TAMILNADU ROAD SECTOR PROJECT-II

Environmental and Social Management Framework(ESMF) - Draft

April 2020 (Revised)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX

Executive Summary

E 1. Project Description

The Government of Tamil Nadu (GoTN) is currently implementing the World Bank supported Second Tamil Nadu Road Sector Project II (TNRSP II) which is improving and maintaining, a part of the state's Core Road Network. The GoTN has requested the World Bank for Additional Financing to scale up the project interventions in TNRSP II. The Additional Financing will provide extra resources to two sub-components under the parent project and support the introduction of four new sub-components. The AF will finance the upgrading of seven additional road sections with an approximate total length of around 110 km and the GoTN will fund the maintenance of the seven roads constructed during the project. The project has a renewed focus on road safety and shall provide institutional support for transport and logistics services

The Additional Financing has adopted framework approach provision under TNRSP II. The parent project's Environmental Management Framework (EMF) is updated to Environmental and Social Management Framework (ESMF) by incorporating the social safeguard measures, increase in scope of the TNRSP-II project through Additional Financing (AF), the lessons learnt from the implementation of TNRSP-II to date, the recommendations of guidance notes issued by the World Bank and recent amendments in environmental regulations. All the possible environmental impacts along with mitigation and management measures have been compiled in the ESMF.

E 2. Purpose and use of ESMF

The purpose of ESMF is to (a) provide a framework for managing environmental and social responsibilities efficiently by integrating the overall operations; (b) help in the management of environmental programs in a comprehensive, systematic, planned and documented manner; and (c) address environmental and social concerns through the allocation of resources, assignment of responsibilities, procedures, and processes, and focuses on continual improvement of the system. The provisions under the framework have been drafted in accordance with the applicable statutory provisions of Government of India and Tamil Nadu, and for compliance with the World Bank Safeguard Policies.

E 3. Legal and Institutional Framework

A range of laws, regulations, rules of the Government of India will be followed, along with the World Bank policies and directives on environmental and social safeguards applicable to the project are (a) OP 4.01 Environmental Assessment, (b) OP 4.04 Natural Habitats, (c) OP 4.36 Forest, (d) OP 4.12 Involuntary Resettlement, (e) OP 4.10 Indigenous People, and (f) OP 4.11 Physical Cultural Resources.

E 4. Summary of Statutory Clearance

A. **Pre-construction Stage (PIU, Responsibility)**: (a) Diversion of forest land for Non-forest use, (b) Permission for removal of avenue tree within the RoW, (c) Environmental Clearance (Applicable, if any State Highway project road under TNRSP–II is passing in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive area), (d) Wildlife Clearance (Applicable if the Project road passes either through protected areas such as National Park, Wildlife Sanctuary, Bird Sanctuary, Conservation Reserve or Biosphere Reserve or Eco-Sensitive Zones of protected areas), (e) Permission for Eco-Sensitive Zone (Applicable, If National Park, Wildlife Sanctuary, Bird Sanctuary, Tiger Reserve or Biosphere are situated with 10 km

distance from the project road).

B. **Construction Stage (Contractor Responsibility)**: (a) Consent to Establish and Operate Hot mix plant, Crushers, Batching Plant and Labour Camps, (b) Authorisation for Disposal of Hazardous Wastes, (c) Permission for Sand Mining from River bed, (d) Permission for Opening of New Quarry, (e) Storage of Hazardous Chemicals (Fuel Oils) and Explosives, (f) Permission for Withdrawal of Ground Water, (g) Pollution Under Control Certificate, (h) Employing Labour, and (i) Registration of Workers.

E 5. Procedure for conducting Environmental and Social Impact Assessment

ESMF describes the process to be adopted to screen the subprojects to decide on including or excluding them; to categorize based on defined criteria and to manage these using both full-fledged ESIAs and ESMPs or using Generic ESMP. ESMF describes the process, institutional mechanism, and budget to undertake screening, scoping, assessing impacts and incorporation of mitigation measures in bid document, monitoring and evaluation. The categorisation of the projects would be made on basis of environmental and social impacts.

Sub-projects which may have significant adverse environmental and social impacts that are sensitive, diverse and unprecedented; thus, necessitating Environmental and Social Impact Assessment (ESIA) are categorised as E1/S1. Such subprojects would require detailed site and activity specific Environmental and Social Assessment, project impact identification and specific mitigation measures to take care of anticipated negative impacts. Subprojects that are expected to have potential adverse environmental and social impacts on human populations or environmentally important areas are less adverse than those of Category A are categorised as E2/S2. Sub Projects which are expected likely to have minimal or no adverse environmental and social impacts are categorized as E3/S3 projects. Hence no environmental or social assessment is required for an E3/S3 project beyond screening. In case a subproject has more than one among these subcomponents, the higher category applicable for any subcomponent would be considered as the category for the subproject as a whole.

ESMF provides guidance to prepare subproject ESIA on Project Screening, Impact Assessment, Institutional Framework for implementation and O&M stages, developing site specific ESMP and including ESMP in contract documents, environmental monitoring plan, supervision and reporting, and monitoring and evaluating the effectiveness of subproject level environmental management. ESMF provides guidance on requirements and preparation of Resettlement and Rehabilitation Action Plan (RAP) to address sub-project involving land acquisition against compensation or loss of livelihood or shelter. ESMF also provides guidance on need and process to be adopted for Cumulative Environmental Impact Assessment, as under the AF many of sub-projects locations are still yet to be confirmed or design are under preparation and implementation of sub-projects have the potential for cumulative impacts.

E 6. Implementation Arrangement

The existing Environmental Cell and Social Development Unit in the TNRSP is well structured and well-functioning as demonstrated in the on-going TNRSP-II. Hence, the same institutional arrangement will be adopted for additional financing. The PIU (TNRSP-II), Construction Supervision Consultant and Contractors are key primary parties responsible to ensure implementation of environmental and social commitments made to regulatory agencies, lending agencies, and other

stakeholders are met, with their roles and responsibilities being clearly defined in the ESMF document**.**

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1 INTRODUCTION

1.1 Overview

The objective of this Environmental and Social Management Framework (ESMF) is to assist the Tamil Nadu Road Sector Project-II, a wing of Highways Department, in the preparation of Environmental and Social Impact Assessment (ESIA) Reports to the required standard for the roads which are undergoing up-gradation (strengthening and widening) through preparation of Detailed Project Reports (DPR's). This environmental and social management framework is prepared based on the existing environmental rules and regulations adopted by the Ministry of Environmental, Forests and Climate Change (MoEF&CC), India and World Bank Operational Policies. This ESMF contains concepts and good practices for roads under Tamil Nadu Road Sector Project-II, Highways Department to adopt while preparing the ESIA report. This ESMF has been structured in such a way to act as a self-explanatory guide with separate procedures for conducting ESA with Impact prediction, mitigation and management measures.

1.2 Rationale and Background

The Government of Tamil Nadu (GoTN), through the Highways Department, has taken up up-gradation, maintenance and improvement of identified core road network for a length of approx. 2079 km in the state. The roads selected for up-gradation are shown in Figure 1. The GoTN has proposed to take up upgrading of about 574 km length of roads with financial assistance from the World Bank. In line with the prioritization exercise, fourteen corridors have been selected in total, aggregating to about 574 km length under TNRSP- II, where there are no sensitive environmental and major social issues are involved. Out of fourteen, eleven corridors have been proposed to implement through EPC mode and remaining three corridors through PPP mode. The proposed improvement includes the strengthening and upgrading of non-standard two-lane roads to 2-lane-with-paved-shoulders/4-lanes. The Environmental Screening (ES), Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for roads under Phase I (i.e. a total road length of about 428 km) have been prepared and finalised. The EIA summary and EMPs for Phase I corridors have been prepared and disclosed.

Table 1: Corridors under EPC mode

Contract	SH.no	Name of the Project Road	Length in Km
EPC 01	SH116	Upgrading Kanchipuram – Vandavasi Road (SH 116) km 14/300 to km 36/700	22.342
	SH 58	Upgrading Madras – Chengalpattu – Kancheepuram – Arakkonam – Thiruthani Road (SH 58) km 0/000 to km 26/811	26.140
EPC 02	SH 4	Upgrading Arcot – Villupuram Road (SH 4) km 29/800 to km 110/165 and km 113/325 to km 114/600	83.075
EPC 03	SH 9	Upgrading Cuddalore – Chittor Road (SH 9) km 41/700 to km 44/000 and km 45/000 to km 66/190 and construction of a new link road between SH 9 and SH 137 (km 66/190 to km 71/147)	28.450
EPC 04	SH 70	Upgrading Vridhachalam – Parangipettai Road (SH 70) km 0/000 to km 35/800	35.800
EPC 05	SH 86	Upgrading Omalur – Sankari – Thiruchengode – Paramathy Road (Sh 86) km 54/800 to km 81/000	26.200
EPC 06	SH 79	Upgrading Malliyakarai – Rasipuram – Trichengode – Erode	50.525

Contract	SH.no	Name of the Project Road	Length in Km
		Road (SH 79) km 0/000 to km 30/600 and km 51/400 to km 71/300	
EPC 07	SH 95	Upgrading Mohanur – Namakkal – Senthamangalam – Rasipuram Road (SH 95) km 0/000 to km 13/100	13.385
EPC 08	SH 89	Upgrading Nanguneri – Bharatavaram – Ovari Road (SH 89) upto ECR Junction km 0/000 to km 35/200	35.200
EPC 09	SH 44	Upgrading Paruvakudi – Kovilpatti – Ettayapuram – Vilathikulam – Vembar Road (SH 44) km 22/500 to km 38/750 and km 41/300 to km 56/700	31.650
EPC 10	SH 41	Upgrading Rajapalayam – Sankarankoil – Tirunelveli Road (SH 41) km 1/800 to km 28/000 and km 33/800 to km 82/800	75.200
Total			**427.967**

Source: TNRSP

The Environmental Screening, Environmental Impact Assessment and Environmental Management Plan for roads of Phase II of TNRSP-II (i.e. a total road length of about 146 km) are under preparation stage.

Table 2: Corridors under PPP mode

Contract	SH.no	Name of the Project Road	Length in Km
PPP 01	SH 15	Gobi – Erode Road (SH 15) km 123/000 to km 153/600	30.60
PPP 02	SH 37	Oddanchatram – Dharapuram – Tiruppur Road (SH 37) km 37/400 to km 108/400	70.20
PPP 03	SH 39	Tirunelveli – Tenkasi Road (SH 39) km 5/000 to 50/600	45.64
Total			**146.44**

Source: TNRSP

The Environmental Management Framework (EMF)[1] for TNRSP –II has been prepared based on the information analysed from environmental screening, environmental impact assessment and environmental management plan. To ensure implementation of mitigation measures during up-gradation of roads under TNRSP-II, necessary environmental safeguards have been incorporated in the EMF and road specific EMP.

