause indirect impact to the movement of animal and their behavior. Further several endemic species like purple face leaf monkey (Trachypithecus vetulus), the toque macaque (Macaca sinica) were recorded during the field survey. However since they are highly mobile species, impact on them during the construction stage is very low. Further trees over 60 cm Girth at Breast Height (GBH) will need to be removed from the existing RoW of several proposed roads (refer EC's). Four species of invasive plants were commonly observed in many road reservations and terrestrial habitats {Lantana camara (Gandapana), Prosopis juliflora (Kalapuandara), Kata Kalu Bovitiya (Clidemia hirta) and Parthenium hysterophorus (Pathinium)}. All these species are already threatening to the bio diversity due to out competing for food and habitats, loss of endemic and native species and damage to the crop and animals too.

158. Activities during construction stage will cause potential impact to breeding, foraging, and migrating behavior of different species of fauna and flora. However most of the impact related to the project activities are temporally and can be mitigated using following actions.

159. Awareness programs should be organized for the workforce about Importance of flora, fauna and their habitats. Contractor should take necessary action to prevent his workforce from disturbing flora, fauna including hunting of animals, poaching, gathering fire wood from the surrounding habitats and fishing in water bodies. Removal of trees should be avoided as much as possible during the construction. Strict supervision should be carried out by the Contractor especially during the construction around environment sensitive locations. Contractor is responsible to modify the design based on the location with the approval of the engineer in order to conserve existing faunal and floral habitats.

160. Construction activities around forested areas, elephant habitats or around their migration paths should be carried out under the instruction of DOFC and DWLC. Prior to all the construction activities PIU will obtain approval from DWLC and DOF for the rehabilitation activities.

161. Construction activities should be limited to daytime around above locations and should be completed within short period of time. Material extraction sites, processing plants and waste disposal sites should not be located around above locations too.

162. Construction of new culverts or rehabilitation of existing culverts will disturb the water level of streams which impact movements of fish along the stream.

8. Establishment of Labour Camps and Sanitation Facilities

163. Improper management of the labour camps may create an unhealthy environment causing health hazards to both workers and nearby residents. Stagnation of water around labor camps can create mosquito breeding sites and vector for communicable diseases. Migration of laborers from outside areas for the construction activities also create conflict situations among the workers and settlers near worker camps.

164. It is essential to establish labour camps away from water bodies, highly residential and environment sensitive areas. Majority of skilled and unskilled workers should be selected from the project influence area to avoid generation of waste and sanitation problems from labour camps. Provision of proper sanitary facilities including drinking water, urinals, toilets bathing facilities and mosquito nets will minimize spreading of communicable diseases and other health

issues. Provision of proper drainage facilities to the labour camps will minimize stagnation of water and prevent breeding of mosquitoes and flies.

165. Frequent toolbox meetings on safety and worker awareness programs on community and cultural aspects should also be carried out as means of reducing any conflicts among migrant labour and communities.

9. Disposal of Construction and Other Wastes

166. Solid waste associated with construction and other related works may impose several negative environmental and social impacts. Significant amount of construction wastes and garbage will also impact on ecology, public health and scenic beauty in the area. Labour camps, garbage disposal sites and material storage yards provide favorable habitats for vectors and decaying wastes attract pests. Contamination of water bodies with wastewater, construction debris and spoil will create significant impact on aquatic lives. Disposal of wastewater from plants specially from batching plants should be identified by the contractor with the instruction of engineer

167. Selection of unproductive lands with adequate capacity for disposal sites away from public and environment sensitive locations is necessary. Disposal sites should be selected with the approval of the PIC which should be followed by the approval of Local Authority and mitigation measures required for the relevant location of disposal sites should be implemented by the contractor as directed by PIC, PIU of LA. Excavated materials from the construction shall be used to backfilling with the approval of Engineer. Debris and residual spoil should not be sited to the agricultural lands, irrigation canals, water bodies, wetlands or to the marshy areas. Management of the waste generated from construction sites, offices and labour camps by the Contractor without contamination of surrounding environment is essential. Provision of garbage bins to labour camps, construction sites and dumping of waste regularly in a hygienic manner should be practiced.

10 Floods and Inundation

168. Northern area of the country has experienced floods and inundation issues many time due to its geographic setup and climate. During the Northeast monsoon (December-February) period this area prone to flood and the situation is vital to the development activities in the area. During the field Environment Assessment of the project identified that, some of the proposed road sections are prone to flood / inundation during rainy season.

169. Lack or insufficient & dilapidated drainage facilities, position of roads in low elevation, obstruction of the drainage and natural water ways, over flowing streams and spilling of tanks, are the main reasons for flooding and inundation of these roads. Impact associate with flood and inundation should avoid or minimize during the construction stage by following measures.

170. All the construction activities should be planned to avoid flood and inundation. Field observations which are verified with public consultation and other field surveys carried out under the project will be used to determine the structures and designs.

171. Construction activities should be minimized during the rainy season and drains should be kept clean all the time without any obstruction. Reconstruction of damage culverts, causeways and bridges based on the existing hydrological values in the exact locations of the roads, construction of new cross drainages, storage of construction materials away from

experienced flood and inundation areas are the proposed mitigation actions for the foreseen impacts.

11. Soil Erosion, Sedimentation and Siltation

172. Roads located within the NP receives significant amount of water during North East Monsoon period. Some of the selected roads in Mannar, Mullaitivu & Jaffna Districts are located within the coastal area while several stream and spillway of tanks are also located across proposed project roads. Therefore, soil erosion, sedimentation and siltation due to seasonal rains, construction and other related activities can cause negative impacts to the environment.

173. Soil erosion, sedimentation and water pollution should be minimized by the Contractor as soon as possible. Top soil generated from construction sites should be stored properly for the reuse without runoff to the water bodies, treatment of clearing and filling areas against flow acceleration, avoid works that lead to heavy erosion during rainy seasons, use of silt traps and erosion control measures close to water bodies, provision of drainage facilities to the required location properly to drain water will be required to prevent from soil erosion, sedimentation and siltation impacts.

12. Damages to Archeological, Cultural and Religious Places

174. Some of the proposed roads/sections runs at the vicinity of archeological and culturally important sites (details of such locations are provided in the environment checklists prepared for each road section). In addition large number of rods/sections runs close to the locally important religious and cultural locations. Proposed project activities will not cause any significant impact to the above site and most of the impacts are temporally and restricted only to the construction period. However during the construction stage above sites should be protected with feasible mitigation actions without any physical damage

175. If there are any valuable items (fossils, coins, articles of value antique, structures etc.) or archeological, cultural and religious structures discovered during the construction, Contractor should inform to the Department of Archeology (DOA) through the Engineer and work should be carried out according to the instruction of DOA at the particular location. Construction activities around religious, archeological, and culturally significant locations should be carried out with the consultation of religious leaders or relevant officials to minimize disturbance especially during the festival season.

C. Operation Stage (including road maintenance period)

1. Safety of the Road Users

176. Improvement of road surface, widening and slightly adjustments of bends will increase the speed of vehicles and incidents of the accidents. Enforcement of speed limits, traffic rules and regulations, installation of warning signs, pedestrian crossings, centerline marking of National roads, sign boards for animal crossings, guard railings for essential locations are need to avoid road accidents. On the other hand convenient passages of these roads with safety measures will reduce number of accidents and risk to the pedestrians and drivers.

2. Air Quality and Noise

177. Improvement of the road reduce traffic congestions specially in urban centers, allow smooth traffic flows and reduce travel time with minimum accelerations and decelerations. The project is therefore expected to have a positive effect on overall air quality compare to current situation. Noise generation during operation period can be managed by enforcing proper traffic rules and installation of sign boards to the particular locations. Maintenance activities will also potentially result in the release of air and dust, both directly and through obstructing traffic. Therefore maintenance work should be schedule during off peak hours or during night time to avoid negative impacts.

3. Drainage Congestion

178. During the construction stage road side drainages and cross drainages (Culverts & bridge) will be improved for the smooth water flow during the rainy season. Throughout the operation stage stagnation or blocking of water flow may occur due to sediments, disposal of rubbish due to maintenance activities or ignorance of public by disposing spoil and garbage. These activities will obstruct road side drainage, culverts, bridges and manholes. Blockage structures provide suitable breeding habitats for mosquitoes, rats and mice and also situation will critically impact to the public around the roads. Therefore, routine maintenance will be needed to avoid drainage congestions and impact to the human health.

4. Encroachment of Right Of Way

179. Encroachment can be taken place any time after completion of construction works and this practice is common around public and environment sensitive locations. This will cause impact to the pavements, road side drains, pedestrians and rooting maintenance of roads. Regular checking and removal of unauthorized structures from ROW by the Client as well as enforcement of rules and regulations is essential to avoid encroachment of road reservations.

D. Positive Impacts of the Project

1. Socio - Economic Benefits

180. Road transport provide conclusive socio-economic benefits to the whole society by providing access to the territory and allowing poverty alleviation and better living standards through employment and other type of economic activities. Socio-economic benefits will be expected to the public of NP through the iRoad Program is as follows.

- Improvement of roads within NP is significant part of overall economic and human development. Active transport facilities reduces poverty by improving economic efficiency, as it decreases costs of production, prices of goods and enhances trade and employment opportunities.
- Poverty is very often far worse in rural areas than in urban centers of the province, as a result of lack of integration with urban centers due to lack of adequate accessibility and mobility. Proper access will be affectively linked poor regions to rapidly growing domestic markets. This will create opportunities for the poor people to contribution of poverty alleviation
- Income level of the population living in rural areas of the province will be improved as a result of the project. Improved access for farmers and fishermen to higher price urban markets and support production of higher value crops,

improvement of farming practices and new employment opportunities will be expected to increase income level of the people through the project.

- Effective transport systems to the rural agricultural areas reduce regional disparity, enable people access to the socioeconomic centers, such as new market, healthcare, education and other social services. This will be ultimately contribute to achieving equity in a country.
- In the long term, new access to the education will improve level of education in rural society. Improvement of associated life values of the people with education level will become more competitive in the labor markets in finding their talents outside the community and province.
- Road network improvement in urban and rural areas of NP will provide transport of rural people and goods with improved travel time and route selections. No need to spend a large amount of time and effort on transport activities to fulfill their basic needs. Low cost transport facilities, reduction of transport cost and travel time is the main benefits received by the rural communities through the project.
- Development of road transport provide significant effect on movement of food surplus, reduction of food prices, improvement of farming practices, helping the transition from subsistence farming to cash crops and market economy. In addition road network improvement will increase economic growth with the improvement of number of industries tourism, fishing, agriculture, distillery, boat & fishing equipment, mineral extraction etc.

2. Climate Change Impacts and Risks

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

182. Improving the surfaces (pavements) of existing roads in Northern 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 (CO2) from motorized vehicles which is a GHG needs to be analysed to evaluate the overall contribution of this investment program in terms of the change in CO2 emissions.

183. The EKB has developed a set of spreadsheet-based models to evaluate the CO2 impacts of rural roads, urban roads, bikeway projects, expressways, light rail and Metro Rail Transit (MRT) projects, Bus Rapid Transit (BRT) projects, and railways. These Transport Emissions Evaluation Models for projects (TEEMPs) consider passenger and freight travel activity, the shares of trips by different modes and vehicle types (structure), fuel CO2 efficiency (intensity), and fuel type, validated by more detailed emission factor models. The models

directly estimate CO2 emissions for a business-as-usual case (a no-action alternative) vs. one or more alternative modal investment interventions (including improvement to road pavement) and calculate scenario differences. The models consider induced traffic demand generated by changes in the generalized time and money cost of travel by different modes, building on best practice analysis techniques.

184. 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 Northern Province. A summary of these input parameters are presented below.

Table 26: Input parameters for TEEMP model for roads in NP

Parameter	Input value
Occupancy/loading	
Two wheeler	1.5
Three wheeler	2.0
Passenger car	3.0
Light Commercial Vehicle	2.0 Ton
Bus	25.0
Heavy Commercial Vehicle	7.0 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

185. **Model predicted CO_2 emission levels.** Three case scenarios were analysed using the model based on the traffic analysis in NP 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 27:. CO2 emission at PAU, Project & induced traffic and Project without induced traffic

	Emission of CO_2 in Ton/km/year (net change in emission)		
	Rural	**Urban**	**Provincial**
BAU	10.0	42.0	46.6
Project with induced traffic	8.6 (1.4)	31.5 (10.5)	34.2 (12.4)
Project without induced traffic	8.6 (1.4)	31.2 (10.8)	33.8 (12.8)

186. 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 NP is around 1,300 km based on the minimum (1.4 T/km/year) and maximum (12.8 T/km/year) net change in CO_2 emissions or CO_2 savings of the proposed investment program in NP will be between 1,820 and 16,640 Tons/year.

187. **Mitigation measures for floods and road sections affected by high tide.** 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. Based on the Preliminary Survey and Engineering works an approximate amount of LKR 850 million has been allocated in the Bills of Quantities (BOQs) to construct new structures and rehabilitate existing structures in selected roads. This allocation is about 2.3% of the total construction cost estimated for NP. 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 selected roads in NP.

VI. INSTITUTIONAL REQUIREMENTS, ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

A. Institutional Arrangement

188. The Ministry of Higher Education & Highways (MOHE&H) is the Executing Agency (EA) and RDA is the Implementing Agency and within RDA there will be a PIU. The 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 EARF is a responsibility of Project Implementation Consultants (PIC). Each province under iRoad 2 will have a PIU under the RDA. PICs set up for each province will supervise the contractor in construction works including managing the environment.

189. The PIU will be headed by a full time Project Director (PD) and supported by a team of engineers from RDA. The PIU will have an Environment and Social Unit with a Safeguards Team including a Senior Social Safeguards Officer and Senior Environment Safeguards Officer and Social/ Environment Officers assistants (one officer for each district) to cover the quantum and geographic distribution of works under the investment program. The PIC will support the PIU for supervision of the design and construction works by the civil works of Contractor. The PIC team will include a team of Environment Safeguards Consultant, Social Gender Resettlement Specialist and Assistants (stationed at each district) for conduction of regular monitoring of safeguards implementation on site. From Contractor's side, there will be an Environment Officer and a Safety Officer. As per the preliminary arrangements there will be two to four contract packages for each district. Other than these key environment and social staff the Project Engineers, Site Engineers and Technical Officers will also be trained on environment and social safeguards compliance requirements. Possible themes for training and awareness are listed below;

- The application of Context Sensitive Design (CSD) in rural road development;
- Effective consultation and handling of public grievances;
- Land donation process;
- Developing of environment management plans based on a site or cluster specific requirement;
- Preparation of environment monitoring checklists;
- Monitoring and reporting of environment safeguards compliance.

B. Environmental Management Plan

190. A general Environment Management Plan (EMP) for both rural and national roads was prepared as part of this IEE report (appendix VI.1[6]) taking in to account the impacts and mitigation measures discussed in chapter on "Impacts and mitigation measures". Once the contracts are finalized the contractors will prepare Site Specific Environmental Management Action Plans (SSEMAP) for each package with road specific details. The SSEMAPs will include both rural and national roads. The SSEMAPs will be based on the impacts and mitigation measures discussed in the general EMP. SSEMAPs should include road specific impacts, mitigation measures supported by site plans as indicated in the EARF.

191. All costs for implementing the mitigation measures will be included in the Bill of Quantities (BOQ) by the Contractor as implementation of the SSEMAP will be the responsibility

[6] This EMP although titled as "Standard EMP for rural roads" it applies for both rural and national roads.

of the Contractor. Contractors who carry out civil works component will have a construction period of two years and routine maintenance for three and five years for rural and national roads respectively. The EMP has been modified accordingly paying more attention on the environmental impacts and mitigation measures during the operational stage together with reconstruction stage.

192. Monitoring of EMP implementation will be carried out during the preconstruction, construction, and operation and maintenance stages of the project (for both rural and national roads). Based on the EMP, Environmental Monitoring Checklists (EMC) will be prepared for each road by the contractor under the supervision of PIC for each of these stages (Please refer to appendix VI.2 for standard EMC for rural roads and appendix VI.3 for sample EMC for National road). The EMC monitors the degree of compliance of the mitigation measures proposed in the EMP in all three stages. Every road must have at least one EMC completed during pre-construction, one to three during construction depending on the length of the road and one per year during operation and maintenance. Based on these records and site visits monitoring reports will be prepared during the construction and operation stage on an annual basis per Province and submitted to ADB for disclosure on the ADB website. Furthermore the Contractor will also be responsible for updating SSEMAP if there are any significant changes in the project site conditions or engineering design.

193. Implementation of the mitigation action during the construction stage is a main and total responsibility of the Contractor. As the project proponent RDA holds the responsibility to carry out the mitigation measures during construction and operation stage through the contractors under the supervision of PIC. The Environment and Social Unit under the PIU will monitor the implementation of mitigation measures with assistance from PIC, while ESDD of the RDA will periodically monitor the implementation of EMP. The TA team of ADB and safeguard mission will be operated in the field during the project.

194. Apart from the EMP common EMoP has been prepared and attached as appendix VI.4. This EMoP is developed based on a contract package basis. Therefore it needs to be considered in each contract package as a separate item. A monthly provisional cost item will be allocated for the execution of the environment management plan. Based on the preliminary cost estimates for NP it is expected that a provision of around SLR 40 – 80 million will be allocated for the execution of the environment management plans of all contracts of NP.

C. Grievance Redress Mechanism

195. The Grievance Redress Mechanism (GRM) is necessary to support general public to resolve their problems due to project activities through mutual understanding and consensus reaching process with relevant parties. The EARF outlines the system of GRM and Grievance Redress Committee (GRC). This provides guidance to establish GRM to address the affected peoples' concerns, complaints, and grievances about the project's environmental performance.

196. The proposed GRM for this project can be of three levels. The very first level is set up at grass root level where representatives from contractor, PIC and PIU will directly receive the complaint and try to resolve any issue at first.

197. Grievances which are simple but cannot be addressed at the grass roots level will be addressed at the Grama Niladhari (GN) level which is level 2. More complex grievances which cannot be addressed at the GN level will be addressed at the Divisional Secretariat (DS) level which is level 3.

198. At the GN level the GRC members will be

Grama Niladhari of the area	Chairman
Representative of PIU	Secretary
Representative of Supervision Consultant	Member
Representative of Contractor	Member
A community member/religious leader	Member

199. The next level will be at Divisional Secretariat level involving following members.

Divisional Secretary of the area	Chairman
Representative of PIU	Secretary
Grama Niladhari	Member
Representative of Supervision Consultant	Member
Representative of Contractor	Member
Representative of a social organization (NGO/CBO) of the area	Member
A community member/religious leader	Member

200. Level 2 GRC meetings will be held at the GN office (Level one) and DS office (Level three) to which people who have lodged complaints will be invited. The people will be informed about the GRC, seven (7) days prior to its meeting.

201. Secretary of GRC is requested to coordinate with all relevant parties to get necessary information. In addition to that the secretary should keep records of all complaints and reports. All complaints should be in written form.