The Government of Tamil Nadu (GoTN), has now proposed to seek Additional Finance (AF) from the World Bank for improving seven road projects totaling about 109km. In view of that, the Environmental Management Framework (EMF) has to be updated for the Additional Financing (TNRSP-II) considering the proposed new components, the lessons learnt from the implementation of TNRSP-II to date, the recommendations of guidance notes issued by the World Bank and recent amendments in environmental regulations. All the possible environmental impacts along with mitigation and management measures have been compiled in the EMF.

Table 3: Corridors under Additional Financing

[1]The Environmental Management Framework (EMF) (March 2015) was prepared for the Second Tamil Nadu Road Sector Project to identify the required environmental management measures that needs to be taken by Highway Department during the planning, design, construction and operations of the project, in order to ensure compliance with own requirements of the Government of India, Government of Tamil Nadu and those of the World Bank.

Sl.no	SH/ MDR. no	Name of the Project Road	Length in Km
1.	SH 116	Four laning and strengthening of Kanchipuram – Vandavasi road (km 2.915 – km 14.115 uptoCheyyar SEZ) including Vandavasi Bypass(Two laning with Paved Shoulder) Connecting SH-116 with SH-5 & 4-Laning of Kanchipuram-Thiruvathipuram road SH-5A Km.0.000 to Km.2.600	17.169
2.	SH 222	Four laning and strengthening of Omalur- Mecheri (km 0.000 – km 14.600)	14.600
3.	SH-30	Strengthening and widening of Malliyakarai –Attur road (km 81.054 – km 91.200)	10.146
4.	SH-15	Four laning and strengthening of Ooty – Kothagiri – Mettupalayam – Sathy – Gobi – Erode road (km 153.600 – km 161.620)Chithode –Erode Section	8.020
5.	MDR-108	Strengthening and widening of Erode – Chennimalai (km 0.000 – km 24.000)	24.000
6.	SH-139	Four laning and strengthening of Ariyalur – Reddipalayam (km 0.0 – km 12.400)	12.400
7.	SH-4	Four laning and strengthening of Arcot – Arni road (km 0.000 – km 24.600)	24.600
Total			**110.935**

Source: TNRSP

During the World Bank Mission in the month of February 2020, it was suggested to update/modify the Environmental Management Framework (EMF) as Environmental and Social Management Framework (ESMF) by incorporating the social safeguard measures, increase in scope of the TNRSP-II project through Additional Financing (AF), the lessons learnt from the implementation of TNRSP-II to date, the recommendations of guidance notes issued by the World Bank and recent amendments in environmental regulations. All the possible environmental impacts along with mitigation and management measures have been compiled in the ESMF.

1.3 Project Description

The ongoing Second Tamil Nadu Road Sector project supports the GoTN's broader state highway development initiative, through three components: (A) Network Improvement; (B) Institutional Capacity Enhancement; and (C) Road Safety as described below.

Component A: Network Improvement (Total Cost: USD 746.45 million; IBRD Loan: USD 274.45 million):

- *Upgradation and maintenance through EPC contracts (Sub-component A1):* construction of civil works for widening and upgrading of approximately 430 km of roads of CRN;
- *Upgradation and maintenance through PPP concessions (Sub-component A2):* construction of civil works for widening and upgrading of approximately 145 km of roads of CRN; and
- *Maintenance through Multi-year Performance-based Maintenance Contracts (Sub component A3):* Maintenance of approximately 600 km of CRN for a 5-year period.

Component B: Institutional Capacity Enhancement (Total Cost: USD 11 million; IBRD Loan: USD 8.8 million): The project will support

a) policy level actions and commitments to improve both mobilization and allocation of resources in the road sector and

b) operational level initiatives to enhance enterprise-level efficiency through
   (i) process improvements;
   (ii) organizational restructuring;
   (iii) sustaining investments in IT infrastructure; and
   (iv) Training & Knowledge Management.

Component C: Road Safety (Total Cost: USD 20 million; IBRD Loan: USD 16 million): The project will support achievement of improved road safety, at two levels. First, at *the state level*, GoTN's capacity to achieve better road safety will be enhanced through a combination of strategic (development of a comprehensive road safety strategy, delineating the roles, responsibilities, investments and other initiatives of various stakeholder departments involved in the road safety agenda) and operational interventions (support implementation of the road safety strategy including through assistance in planning, investments and monitoring and evaluation). Second, at the field level i.e. in two districts and a corridor, the project will support designing and implementation of road safety improvement initiatives, to demonstrate how multiple stakeholder departments could achieve better outcomes through coordinated efforts and investments.

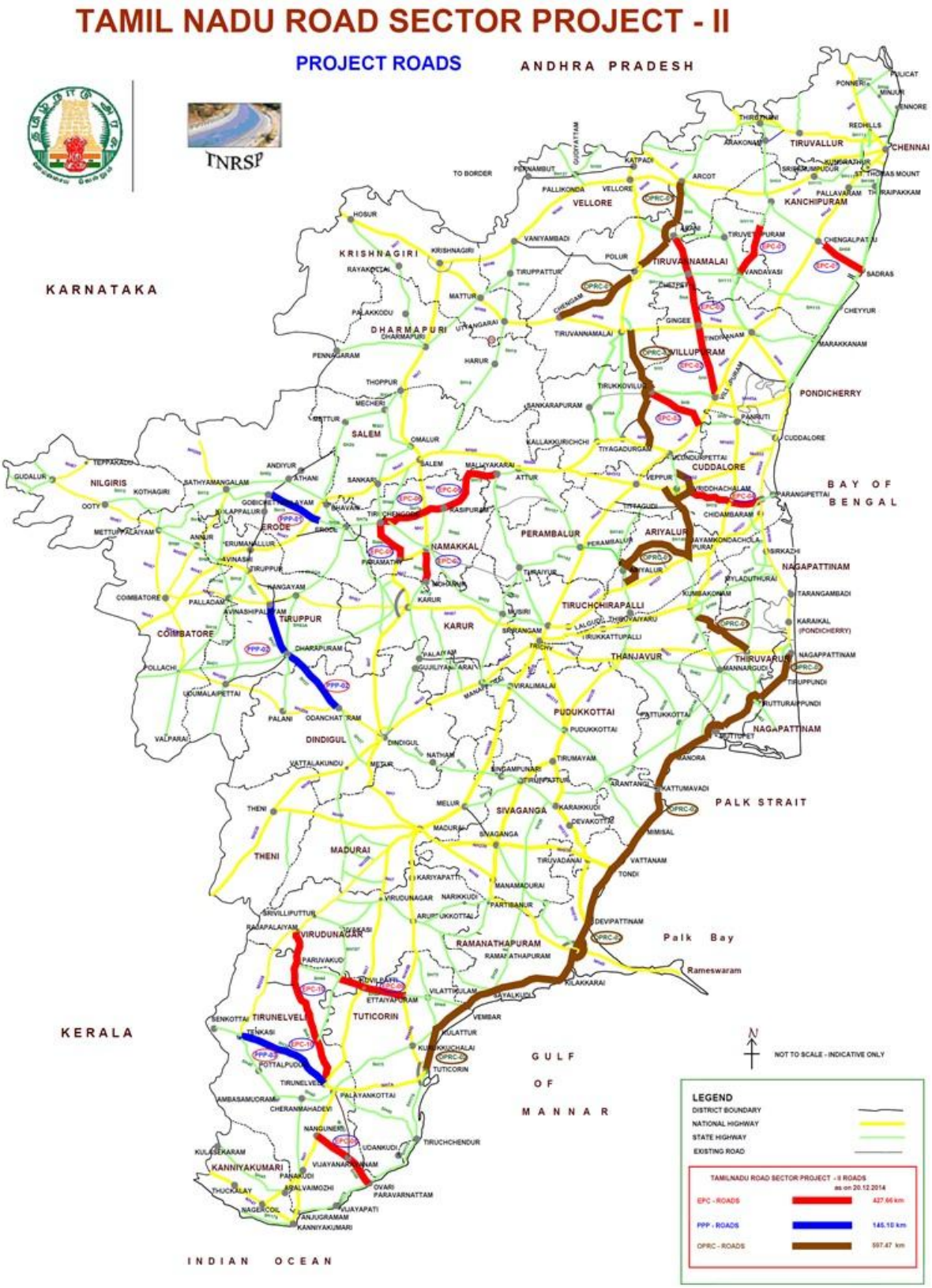


Figure 1: Roads Selected for Upgradation under TNRSP II

1.4 Additional Financing

The proposed components under AF will scale-up activities to enhance the impacts of TNRSP II. The Additional Financing will provide extra resources to two sub-components under the parent project and support the introduction of four new sub-components.

Under Component A: Network Improvement

- Sub-component A1: Upgradation and maintenance through EPC contracts. The AF will finance the upgrading of seven additional road sections with an approximate total length of around 110 km.
- Sub-component A4: Supervision during construction. The AF will support consultancy services contracts for the Authority Engineers to supervise the seven EPC civil works contract, RAP implementation agencies; third-party audit consultancy that will monitor the seven civil works contracts and the achievement of payment milestones, and a RAP monitoring consultancy.
- Sub-component A5: Maintenance of project roads (EPC) for 5 years. The GoTN will fund the maintenance of the seven roads constructed under sub-component A1 through EPC contracts for a period of 5 years.
- Sub-component A8: Other costs. The GoTN will finance land acquisition, resettlement and rehabilitation, and the relocation of utilities for the seven upgraded roads. The costs of land acquisition and resettlement will be financed from counterpart funding.

Under Component C: Road Safety

- Sub-component C6: Road Safety Institutions. The establishment and strengthening of road safety management institutions and funding arrangements in the state will be supported under this new sub-component.
- Sub-component C7: Road Safety Improvements. The new sub-component will support prioritized road safety improvements that include: (i) civil works for localized road realignment, junction improvement, and the provision of road safety features such as paved shoulders, footpaths, bus bays and parking areas; (ii) installation of signs, road markings and crash barriers; (iii) road safety enforcement measures and equipment; (iv) accident response and trauma care; (v) data collection and analysis; and (vi) training for staff and capacity building of institutions involved in road safety.

Under Component D: Transport and Logistics Services - new component

- Sub-component D1: Institutional support for transport and logistics services. This sub-component will support: (i) development and adoption of a Logistics Strategy; (ii) establishment of institutional arrangements to coordinate transport and logistics services; and (iii) preparation of a Logistics Master Plan and associated State-Level Action Plan.
- Sub-component D2: Infrastructure improvements to remove logistics choke-points on a pilot corridor. This sub-component will support: (i) localized civil works to improve accessibility or traffic flow; (ii) preparation of reforms to logistics administration procedures; and (iii) civil works, goods, and services required to implement reform of logistics procedures.

Road No.	Description: Project Preparation Consultancy Services for updating/preparing Detailed Project Report (DPR) for the following road works	Road Length in Km
1)	Four laning and strengthening of Kanchipuram-Cheyyar(SEZ)(km.2/915 – km. 14/112) including Vandavasi Byepass. Connecting SH 161 & SH 05 (km 36.457 to km 39.829)	14.569
2)	Four laning and strengthening of Omalur-Mecheri (SH222) (km. 0/000 – km. 14/600)	14.600
3)	Strengthening and widening of Attur-Malliyakarai road(SH30) (km.81/054 – km. 89/250)	8.196
4)	Ooty – Kothagiri – Mettupalayam – Sathy – Gobi – Erode road(SH-15) (Chithode to Erode Section) (km. 153/6 – km. 161/620)	8.020
5)	Erode – Chennimalai (MDR-108) (km. 0/00 – km. 24/000)	24.00
7)	Ariyalur – Reddipalayam (SH139) (km. 1/40 – km. 11/600)	10.2
8)	Arcot – Arni (SH4) (km. 0/00 – km. 24/600)	24.6

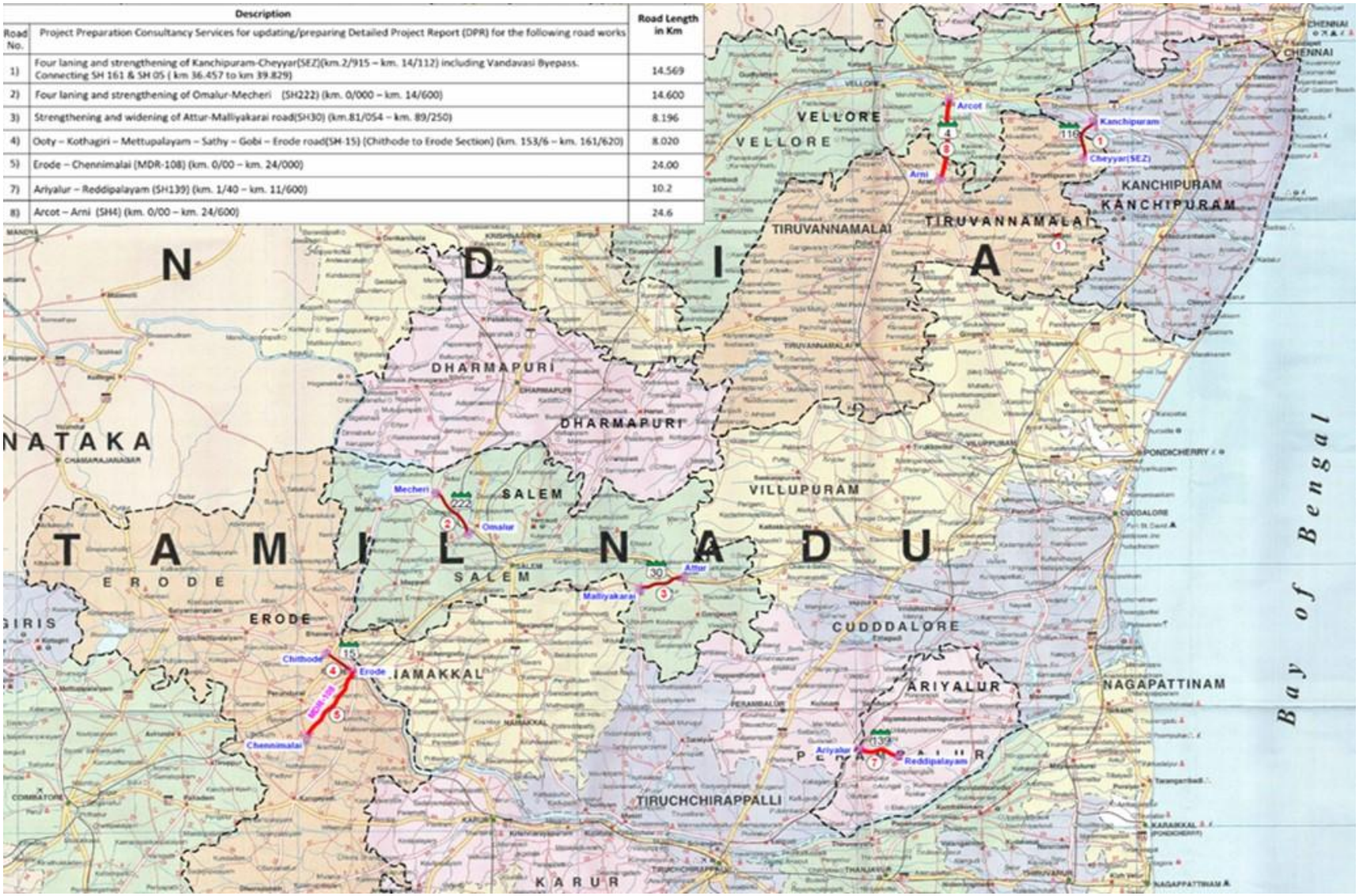


Figure 2: Location Map of Project Roads

1.5 TNRSP-II Proposed Improvements

1.5.1 Design Intervention for Upgradation Roads

The up-gradation (strengthening and widening) proposal incorporating the various cross sections to accommodate with in the rural and urban stretches has been suggested based on the traffic projections estimated till the year 2042. The typical cross sections that are being adopted are depicted in section 1.5.2 and section 1.5.3. The proposed road cross-sections are designed keeping in view of the following

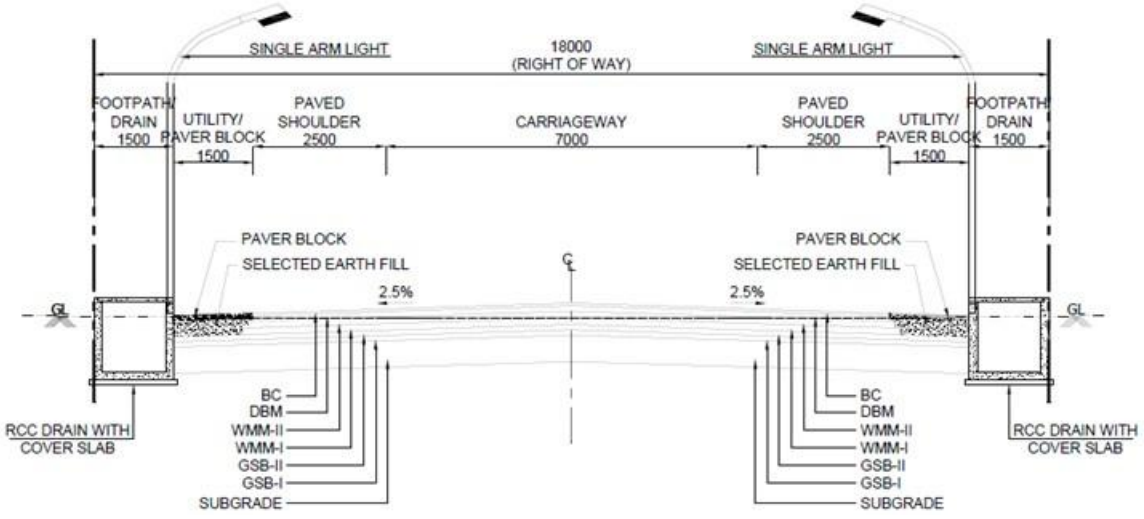
(i) to maximise the impact of road safety interventions in the reduction of accidents,
(ii) to minimise the additional land acquisition,
(iii) to minimise the feeling of avenue trees for the proposed widening, and
(iv) to minimise the environmental degradation to the surroundings.

In addition to the improvement of road cross-section by widening, strengthening and/or reconstruction of the pavement, other design measures undertaken are presented below:

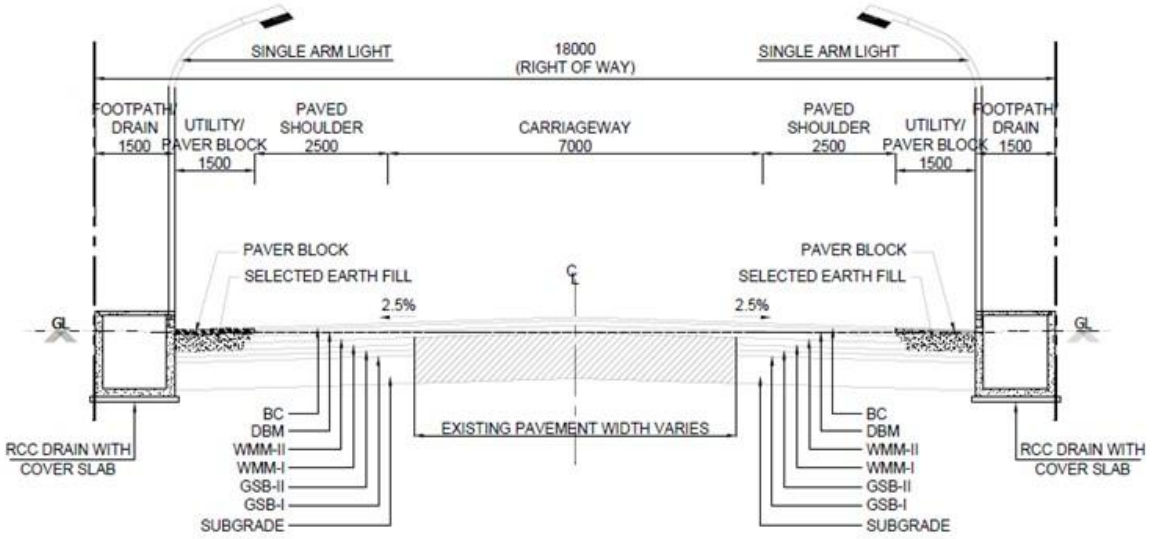
- Improvement of horizontal alignment and vertical profile of the roads with minimum land acquisition and through avoidance of obstructions such as trees, utilities, road side building structures, etc. to the extent possible,
- Improvement of intersections and junctions,
- Provision of road side appurtenances such as signage, delineators, guard rails, street lighting, etc., and
- Provision of road side facilities such as road side drains, pedestrian footpaths, pedestrian and cattle crossings, bus bays, bus shelters, parking bays, etc.