202. If the issue is resolved at GN level GRC, the decision should be informed by the secretary to the Site Manager without any delay (in written form). If the issue cannot be resolved at this level then it should be brought in to the notice of DS Level GRC without any delay.

203. Committee meetings will be conveyed by the Secretary, the PIU representative. The chairman of GRC is expected to take appropriate actions with the consultation of other committee members within three weeks' time and to be informed immediately to affected people.

204. The issues that could not be resolved by level two GRC will be forwarded to DS level GRC within seven days (working days) of the final decision of GN level GRC.

205. The flow chart of the GRM is presented in figure VI.1.

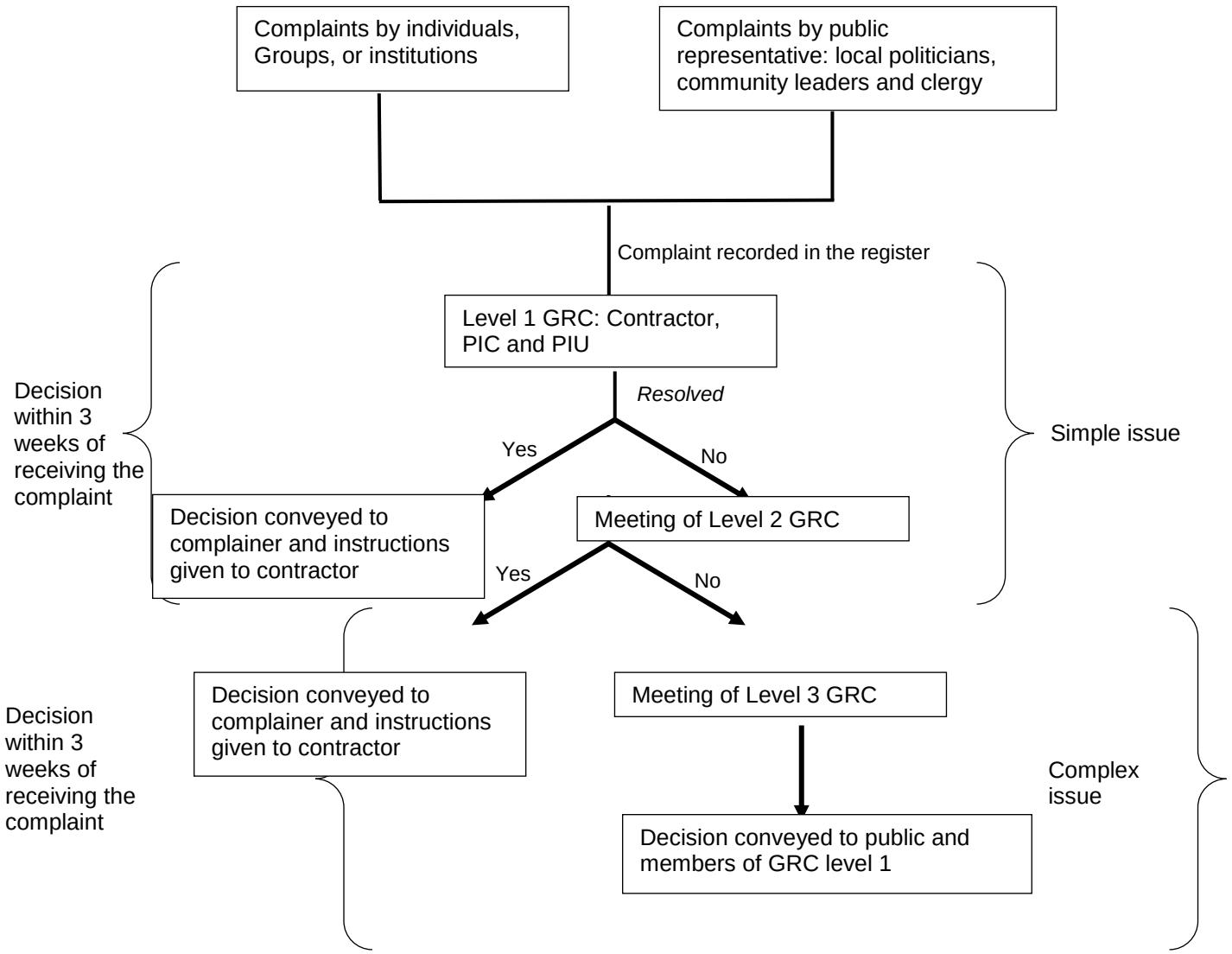


Figure VI.1. The flow chart of the GRM

VII. PUBLIC CONSULTATIONS AND INFORMATION DISCLOSURE

A. Public Consultation

206. Based on the ADB Environmental Guidelines, public consultation and information disclosure is main activity carried out during the initial stage of the project. Public consultation process for the project was carried out during the field Environment Assessment survey on 27th August to 15th October 2016 along the proposed roads for the preparation of ECs.

207. The aim of the public consultation is to understand the view point of the public about the environmental and social issues of the project roads and respond to their concern and suggestions during the early stage of the project. Incorporation of the environment and social concerns to the decision making process especially for design stage through the public consultation can avoid or minimize adverse impact during the implementation of the project. During the public consultation process, information about the improvement work under the project were given to the public. Community members of each project roads, including women and vulnerable groups participated for the public consultation sessions and expressed their views regarding the existing environment, social and economic situation of the proposed roads and expectations through the project. Information of public consulted (name, age and address) for each project road is given in Annex 1 of ECLs.

208. Most of the proposed roads for the upgrading within the NP are very important road sections which directly and indirectly connect roads belong to rural, local government and municipal councils to the provincial road network or national road network. The key benefit perceived by the general public due to upgrading of the proposed roads is improving their living standards. Further reduction of road accidents, easy access to urban centers, schools and other public sensitive locations, ability to use roads in all weather conditions, increase land values etc. are the other benefits of the proposed project.

Public consultation with the people of Veli -Oya Pradeshiya Shaba of Mullaitivu District

Public consultation with the people of Vavuniya North PS of Vavuniya District

Public consultation with the people of Nanatan PS of Mannar District

Figure 6: Group discussion made during the field survey of NP roads.

B. Information Disclosure

209. Information disclosure at the initial stage of the project provide opportunity to discuss with the public and other organizations regarding the environment and public issues that could be aroused due to the proposed project. Disclosure of information is also important to avoid or minimize misunderstanding regarding the project.

210. Disclosure of information to the village level was forwarded through Divisional Secretaries (DS), Grama Niladhari (GN) and other community based organizations. In accordance with the ADB's Information disclosure policy, draft IEE will be disclosed before the Management Review Meeting (MRM) or equivalent meeting. If there is no MRM. Signboards with project information including details on nature of construction works, road length, construction period, name of contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil and English) for rural roads. For the national roads there will be sign boards on period of works and contact information for reporting complaints or grievances in three languages. During project implementation annual environmental monitoring reports will be prepared per province and submitted to ADB for disclosure on the ADB website.

C. Consultation Findings

211. In general road users and road side communities in the project influence areas are in favor of this iRoad project because, most of the proposed roads are currently in highly dilapidated condition due to lack of maintenance during past few decades due to prevailed conflict situation in the Northern area of the country. Following are the key feedback and concerns expressed during public consultation sessions in NP.

212. All the RDA, PRDD and most of the PS and MC roads/sections are very important link roads to the other national roads and provincial roads located in the area. Majority of PS, MC and UC roads provide access to the internal areas; residential, agricultural and other important locations such as inland water resources and coastal areas for fisheries. Therefore improvement of these roads under the project is very important.

213. All the participants highlighted that the selected tar road sections need to be upgraded due to excessive usage and hazardous driving condition. The existing dilapidated condition with potholes, uneven surface, broken edges and accident risk are the main issues of macadam road sections specially RDA & PRDA roads. Currently most of the government and private owned transport facilities provide their services mainly through proposed national and provincial road sections.

214. In addition dust generation during dry season is a major problem for the people in rural area due to unpaved road sections. Therefore, public requested some mitigation measures for dust generation during construction period and transportation of construction materials.

215. Majority of the identified rural roads/sections (MC, UC, LAs) prone to flood and inundation during heavy rains. Further storm water runs over the road surface or stagnate due to insufficient drain capacity will create potholes. Some locations of RDA and PRDD roads also get inundated during heavy rains. This will create disturbances to day to day activities of people and schooling of children. Therefore, hydrological investigations should be highly considered during the design phase of the particular roads. Increasing of embankment height, removal of structurally damaged concrete paved sections, culverts, cause ways and bridges, provision of suitable drainage facilities with consultation of Department of Irrigation and Provincial Irrigation department are important to overcome hydrological issues.

VIII. CONCLUSIONS AND RECOMENDATIONS

A. Conclusion

216. This is the IEE report prepared for the proposed rural road rehabilitation and improvement works in Northern Province under proposed iRoad 2 program. The construction activities associated with project roads will not expect significant social and environment impacts. The identified potential negative environmental impacts are temporary and mainly restricted to the construction stage of the project. These negative impacts can be avoided, minimized or mitigated by adhering to the mitigation actions included to the EMP of the project. The temporary impacts associated with the project, can be mitigated during the construction stage. In addition to that predicted positive environmental and social impacts clearly outline the negative impacts of the project.

217. Environment pollution during the construction period (air quality noise, dust, vibration) due to extraction, transportation, storage and processing of the construction materials, depletion of natural resources due to extraction of construction materials, deterioration of water quality due to solid waste disposal, soil erosion, siltation and construction of drains, impact to the aesthetic value of the environment due to construction activities and use of natural resources are the anticipated negative impacts to the environment.

218. Easy access to agricultural lands (paddy fields, Chena cultivations, vegetable, banana and other fruits) coastal and inland fishing areas, public sensitive locations (hospital, offices and other government and pirate workplaces, markets, religious places) for general public, schooling of children, reduction of travel time, road accidents, traffic and the cost of transportation, vehicle operation cost, environment pollution, increase of the land value, road safety, income generation activities and daily income are the main benefits expect through the proposed iRoad project.

219. Almost all the proposed national, provincial and other rural roads for the project are currently in highly dilapidated condition. Some of the roads run through the areas of recently resettled people by the government. Considerable number of people use these roads for their daily needs. In some cases several proposed roads are only available convenient and short distance roads that connect with main towns, offices, schools, markets etc. Currently people in several areas use alternative long distance roads with high traveling cost to overcome transport difficulties of several proposed roads. Hence improvement of proposed roads through the project is very important to upgrade the living standards of the people in Northern area.

220. All the villages of the Province are located within the former conflict affected areas of the country. So existing poverty and unemployment is a significant issue for the living condition of the people. Majority of the people within all 5 District of NP depend on agriculture as their main income generation activity. Thus improvement of the road network in the NP will directly contribute to the poverty alleviation in respect of improving of income generation activities, employments, increase agriculture, fishing and livestock farming, local and foreign investments, tourism etc. Apart from that during the construction stage construction opportunity for local Contractors, material suppliers, vehicle and machinery owners, large number of temporary job and service opportunities for skilled and unskilled workers through the project will be expected to enhance social and economic development in the area.

B. Recommendations

221. Neglected maintenance of these proposed NP roads during past few decades are the main reason for the severe deterioration. Further stagnation of potholes, soil erosion, inundation during the heavy rains, and use of heavy vehicles over the capacity of roads are the main reasons for severe damage. Therefore proper maintenance program is essential to maintain long term stability of the selected roads after improvement work by the RDA, PRDD and other Local Government Authorities. Periodic cleaning of the road surface, edges, drains, shoulders and cross drainages and clearing of road side vegetation are key maintenance work that should be carried out during the maintenance period of three and five years for rural and national roads respectively.

222. Within NP, there are future plans of commencing number of infrastructural development projects by the GoSL under different line agencies (SLT, NW&DB and CEB). Therefore it is recommended that the project design team should properly coordinate with these line agencies on their future development schedules which will minimize impacts during road rehabilitation process.

223. Even though some project roads are located close to wetlands, sanctuaries and other important ecological and biological important habitats, activities such as land acquisition, removal of trees and green cover vegetation from above habitats will not be practiced. Therefore the construction activities associated with the propose project will not cause any impact to the above habitats. Proper planning of the project with appropriate construction practices and recommended mitigation actions are need to achieve the success of the project.

224. Further the IEE recommends to update EMP and EMC for each package with road specific information and locations before commencement of construction activities. In addition EMC should be effectively implemented in order to monitor application of the EMP. A comprehensive training program for contractors about the project, anticipated impacts, proposed mitigatory measures, implementation of EMP and EMC is also recommended.

APPENDIX I.1 LIST OF ROADS TO BE UPGRADED UNDER IROAD PROGRAM WITH THEIR ADMINISTRATIVE BOUNDARIES

Road list – Jaffna district

DS Division	iRoad_ID	Name of the Road
Nallur	NJF001	Ariyalai East Road Section I
	NJF002	Temple Road - Kokuvil
	NJF003	Kulankarai veethy
	NJF017	Chemmani Lane
	NJF019	Brown road 1st lane Arasady road link Road
	NJF021	Oodaikarai lane
	NJF022	Ponampalam Road Nedunkulam Road link roads
	NJF024	Gurunagar 2nd cross lane
	NJF026	Ampal Lane, Ariyalai Center
	NJF030	Chulipuram Chankanai Road. Section II
	NJF034	Munkodai Veethy
	NJF036	Kiravoolai Veethy
Jaffna	NJF029	Cheddiyarmadam Sangarathai Chankanai Pirampathai Road. Section I
	NJF031	Araly Post Office Cheddiyarmadam Road.
	NJF032	Sathiyakaddu Market Veethy
Chankanai	NJF037	Moolai 4th Veethy
	NJF038	Vaddu South Primary Health CareVeethy
	NJF039	Anthiran Branch Lane Section II
	NJF041	Gnanasampanthar - Muthali Kovil Veethy
	NJF042	Sulipuram Nelliyan Road
	NJF045	Chankanai Thoddiladi Veethy Section III
	NJF046	Selvachannithy Road Section II
	NJF047	Valvetti-Oorikadu-Kommanthurai Road
	NJF048	Police Station Road Valvettithurai
	NJF049	Polikandy -Navindil -Karanavai Road Section II
	NJF050	Sandasanthy- Polikandy Road Section I
	NJF051	Udupiddy-Malisanthy-Alvai Road Section II
	NJF052	Navalady -Thikkam Road
	NJF053	Puloly Hospital Vallipuram Road
	NJF054	Thunnalai Puloly South Vallipuram Road
	NJF055	Manthikai-Thambasidy-Alvai Road
	NJF056	Kumarathipulam Road
	NJF057	St Xavier Sea side Road Section II
	NJF058	Thumpalai Road
	NJF060	Mavilankaiyadi Old church Cemetery Road Sec. ii.
	NJF061	Koovil Theepajothy Front lane(Muthumariamman Road)

DS Division	iRoad_ID	Name of the Road
Sandilipay	NJF044	Sulipuram Chankanai Road
Point Pedro	NJF062	Panampattai Alankaddai Veethi
	NJF081	Netkolu vairavar kovil behind Road
	NJF088	Nelliady-Karanavai Road
	NJF090	Karaveddy East Kevalai Road
	NJF091	Anthananthidal -Kapputhu Road
	NJF098	Pannalai Keerimalai Road.
	NJF099	Naguleswary Road. Section II
	NJF100	Ampanai Mavidapuram Road.
	NJF102	Ampanai Alaveddy Road.
	NJF104	Annaivilunthan Kadaivayal Road.
	NJF105	Amman Veethy
	NJF106	Cooperative- Sothy Veethy link Road
	NJF109	Sothy Veethi-Kesari Veethy link Road Sec. ii.
	NJF110	Thanathampu Veethy
	NJF114	Konavalai veethy
	NJF115	Mankumpan Chaddy Velanai Road.
	NJF116	Allaipiddy Mankumpan Road.
Karaveddy	NJF083	Selvachchannithy kovil front 2nd lane
	NJF086	Imayanan- Puraporruki Road
	NJF087	Karanavai- North Road
	NJF089	Karaveddy Road
	NJF092	Karanavai -South Road
	NJF094	Unionady Illanthaikadu Veethy Section II
	NJF095	Navtkaladdy Veethy (Veerapathirayan) Section I
	NJF096	Arivalaiyam Community Centre Approach Veethy
	NJF097	Tellippalai Thyiddy Road.
	NJF101	Kunchchan Road.
	NJF103	Alaveddy Periyavillan Road.
	NJF132	Melinchimunai Main road at Melinchimunai Stage IV
	NJF133	Puliyankoodal south road
	NJF137	East Sea side road
	NJF244	Brown Road Sec. ii
Karaveddy (Vadamaradchi South-west)	NJF117	Vallam Road.- Punguduthivu
	NJF130	Kondagam Road 16th Lane
	NJF131	Kayts Suruvil Saravanai Road.
	NJF132	Melinchimunai Main road at Melinchimunai Stage IV
	NJF138	Palavodai Oori Road.

DSD Division	iRoad_ID	Name of the Road
Tellipallai	NJF141	Thannai Pillaiyar Kovil Veethy
	NJF158	Vettilai kerny Vinayakapuram Road
	NJF159	Kaddaikadu Kudiiruuppu Veethy1
Tellipallai(Valikamam North)	NJF143	Eddukaddy Palavodai Veethy
	NJF144	Pandiththalvu Veethy
	NJF145	Nagammal Kovil Veethy Sec. ii.
	NJF147	Maveli Periyathurai Road.
	NJF152	Konanthodda road
	NJF155	Kalamunai panankani road
	NJF157	Mamunai-Kaddaikadu Road
	NJF161	Vaththirayan Kudiiruuppu Veethy 1
	NJF163	From Nagarkovil Junction to Beach Road
Kopay	NJF033	Alliapulam Veethy
	NJF165	Neerveli-Punnalaikaduvan Road
	NJF186	Kachchai Ketpeli Elephantpass Road
	NJF187	Church Veethy(Potkollar Veeth) Section II
	NJF188	Phip Road & Arasady Veethy Section I
	NJF189	Kaithady Kallikaadu veethy Section II
	NJF190	Kaithadi East Annamar Kovil Veethy
	NJF191	Kaithady Moorththiyavaththai veethy
	NJF192	Varani Hospital Idaikkurichchi sri suppiramaniyam joint veethy
	NJF193	Pichchappallam Vellavaikkal Veethy
	NJF195	Madaththady 1st Lane
	NJF196	Puluddaiyan Pillaiyar Kovil Road
	NJF197	Manankunappillaiyar Kovil Road
	NJF201	Thamotharampillai 1st Lane
	NJF204	Perunkulam Pillaiyar Road
	NJF214	Chavakachcheri Kalvayal Road
	NJF215	Erlalai Kadduwan Road.
	NJF218	Mandaan veethy
Chavakachcheri	NJF219	Thunmalai Road
	NJF220	Thavady Suthumalai Cemetery Road
	NJF221	Pirampathai Pandatharuippu Road.
	NJF222	Alankulai Kalvalai Road. Section III
	NJF224	Sandilipay Hindu college Road links Kammalai Veethy
	NJF225	Kaya 1st,2nd Veethy Sec. ii.
	NJF226	Navali Rajarajeswary Veethy Sec. ii.
	NJF227	Malaivembadi Veethy

DSD Division	iRoad_ID	Name of the Road
Chavakachcheri	NJF228	Savari Veethy
	NJF231	Seddiyadaippu veethy
	NJF232	Sandilippai 5 -kan Mathavadi Manal Veethy
	NJF233	Navali North Thaluvil Road Sec. ii.
	NJF235	Wyman Road
	NJF236	Pazham Road
	NJF237	Kanagaratnam Road
	NJF238	Sivan Veethy
	NJF239	Saddanathar Road Sec.i.
	NJF240	New Sivan Road
	NJF241	Sangiliyan Road
	NJF243	Rasavinthoddam Road
	NJF245	Forest Office Lane
	NJF246	Rakka Road
	NJF247	Punkankulam Road
	NJF248	Somasundaram Road
	NJF250	Maruthady Road
	NJF251	Hospial Road, Chankanai Sec.i.
	NJF252	Mluwai Road Sec.ii.
	NJF253	Karungali Murugamoorthy Kovil Veethi Sec.i.
	NJF254	Kesadai Veethi
	NJF255	Verapity Veethi Sec.i.
	NJF256	Vanki Veethi
	NJF257	Modara Kerny Veethi Sec.i.
	NJF258	Thaddankulam Road
	NJF259	Pointpedro Road-Kudamiyan G.T.M. School Joint Road
	NJF260	Kaddaiparithan-Manthuvil Siriparathy School Road
	NJF261	Koyilamanai Road
	NJF262	Palaiyavaikkai-Padithamakaler Scheme Road
	NJF263	Kollankirai Road (A9-A32 Joint Road) Sec.i.
	NJF264	Sellaiya Road
	NJF265	Thavadi-Suthumalai-Urelai Veethi Sec.i.
Velanai	NJF166	Urelu-Neerveli Road
	NJF167	Weeravany-Watharawathai Road
	NJF171	Rasa Veethy Thoppu Road
	NJF173	Raja Veethy Kannan Lane
Kayts	NJF168	Sivan Road Sec. ii.
	NJF170	Ilankadu Cemetry Road Sec. i.
	NJF172	Barathy Road Sec. ii.
	NJF174	Sellapillaiyar Veethy

DSD Division	iRoad_ID	Name of the Road
Kayts-Karainagar	NJF176	From Urmpirai East Palali Road to Karanthan Neerveli Sivan Road & Sellappa Road Sec. ii.
	NJF177	Nagathambiran Road
	NJF178	Nunavil -Sarasalai Road
	NJF179	Chavakachcheri -Dutch Road Section I
Delft	NJF180	Eluthumadduwal-Kilaly Road
	NJF182	Meesalai Varany Road
Maruthnkerny(Vadamarachchy East)	NJF183	Varany-Kudathanai Road
	NJF184	Varany- Iyatalai- Viraly Road
	NJF185	Madduvil Amman kovil Road

Road list – Kilinochchi District

DSD Division	iRoad_ID	Name of the Road
Karachchi	NKL001	Murukandy - Akkarayankulam - Vanerikulam Road
	NKL002	Akkarayankulam L.B.Main Chl - Nallur Road
	NKL003	Alakaratnam Road
	NKL004	Taylor Road
	NKL005	Murukandy - kanakapuram
	NKL007	Rose Road.
	NKL008	Puthumurippu - Konavil Road
	NKL009	Konavil Skanthapuram Road
	NKL010	Ampaalkulam Central Road
	NKL011	Kannagaipuram Joint Road Sec.i
	NKL012	Konavil Union Kulam Road
	NKL013	Thirukkudumpa Kanniyar Madam Road Sec.i
	NKL014	Kanagapuram Road
	NKL015	Vannerikulam Road Sec.i
	NKL016	Main Road
	NKL017	Thirunagar Kanagapuram Road
	NKL018	Kumaraswamy Road
	NKL019	Main Road
	NKL047	Ramanathapuram- Tharmapuram Road
	NKL048	Kumarapuram second Road

DSD Division	iRoad_ID	Name of the Road
Karachchi	NKL059	Hudson Road
	NKL060	Hudson Road 2nd
	NKL061	Silva Road Sec.i
	NKL062	Arumukam Road (Krishnan Kovil Road)
	NKL063	Sivasuntharam Road
Poonakary	NKL006	Vannerikulam Jeyapuram Road.
	NKL020	Chempankundu Palavi Kiranchi Road
	NKL021	Pirapankirai - Kalmunai Road
	NKL022	Vannerikulam - Pallavarayankaddu Road
	NKL024	Veeravil - Valaipadu Fisheries Road.
	NKL026	Veerapandiyan Road
	NKL027	Anaikkaddy Road
	NKL029	Veddukkaddu Road Sec.i
	NKL031	Ellaikkal Road
	NKL032	Sekkalai Mudkompan Road
	NKL033	Sivapalappiddi maravarKurichchy Road Sec.i
Pachchilaipalli	NKL034	Kachchai Ketpeli Elephantpass Road
	NKL035	Palai Road (Pulopalai - Allippalai Road)
	NKL036	Sankaththarvajal cross road
	NKL037	Masar road
	NKL039	Mannavindan road Sec.i.
	NKL040	Sinnaththalaiyadi road(A9 joint road)
Kandavalai	NKL046	Kanadwalai - Punnaineeravi Road Sec.i
	NKL049	Aavaaranchaaddi Road
	NKL050	4th Junction to Cemetry
	NKL051	4th Unit Road
	NKL052	Murugan Temple Road
	NKL053	Second Unit School Road
	NKL054	Uppukkulam Road
	NKL055	Punnai Neeravi Piramanthanaaru Road
	NKL056	Naga Thampran Temple to Kallveddithidal School Road
	NKL057	Visvamadu to Piramanthanaaru Road
	NKL058	Muthirampiddi Housing Scheme Internal Road Sec.i.

Road list – Mullaitivu District

DSD Division	iRoad_ID	Name of the Road
Maritimepattu	NMU001	Thanniyoottu Kumulamunai Alampil Road
	NMU004	Nanal Road
	NMU005	Pradesiya sabha 2nd cross Road
	NMU008	Public Market Front Road
	NMU009	Big brigd Road
	NMU011	Semmalai East Housing scheeme Road
	NMU012	1st Cross Road
	NMU013	Thilakam Mill Road Section I
	NMU014	2nd Cross Road
	NMU017	Navatkadu Cemitary Road
	NMU019	World vision Housing scheeme 1st Cross Road
	NMU021	PWD 3rd Cross Road Section I
	NMU023	Kallappadu kadtkarai Main Road
	NMU024	Hospital Front Road
	NMU025	Siyonmalai Jepa aalaya Road
	NMU026	Anna padippaka Veethy
	NMU070	Thanduvan Periyakulam Road
	NMU072	Nelumwewa Sinhapura Road
Pudukudiyirippu	NMU018	Semmankunru Right side Road
	NMU027	Thevipuram Road
	NMU028	Kaiveli elukai veethi
	NMU030	Udaijaar kaddu sudalai veethi
	NMU031	Jesuthas veethy
	NMU032	Kaaddu athisaja pillaijaar veethi
	NMU033	Arasadi pillaijaar veethi
	NMU034	Kulanthai jesu kovil veethi
	NMU035	Suwaiyuttu veethy
	NMU036	Theravil Ilankopurm veethi
Oddusuddan	NMU029	Visuvamadu athisaja vinajagar aalaja veethi Section I
	NMU037	Valluvarpurm pirathaana veethi Section I
	NMU038	Nijooddan veethi Section I
	NMU038	Nijooddan veethi Section II
	NMU039	Thapaalaga veethi Section I
	NMU040	Panikkan kulam paadasaalai veethi
	NMU041	Olumadu paadasaalai veethi
	NMU042	Thashsadam[pan sittoor veethi
	NMU043	Saalampan veethi
	NMU044	Koolamurippu kerudamadu enaippu veethi

DSD Division	iRoad_ID	Name of the Road
Oddusuddan	NMU069	Kanagarayankulam District Boundary Road (NPC011)
	NMU071	Olumadu Pullmachchinathikulam Ampakamam Road
Mathai East	NMU046	Poovarasankulam Thunukai Road (NPC008)
	NMU047	Pandiyankulam to Mallavi link Road
	NMU050	Karumpulliyan Internal Road Section I
Tunukkai	NMU056	Kumulamunai Akkarayan Road (Nagapadduwan Path)(NPC003)
	NMU057	Kokkavil Thunukkai Road
	NMU058	Hospital front Road
	NMU059	Mallavi 3rd cross Road
	NMU060	Mallavi 6th cross Road
	NMU062	Aninchiyankulam 6th Lane Road
	NMU063	Arokkiyapuram
	NMU064	Iyankulam palayamurukandy Road
	NMU065	Ampalapperumal palayamurukandy Road
	NMU066	Mallavi Terankandal Road
	NMU067	Mankainagar 8th Lane Road
	NMU068	Baarathinagar to Pugalenthinagar link Road

Road list – Vavuniya District

DSD Division	iRoad_ID	Name of the Road
Vavuniya	NVA001	Omanthai - Elamaruthankulam Road
	NVA002	Navatkulam - Maraiyadithakulam Road
	NVA003	Palamoddai - Moondumurippu Road
	NVA004	Pandikeithakulam - Maraiyadithakulam Road
	NVA005	Poovarasankulam - Thunukkai Road
	NVA006	Malikai-Chemamadu Road
	NVA007	Kulumadu Junction- to Marakkarampalai veethy
	NVA008	Mathavuvaithakuiam-kanthapuram-Veethy
	NVA009	Kanthapuram-Rajendirankuiam-Veethy
	NVA011	Kalnatinakulam - Asikulam Road
	NVA012	Poonthoddam -Santhasolai Road
	NVA013	Sanakarapillai Road
	NVA014	Mannar Road 6th Lane
Vavuniya	NVA016	Kovilkulam Sudalai Road
	NVA019	Pandarikulam Amman Kovil Road
	NVA021	Sinkala Divisional Secretariet Road - Section I
	NVA022	Thirunavatkulam 1st Lane

DSD Division	iRoad_ID	Name of the Road
Vavuniya	NVA042	Katkulam Sithamparapuram Internal Road (Palani Murukan Kovil Road
	NVA043	Oyarsinnakulam Section II (4th)
	NVA047	Nochchimodai Crusher Road
	NVA048	Maharampaikulam Kanthy Road
	NVA049	Sriramapuram Housing Scheme 1st Cross Lane
	NVA050	Koomankulam Main Road
	NVA051	Kanthankulam Main Road
	NVA052	Rasenthirankulam Mail Road
	NVA053	Pampaimadhu Sundarpuram Road
	NVA055	Sivapuram Main Road
	NVA056	Marukarampalai Vinayagar Viddalaya Road
	NVA058	Mahakachakodiya Pirapamadu Main Road Section II
Vavuniya North	NVA010	From A 9 Road to PuthoorKovil Road
	NVA023	Nainamadu - Samalankulam Road
	NVA024	Nedunkerny - Koolankulam Road
	NVA025	Kanagarayankulam-Karappukuthi Road
	NVA025	Kanagarayankulam-Karappukuthi Road
	NVA026	Nainamadu-Karapukuthi Road
	NVA027	Nedunkerny Welioya Connection road
	NVA028	School Front Road Nagarkulam
	NVA029	Pillayarkovil Front Road
	NVA030	Aathimodai Periyakulam Road
	NVA031	Maaraillupai Kulavisuddan Road
	NVA031	Maaraillupai Kulavisuddan Road
	NVA032	Maaraillupai Nedunkerny Road
	NVA034	Ayiladikula Road
	NVA036	Sooduventhan kulavisuddan Road
	NVA038	Navalar Road
	NVA039	Nedunkerny North Amman Road
Vavuniya South	NVA020	Velikulam Amman Kovil Road
	NVA040	Ulukulam - Varikudiyoor Road
	NVA041	Maniyarkulam - Pirappamadu Road
	NVA046	Srinagar Section IV (7th)
	NVA059	Kokaliya Akpopura Main Road
	NVA060	Mahakachakodiya 4th Cross Road Section III
	NVA062	Alakala Paddy Field Road
	NVA063	Arukampulweliya Circular Road
	NVA066	Aluthpirapamaduwa Transformer Road
	NVA067	Nawakamuva Road
	NVA068	Mamaduva Devarahamanaya Main Road
	NVA077	Pavatkulam Unit 4 to Thalikkulam Road
	NVA078	Pavatkulam Unit 2 Road
Vengalacheddiculam	NVA065	Acre 400 3rd Cross Road
	NVA069	Poovarasankulam - Cheddikulam Road
	NVA070	Piramanalankulam - Parappukadanthan Road

DSD Division	iRoad_ID	Name of the Road
Vengalacheddiculam	NVA071	Veppankulam Kallaaru Road
	NVA073	Paththinathapuram Road
	NVA075	Puliyankulam Road
	NVA076	Jayanthinagar Erukkalankal Road
	NVA079	Muthaliyarkulam housing Scheem Road - Sec.x.
	NVA080	Mankulam SDO Road
	NVA081	Sinnakulam Internal Road
	NVA082	Sinnathampanai School Road
Andiyapuliyankulam	NVA083	Menifarm Unite 2

Road list – Mannar District

DSD Division	iRoad_ID	Name of the Road
Manthai West	NMA001	Uyilankulam - Adampan Road
	NMA002	Vellankulam - Thevanpiddy Road
	NMA003	Adampan - Kandal Road
	NMA004	Pallamadhu - Alkadively Road
	NMA005	Kaddadivayal Ramayankulam NPC014
	NMA006	Alankulam Internal Road
	NMA007	Vannakulam Internal Road Sec.i.
	NMA008	Parapukadanthan Amman Kovil Road Sec.i.
	NMA009	Alkadively Internal Road Sec.i.
	NMA010	Thetavady Internal Road
	NMA011	Sannar Internal Road
	NMA013	Kalliyadi Internal Road Sec.i.
	NMA014	Puthukadu New Housing internal Road
	NMA015	Adampan Internal Road
	NMA017	Palaiyadiputhukulam Internal Road Sec.ii.
	NMA018	Sethuvinayakar kulam Sec.v.
	NMA019	Vidathalthivu Play ground Road Sec.i.
Madhu	NMA020	Sinnpandivirichan periyapandivirichan Link Road
	NMA021	Periyapandivirichan 3rd Cross Street
	NMA022	Thachnamaruthamadhu Palampitty Rd
	NMA087	Mahilankulam - Pallamadhu Road NPC009 Sec.ii.
	NMA089	Poovarasankulam - Thunukkai Road NPC008
	NMA098	Pannavedduvan Old Village Road Sec.i.

DSD Division	iRoad_ID	Name of the Road
Madhu	NMA110	Madhu Road Housing Scheme Internal Road
Mannar Town	NMA024	Thiruketheeswaram Road Sec.i.
	NMA025	Mannar-Thalvupaddu-Tharapuram Road
	NMA026	Jubilee Road
	NMA027	Emilnagar Kaluthavaranai Road
	NMA028	Emilnagar South bar Joint Road Sec.i.
	NMA029	South bar Main Road
	NMA030	Santhipuram Kovil Road
	NMA031	Pansalai 1st , 2nd Lane 2nd Lane
	NMA032	St.Xavier Road
	NMA033	Anni Therasa Road
	NMA034	Puthumai Matha Lane
	NMA036	Kadaleri Veethi (End of Fish Market)
	NMA038	St.Thomas 1st Lane
	NMA039	Thomayar Main Road
	NMA040	Eluthoor Main Road
	NMA041	Periyakamam to Eluthoor Joint Road
	NMA043	Kurusukovil Road
	NMA045	Computer Center 1st Lane Road Sec.i.
	NMA048	Thamotharanpillai Road
	NMA050	Tower Lane (Moor Street)
	NMA051	New Moor Street Road Sec.i.
	NMA052	Uppukkulam Anni Illam Hostol Road
	NMA054	Manokarakurukkal Road
	NMA056	Building Department 2nd Lane Sec.i.
	NMA059	Konthaipiddy Road
	NMA060	Uppukkulam Mannar Gust House Road
	NMA062	J R S Behind Road
	NMA065	Thalaimannar Pier East Internal Road Sec.i.
	NMA066	Thalaimannar Pier West Internal Road
	NMA069	Thalaimannar Village South Internal Road Sec.iv.
	NMA070	Oalaithoduvai Konnayankudiyiruppu Access Road
	NMA071	Siruthoppu Internal Road Sec.i.
	NMA072	Kaddasapathiri internal Road Sec.i.
	NMA075	Erukalampity East Internal Road Sec.i.
	NMA076	Puthukkudiyiruppu Internal Road Sec.i.

DSD Division	iRoad_ID	Name of the Road
Mannar Town	NMA077	Thoddaveli Internal Road
	NMA078	Tharapuram West Internal Road Sec.i.
	NMA081	Uyilankulam internal Road Sec.i.
	NMA082	Neelasenai Internal Road
	NMA083	Periyanavatkulam Internal Road
	NMA086	Parapankandal Internal Road
Nanaddan	NMA091	Murunkan - Nanaddan Road Sec.i.
	NMA092	Uyilankulam - Mankulam - Nanaddan Road Sec.ii.
	NMA093	Achchankulam Village Road
	NMA094	Pallankoddai Village Road
	NMA095	Murungan Piddi Internal Road Sec.i.
	NMA097	Arthikuly Village Road
	NMA099	Vankalai Word – 05 Internal Road Sec.i.
	NMA100	Razoolputhuvely Village Road
	NMA101	Parikarikandal Internal Road Sec.i.
	NMA102	Thomaspuri Internal Road
	NMA103	Naruvilikulam – Koddaikadhu Village Road Sec.i.
	NMA104	Sirukandal Village Road
	NMA106	Pidarikulam Village Road
	NMA107	Katkadanthakulam Village Road
	NMA108	Vankalai – Eraththinapury Internal Road
	NMA109	Sooriyakaddaikadhu – Puthukkudiruppu Village Road
	NMA114	Vanchiyankulam Village Road
	NMA115	Valkaippetankandal Village Road
	NMA116	Vankalai Word – 06,07 Internal Road Sec.i.
	NMA117	Ilanthaikulam Internal Road
	NMA118	Vankakai Suganthapuri Internal Road
	NMA119	Kovankulam – Uyilankulam Road
	NMA120	Vankalai – Gunavarthana Road Sec.i.
	NMA121	Moddaikadai Internal Road Sec.i.
Musalai	NMA123	Peryapulathusenai - Potkerny - Bandaeavely Road
	NMA124	Maruchukady - Uvaiyadikulam Road
	NMA125	Arippu -Pandaraveli Road Sec.iii.
	NMA126	A.S.Kuluam internal Road
	NMA127	Vappankulam alakkaddu internal Road
	NMA128	S.P.Podkerny Internal road
	NMA129	P.P.Podkerny alakkaddu internal Road
	NMA130	Ahathimurippu - koolankulam internal road

DSD Division	iRoad_ID	Name of the Road
Musalai	NMA131	Variveli - Musali road Sec.i.
	NMA133	Ahathimurippu Alakkaddu
	NMA137	Kayakkuli internal road Sec.ii.
	NMA138	Palakkuli Internal Road Sec.i.
	NMA139	Mullikkulam internal Road
	NMA140	Karadikkuli internal road Sec.i.
		Manakkulam -Aruviyaru road

Proposed National Roads (IRoad – Phase II)

No.	Name of the Road	Length (km)
1.	AB 039 – Valukkaiyaru – Punguduthivu – Kurikkatuvan Road	24.4
2.	A 014 – Thalaimannar – Mannar Road	30.0
3.	A 030 – Vavuniya – Parayanalankulam Road	35.8
4.	B 371 – Point Pedro – Maruthankerni Road	29.0
5.	B 325 – Vavuniya – Neriyakulam Road	21.7
	Total	140.9

APPENDIX I.2 SAMPLE ECS

ENVIRONMENTAL CHECKLIST

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVELOPMENT AUTHORITY

Road Name : World vision Housing scheme 1st Cross Road.