1.5.2 Two-Lane Road Configuration

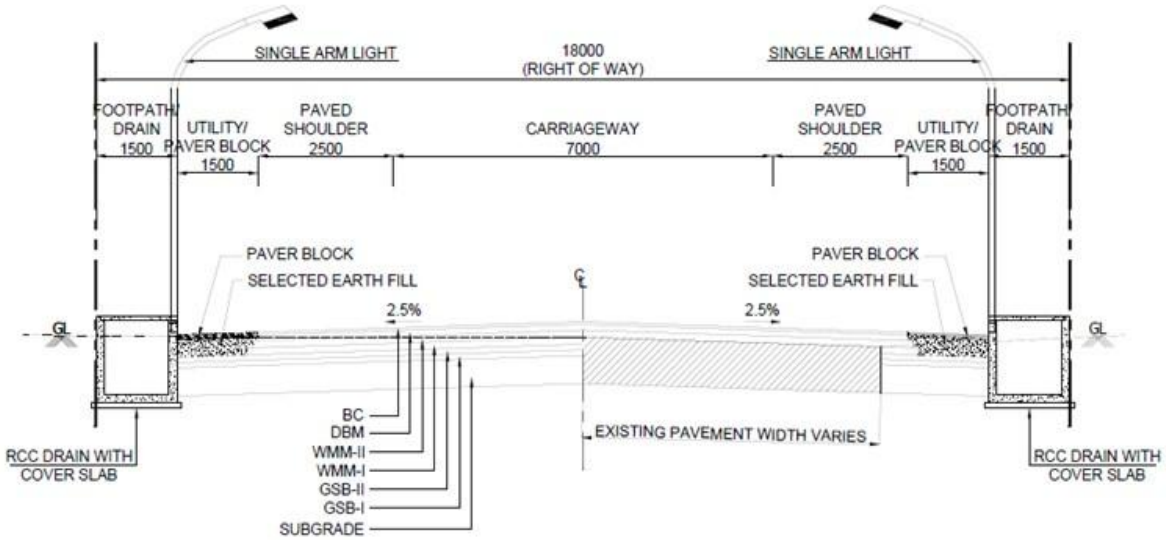
The typical cross-section proposed for the two-lane roads under the TNRSP –II is given in the following figures.



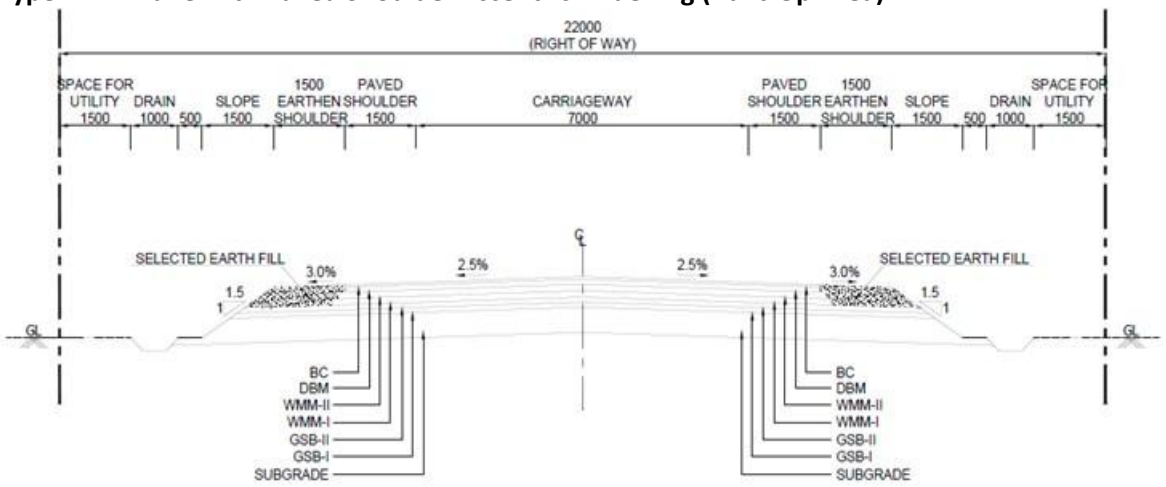
Type 1: Lane with Paved Shoulder (Built-Up Area) Realignment



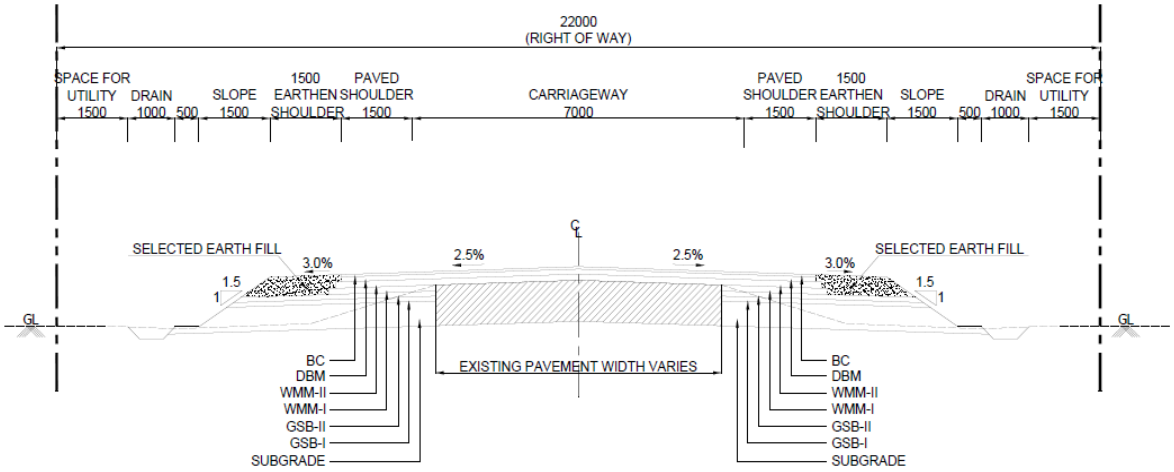
Type 1A: 2 Lane with Paved Shoulder Concentric Widening (Built-Up Area)



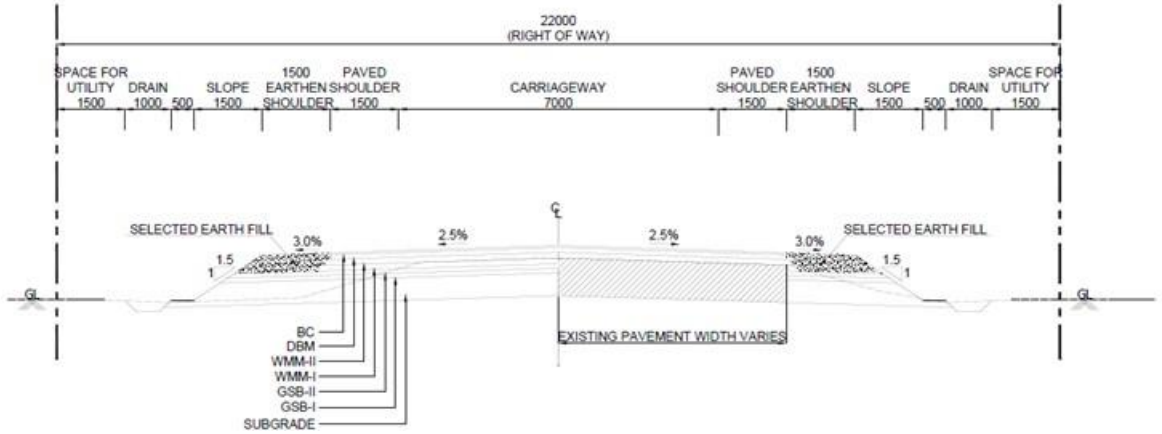
Type-1B: 2 Lane with Paved Shoulder Eccentric Widening (Built-Up Area)



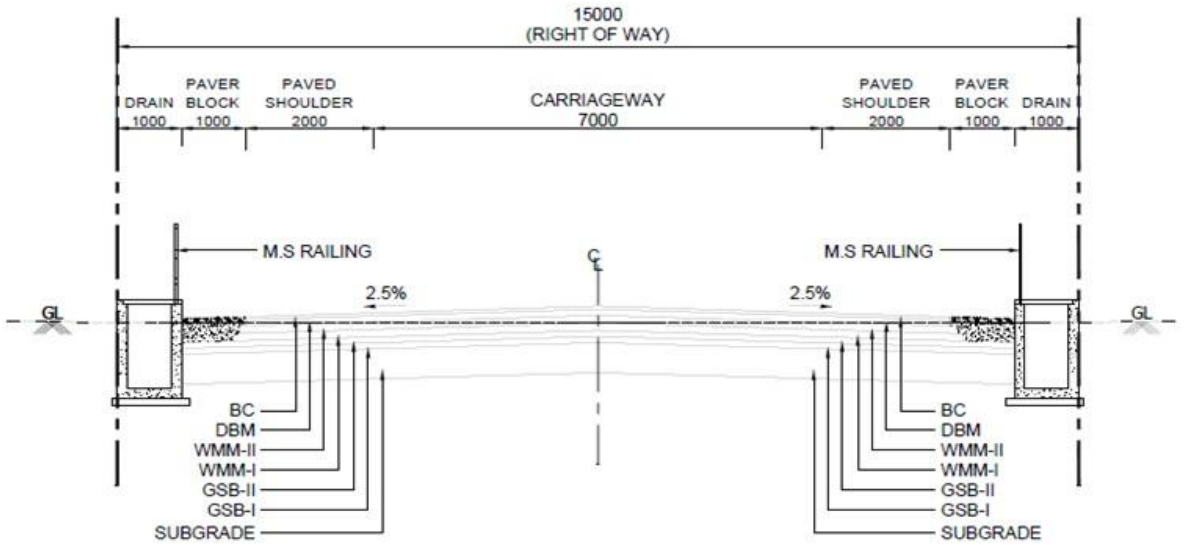
Type-2: Typical Cross Section of 2-Lane Road with Paved Shoulders - Rural Area - Realignment



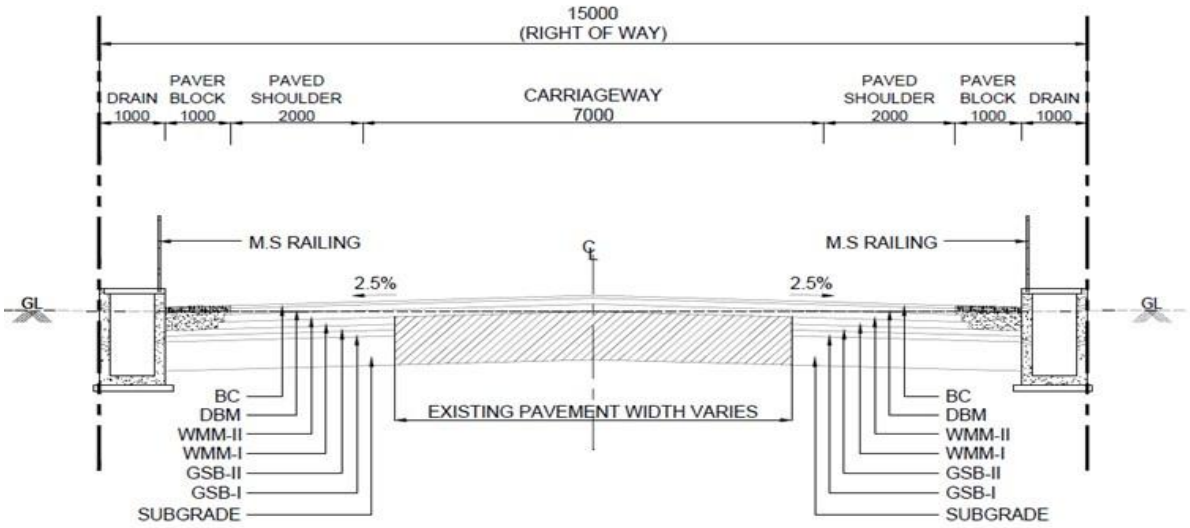
Type-2A: Typical Cross Section of 2-Lane Road with Paved Shoulders Concentric Widening - Rural Area



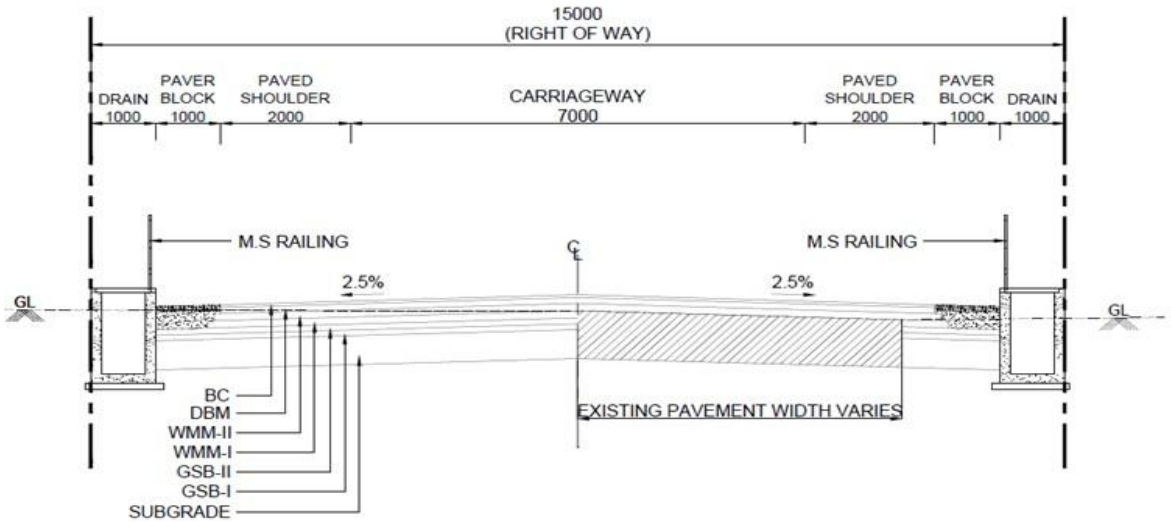
Type-2B: Typical Cross Section of 2-Lane Road with Paved Shoulders Eccentric Widening - Rural Area



Type-3: 2 Lane with Paved Shoulder (Built-Up)



Type-3A: 2 Lane with Paved Shoulder Concentric Widening (Built-up)

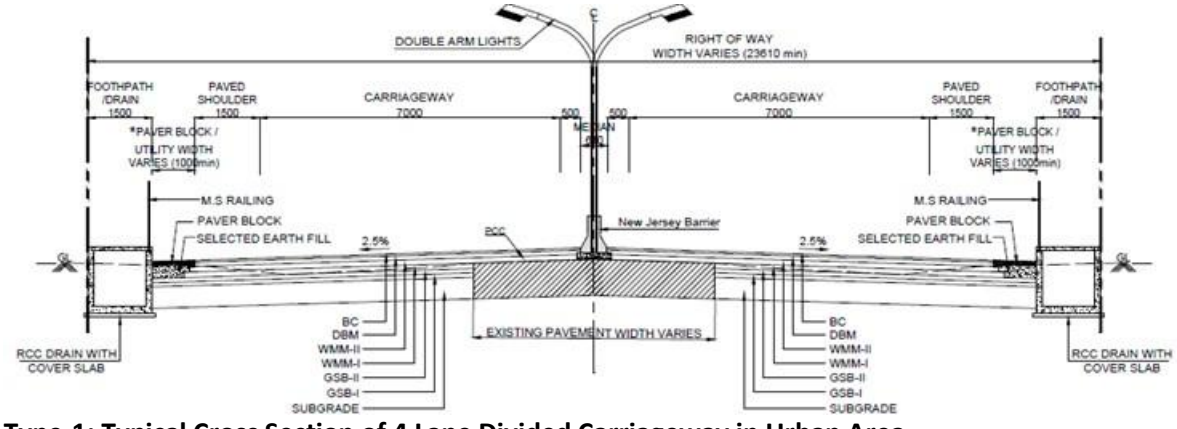


Type-3B: 2 Lane with Paved Shoulder Eccentric Widening (Built-Up)

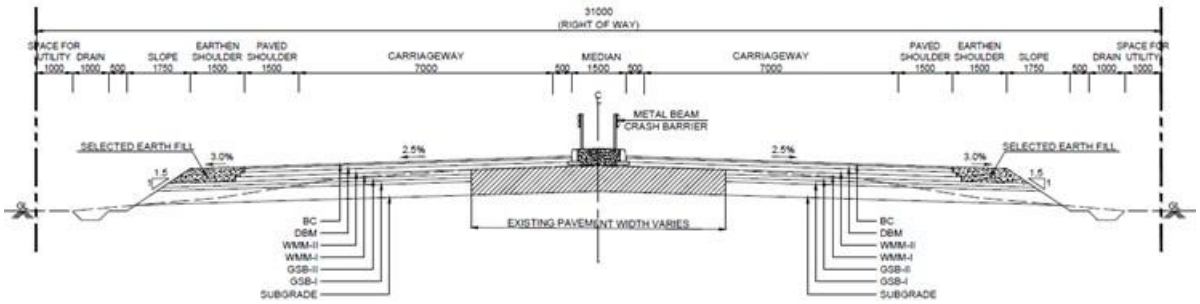
Figure 3: Typical Cross-section for 2 Lane Roads

1.5.3 Four Lane Road Configuration

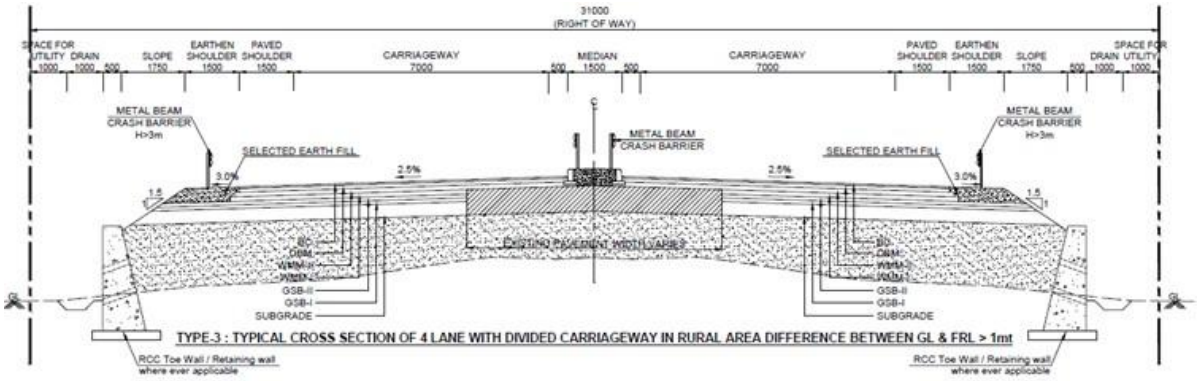
Typical cross-section proposed for the four-lane roads under the TNRSP –II is given in the following figures.



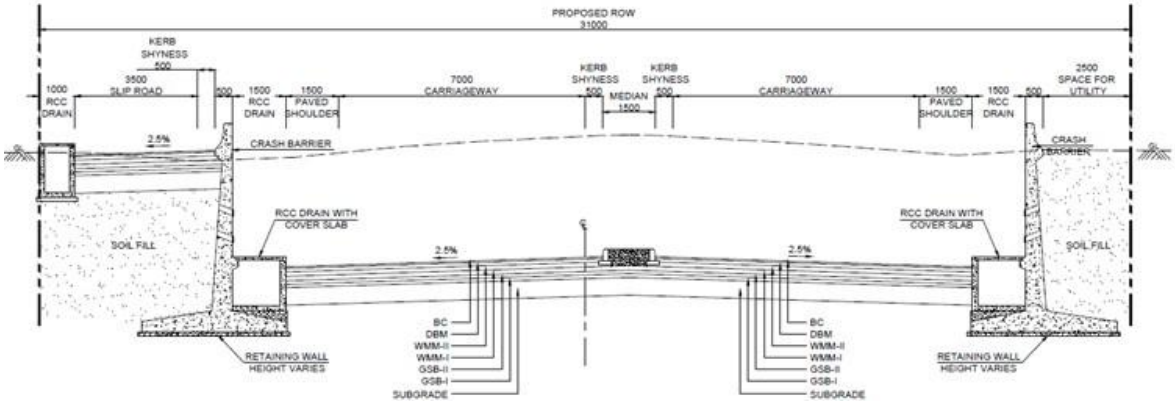
Type-1: Typical Cross Section of 4 Lane Divided Carriageway in Urban Area



Type 2: Typical Cross Section of 4 Lane Divided Carriageway in Rural Area difference Between OGL & FRL < 1.1mt



Type-3: Typical Cross Section of 4 Lane with Divided Carriageway in Rural Area Difference Between GL & FRL > 1mt



Type 4: Typical Cross Section for Four - Lane Divided Carriageway @ Cut Section RHS (Cut Section < 5.0m) & LHS (Slip Road)

Figure 4: Typical Cross-section for 4 Lane Roads

1.6 Need for the ESMF

This ESMF aims to guide the Tamil Nadu Road Sector Project (TNRSP-II), Highways Department, in sub-project selection, screening and categorization, environmental and social impact assessment and preparation, and implementation, monitoring, and preparation of environmental and social management plans for the project roads to facilitate compliance with the requirements specified in the World Bank Safeguard Policies and Government of India (GoI) rules and regulations. This ESMF shall apply to any upgradation, improvement, and development works under component A, C & D proposed to be taken up under TNRSP-II and its Additional Financing.

The proposed development envisaged in TNRSP-II and AF pertains to improvements/ strengthening/ widening/ maintenance of existing State Highways (SH); other roads including MDR; road safety Improvements; and infrastructure improvements to remove logistics choke-points on a pilot

corridor. The proposed road improvement work would be concentrated along the existing alignments and bypasses; there is no road which passes through or would be adjacent to the environmentally sensitive areas. This ESMF shall assist Highways Department (TNRSP -II), in the identification, assessment, and management of environmental and social concerns at all stages of the project.