Road ID : NMA019

District Name: Mullaitivu

DSD & GNDs:

DSD	GNDs
Maritimepattu	Mullivaikkal West

Total length of the road: 0.550km

Overview of the road

The proposed World Vision Housing scheme 1st Cross Road starts in front of army camp road and ends at 45th km post on Paranthan – Mullative road (A35) at Maritimepattu. ROW size is about 40 feet and carriageway is 15feet. In general terrain of the road section is flat and slightly undulating. Road surface of the section is gravel and earth. There are no side drains in the road section. Land use beside the road include residences and home gardens. Road condition is fairly good.

GPS coordinates	Starting point of the road	End point of the road
	N 09° 19.196	N 9° 18.992
	E 80° 46.702	E 80° 46.476

Climatic Conditions

Temperature-^{0}C	High: 39.3^{0}C Low: 23^{0}C
Humidity	High: 93% Low: 67%
Rainfall (Minimum and Maximum) Rainy Season	1300 - 2416mm /year From October to December (Dry Zone – bimodal rainfall pattern).

(Source: Environmental Profile of Mullaitivu District, Central Environment Authority, Mullaitivu District)

A. Location of the Road and Generic description of Environment

No:	Type of Ecosystem	Yes	No	Explanation
1.	Type of Terrain (Plain/ Undulating/ Hilly/ Mountainous etc.)	√		In general the road traverse through a flat and slightly undulating terrain. Altitude:

No:	Type of Ecosystem	Yes	No	Explanation
	(Explain the topography of the area and how many km of the road are located in the hilly area)			Maximum elevation -11m Minimum elevation -07m
2.	Forest Area / Mangrove / Other natural habitats (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?		√	No natural habitats were found in the area.
3.	Inhabited Area	√		World vision Housing Scheme houses were located.
4.	Agricultural Land	√		home gardens were observed beside the road
5.	Barren Land		√	No barren lands were observed in the area.

B. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	According to the public view, no such previous incidences have been recorded in the project area.
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)		√	
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)		√	According to the public view, no sections of the road gets inundated during rainy period.

No.	Parameter/ Component	Yes	No	Explanation
4.	Are there any trees with a GBH of 60 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)		√	No trees were observed in the road side.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	No such habitats were observed beside the road
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	No threatened flora and fauna species were found in the area.
7.	Are there any utility structures[1] within 2 m on either side from the edge of the road carriageway or within the existing ROW of the road? (If yes, attach list with chainage)		√	No electric poles and telephone poles were observed in the sturdy. No Water supply pipe lines are located along the road.
8.	Are there any religious, cultural or community structures/buildings[2] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		Hindu temple, public library, Pradesiya shaba office and GN Office were located. However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimize impacts due to degradation of air quality and noise at these sensitive receptors.

[1] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[2] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

C. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. (Attach list of people met and dates)	√		Public consultations were made during the field environment assessment. *Please refer to the annex 1 for the list of public consulted and their views*
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public highlighted the need of proper improvement with road related facilities. Rehabilitation of the road is essential with widening of existing CW, Installation of the side drains and construction of culverts and bridges where necessary. *Please refer to the annex 1 for the list of public consulted and their views*
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

D. Attached the following

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

II. List of community structures indicating location and the side of the road (RHS or LHS) as required under B.8.

Chainage (km)	Location	Right	Left
0+000 – 0+100	Hindu temple	√	
0+400 – 0+500	Public library	√	
0+400 – 0+500	Pardesiya Shaba Sub Office	√	
0+500 – 0+600	GN office	√	

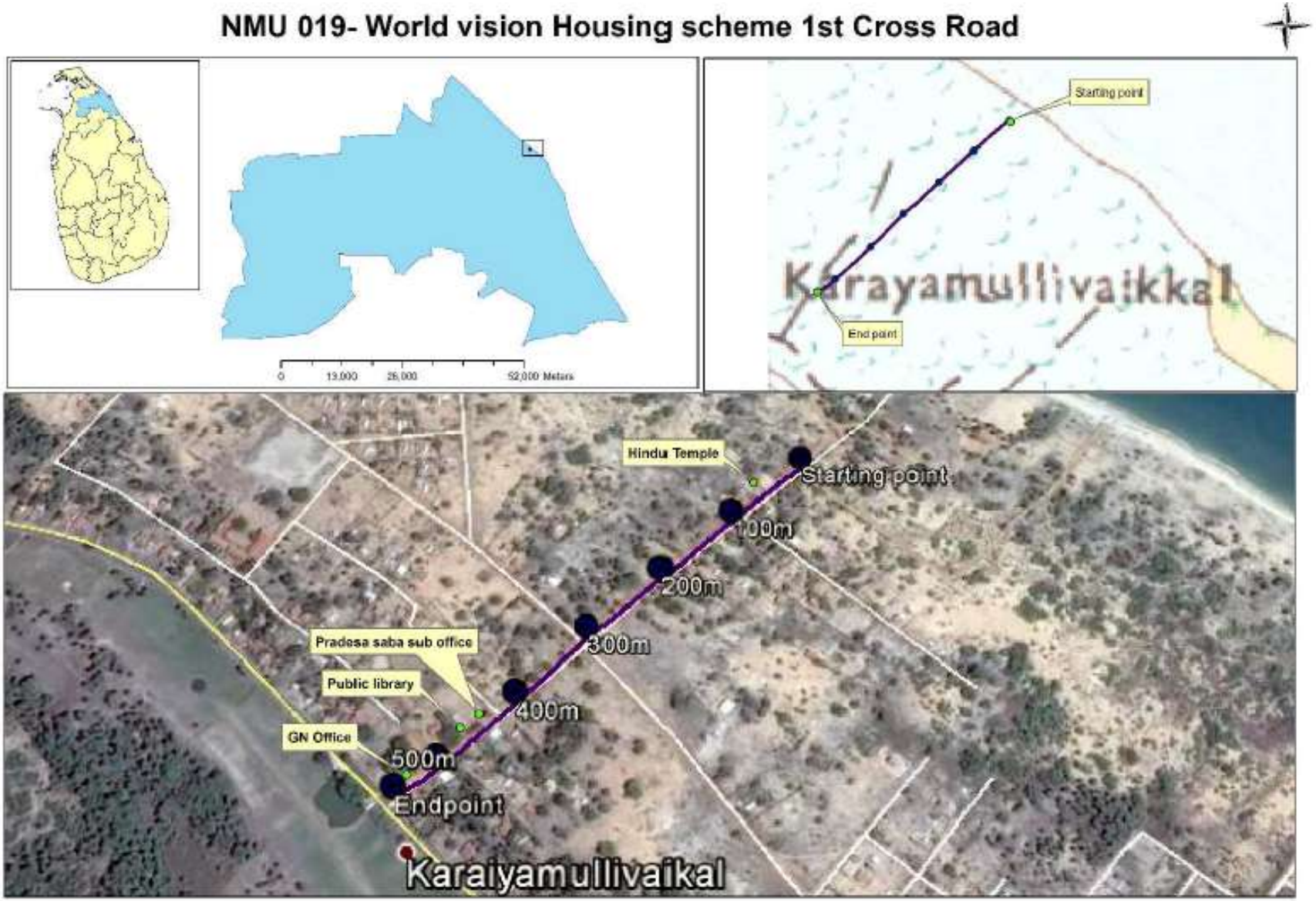
III. Project map is attached in annex 2

IV. Photographs of the project area showing at least 02 m on either side from centre line of road alignment are attached in annex 3.

V. List of trees with 60cm GBH or more located within study area (within existing ROW or within 2m from edge of the carriageway to the either sides of the road if ROW is not clear) as required in B.4.

Annex 1. Public consultation of NMU019: World vision Housing scheme 1st Cross Road.

Name of the Respondent	Age	Sex	Address	Views
Mr. S. Vijayakantha	47 Years	Male	Mullivaikkal West.	Road rehabilitation will help to people who are using the road. Proper draining system will improve the life time of road. Installation of the side drains and construction of culverts and bridges where necessary.
Mr. R. Niroshan	29 Years	Male	Mullivaikkal West.	This road section has not been rehabilitated and properly maintained during last years. So rehabilitation of the road is essential with widening of existing CW, Installation of the side drains and construction of culverts and bridges where necessary.


NMU 019- World vision Housing scheme 1st Cross Road
0
13,000
26,000
52,000 Meters
Starting point
End point
Karayamullivaikkal
Hindu Temple
Starting point
100m
200m
300m
400m
500m
Endpoint
Pradesa saba sub office
Public library
GN Office
Karaiyamullivaikal

Annex 3 – Photo Gallery of NMU019 World vision Housing scheme 1st Cross Road.

The proposed World Vision Housing scheme 1st Cross Road starts from the in front army camp.

Road condition at the 0+400km+.

Road ends at 45th km post on Paranthan – Mullative road (A35) at Maritimepattu.

ENVIRONMENTAL CHECKLIST

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVELOPMENT AUTHORITY

Road Name : Mallavi 6th cross Road
Road ID : NMU060
District Name: Mullativu

DSD & GNDs:

DSD	GNDs
Thunukkai	Mallavi, Yogapuram , Thirunagar

Total length of the road: 0.910km

General Overview of the road

The proposed Mallavi 6th cross Road starts from the south of Mallavi and the road ends at Thirunagar. In general, the terrain of the road is flat. The road surface is gravel from starting point to end point. ROW of the road varies from 8.0m to 9.0m. No proper drainage system was found in the road. Some culverts are already blocked or located inproper locations, thus water stagnates in many sections during the rainy season. Land use beside the road includes residences and home gardens. Two Hindu temples are located beside the road.

GPS coordinates	Starting point of the road	End point of the road
	N 09 08.323	N 09 07.850
	E 80 17.663	E 80 17.740

Climatic Conditions

Temperature-0C	High: 39.30C Low: 230C
Humidity	High: 93% Low: 67%
Rainfall Rainy Season	1300 - 2416mm /year From October to December (Dry Zone – bimodal rainfall pattern).

(Source: Temperature & Humidity– Statistical Abstract 2015. Table 1.4 & 1.5, Rainfall -The National Atlas of Sri Lanka, The survey Department of Sri Lanka, 2nd edition, 2007)

A. Location of the Road and Generic description of Environment

No:	Type of Ecosystem	Yes	No	Explanation
1.	Type of Terrain (Plain/ Undulating/ Hilly/ Mountainous etc.) (Explain the topography	√		In general the road traverse through a flat terrain. Altitude:

No:	Type of Ecosystem	Yes	No	Explanation
	of the area and how many km of the road are located in the hilly area)			Maximum elevation - 46m Minimum elevation - 43m
2.	Forest Area / Mangrove / Other natural habitats (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?		√	No such habitats were observed beside the road corridor
3.	Inhabited Area	√		Residences are distributed on both sides of the road
4.	Agricultural Land	√		Home gardens were observed beside the road
5.	Barren Land		√	No barren lands were observed in the area.

B. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	According to the public view, no such previous incidences have been recorded in the project area.
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)		√	No Tanks/streams /rivers were observed beside the road
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		Road gets inundated during rainy season, No proper drainage system was observed. Therefore improvement of drainage facility across and along the road is necessary.

No.	Parameter/ Component	Yes	No	Explanation
4.	Are there any trees with a GBH of 60 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		Six (6) trees were observed on LHS Tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate the impact due to trees removal.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	No faunal habitats were found in the area.
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	No threatened flora and fauna species were found in the area.
7.	Are there any utility structures[1] within 2 m on either side from the edge of the road carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		Five (5) electric poles were observed on LHS and three (3) electric poles were observed on RHS. Tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate the impact due to trees removal.
8.	Are there any religious, cultural or community structures/buildings[2] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		Two Hindu temples were located beside the road However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimize impacts due to degradation of air quality and noise at these sensitive receptors. In addition safety measures are

[1]Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[2] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

No.	Parameter/ Component	Yes	No	Explanation
				recommended at the school during both construction and operational phases of the project

C. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. (Attach list of people met and dates)	√		Public consultations were made during the field environment assessment. *Please refer to the annex 1 for the list of public consulted and their views*
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public highlighted the need of proper improvement with road related facilities. The road is highly degraded due to no any rehabilitation. Road dust cause health issues to the inhabitants. *Please refer to the annex 1 for the list of public consulted and their views*
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

D. Attached the following

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

Chainage (Km)	Utility structure	LHS	RHS
0+000-0+100	Electric poles	-	3
0+200-0+300	Electric poles	2	-
0+300-0+400	Electric poles	2	-
0+700-0+800	Electric poles	1	-
Total		**05**	**03**

II. List of community structures indicating location and the side of the road (RHS or LHS) as required under B.8.

Chainage (km)	Location	Right	Left
0+000-0+100	Hindu temple		√
0+300-0+400	Hindu teple	√	

III. Project map is attached in annex 2

IV. Photographs of the project area showing at least 02 m on either side from centre line of road alignment are attached in annex 3.

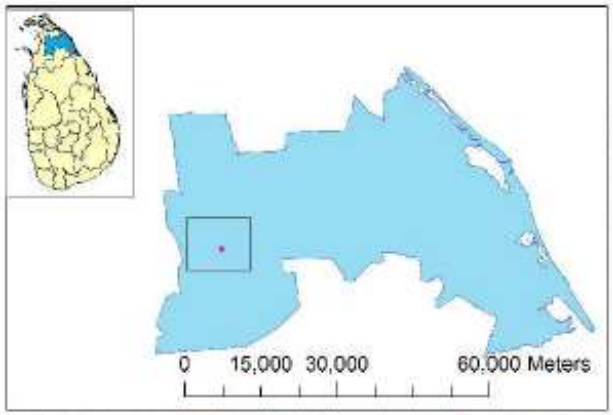
V. List of trees with 60cm GBH or more located within study area (within existing ROW or within 2m from edge of the carriageway to the either sides of the road if ROW is not clear) as required in B.4.

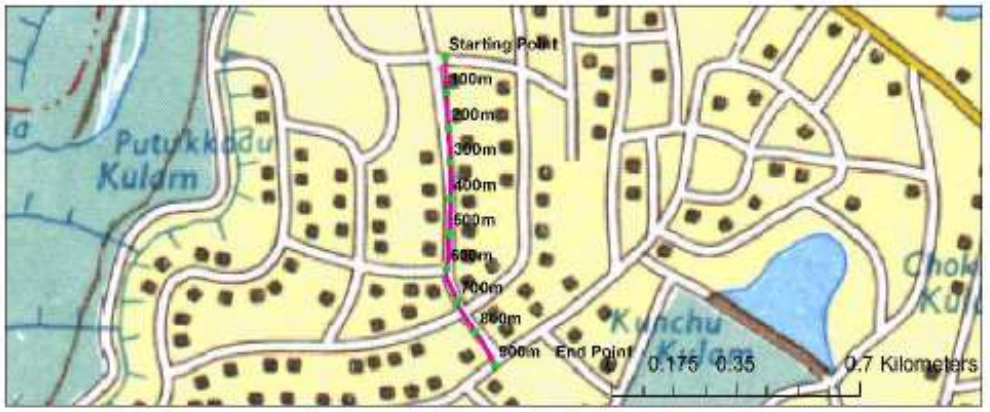
Chainage (Km)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
0+000-0+100	Kohomba	*Azadirachat indica*	3			
0+300-0+400	Siymbala	*Tamarindus indica*	2			
0+400-0+500	Kohomba	*Azadirachat indica*	1			
Total			**6**			**0**

Annex 1. Public consultation of NMU060 Mallavi 6th cross Road

Name of the Respondent	Age	Sex	Address	Views
Mr. T. Sudarshan	58	Male	543, Valanagar, Yogapuram West, Thunukkai,	Culverts along the road silted and blocked. Storm water run off is blocked. There ia a need to rehabilitate the road with installation of new culverts and drain facilities to the required location.
Mr. K. Kanthan	41	Male	541, Valanagar, Yogapuram West, Thunukkai,	The road is highly dilapidated with many potholes on the surface due to insufficient drainage system. Water stagnate in these potholes. Thus, it is essential to establish a proper drainage system during the rehabilitation work.
Ms. A. Ysoda	43	Female	537, Valanagar, Yogapuram West, Thunukkai,	The road is highly degraded due to no any rehabilitation. Road dust cause health issues to the inhabitants. Further, water stagnates in the potholes which create wet and muddy condition in the road during the rainy seasons. Immidiate rehabilitation is necessry.

Mallavi 6th Cross Road - NMU060





Annex 03. Photo gallery of NMU060 Mallavi 6th cross Road

Starting point of the road

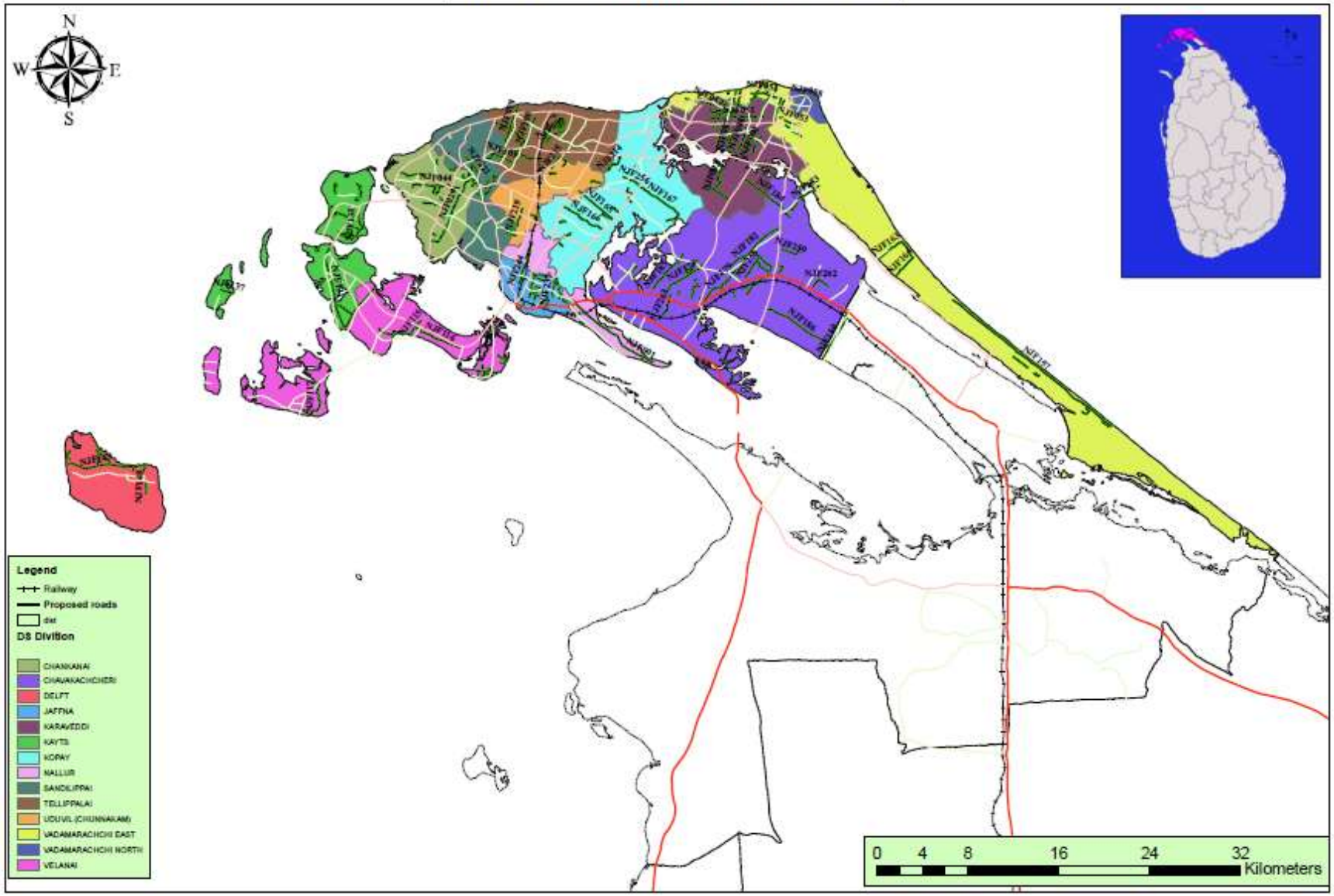
Roadside environment at 0+200-0+300km

Hindu temple at 0+300-0+400km

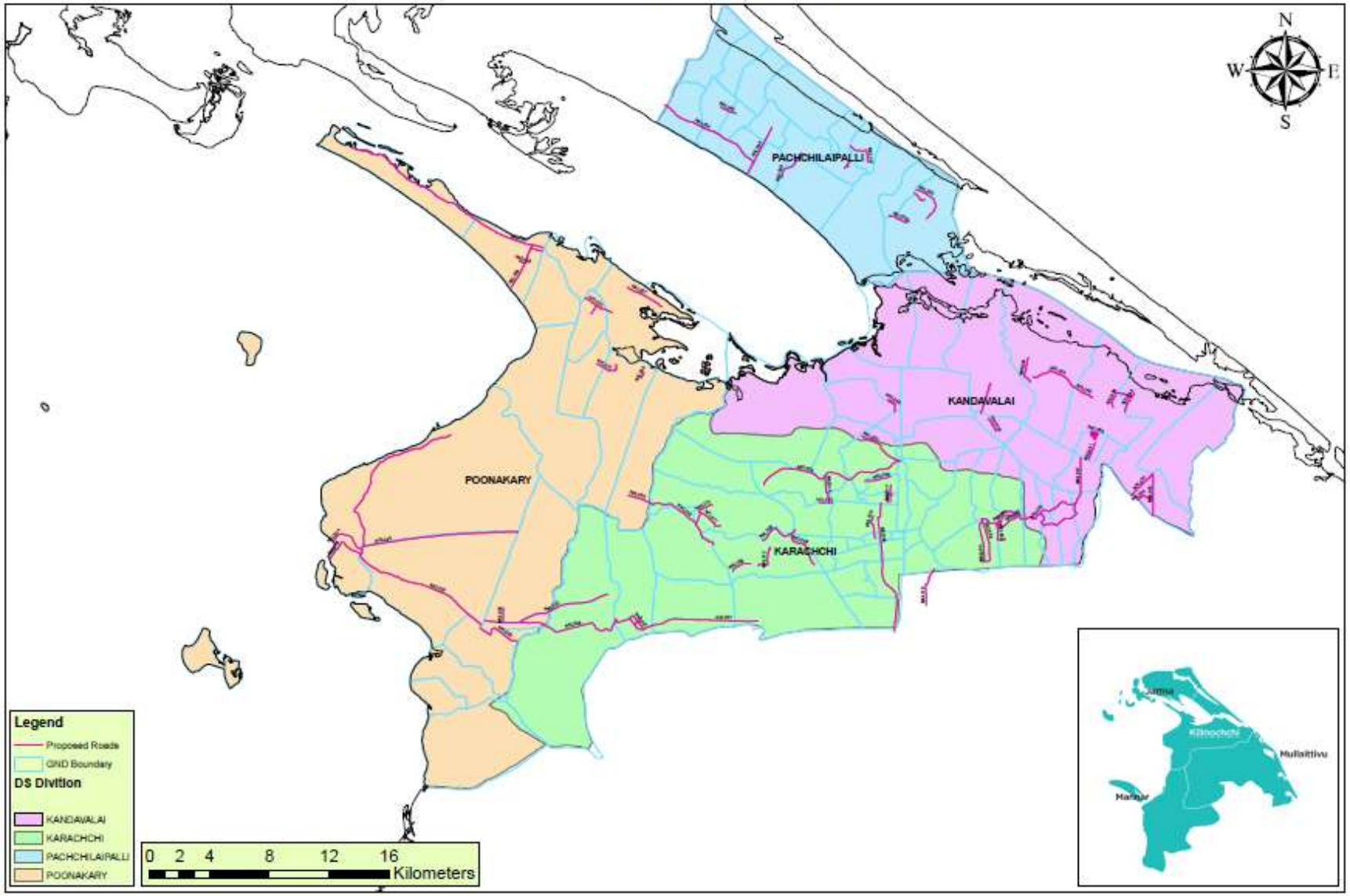
End point of the road

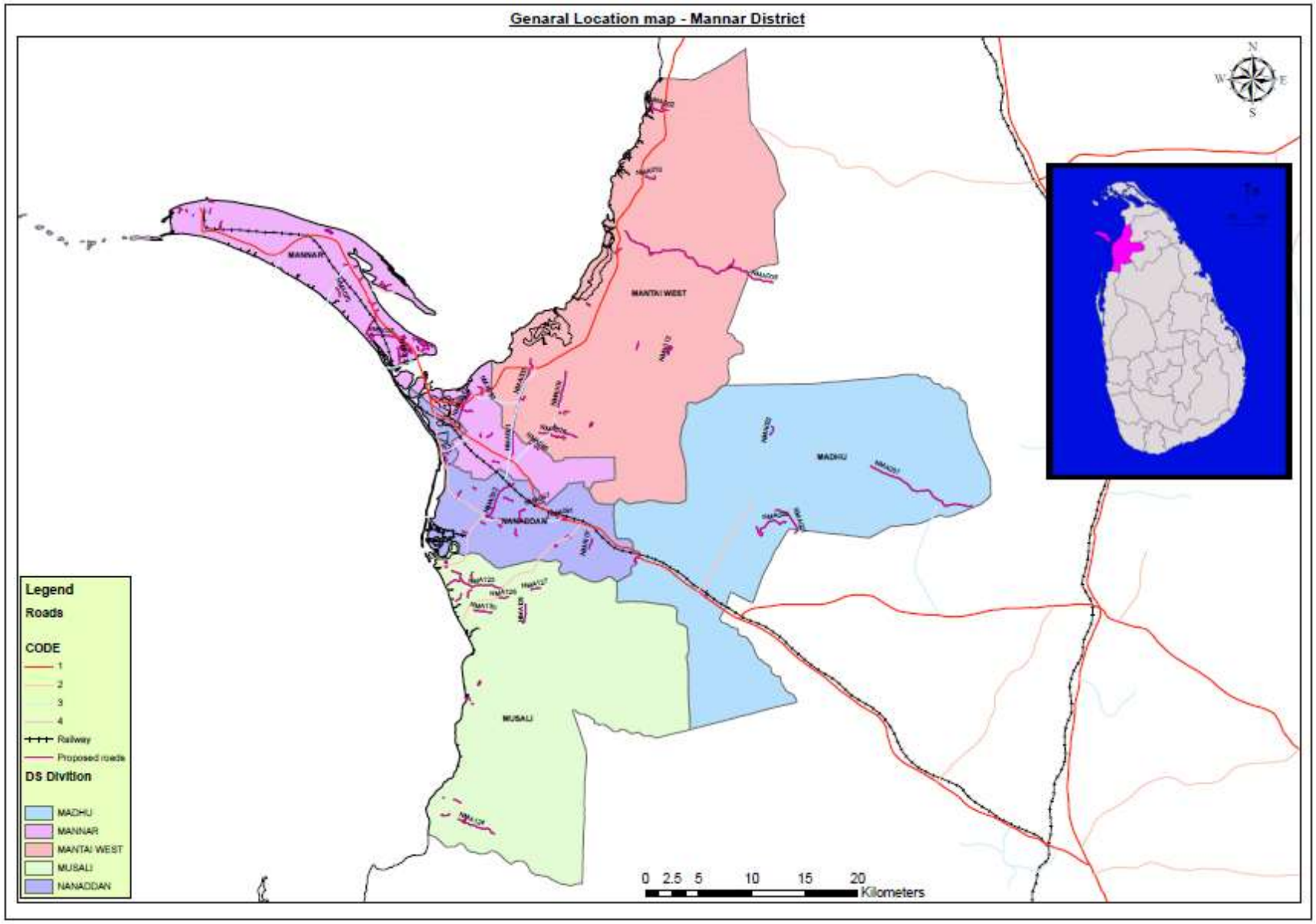
APPENDIX II.1 GENERAL LOCATION MAPS

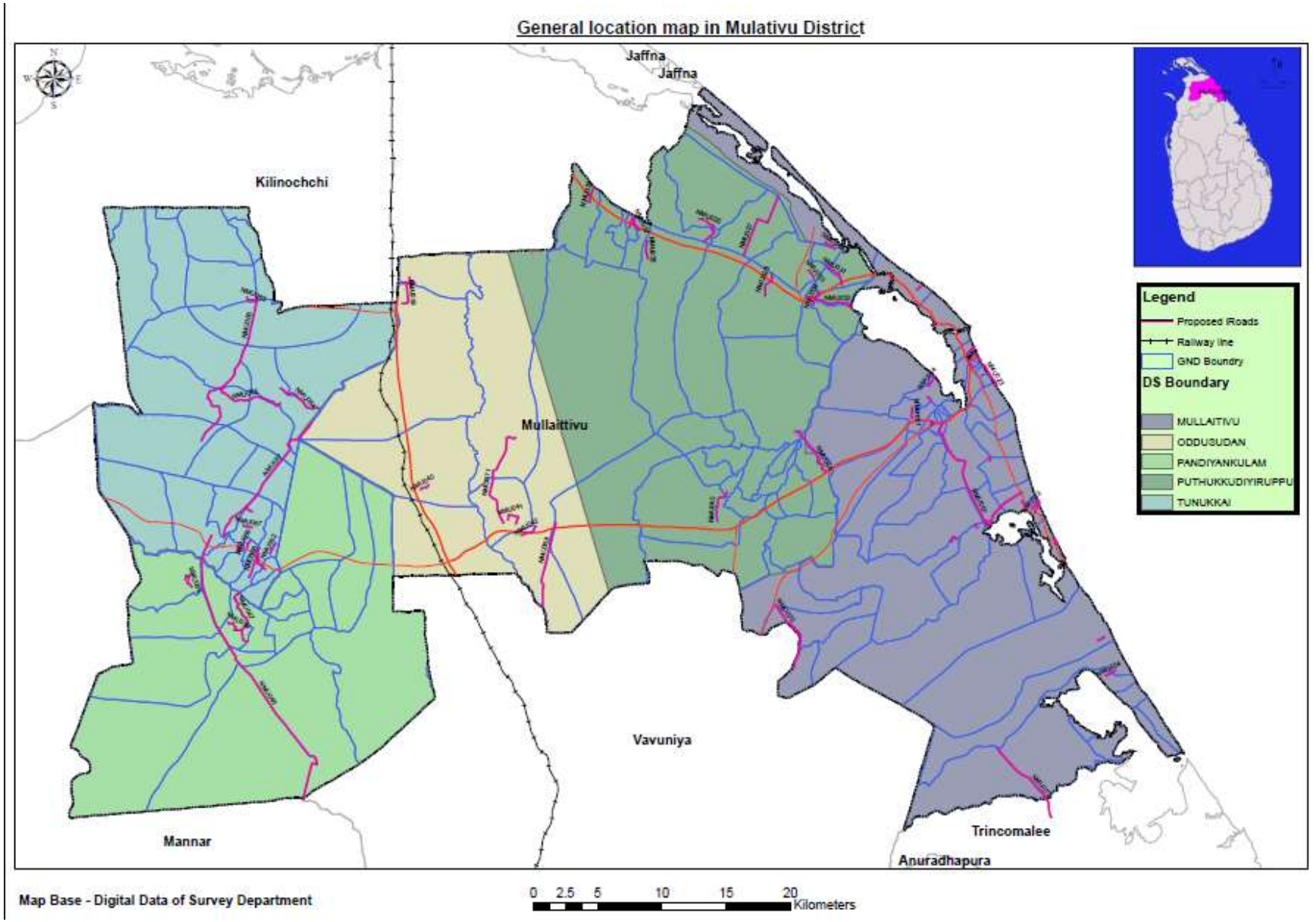
General location map - Jaffna District



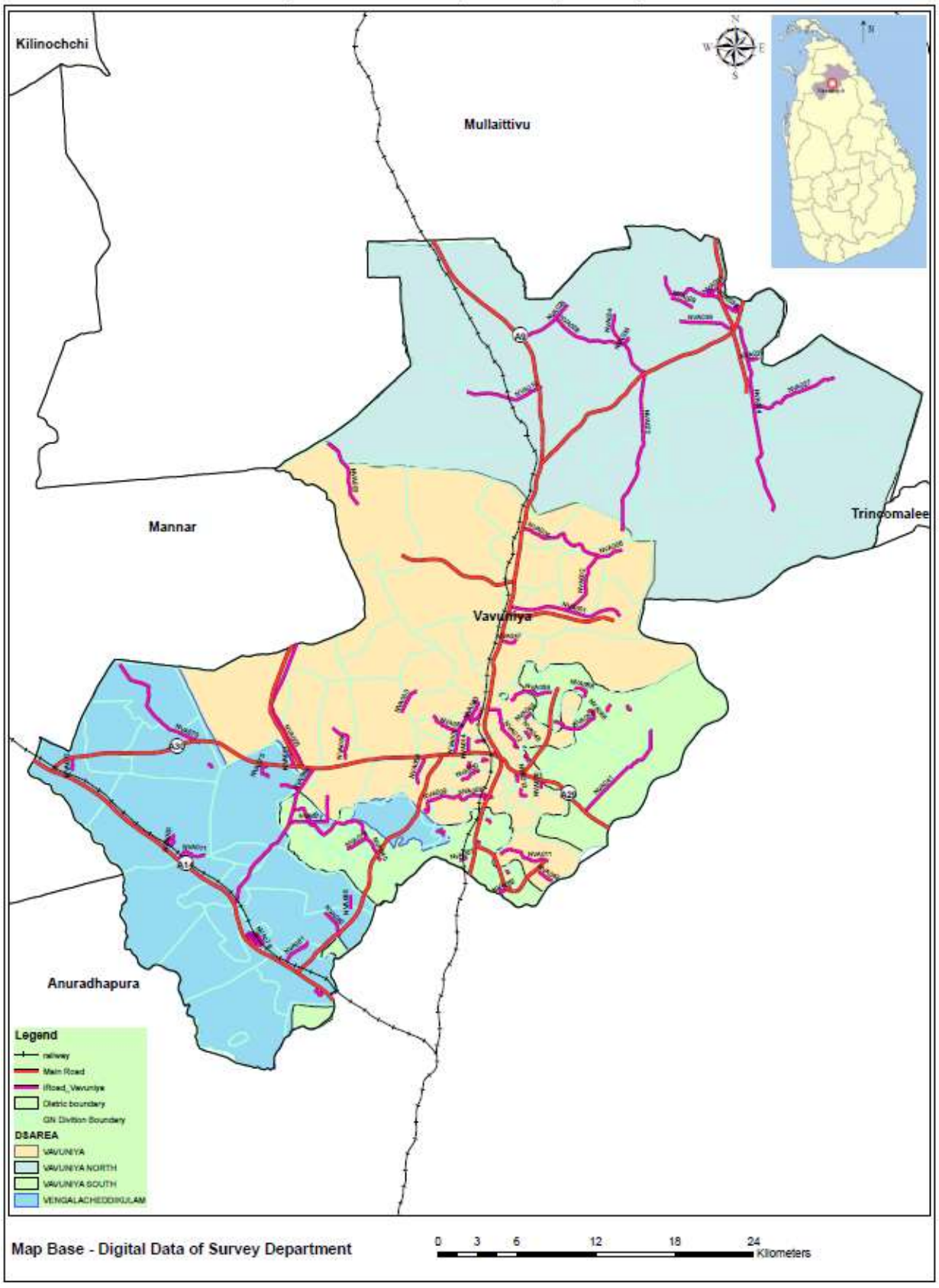
General location map - Kilinochchi District