1.7 Purpose and use of ESMF

The ESMF is prepared in-line with the MOEF&CC EIA Guidance Manual for Highways and World Bank safeguard policies. It also provides a framework for managing environmental and social responsibilities efficiently by integrating the overall operations. It helps in the management of environmental programs in a comprehensive, systematic, planned and documented manner. The ESMF addresses environmental and social concerns through the allocation of resources, assignment of responsibilities, procedures, and processes, and focuses on continual improvement of the system.

It also highlights the importance of the environmental and social screening and scoping exercises detailing the procedures to be followed for a better understanding of the project's impacts on the environment and social at the initial stage of the project itself. The ESMF also helps to categorise the subprojects based on the environmental and social severity. For the identified environmental and social impacts and issues arising during the planning, designing, construction and operation phase, a generic Environmental and Social Management Plan (ESMP) is also developed. The ESMF will be used to define the criteria required to determine the level of ESIA required (either detailed or limited ESIA) for the project and the processes involved, determines their sequence to conduct the ESIA studies for various components/phases of road projects considering the legal requirements and its implications.

The ESMF being a living document, it has been updated as part of Additional Financing preparation cognizant of (a) addition of new components; (b) amendments in environmental regulations, rules and acts both at national and state level; (c) use of the World Bank’s Procurement Regulations for IPF Borrowers for Goods, Works, Non-Consulting and Consulting Services, dated July 1, 2016 (revised in November 2017 and August 2018) and; (d) recommendations of guidance notes issued by the World Bank. The ESMF shall be reviewed by the PIU (TNRSP-II) staff annually. For further updates and modifications of the ESMF, a checklist shall be prepared, with dates detailing each revision status. A data sheet shall be maintained to show that records are maintained for all the changes that have been carried out.

The updating of ESMF has (a) reviewed the environmental profile of the new project districts; (b) consultated with key stakeholders; and (c) used experience gained from implementation. Based on the consultations and reviews, a consensus on the following key aspects was arrived:

- The Environmental Management Framework used for TNRSP II is held relevant for Additional Financing project. The framework can be adopted for with a few modifications, primarily guided by the experience gained through implementation of TNRSP II.
- Updating the regulatory framework section to reflect changes in policy, rules, regulations and, good practice made since 2015.
- Updating the regulatory framework section to reflect changes in policy, rules and regulations made since 2015.
- For effective screening and review process, include criteria for categorization of sub-project to aid to decision making process.

The provisions under the framework have been drafted in accordance with the applicable statutory

provisions of Government of India and Tamil Nadu, and for compliance with the World Bank Safeguard Policies. This ESMF is intended to guide its users in:

- Undertaking/understanding environmental and social issues in road projects
- Standardizing work efforts and environmental documents;
- Improving the quality of the documents and the analysis;
- Facilitating the development and review of documents by PIU (TNRSP-II) staff; and
- Providing technical guidance on impact assessment

Land Acquisition and Resettlement Impacts. The proposed roads under additional financing will involve substantial land acquisition (more than 100 hectares) and cause physical and economic displacements. To mitigate these impacts, a separate Resettlement Policy Framework (RPF) has been prepared. The RPF includes the principles and objectives of resettlement, process for conducting census survey, socio-economic surveys, and preparation of RAPs, entitlements for different types of impacts, process of land acquisition, valuation of affected assets, consultations and disclosure, institutional arrangements, coordination with civil works, grievance redress mechanism, and monitoring and evaluation arrangements. The Entitlements matrix containing the compensation and resettlement assistance to the affected people is presented in **Annex 4.**

Other Social Impacts. In addition to land acquisition and resettlement impacts, other social impacts related to labor influx, gender-based violence, gender mainstreaming and consultations with various stakeholders will be focused. Separate consultations with women will be carried out to understand their concerns and issues and propose measures to address their concerns in ESIA/ESMP.

2 LEAGAL FRAMEWORK

2.1 Environmental Rules and Regulations

To understand the extent of the environmental and social assessment for the proposed improvement works, applicable laws, legislation, and policies have been reviewed. A summary of environmental legislation/regulations relevant to TNRSP II is furnished in **Table 4**.

Table 4: Environmental Legislation / Regulations applicable to TNRSP – II

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
Environment (Protection) Act.	1986	To protect and improve the overall environment	MoEF&CC	Yes, It is an umbrella act applicable for all the subprojects
Environment Impact Assessment Notification and amendments	2006 2009 2013[2] 2015[3]	To provide environmental clearance to new development activities following the environmental impact assessment.	MoEF&CC& SEIAA	No[4]
Notification on use of fly ash (subsequent amendments)	1999 2003 2009 2016	To mandate reuse of large quantities of fly ash from thermal power plants for development projects within a 300km radius.	MoEF&CC	Yes, for the subproject roads falling within 300km radius from Thermal Power Plants.
Wildlife Protection Act (subsequent amendments)	1972 2002	To protect wild animals and birds through the creation of National Parks / Sanctuaries and it also provides more stringent sections detailing punishments, includes the penalty for offenses under the Act.	MoEF&CC (Wildlife Division)	Yes[5], for the subproject roads passing through Protected areas and/or Eco-Sensitive Zones of protected areas.
Forest (Conservation) Act	1980	To protect and manage forests, to check deforestation by restricting the conversion of forest areas into non-forest areas	Forest department, GoTN/ MoEF&CC	Yes, for the sub project roads, which requires diversion of Forest land for widening

[2]highway expansion projects require Environmental Clearance if, Expansion of National Highways greater than 100 km involving additional right of way or land acquisition greater than 40 m on existing alignments and 60m on re-alignments or by-passes

[3]Consideration of development projects located within 10km of National Park and Sanctuaries seeking environmental clearance under EIA Notification, 2006

[4]As per EIA Notification 2006 & subsequent amendments, Environmental clearance will be required if any State Highway project road under TNRSP –II is passing in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive area

[5]If any State Highway project road under TNRSP –II is passing through protected area like Wildlife Sanctuary /National Park/Biosphere/Tiger Reserves/Bird Sanctuary, etc., prior Wildlife Clearance will be required from National Board for Wildlife and Hon'ble Supreme Court of India and if passing through Eco-sensitive Zone of protected area prior clearance from National Board for Wildlife will be required.

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
				purposes
Biological Diversity Act	2002	Disclosure of species survey or collection activities to the National Biodiversity Authority	MoEF&CC	Yes
Water (Prevention and Control of Pollution) Act (and subsequent amendments)	1974	To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	CPCB/ TNPCB	Yes, for establishing Labour camps, Hotmix plants, batching plants
Air (Prevention and Control of Pollution) Act (and subsequent amendments)	1981	To provide for the prevention, control, and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	CPCB/ TNPCB	Yes, for establishing Labour camps, Hotmix plants, batching plants
Noise Pollution (Regulation and Control) rules	2000	Noise pollution regulation and controls	CPCB/ TNPCB	Yes, as per the Environmental Protection Act 1986
Hazardous Waste (Management& Transboundary Movement) Rules and subsequent amendments	2008 2016 2019	Storage, handling, transportation, and disposal of hazardous waste	TNPCB	Yes, storage and handling of Hazardous waste during construction
The municipal solid waste management rules and subsequent amendments	2000 2016	Management and handling of solid waste	TNPCB, and concern ULB's/ corporation	Yes, for disposal of solid waste generated during construction
Batteries (Management and Handling) Rules	2001 2010 2016 2018	Safe recycling of lead-acid batteries	TNPCB	Yes
Public Liability and Insurance Act	1991	Protection form hazardous materials and accidents	Third-Party Insurance Company	Yes
Minor Minerals Conservation land Development Rules	2010 2017	For new quarry operations	District Collector	Yes
Explosive Act Explosive Rule	1984 2008	Safe transportation, storage and use of explosive material	Chief Controller of	Yes, for the use of explosives in the

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
			Explosives	subproject roads
Tamil Nadu Minor Mineral Concession Rules	2008 2016	For new quarry operations	Mining & Geology Department	Yes
Coastal Regulation Zone (CRZ) Notification	2011 2018 2019	For the construction of the road in Coastal Regulation Zone Notification Area	MoEF&CC	Yes, for the subproject roads falling in Coastal Regulation Zone Area
Environmental Clearance (EC) under EIA notification (and subsequent amendments) for new Quarry areas	2006	For new quarry operations	SEIAA, TNPCB	Yes, for new quarry operations it is mandatory to obtain EC from the SEIAA
Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989 2019	To control vehicular air and noise pollution. To regulate the development of the transport sector, check and control vehicular air and noise pollution.	Transportation Department, GoTN	Yes, for all the vehicles used for construction purposes
The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act	2010	To amend the Ancient Monuments and Archaeological Sites and Remains Act, 1958, including a declaration of regulated and prohibited areas around the monuments.	Department of Archaeology, GoTN, National Monuments authority	Yes, in case of chance-find
The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 (Act 30 of 2013) (LARR)	2013	set out rules for fair compensation and acquisition of land	The revenue department, GoTN	Yes, this will be applicable as there will be a land acquisition for widening, geometric improvements, and realignment
The Tamil Nadu Protection of Tanks and Eviction of Encroachment Act, 2007	2007	An Act to provide measures for checking the encroachment, eviction of encroachment in tanks which are under the control and management of the Public Works Department, protection of such tanks and	Water Resource Department (WRD), PWD	Yes, it will be applicable for the widening of roads near the water bodies

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
		for matters incidental thereto.		
Tamil Nadu Highways Act, (TNHA)	2001	An Act to provide for the declaration of certain highways to be State highways, restriction of ribbon development along such highways, prevention and removal of encroachment thereon, construction, maintenance and development of highways, and levy of betterment charges and for matters connected therewith or incidental thereto	Tamil Nadu Highways Department, GoTN	Yes, this will be applicable as there will be a land acquisition for widening, geometric improvements, and realignment
Tamil Nadu Groundwater (Development and Management) Act, 2003	2003	To protect groundwater resources from over exploitation and to ensure its planned development and proper management in Tamil Nadu	Groundwater Department, GoTN	Yes, for the use of groundwater for construction purposes

Source: GoI, MoEF&CC, and GoTN

2.2 World Bank Safeguard Policies

In addition to the national and state policies, acts and rules, the World Bank policies and directives on environmental and social safeguards need to be adhered to in the present assignment. The applicability of the relevant policies pertaining to the roads that are undergoing upgradation (strengthening and widening) are summarized in Table 5.

Table 5: Applicability of WB Safeguard Policies

WB SafeguardPolicy	PolicyObjectives
OP 4.01 Environmental Assessment	Help to ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process
OP 4.04 Natural Habitats[6]	Assist in appropriate conservation and mitigation measures remove or reduce adverse impacts on natural habitats or their functions, keeping such impacts

[6](a)**Naturalhabitats**arelandandwaterareaswhere(i)theecosystems'bio-logicalcommunitiesareformedlargelybynativeplantandanimal species,and(ii)humanactivityhasnotessentiallymodifiedthearea'sprimaryecologicalfunctions.

(b)**Criticalnaturalhabitats**are:(i)existingprotectedareasandareasofficiallyproposedbygovernmentsasprotectedareas(e.g.,reservesthat meetthecriteriaoftheWorldConservationUnion[IUCN]classifications,areasinitiallyrecognizedasprotectedbytraditionallocalcommunities (e.g., sacred groves), and sites that maintain conditions vital for the viability of these protected areas (as determined by the environmental assessment process).

WB SafeguardPolicy	PolicyObjectives
	within socially defined limits of acceptable environmental change. Specific conservation measures depend on the ecological characteristics of the given site.
OP 4.36 Forest	The Policy envisages the protection of forests through consideration of forest-related impact of all investment operations, ensuring restrictions for operations affecting critical forest conservation areas, and improving commercial forest practice through the use of modern certification systems.
OP 4.12 Involuntary Resettlement	Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher.
OP 4.10 Indigenous People	Design and implement projects in a way that fosters full respect for indigenous peoples' dignity, human rights, and cultural uniqueness so that they i. Receive culturally compatible social and economic benefits, and ii. Do not suffer adverse effects during the development process.
OP 4.11 Physical Cultural Resources (PCR)	Assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.

In addition to compliance with the above World Bank safeguards policies, recommendations from the following guidelines and good practice notes will be adopted:

- Environmental, Health, and Safety (EHS) Guidelines. General EHS Guidelines: Occupational Health and Safety, World Bank Group. 2007. Available at: https://www.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES
- Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx, The World Bank. December 2016. Available at: http://pubdocs.worldbank.org/en/497851495202591233/Managing-Risk-of-Adverse-impact-from-project-labor-influx.pdf
- Good Practice Note; Addressing Gender Based Violence in Investment Project Financing involving Major Civil Works, The World Bank. September 2018. Available at: http://pubdocs.worldbank.org/en/399881538336159607/Good-Practice-Note-Addressing-Gender-Based-Violencev2.pdf
- IFC and EBRD Workers' Accommodation: Process and Standards available at: https://www.ifc.org/wps/wcm/connect/60593977-91c6-4140-84d3-737d0e203475/workers_accomodation.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-60593977-91c6-4140-84d3-737d0e203475-jqetNIh

Procurement will be carried out in accordance with Procurement Regulations for IPF Borrowers for Goods, Works, Non-Consulting and Consulting Services, dated July 1, 2016 (revised in November 2017 and August 2018) using bidding documents that contain specific provisions for the management of Environmental, Social, Health and Safety risks.

Table 6: Comparisonof National Environmental Policy and Bank's Safeguard Operational Policies

S.No	Bank's Safeguard OPs	Equivalent National Environmental Policy and Regulations	Policy Gaps and its redressal
1.	OP 4.01 Environmental Assessment	• Environmental Impact Assessment Notification-2006, 14th Sep-2006, as amended in 2009 and 2016 • Environmental protection Act, 1986 and subsequent amendments • Environmental Impact Assessment Notification-2006, 14th Sep-2006, as amended in 2009 and 2013 • Air (Prevention and Control of Pollution) Act, 1981; • Water (Prevention and Control of Pollution) Act, 1974, for Pollution-Prevention-and-Management; • The Noise Pollution (Regulation And Control) Rules, 2000 • National Resource Efficiency Policy, 2019 (Draft) • Notification for use of fly ash, 2003 and MoEF&CC notification dated 25th March 2015 • Fly Ash Notification 2016 • Municipal Solid Waste (Management & Handling) Rules, 2000 (MSW Rules) • Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008. • Batteries (Management and Handling) Rules, 2001 • Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989 • The E-Waste (Management) Rules, 2016, • Plastic waste Management Rules, 2016 • Construction & Demolition, Waste Management Rules, 2016Right to information Act 2005 • The Building and Other Construction Workers (Regulation of Employment And Conditions Of Service) Act, 1996 • Contract Labour (Regulation & Abolition) Act 1970, • Minimum Wages Act 1948, Payment of Wages Act 1936, • Child Labour (Prohibition & Regulation) Act 1986,	The OP4.01 requires EA for road irrespective of its type. While, EIA notification is limited to Expressway, National highway and State Highway. However, Environmental Impact Assessment Notification-2006 is not applicable to the project road.

S.No	Bank's Safeguard OPs	Equivalent National Environmental Policy and Regulations	Policy Gaps and its redressal
		• Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979 • The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 (Act 30 of 2013) (LARR)	
2.	OP 4.04 Natural Habitats	• Biological Diversity Act, 2002, • Wildlife Protection Act 1972 (WLPA),	Provisions from the acts meets the OP 4.04 requirements. AF roads are not passing through any protected area nor wildlife presence along corridor. No direct impact due to Erode-Chennimalai road located 2km away from Velode Bird Sanctuary. The management measure to address indirect impact will be included in ESMP.
3	OP 4.09 Pest Management	Not applicable	
4	OP 4.10 Indigenous People	Not applicable	
5	OP 4.11 Physical Cultural Resources (PCR)	• Ancient Monuments and Archaeological Sites and Remains Act, 1958	Provisions from the act meets the OP 4.11 requirements. Chance find procedures is included in EMSP. Impacts on religious structures (not protected, but social and cultural value) will be mitigated or managed through provisions for restoration or reconstruction of CPRs in RAP.
6	OP 4.12 Involuntary Resettlement	• The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 (Act 30 of 2013) (LARR) • Tamil Nadu Highways Act, (TNHA)	Gap exists specifically related to aspects such as identification of non-titleholders as PAPs; cut off dates for non-titleholders and valuation of structures with depreciation. The gaps are addressed with suitable provisions in RPF.

S.No	Bank's Safeguard OPs	Equivalent National Environmental Policy and Regulations	Policy Gaps and its redressal
7	OP 4.36 Forest	• The Forest (Conservation) Act, 1980 (FCA) • The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	Objectives of the acts are aligned with OP 4.36 requirements. The AF roads don't have Forest area within study area. For trees directly impacted, compensatory plantation provision is made in ESMP.
8	EHS Guidelines for Construction Materials Extraction, April, 2007, IFC	• Environmental protection Act, 1986 and subsequent amendments • Environmental Impact Assessment Notification-2006, 14th Sep-2006, as amended in 2009 and 2013 • Air (Prevention and Control of Pollution) Act, 1981; • Water (Prevention and Control of Pollution) Act, 1974, for Pollution-Prevention-and-Management; • The Noise Pollution (Regulation And Control) Rules, 2000 • National Resource Efficiency Policy, 2019 (Draft) • Notification for use of fly ash, 2003 and MoEF&CC notification dated 25th March 2015 • Municipal Solid Waste (Management & Handling) Rules, 2000 (MSW Rules) • Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008. • Batteries (Management and Handling) Rules, 2001 • Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989 • The E-Waste (Management) Rules, 2016, • Plastic waste Management Rules, 2016 • Construction & Demolition, Waste Management Rules, 2016 • The Mines and Minerals (Development and Regulation) Act 1957	The majority of OPs requirements are addressed by existing regulations and indirectly for resource efficiency and climate change aspects. Further, bridging of gap is most likely after notification of National Resource Efficiency Policy, 2019, currently at draft stage. Project design considers measures for minimization of natural material extraction and reuse of extracted materials in project construction, rainwater harvesting structures.

2.3 Other Legislations Applicable to TNRSP-II

Environmental and social issues during the road construction stage generally involve equity, safety, and public health issues. The road construction agencies require complying with laws of the land, which include inter alia, the following:

(i) **Workmen's Compensation Act 1923**: The Act provides for compensation in case of injury by accident arising out of and duringemployment;

(ii) **Contract Labour (Regulation and Abolition) Act, 1970:** The Act provides for certain welfare measures to be provided by the contractor to contract labour;

(iii) **Minimum Wages Act, 1948:** The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act;

(iv) **Payment of Wages Act, 1936:** It lays down as to by what date the wages are to be paid when it will' be paid and what deductions can be made from the wages of the workers;

(v) **Equal Remuneration Act, 1979:** The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for discriminating against female employees;

(vi) **Child Labour (Prohibition and Regulation) Act 1986 amended in 2016:** The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for the regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in the Building and Construction Industry;

(vii) **Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979**: The inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.;

(viii) **The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996:** All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act; the employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc.;

2.4 Clearance Requirements

2.4.1 Environmental Clearance (EC)

EIA notification of the MoEF& CC dated 14th September 2006, categorizes all projects and activities into two categories[7]- Category A and Category B, based on the spatial extent of potential impacts

[7] All projects or activities included as ***Category "A"*** in the Schedule, including expansion and modernization of existing projects or activities and change in product mix, shall require prior environmental clearance from the Central Government in the Ministry of Environment, Forest and Climate Change (MoEF&CC) on the recommendations of an Expert Appraisal Committee (EAC) to be constitutedbytheCentralGovernmentforthepurposesofthisnotification;Allprojectsoractivitiesincludedas***Category "B"***intheSchedule,includingexpansionandmodernizationofexistingprojectsoractivitiesasspecifiedinsubparagraph (ii) of paragraph 2, or change in product mix as specified in sub paragraph (iii) of paragraph 2, but excluding those which fulfill

and potential impacts on human health and natural and manmade resources. Environmental Impact Assessment Notification, amendment in 2009, states that "all state highways and state highways undergoing expansion in hilly terrain (above 1000m AMSL) and/or ecological sensitive area" should obtain environmental clearance from State Environmental Impact Assessment Authority (SEIAA). The selected roads under TNRSP-II are not passing through hilly terrain (above 1000m AMSL) and/or ecological sensitive area". Therefore, EIA Notification 2006 as amended in 2009 is not applicable and environmental clearance is not required for any selected roads. In case of environmental clearance is required for any roads, the procedure given in the EIA Notification 2006 and subsequent amendments shall be followed as shown in Figure.

the General Conditions (GC) stipulated in the Schedule, will require prior environmental clearance from the State/Union territory Environment Impact Assessment Authority (SEIAA). The SEIAA shall base its decision on the recommendations of a State or Union territory level Expert Appraisal Committee (SEAC) as to be constituted for in this notification.