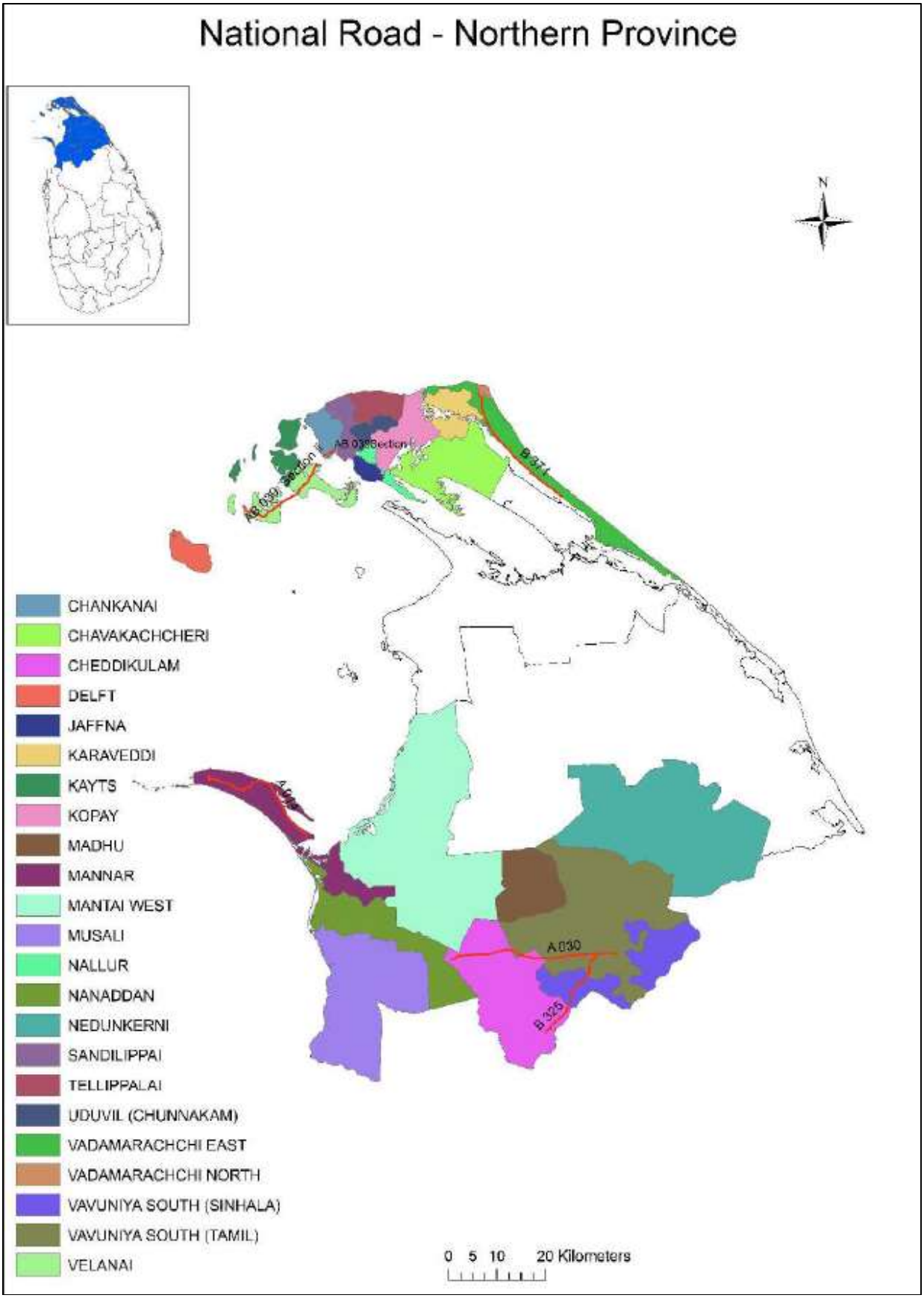



Genaral Location map - Mannar District
N
W
E
S
MANNAR
MANTAI WEST
MADHU
NANADDAN
MUSALI
Legend
Roads
CODE
1
2
3
4
Railway
Proposed roads
DS Divition
MADHU
MANNAR
MANTAI WEST
MUSALI
NANADDAN
0 2.5 5 10 15 20
Kilometers


General location map in Mulativu District
Jaffna
Jaffna
Kilinochchi
Mullaittivu
Vavuniya
Mannar
Trincomalee
Anuradhapura
Legend
Proposed Roads
Railway line
GND Boundry
DS Boundary
MULLAITIVU
ODDUSUDAN
PANDIYANKULAM
PUTHUKKUDIYIRUPPU
TUNUKKAI
Map Base - Digital Data of Survey Department
0 2.5 5 10 15 20
Kilometers

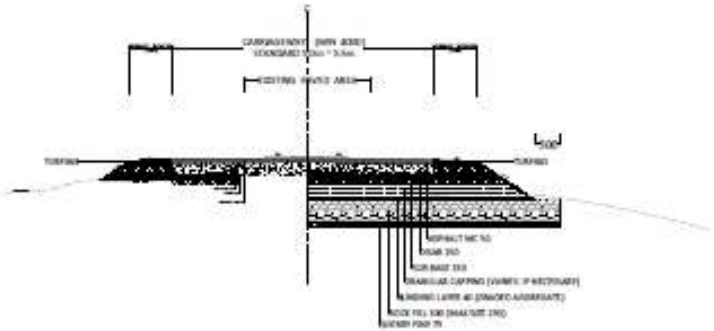
General location map in Vavuniya District



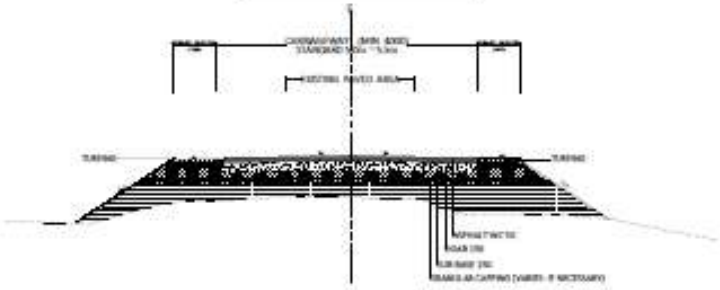

National Road - Northern Province
N
CHANKANAI
CHAVAKACHCHERI
CHEDDIKULAM
DELFT
JAFFNA
KARAVEDDI
KAYTS
KOPAY
MADHU
MANNAR
MANTAI WEST
MUSALI
NALLUR
NANADDAN
NEDUNKERNI
SANDILIPPAI
TELLIPPALAI
UDUVIL (CHUNNAKAM)
VADAMARACHCHI EAST
VADAMARACHCHI NORTH
VAVUNIYA SOUTH (SINHALA)
VAVUNIYA SOUTH (TAMIL)
VELANAI
A 030
B 325
0 5 10 20 Kilometers

APPENDIX II.2 PROPOSED CROSS SECTIONS

PROPOSED TYPICAL SECTION (TS) FOR PRDA ROAD



TS-1A (TYPICAL SECTION FOR MARSHY AND PEAT SOIL AREA)



TS – 1 (TYPICAL SECTION FOR EMBANKMENT AREA)

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (CBR > 30 %)	GS
	GRANULAR CAPPING (CBR > 10 %)	GC
	SHOULDER FILL	

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
4. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
5. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
6. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm. IF THE THICKNESS < 100mm USE GRANULAR SUB BASE.
7. SELECT DRAIN AS PER SITE CONDITION
8. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECTED TO THE APPROVAL OF THE ENGINEER
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING

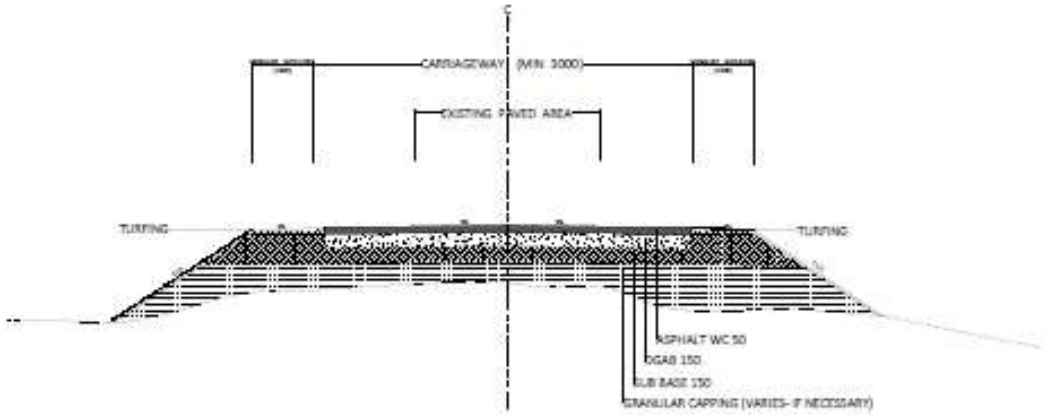
ADB FUNDED
ROAD PROJECT
NORTH CENTRAL PROVINCE

DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS HIGHWAYS & SHIPPING
Road Development Authority

SKILLS INTERNATIONAL (PVT) LTD

TYPICAL CROSS SECTION FOR PRDA ROAD

PROPOSED TYPICAL SECTION (TS) FOR PS ROAD - WEAK SOIL AREA



TS - N (TYPICAL SECTION FOR EMBNKMENT AREA)

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (CBR > 30 %)	GS
	GRANULAR CAPPING (CBR > 10 %)	GC
	SHOULDER FILL	

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
4. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
5. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
6. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm. IF THE THICKNESS < 100mm USE GRANULAR SUB BASE.
7. SELECT DRAIN AS PER SITE CONDITION
8. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECTED TO THE APPROVAL OF THE ENGINEER
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING

ADB FUNDED ROAD PROJECT NORTH CENTRAL PROVINCE

DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS HIGHWAYS & SHIPPING
Road Development Authority

REVISION | DATE

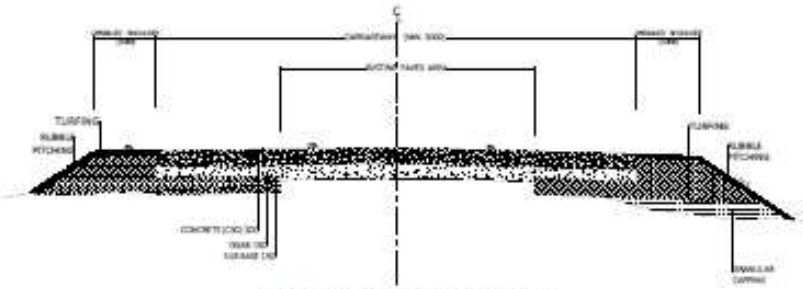
SKILLS INTERNATIONAL (PVT) LTD

TYPICAL CROSS SECTION FOR PRDA ROAD

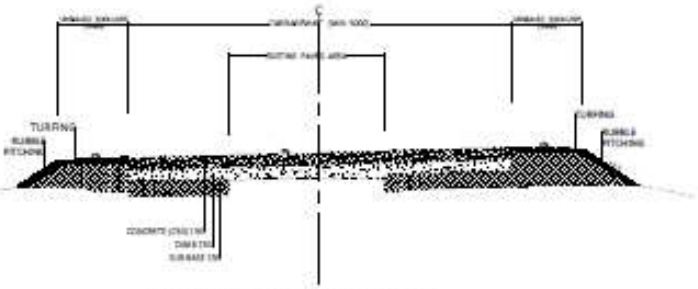
DWG NO :

DES :
DRW :
CHK :
DATE :

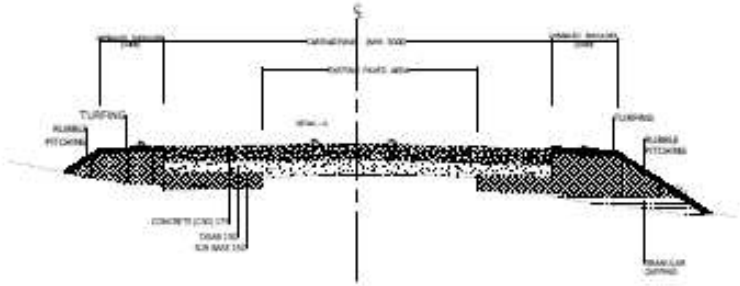
PROPOSED RIGID PAVEMENT TYPICAL SECTIONS FOR INUNDATING AREA



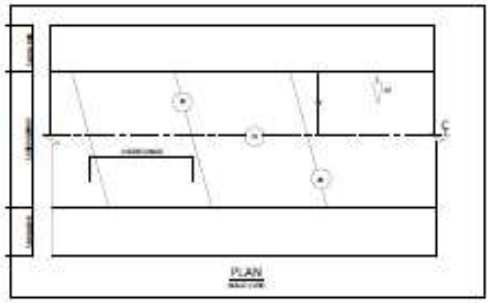
RTS - A (RIGID TYPICAL SECTION FOR RDA ROADS)



RTS – C (RIGID TYPICAL SECTION FOR PS ROADS)



RTS - B (RIGID TYPICAL SECTION FOR PRDA ROADS)



PLAN

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (CBR > 30 %)	GS
	GRANULAR CAPPING (CBR > 10 %)	GC
	SHOULDER FILL	

NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.

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ROAD PROJECT
NORTH CENTRAL PROVINCE

DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS HIGHWAYS & SHIPPING
Road Development Authority

REVISION | DATE

SKILLS INTERNATIONAL (PVT) LTD

TYPICAL CROSS SECTION
FOR RDA/PRDA & PS ROADS

DWG NO :

DES :
DRW :
CHK :
DATE :

APPENDIX II.3 MAP OF EXISTING QUARRY SITES

APPENDIX IV.1 FOREST APPROVAL LETTER

වන සංරක්ෂණ දෙපාර්තමේන්තුව

வன பரிபாலனத் திணைக்களம்

FOREST DEPARTMENT

ප්‍රධාන කාර්යාලය, සම්පත්පාය, තැ. පෙ. 3, බත්තරමුල්ල, ශ්‍රී ලංකාව
தலைமை அலுவலகம், "சம்பத்பாய", த. பெ. இல. 3, பத்தரமுல்லை, இலங்கை.
Head Office, Sampathpaya, P. O. Box 3, Battaramulla, Sri Lanka

දුරකථන / தொலைபேசி / Telephones: 2866631, 2866632, 2873540

ෆැක්ස් / தொலைநகல் / Fax: (94-1) 2866633

E-mail: Forest@slt.lk.

මගේ අංකය / எனது இல. / My Ref.: EMD/EIA/RD/rural roads/2014

ඔබේ අංකය / உமது இல. / Your Ref.:

දිනය / திகதி / Date: 2014.08. 27

අධ්‍යක්ෂ, (පරිසර සහ සමාජ සංවර්ධන)
මාර්ග සංවර්ධන අධිකාරිය.

<u>ග්‍රාමීය මාර්ගවල වැඩිදියුණු කිරීමේ ව්‍යාපෘතිය - මාර්ග සංවර්ධන අධිකාරිය</u>

ඉහත කරුණට අදාළව ඔබේ අංක RDA/DG/07/113, හා 2014.07.25, යන ලිපිය හා අංක RDA/ESD/iroad හා 2014.08.04, හා 2014.08.26 දිනැති ලිපි හා බලන්න.

02. මෙම වැඩ සටහන යටතේ වැඩි දියුණු කිරීමට යෝජිත මාර්ග වලට ඇතුළත් වන සංරක්ෂණ දෙපාර්තමේන්තුවේ පාලනය යටතේ පවත්නා වනාන්තර තුලින් වැටී ඇති මාර්ග සම්බන්ධව මෙම මෙහෙම පරීක්ෂා කර නිර්දේශ ඉදිරිපත් කිරීමට කළත් ගෙවන බව දන්වමි.

03. මෙහි සඳහන් අවශ්‍යතාවය සඳහා වනාන්තර තුලින් වැටී ඇති මාර්ගවල අමතර කිසිදු අළුත් ගොඩ කිරීමකින් හෝ ගස් ඉවත් කිරීමකින් තොරව, දිසා වන නිලධාරී ගේ අධීක්ෂණය යටතේ මෙම කාර්යයන් සිදු කිරීම සඳහා අවසර ලබා දීමට හැකියාව ඇති බව කාරුණිකව දන්වමි.

මහින්ද සෙනෙවිරත්න
වන සංරක්ෂක
(පරිසර සංරක්ෂණ හා කළමනාකරණ)
වන සංරක්ෂක ජනරාල් වෙනුවට

වන සංරක්ෂක ජනරාල් / Conservator-General of Forests: 2866616

වන සංරක්ෂක / Conservator of Forests

මෙහෙයුම් / Operations: 2866624
පර්යේෂණ / Research: 2866628
පාලන / Administration: 2866623

Translation of the letter

27.08.2014

Director
Environment and Social Development Division
RDA

Program for upgrading of Rural roads - Road Development Authority

This refers to the letter no. RDA/DG/07/113 dated 25th of July 2014 and subsequent letters no RDA/ESD/IROAD dated 4th of August 2014 and 26th of August 2014 on above.

It seems that it will take a long time to inspect and give specific conditions on roads that are within the forest areas.

Therefore, considering the urgency of this program, Forest Department is able to grant approval to carry out the road construction work without using additional lands and removal of any trees within sensitive forest areas and it is recommend to carry out the development work under the supervision of the relevant District forest Officer of the Department of Forest.

Mahinda Senevirathne
Forest Conservator
(Environment Management)
For Conservator General of Forests

APPENDIX VI.1 STANDARD EMP FOR RURAL ROADS

Appendix VI.1 : Environment Management Plan: Upgrading of Rural Roads- Northern Province

No	Action of the Project	Mitigation Measures	Approximate Location	Mitigation cost	Institutional responsibility	
					Implementing	Monitoring
A: Design and Pre construction stage						
01	Land acquisition	• Land acquisition will not be involved for the project except realignment of bends or construction of cross drainages in several locations based on the design requirements • If land need from the public, negotiation with property owners will be carried out with involvement of third party • All effort will be made to avoid land acquisition for the project	Several project roads	To be included under the total project cost	PIU and PIC	Client, PIC, DS
02	Selection of temporary use lands	• Effort shall be taken to minimize use of temporally land for the construction activities • Selection of temporary lands with considering of social and environmental background adhering to laws and regulations in the county • Approval for the temporally use lands shall be obtained from Engineer and need to sign agreement with the land owners.	Throughout the project roads if need to use temporary lands	To be included under the Contractors' cost	Contractor	PIU, PIC
03	Removal of trees	• Effort shall be taken to minimize removal of road side trees • No removal of religious and cultural important trees and avoid removal of trees from temporary use lands • Removal of tree should be based on the final design of the roads • Preparation of inventory prior to removal of potential trees and permission shall be taken from DS for removal • Remove trees shall be handed over to Timber cooperation or rightful owners	Throughout the all project roads	Removal cost of trees and compensatory tree planting	Contractor	PIU, PIC, Divisional Secretory (DS)

		• Provision shall be made to additional compensation tree planting program with native species • Organizing of tree planting program in compensation at least one tree cut with planting 3 trees • Tree planting should be done where ever possible with the help of DOFC, DS in the area, CBOs, NGOs etc.				
04	Shifting of public utilities	• Proper utility survey shall be carried out in order to identify the effected utilities and the exact locations • Consent & action shall be obtained from relevant service providers (CEB, NWS&DB, and SSLT) to minimize time and the duration of utility disruption • Approval shall be obtained from DOI for any proposed construction works on Irrigation canals • Advance notice to the public about time and the duration of utility disruption • Use of well trained and experienced machinery operators for the shifting/reestablishment of utilities to minimize accidental damage and functional purposes • Special attention shall be taken to provide relevant services to the public without long delay. • Water and other utilities shall be provided to the public if long delay to reestablish services with the instruction of PIC	Throughout the project roads: if those facilities are available and need to shifted for improvement activities	To be included under the total project cost	Contractor/Service providers	PIU, PIC, CEB, NWS&DB, SLT, DOI, Community water supply schemes
05	Impact to the public properties	• Construction activities are restricted to the existing ROW, no impact to the road side properties • Religious and culturally important structures within ROW will not be affected due to project activities • Action should be taken to minimize impact to the common properties within ROW	Throughout the project roads: if public properties are available	To be included under the cost of removing and repairing of common properties	Contractor	PIU, PIC
06	Hydrology and drainage	• Design of new culverts and other drainage structures by considering hydrological investigation report and consultation with Department of Irrigation and Provincial Irrigation Department • Provision of adequate drainage facilities to the	All cross drainages, streams and Aru cross the rods, inundation and	To be included under the project cost	PIU, contractor	PIU, PIC

		inundation and flood prone locations • Temporary diversion of water ways during construction should be ensured that no obstruction to natural water flow. • Construction work affecting water bodies should be prevented and work should be scheduled during the dry season. • Excavation of beds of any streams, irrigation systems and other water resources should be avoided by the Contractor. • Contractor shall not divert, close or block existing canals and streams in a manner that adversely affect downstream intakes.	flood prone locations			
B: Construction stage						
01	**Flood and inundation**	• Construction activities should be scheduled to avoid flood and inundation as a result of construction e.g. blockage of drainage path • Construction should minimize during the rainy season and drains should keep clean all the time without any obstruction. • Increase height of embankment in flood prone and inundation sections, construction of new culverts and other cross drainages as required to above locations • If flood and inundation cause due to negligence of the contractor, contractor should rectify all the damages with his own cost	Throughout the project roads, special attention to flood prone and inundation sections	To be included under the Contractors' cost	Contractor	PIU, PIC
02	**Extraction of construction materials**	• Suitable quarry sites, sand mines and borrow pits shall be identified at the initial stage within project influence area • Use existing licenses quarries and borrow pits which are approved by the GSMB and CEA as much as possible • Prior approval should be obtained from GS&MB/CEA for new quarries/borrow pits or sand mines • Use alternative sources for river sand such as sea sand and screen crusher fines with the consent of PIC • Quarries and borrow pits should not be located in productive agricultural lands, environment and public	Throughout the project area including Identified material extraction sites for the project	To be included under the Contractors' cost	Contractor	PIU, PIC

		sensitive areas • Restoration of borrow pits and quarry sites once after extraction based on IML instructions of GS&MB				
03	**Transportation and storage of construction materials**	• Lording of construction materials should not exceed the caring capacity of tucks • Materials shall be properly covered during transportation with no spillage • Lording, unloading and transport of materials shall not be inconvenient to the road side community or road users • Selection of sites for stock piling with the approval of PIC away from environment and public sensitive locations • Storage of fuel, lubricant and chemicals use for the construction activities on paved surface without contamination to the environment and storm water runoff • Approval shall be taken prior to use of local roads from relevant authorities and need to maintenance during the use by the Contractor	Throughout the project area including Identified material extraction sites, transportation roads, stockpiling yards	To be included under the Contractors' cost	Contractor	PIU, PIC
04	**Establishment of construction camp, offices and other temporally facilities**	• Labour camps and other temporally facilities should be located away from water bodies, residential and environment sensitive areas. • Provision of proper drainage facilities to the labour camps and prevent breeding of mosquitoes, flies and other vector borne diseases. • Provision of proper sanitary facilities to the labour camps offices and other temporally facilities including water, urinals, toilets bathing facilities, mosquito nets with adequate capacity of septic tanks and soak pits. • Handling and disposal of domestic solid waste in acceptable manner without contamination of surrounding environment with consultation of Local authorities. • Provision of first aid facilities and health care facilities to the labour camps offices and other temporally	Throughout the project area including labour camps, offices, other temporally facilities	To be included under the Contractors' cost	Contractor	PIU, PIC, LAs

		facilities Provision of garbage bins to labour camps, construction sites and those should be dumped regularly in a hygienic manner.				
05	**Impact to the ground and surface water quality and quantity**	• Temporary storage of material should be done in approved sites by the Engineer where natural drainage is not disturbed. • Construction activities effecting the quantity of water sources should be carried out during the dry season • All toxic and hazardous materials should be sited at least 500m away from water bodies and should prevent their entering into these locations. • Water that contaminate with fuel, oil and grease should not be directly released to storm water or natural water drainage system. • Vehicles and equipment used for the construction activities should be maintained in good condition, ensuring no undue leakage.	Throughout the project roads including streams, Aru, marshlands, wetlands, community and public wells	To be included under the Contractors' cost	Contractor	PIU, PIC
06	**Soil erosion, sedimentation and siltation**	• Construction activates: excavation and earth work around vulnerable area for soil erosion, inundation and flood prone mainly restricted to the dry season and removal of green cover vegetation of above locations shall be minimized • Temporary soil dumps should be removed from the construction sites and top soil shall be prevented to use for tree planting or turfing activities • Use of erosion control measures to the particular locations; ripraps, fiber mats, planting of deep rooted grasses, shrubs or other suitable plant species • Proper drainage facilities shall be established to the construction sites, material stock piling sites and dumping sites to drain water to the law laying areas • Silt traps shall be placed to the erodible locations specially construction sites of bridges and culverts • Temporally land use for the construction relate facilities should be reestablished to its original status before handover to rightful owners	Throughout the project area including temporally use lands for the project	To be included under the Contractors' cost	Contractor	PIU, PIC

07	**Contamination of soil**	• All the vehicles, machineries and other equipment shall be serviced only in vehicle surviving yards • Oil soaking materials shall be used to the places where possible leakage • Collected waste oil and soaking materials shall be correctly stored and disposed to the approved location • Oil traps should be provided to the vehicle surviving yards and fuel pilling points • Fuel and lubricant should be properly stored in impervious surface with collecting point of spills	Throughout the project area including temporally use lands for vehicle surviving yards and fuel storage	To be included under the Contractors' cost	Contractor	PIU, PIC
08	**Impact on biodiversity**	• Awareness programs should be organized for the workforce about conservation of important terrestrial & aquatic habitats with their flora and fauna. • Construction activities near forested areas, elephant habitats or around migration paths should be carried out under the instruction of DOFC and DWLC. • Material extraction sites, processing plants and waste disposal sites should not be located around above locations. • Construction activities around these locations should be limited to daytime and completed within short period of time. • No introduction of invasive alien species to the project area due to construction and other related activities. • Avoid removal of religious, cultural and aesthetic important trees as well as removal should not be impacted to the breeding season of birds, important roosting sites of mammals and other species of fauna	Around environment sensitive, ecological important and forested areas	To be included under the Contractors' cost	Contractor	PIU, PIC
09	**Construction debris and wastes**	• Selection of unproductive lands for disposal sites with adequate capacity away from public and environment sensitive locations • Excavated materials from the construction shall be re used to backfilling with the approval of PIC • Top soil 20 to 25 cm depth should be stored in properly for tree planting and turfing • Debris, residual spoil & dismantled & demolished	Throughout the project area including Identified disposal yards	To be included under the Contractors' cost	Contractor	PIU, PIC

		structures should not be sited to the agricultural lands, irrigation canals, flood prone locations, water bodies and wetlands or to the marshy areas. • All debris and residual spoil materials including left earth should be disposed to the location approved by the LAs.				
10	Traffic management and road safety	• Traffic Management Plan should be implemented to required location based on daily traffic volume with close coordination of local police • Insolation of traffic warning signs, temporary traffic lights, or flagmen at the construction site or location of road diversion • Since number of proposed roads under the project cross the railway line in different locations warning signs shall be provided both side of the railway crossing • Road furniture including footpaths, crash barrier, traffic signs, speed limits, pavement markers, center line etc., should be provided to the essential locations with the improvement of roads • Stage construction or provision of safe convenient passage to the vehicles/ passengers and livestock from the road side during the construction • Avoid/limit peak hours for transportation of construction materials, movement of heavy vehicles through urban and other public sensitive areas and use of alternative roads to avoid traffic congestion	Throughout the project roads	To be included under the Contractors' cost	Contractor	PIU, PIC
11	Air Quality	• Sprinkling of water in material extraction sites, processing plants and construction area as well as, road which use for the transportation of construction materials in regular intervals • Dust extraction unit should be fitted to the construction vehicles equipment and plants (Crushers, Asphalt, Concrete & Batching plants) • Materials shall be properly covered during transportation and proper storage to ensure	Throughout the project roads including public sensitive locations	To be included under the Contractors' cost	Contractor	PIU, PIC

		protection from dust and other emissions • Regularly maintenance of construction vehicles, equipment and machineries to meet National Emission Standards • Erection of dust barriers to the public, religious and other social important locations • Metal quarries, crushers and all the plants should be located at least 500m from public sensitive and residential areas				
12	**Noise and Vibration**	• Implement of Noise Control Regulations for construction equipment, machineries and plants (Crushers, Asphalt, Concrete & Batching plants) • Construction activities that create noise should be limited to day time from 6.00am to 6.00pm and no work during night time specially around residential and public sensitive locations • Special approval should be obtained from CEA for night time work through PIC • Exhaust silencers should be fitted to heavy construction equipment (Loaders, Compactors, Cranes & Plants), limit the noise less than 75db • Regularly maintenance of all construction vehicles, equipment and machineries to limit generate of excess noise and vibration • Contractor should be taken proper action to safeguard road side properties due to vibration of construction equipment and machineries	Throughout the project road including public sensitive locations	To be included under the Contractors' cost	PIU, PIC	
13	**Occupational Health and Safety**	• Organize awareness programs about personal safety of workers with proper briefing and training on safety precautions. • Provision of Personal Protective Equipment (PPE) high visibility jackets for night time work with necessary lighting arrangements. • Providing firefighting equipment to the construction sites and arrangement of the workshop and training program about use of firefighting equipment in emergency situation • Regular inspection of construction sites and other related locations to ensure use of proper PPE by workforce and their safety.	Throughout the project roads	To be included under the Contractors' cost	Contractor	PIU, PIC

		• Arrangement of first aid facilities to the all construction sites, trained paramedical personal and transport facilities for emergency situation. • Organize awareness program of STD/HIV/ AIDS for the work force to avoid risk of speeding STD.				
14	Planting of trees	• Tree planting shall be done in compensation at least one tree cut with 3 trees along the road side if the space available or find the suitable locations of project affected area with the approval of PIC • Identification of the suitable nurseries with native species for the tree planting process with the consent of DOFC • Planting of trees should be carried out with close coordination of DOFC with participation of local communities/ CBO • Proper maintenance of planted saplings for a minimum of 3 years	Throughout the project roads	To be included under the Contractors' cost	Contractor	PIU, PIC
C: Post construction and Operational stage						
1	Hydrology and drainage	• Rooting maintenance, repairing, removal of sediments and rubbish to avoid drainage congestions and obstruction to storm water flow.	All the drainage structures of project roads	Maintenance cost	During the maintenance period by Contractor after handed over by RDA, PRDA, LAs UC or MC	PIU/RDA
2	Air quality and noise	• Construction of noise and dust barriers to the required location • Enforcement of speed limits, traffic rules/ regulations and installation of sign boards to the particular locations.	All the project roads	Maintenance cost	During the maintenance period by Contractor after handed over by RDA, PRDA, LAs UC or MC	PIU/RDA/ PRDA/ LAs /UC / MC
3	Site restoration	• Restoration of borrow pits, crusher plants and quarry sites based on IML instructions of GS&MB. • Re-establishment of material storage yards, material processing plants and temporary constructed offices , labour camps and toilets to the original situation as per the agreement by the land owners	Temporary constructed labour camps and offices, Material extraction sites, storage yards	To be included under the Contractors' cost	Contractor	PIU/RDA/ PRDA/ LAs /UC / MC

4	**Maintenance of roads**	• Implementation of proper maintenance program after handed over by the contractor	All the project roads	Maintenance cost	RDA, PRDA, LAs UC or MC	PIU/RDA/ PRDA/ LAs /UC / MC
5	**Encroachment of ROW**	• Rooting checking and removal of unauthorized structures	All the project roads	Maintenance cost	RDA, PRDA, LAs UC or MC	PIU/RDA/ PRDA/ LAs /UC / MC
6	**Replanting of trees**	• Upkeep planted saplings for a minimum of 3 years until proper establishment in the ground • Survivability assessment should be carried out by the Contractor and need report to PIU regarding the status of compensatory tree plantation • Supplementary sapling should be implanted for dead plants	All replanted areas	To be included under the Contractors' cost	During the maintenance period by Contractor after handed over by RDA, PRDA, LAs UC or MC	PIU/RDA/ PRDA/ LAs /UC / MC

APPENDIX VI.2 SAMPLE EMC FOR RURAL ROADS

Appendix VI.2 : Environment Monitoring Checklists : Upgrading of Rural Roads- Northern Province

No	Action of the Project	Mitigation Measures	Location	Compliance status	Corrective actions if any
A: Design and Pre construction stage					
01	Land acquisition	• Land acquisition will not be involved for the project except realignment of bends or construction of cross drainages in several locations based on the design requirements • If land need from the public, negotiation with property owners will be carried out with involvement of third party • All effort will be made to avoid land acquisition for the project	Several project roads		
02	Selection of temporary use lands	• Effort shall be taken to minimize use of temporally land for the construction activities • Selection of temporary lands with considering of social and environmental background adhering to laws and regulations in the county • Approval for the temporally use lands shall be obtained from Engineer and need to sign agreement with the land owners.	Throughout the project roads if need to use temporary lands		
03	Removal of trees	• Effort shall be taken to minimize removal of road side trees • No removal of religious and cultural important trees and avoid removal of trees from temporary use lands • Removal of tree should be based on the final design of the roads • Preparation of inventory prior to removal of potential trees and permission shall be taken from DS for removal • Remove trees shall be handed over to Timber cooperation or rightful owners • Provision shall be made to additional compensation tree planting program with native species • Organizing of tree planting program in compensation at least one tree cut with planting 3 trees • Tree planting should be done where ever possible with the help of DOFC, DS in the area, CBOs, NGOs etc.	Throughout the all project roads		

04	Shifting of public utilities	• Proper utility survey shall be carried out in order to identify the effected utilities and the exact locations • Consent & action shall be obtained from relevant service providers (CEB, NWS&DB, and SSLT) to minimize time and the duration of utility disruption • Approval shall be obtained from DOI for any proposed construction works on Irrigation canals • Advance notice to the public about time and the duration of utility disruption • Use of well trained and experienced machinery operators for the shifting/reestablishment of utilities to minimize accidental damage and functional purposes • Special attention shall be taken to provide relevant services to the public without long delay. • Water and other utilities shall be provided to the public if long delay to reestablish services with the instruction of PIC	Throughout the project roads: if those facilities are available and need to shifted for improvement activities		
05	Impact to the public properties	• Construction activities are restricted to the existing ROW, no impact to the road side properties • Religious and culturally important structures within ROW will not be affected due to project activities • Action should be taken to minimize impact to the common properties within ROW	Throughout the project roads: if public properties are available		
06	Hydrology and drainage	• Design of new culverts and other drainage structures by considering hydrological investigation report and consultation with Department of Irrigation and Provincial Irrigation Department • Provision of adequate drainage facilities to the inundation and flood prone locations • Temporary diversion of water ways during construction should be ensured that no obstruction to natural water flow. • Construction work affecting water bodies should be prevented and work should be scheduled during the dry season. • Excavation of beds of any streams, irrigation systems and other water resources should be avoided by the Contractor. • Contractor shall not divert, close or block existing canals and streams in a manner that adversely affect downstream intakes.	All cross drainages, streams and Aru cross the rods, inundation and flood prone locations		

01	Flood and inundation	• Construction activities should be scheduled to avoid flood and inundation as a result of construction e.g. blockage of drainage path • Construction should minimize during the rainy season and drains should keep clean all the time without any obstruction. • Increase height of embankment in flood prone and inundation sections, construction of new culverts and other cross drainages as required to above locations • If flood and inundation cause due to negligence of the contractor, contractor should rectify all the damages with his own cost	Throughout the project roads, special attention to flood prone and inundation sections		
02	Extraction of construction materials	• Suitable quarry sites, sand mines and borrow pits shall be identified at the initial stage within project influence area • Use existing licenses quarries and borrow pits which are approved by the GSMB and CEA as much as possible • Prior approval should be obtained from GS&MB/CEA for new quarries/borrow pits or sand mines • Use alternative sources for river sand such as sea sand and screen crusher fines with the consent of PIC • Quarries and borrow pits should not be located in productive agricultural lands, environment and public sensitive areas • Restoration of borrow pits and quarry sites once after extraction based on IML instructions of GS&MB	Throughout the project area including Identified material extraction sites for the project		
03	Transportation and storage of construction materials	• Lording of construction materials should not exceed the caring capacity of tucks • Materials shall be properly covered during transportation with no spillage • Lording, unloading and transport of materials shall not be inconvenient to the road side community or road users • Selection of sites for stock piling with the approval of PIC away from environment and public sensitive locations • Storage of fuel, lubricant and chemicals use for the construction activities on paved surface without contamination to the	Throughout the project area including Identified material extraction sites, transportation roads, stockpiling yards		

		environment and storm water runoff • Approval shall be taken prior to use of local roads from relevant authorities and need to maintenance during the use by the Contractor			
04	Establishment of construction camp, offices and other temporally facilities	• Labour camps and other temporally facilities should be located away from water bodies, residential and environment sensitive areas. • Provision of proper drainage facilities to the labour camps and prevent breeding of mosquitoes, flies and other vector borne diseases. • Provision of proper sanitary facilities to the labour camps offices and other temporally facilities including water, urinals, toilets bathing facilities, mosquito nets with adequate capacity of septic tanks and soak pits. • Handling and disposal of domestic solid waste in acceptable manner without contamination of surrounding environment with consultation of Local authorities. • Provision of first aid facilities and health care facilities to the labour camps offices and other temporally facilities Provision of garbage bins to labour camps, construction sites and those should be dumped regularly in a hygienic manner.	Throughout the project area including labour camps, offices, other temporally facilities		
05	Impact to the ground and surface water quality and quantity	• Temporary storage of material should be done in approved sites by the Engineer where natural drainage is not disturbed. • Construction activities effecting the quantity of water sources should be carried out during the dry season • All toxic and hazardous materials should be sited at least 500m away from water bodies and should prevent their entering into these locations. • Water that contaminate with fuel, oil and grease should not be directly released to storm water or natural water drainage system. • Vehicles and equipment used for the construction activities should be maintained in good condition, ensuring no undue leakage.	Throughout the project roads including streams, Aru, marshlands, wetlands, community and public wells		
06	Soil erosion, sedimentation and siltation	• Construction activates: excavation and earth work around vulnerable area for soil erosion, inundation and flood prone mainly restricted to the dry season and removal of green cover	Throughout the project area including temporally use		

		vegetation of above locations shall be minimized • Temporary soil dumps should be removed from the construction sites and top soil shall be prevented to use for tree planting or turfing activities • Use of erosion control measures to the particular locations; ripraps, fiber mats, planting of deep rooted grasses, shrubs or other suitable plant species • Proper drainage facilities shall be established to the construction sites, material stock piling sites and dumping sites to drain water to the law laying areas • Silt traps shall be placed to the erodible locations specially construction sites of bridges and culverts • Temporally land use for the construction relate facilities should be reestablished to its original status before handover to rightful owners	lands for the project		
07	Contamination of soil	• All the vehicles, machineries and other equipment shall be serviced only in vehicle surviving yards • Oil soaking materials shall be used to the places where possible leakage • Collected waste oil and soaking materials shall be correctly stored and disposed to the approved location • Oil traps should be provided to the vehicle surviving yards and fuel pilling points • Fuel and lubricant should be properly stored in impervious surface with collecting point of spills	Throughout the project area including temporally use lands for vehicle surviving yards and fuel storage		
08	Impact on biodiversity	• Awareness programs should be organized for the workforce about conservation of important terrestrial & aquatic habitats with their flora and fauna. • Construction activities near forested areas, elephant habitats or around migration paths should be carried out under the instruction of DOFC and DWLC. • Material extraction sites, processing plants and waste disposal sites should not be located around above locations. • Construction activities around these locations should be limited to daytime and completed within short period of time. • No introduction of invasive alien species to the project area due	Around environment sensitive, ecological important and forested areas		

		to construction and other related activities. • Avoid removal of religious, cultural and aesthetic important trees as well as removal should not be impacted to the breeding season of birds, important roosting sites of mammals and other species of fauna			
09	Construction debris and wastes	• Selection of unproductive lands for disposal sites with adequate capacity away from public and environment sensitive locations • Excavated materials from the construction shall be re used to backfilling with the approval of PIC • Top soil 20 to 25 cm depth should be stored in properly for tree planting and turfing • Debris, residual spoil & dismantled & demolished structures should not be sited to the agricultural lands, irrigation canals, flood prone locations, water bodies and wetlands or to the marshy areas. • All debris and residual spoil materials including left earth should be disposed to the location approved by the LAs.	Throughout the project area including Identified disposal yards		
10	Traffic management and road safety	• Traffic Management Plan should be implemented to required location based on daily traffic volume with close coordination of local police • Insolation of traffic warning signs, temporary traffic lights, or flagmen at the construction site or location of road diversion • Since number of proposed roads under the project cross the railway line in different locations warning signs shall be provided both side of the railway crossing • Road furniture including footpaths, crash barrier, traffic signs, speed limits, pavement markers, center line etc., should be provided to the essential locations with the improvement of roads • Stage construction or provision of safe convenient passage to the vehicles/ passengers and livestock from the road side during the construction • Avoid/limit peak hours for transportation of construction materials, movement of heavy vehicles through urban and other public sensitive areas and use of alternative roads to	Throughout the project roads		

		avoid traffic congestion			
11	Air Quality	• Sprinkling of water in material extraction sites, processing plants and construction area as well as, road which use for the transportation of construction materials in regular intervals • Dust extraction unit should be fitted to the construction vehicles equipment and plants (Crushers, Asphalt, Concrete & Batching plants) • Materials shall be properly covered during transportation and proper storage to ensure protection from dust and other emissions • Regularly maintenance of construction vehicles, equipment and machineries to meet National Emission Standards • Erection of dust barriers to the public, religious and other social important locations • Metal quarries, crushers and all the plants should be located at least 500m from public sensitive and residential areas	Throughout the project roads including public sensitive locations		
12	Noise and Vibration	• Implement of Noise Control Regulations for construction equipment, machineries and plants (Crushers, Asphalt, Concrete & Batching plants) • Construction activities that create noise should be limited to day time from 6.00am to 6.00pm and no work during night time specially around residential and public sensitive locations • Special approval should be obtained from CEA for night time work through PIC • Exhaust silencers should be fitted to heavy construction equipment (Loaders, Compactors, Cranes & Plants), limit the noise less than 75db • Regularly maintenance of all construction vehicles, equipment and machineries to limit generate of excess noise and vibration • Contractor should be taken proper action to safeguard road side properties due to vibration of construction equipment and machineries	Throughout the project road including public sensitive locations		
13	Occupational Health and Safety	• Organize awareness programs about personal safety of workers with proper briefing and training on safety precautions. • Provision of Personal Protective Equipment (PPE) high visibility jackets for night time work with necessary lighting arrangements. • Providing firefighting equipment to the construction sites and arrangement of the workshop and training program about use	Throughout the project roads		

		of firefighting equipment in emergency situation • Regular inspection of construction sites and other related locations to ensure use of proper PPE by workforce and their safety. • Arrangement of first aid facilities to the all construction sites, trained paramedical personal and transport facilities for emergency situation. • Organize awareness program of STD/HIV/ AIDS for the work force to avoid risk of speeding STD.			
14	Planting of trees	• Tree planting shall be done in compensation at least one tree cut with 3 trees along the road side if the space available or find the suitable locations of project affected area with the approval of PIC • Identification of the suitable nurseries with native species for the tree planting process with the consent of DOFC • Planting of trees should be carried out with close coordination of DOFC with participation of local communities/ CBO • Proper maintenance of planted saplings for a minimum of 3 years	Throughout the project roads		
1	Hydrology and drainage	• Rooting maintenance, repairing, removal of sediments and rubbish to avoid drainage congestions and obstruction to storm water flow.	All the drainage structures of project roads		
2	Air quality and noise	• Construction of noise and dust barriers to the required location • Enforcement of speed limits, traffic rules/ regulations and installation of sign boards to the particular locations.	All the project roads		
3	Site restoration	• Restoration of borrow pits, crusher plants and quarry sites based on IML instructions of GS&MB. • Re-establishment of material storage yards, material processing plants and temporary constructed offices , labour camps and toilets to the original situation as per the agreement by the land owners	Temporary constructed labour camps and offices, Material extraction sites, storage yards		
4	Maintenance of roads	• Implementation of proper maintenance program after handed over by the contractor	All the project roads		
5	Encroachment of ROW	• Rooting checking and removal of unauthorized structures	All the project roads		
6	Replanting of trees	• Upkeep planted saplings for a minimum of 3 years until proper establishment in the ground • Survivability assessment should be carried out by the Contractor and need report to PIU regarding the status of compensatory tree plantation • Supplementary sapling should be implanted for dead plants	All replanted areas		

APPENDIX VI.3 SAMPLE EMC FOR NATIONAL ROADS

I. Environmental Monitoring Checklist during Design and Pre-Construction Stage

For Reconstructed Roads under OPRC Package

District:
Road Name:
Road ID:
Total length:
Report No. and date:
Completed by:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1..	Climate Change Consideration and Vulnerability screening	○ Compliance to climate change vulnerability check point given under EARF and adoption of necessary mitigatory measures as may be required ○ Efforts shall be made to plant additional trees for increasing the carbon sink. The trees may be planted with help of DoF (Department of Forest) and space for additional planting will be explored with the help of DoF, Divisional Secretary (DS) and Community Based Organizations (CBO).	Throughout the subproject and other possible areas of tree planting		
2..	Clearing of vegetation and removing trees	○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from DoF shall be obtained for cutting of roadside trees ○ Cut trees shall be handed over to the Timber Corporation. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. ○ Only native species with the consent of DoF will be selected for replanting and locations for tree replanting	Throughout the subproject area		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		will be as closer as possible to the tree removed. o And if road side space for replanting is not available, other possible locations such as schools, public areas will be explored with the help of DoF, DS and CBOs of the area. o Provision shall be made for additional compensatory tree plantation. o Any leftover of trees shall be removed and disposed in approved manner.			
3.	Shifting of utilities	o The proposed Right of Way (ROW) shall be clearly demarcated on the ground. o All efforts will be made to minimize shifting of utilities o Utility shifting shall be planned in consultations and concurrence of the relevant service provider. o Required permissions and necessary actions will be taken from relevant service provider on a timely basis for removing and shifting utility structures before road construction activities begin. o The public/users of the particular service should be aware well in advance about the timing of the shifting/removal of the relevant utility lines when the service will be disrupted	Utility poles located along either the side of the road which may be shifted due to the road improvement		
4.	Impacts to common properties	o All efforts will be made to minimize shifting of common properties. o Structures with religious importance will not be damaged o Any common property built within the existing ROW and to be removed due to road improvement will be reconstructed as to the satisfactory level to the relevant owner	Throughout the road with special attention to any common property to be shifted		
5.	Hydrology and	o Provision of adequate cross drainage structure shall be	Near all drainage crossings, rivers,		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
	Drainage	made to ensure smooth passage of water and maintaining natural drainage pattern of the area. Here, special attention should be paid for flood prone areas if any. ○ The discharge capacity of the cross drainage structure shall be designed accordingly. ○ Provision of adequate drainage structures shall be made in water stagnant/logging areas. ○ The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. ○ Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides.	streams and tanks.		
6.	Grievance Redress	○ Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

NOTE: Each report must enclose photographs to demonstrate the mitigation measures implemented

II. Environmental Monitoring Checklist during Construction Stage
For Reconstructed Roads under OPRC Package

District:
Road Name:
Road ID:
Total length:
Report No. and date:
Completed by:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.	Sourcing and transportation of construction material	**Borrow Earth:** ○ The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. ○ And if new borrow pits are opened for the subproject, necessary approvals and licenses should be obtained from GSMB and CEA. And all conditions laid down in such licenses should be strictly adhered. ○ All completed borrow pits should be rehabilitated to satisfy conditions given mining license of GSMB ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. **Aggregate :** ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIC through PIC. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage.	Throughout the subproject area with special attention to borrow pits and quarries		

		Transportation of Construction Material ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation.			
2.	Loss of Productive Soil, erosion and land use change	○ The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Shrubs shall be planted in loose soil area. ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over to land owner.	Throughout the subproject area and camps sites, storage areas and temporary offices		
3.	Compaction and Contamination of Soil	○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. ○ Fuel and lubricants shall be stored at the predefined storage location. ○ The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. ○ All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. ○ To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and	Throughout the project area with special attention to paddy and other agricultural lands		

		hazardous sign be displayed) and sold off to relevant parties. ○ Any land degraded due to construction activities should be restored to the satisfactory level of the owner			
4.	Establishment of Construction Camp, temporary office and storage area	○ Construction camp sites and storage areas shall be located away from any local human settlements, water bodies and forested areas (minimum 0.2 km away) and preferably located on lands, which are not productive (barren/waste lands presently). ○ The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. ○ The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipments (PPEs) such as helmet, boots, earplugs for workers, first aid and fire fighting equipments shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. ○ Provision shall be made for domestic solid waste disposal in acceptable manner. The solid waste shall be handed over to the waste collecting system of the Local Authority (LA) of the area and wastewater should be disposed with the approval of the PIC. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage.	Throughout the subproject area with special attention to labour camps, storage areas and office premises		

5.	Construction Debris and waste	○ Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. ○ Unusable debris material and removed pavements of roads should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority such as LA/DS. ○ The bituminous wastes shall be disposed in secure manner and environmentally accepted manner. ○ In establishing disposal sites, unproductive/wastelands shall be selected with the help the PIC and villagers. The dumping site should be of adequate capacity. It should be located without causing nuisance to residential areas. Dumping sites should also be away from water bodies to prevent any contamination of these bodies.	Throughout the subproject area and all disposal sites		
6.	Air and Noise Quality and vibration	○ Vehicles delivering loose and fine materials like sand and aggregates shall be covered. ○ Dust suppression measures such as water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. ○ Batching plants and asphalt (hot mix) should be operated with necessary licenses (Environmental Protection License (EPL) and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and should not disturb normal life of residents. ○ Material storage areas shall also be located downwind of the habitation area. ○ Hot mix plant shall be fitted with stack of adequate height (30m) or as may be prescribed in the EPL to ensure enough dispersion of exit gases. ○ Diesel Generators (DG) shall also be sound proof or fitted with stack of adequate height. ○ Construction vehicles and machineries shall be periodically	Throughout the subproject road with special attention to schools, hospitals and religious places		

		maintained. ○ All heavy equipment and machinery shall be fitted in full compliance with the national regulation, Noise Control Regulations - Extra Ordinary Gazette No. 924/12 May 1996 amended by Extra Ordinary Gazette 937/7 April 1997. ○ Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration.			
7.	Tree plantation	○ Compensatory afforestation shall be made on 1:3.ratio basis. ○ Only native species should be selected with the consent of DoF for replanting ○ Additional trees shall be planted wherever feasible. ○ Follow up maintenance of planted saplings will be carried out for a minimum of 3 years	Throughout the road.		
8.	Ground Water and Surface Water Quality and Availability	○ The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. ○ Water intensive activities shall not be undertaken during dry period to the extent feasible. ○ Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible. ○ Preventive measures such as proper storage of unsuitable soil, construction chemicals, servicing construction vehicles in approved sites, slope stabilisation, etc shall be taken for prevention of siltation and pollution of water bodies.	Throughout road with special attention to streams, tanks and marshes		
9.	Occupational Health and Safety	○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. ○ First aid facility should be readily available at every construction site throughout the construction period	Throughout the road		

		○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA.			
10.	Traffic Management and Road Safety	○ Identify the areas where temporary traffic diversion may be required. ○ Prepare appropriate traffic movement plan approved by PIC and RDA for ensuring continued safe flow of traffic, pedestrians and all road users during construction. ○ Wherever, cross drainage structure work require longer construction time and road is to be blocked for longer duration, the PIC shall define appropriate measures for traffic diversion before the start of the construction. ○ Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should comply with the Road Safety Manual of RDA. ○ It is proposed to discuss with the Department of Railways for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing. ○ Road furniture including footpaths, railings, storm water drains, crash barrier, traffic signs, speed zone signs, pavement markers and any other such items will be provided to enhance the road safety where necessary at the completion of the project	Throughout the subproject area		
11.	Biological impacts	○ No solid waste or spoil dumping sites, hot mix plants and worker camps should be located within or close to the protected areas. Prior approval should be taken from the relevant department for entrance or temporary alteration of properties belongs to such areas. Strict worker force supervision should be carried out by the contractor when conducting construction work within the area and the	Near forest reserves, national parks, sanctuaries if any		

		construction works should be completed within a minimum specified time period.			
12.	Road reconstruction within flood prone areas	○ Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains. The contractor shall take all measures necessary or as directed by 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, contractor shall compensate for any loss of income or damage as a result. ○ When working in flood prone areas during rainy season the contractor shall avoid storing materials, chemicals and other items of work in areas where those can be washed away by the floods.	Flood prone areas crossed by the roads if any		
13.	Grievance Redress	○ Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

NOTE: Each report must enclose photographs to demonstrate the mitigation measures implemented

III. Environmental Monitoring Checklist during Post-Construction or Operation Stage

For Reconstructed Roads under OPRC Package

District:
Road Name:
Road ID:
Total length:
Report No. and date:
Completed by:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.	Site restoration	○ All construction camp/temporary office/material storage areas are to be restored to its original conditions or as agreed with the land owner. ○ The borrow areas rehabilitation will be as per the conditions laid down in GSMB approval.	All locations of construction camps/temporary office/ material storage, and borrow areas		
2.	Disposal of unsuitable material	○ All unsuitable material generated due to maintenance works including soil, vegetation, removed degraded road surface etc... should be disposed only at approved locations	Throughout the road		
3.	Hydrology and Drainage	○ Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. ○ Renovation of the drainage system by repairing removing encroachments/ congestions shall be regularly conducted	At project road locations with drainage structures		
4.	Degradation of water quality	○ Chemicals used for road maintenance should be carefully handled and stored	Throughout the road with special care		

		○ Storage facilities should sited well away from water bodies	near water bodies		
5.	Air and Noise Quality	○ Placing sign boards for speed limitation and honking restrictions to be enforced near sensitive locations. ○ Removal of dust & mud collected on road surface to avoid dust emanation	Throughout the road		
6.	Extraction of material for road maintenance	○ Construction material shall be purchased only from licensed suppliers	Throughout the road		
7.	Tree replanting	○ Contractor to undertake survivability assessment and report to PIC the status of compensatory tree plantation. ○ Additional plants should be planted for dead plants if any	Tree replanted areas		
8.	Road safety	○ Safety of road users could be ensured during repairing of carriageway and hydraulic structures by placing standard sign boards, barricading of the repairing site etc...	Throughout the road		
9.	Grievance Redress	○ Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

NOTE: Each report must enclose photographs to demonstrate the mitigation measures implemented

APPENDIX VI.4 SAMPLE EMOP

Annex VI.4 : Common Environment Monitoring Plan (EMOP) for North Province

Environmental component	Project Stage	Parameters	Frequency	Standard	Unit cost	Total Cost	Responsibility	
							Implementation	Supervision
Air	Design stage	TSPM, PM_{10}, NO_2 , CO, So_2 , Pb	A single time	National Air Quality Standers of Sri Lanka	Rs. 22000.00	Rs. 22000.00	RDA/PRDA by engaging approved monitoring agency of GoSL	CEA
	Construction stage	TSPM, PM_{10}, NO_2 , CO, So_2 , Pb	Three times per year/ two years	National Air Quality Standers of Sri Lanka	Rs. 22000.00	Rs. 132000.00	Contractor by engaging approved monitoring agency of GoSL	CEA/ RDA/PRDA
	Operation	TSPM, PM_{10}, NO_2 , CO, So_2 , Pb	Single time Per year/ 3 years	National Air Quality Standers of Sri Lanka	Rs. 22000.00	Rs. 66000.00	By RDA/PRDA, by engaging approved monitoring agency by GoSL	CEA
Water	Design stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli	A single time	National water Quality Standers	Rs. 8500.00	Rs. 8500.00	RDA/PRDA by engaging approved monitoring agency of GoSL	CEA
	Construction Stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli	Three times per year/ two years	National water Quality Standers	Rs. 8500.00	Rs. 51000.00	Contractor by engaging approved monitoring agency of GoSL	CEA/ RDA/PRDA
	Operation stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli	Single time Per year/ 3 years	National water Quality Standers	Rs. 8500.00	Rs. 25500.00	RDA/PRDA by engaging approved monitoring agency of GoSL	CEA

Noise	Design Stage	dB levels	A single time	National Environmental Noise Control Regulations	Rs. 4200.00	Rs. 4200.00	RDA/PRDA, by engaging approved monitoring agency of GoSL	CEA
	Construction Stage		Three times per year/ two years	National Environmental Noise Control Regulations	Rs. 4200.00	Rs. 25200.00	Contractor by engaging approved monitoring agency of GoSL	CEA/ RDA/PRDA
	Operation stage		Single time Per year/ 3 years	National Environmental Noise Control Regulations	Rs. 4200.00	Rs. 12600.00	RDA/PRDA, by engaging approved monitoring agency of GoSL	CEA
Total						**Rs. 347000.00**		

TSPM: Total Suspended Particulate Matter
PM_{10}: Particulate Matter < 10
NO_2: Nitrogen Dioxide
CO: Carbon Monoxide
So_2: Sulphur Dioxide
Pb: Lead
EC: Electrical Conductivity
DO: Dissolved Oxygen
TSS: Total Suspended Solids
BOD: Biological Oxygen Demand
E. Coli: Escherichia coli
pH: Potential of hydrogen
CEA: Central Environment Authority
RDA: Road Development Authority
PRDA: Provincial Road Development Department