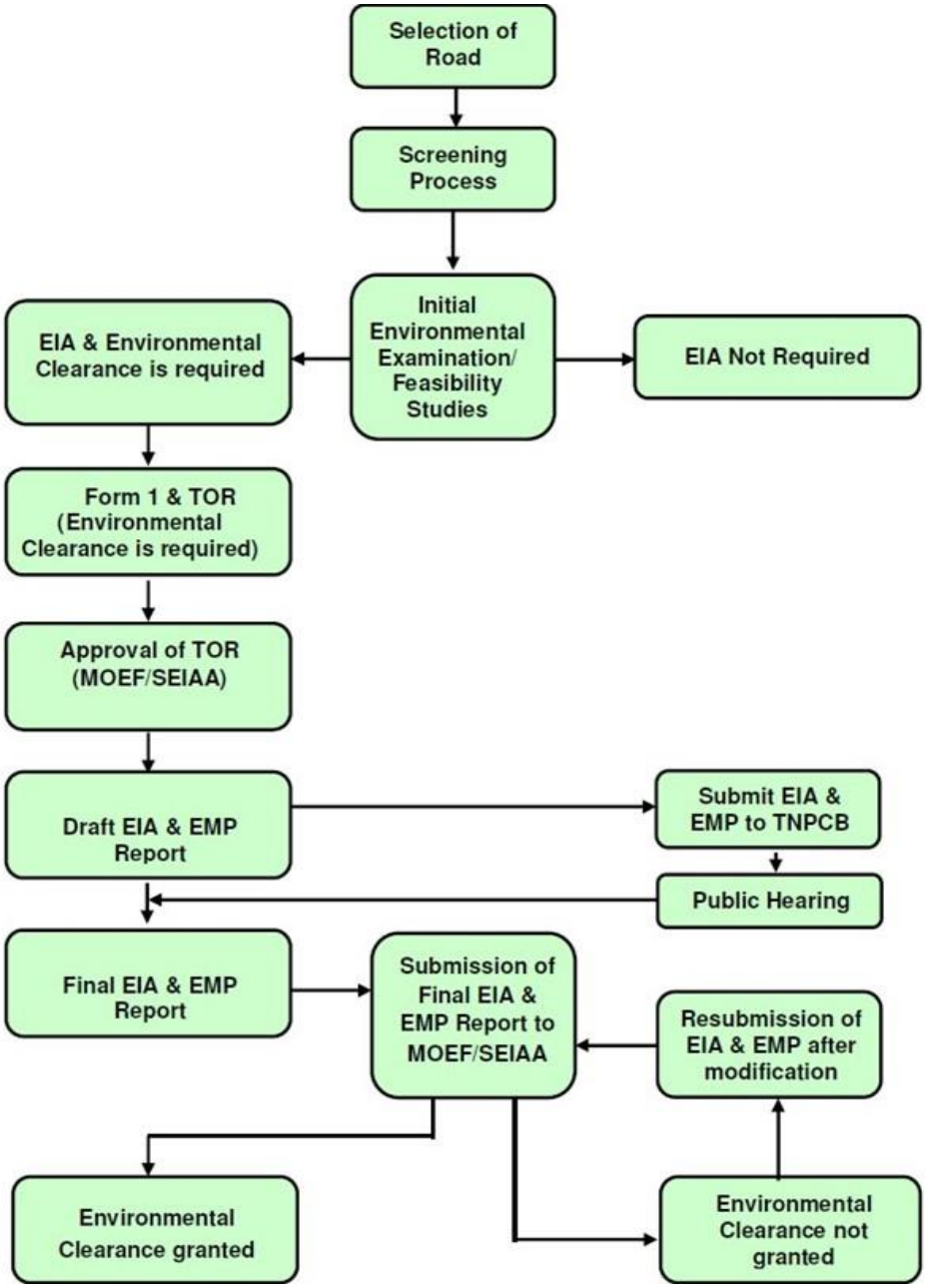


Figure 5: Environmental Clearance Procedures

2.4.2 Consents from Tamil Nadu Pollution Control Board

The sub-project roads shall require obtaining "Consent to Establish" and "Consent to Operate" from Tamil Nadu Pollution Control Board for establishment and operation of Hot Mix Plant (HMP), WMM, Crushers and Constructors Labour Camps (as per Schedule-I), under Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981) and authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008, as amended.

2.4.3 Permission of Eco-Sensitive Zones

In the Tamil Nadu State, there are 15 wildlife sanctuaries, 15 Bird Sanctuaries, 5 National Parks, 4 Tiger Reserves, 4 Elephant Reserves and 3 Biosphere Reserves for protection and conservation of

wild fauna and flora have been declared under the wildlife (protection) Act 1972. In case any project road passes through Eco-Sensitive Zone of protected area is located within a 10 km distance from the project roads, prior permission from National Board for Wildlife (NBWL) will be required under the wildlife (protection) Act 1972 and Environmental clearance under the Environmental (Protection) Act, 1986 and EIA notification 2006 to start the construction of the sub-project roads.
With reference to AF, Velode bird sanctuary is located about 2 kms away from the Erode-Chennimalai road proposed in Phase-2 of the TNRSP-II (AF). Prior statutory permissions shall be obtained before commencement of work on this road and mitigation measures during construction and operation stages will be included in ESMP.

2.4.4 Wildlife Clearance from Supreme Court in Notified Wildlife Areas

If any sub-project roads under TNRSP –II passes through a protected area, like, a National park, Wildlife sanctuary, Bird sanctuary, Tiger Reserve or Biosphere reserve, prior wildlife clearance will be necessarily obtained from National Board for Wildlife (NBWL) and then from Hon'ble Supreme Court of India. The wildlife clearance is a prerequisite for forest clearance for diversion of forest land located in protected area. It is important to mention that even surveys and geo-technical studies in protected area, require prior clearance from the National Board of Wildlife.

With regard to AF, prior to commencement of work, NBWL clearance will be needed for Erode-Chennimalai road, which is located about 2 kms away from nearest boundary of Velode Bird Sanctuary. The ESMP has measures to mitigate indirect impacts during construction and operation stages.

2.4.5 CRZ Clearance for Road Construction in Coastal Regulation Zone (CRZ) Area

If any subproject roads under TNRSP –II is passed through Coastal Regulation Zone (CRZ) notification area, prior CRZ clearance will be necessarily obtained as per provisions of Coastal Regulation Zone (CRZ) Notification 2011 and subsequent amendments in 2018 and 2019.

2.4.6 Forest Clearances

In Tamil Nadu state, road plantations along the MDR, ODR and State Highways (SH) are not declared as Notified Protected Forest (NPF), under the Forest (Conservation) Act 1980. Hence, the identified roads, including strengthening and widening activity would not attract Forest clearance for roadside trees felling.
In some subproject roads, reserved/protected forest land is close to the road and diversion of forest land may be avoidable. Forest clearance will be required under the Forest (Conservation) Act, 1980 if diversion of forest land is necessary. As per the Forest (Conservation) Act, 1980, Form, "A" (refer **Appendix 1**) needs to be filled by the project proponent and has to be uploaded along with the necessary enclosures in PARIVESH portal (https://parivesh.nic.in) for seeking Diversion of Forest Land., further stages of forest clearance (as per IRC –SP-93-2011) procedures are shown in the following **Figure 5.**

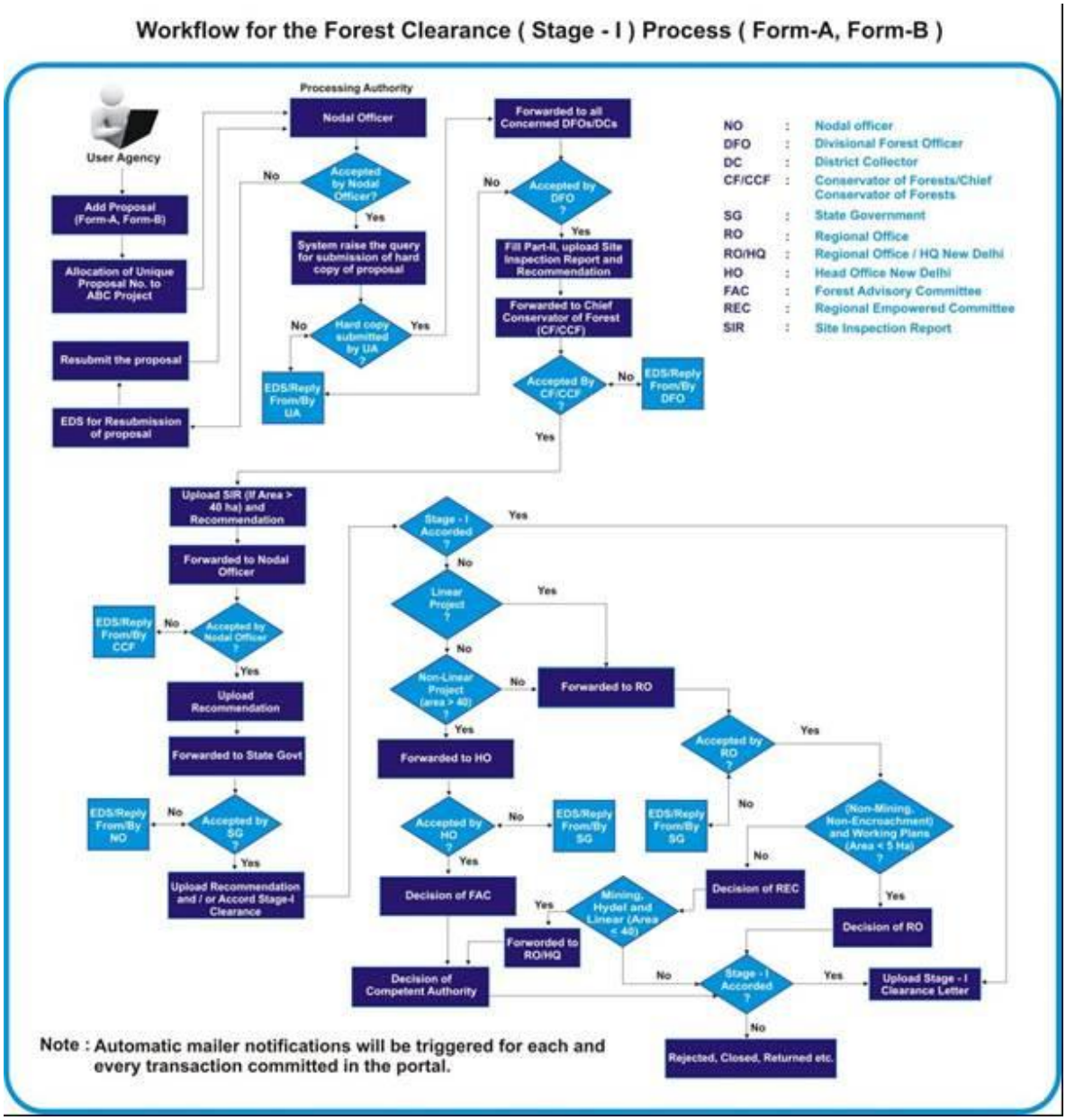


Figure 6: Forest Clearance Procedures

2.5 Summary of Clearance Requirements

Table 6summarizes the clearance requirements for the project, including the agency responsible for obtaining the clearances, the time period required

Table 6: Clearance/ NoC/Permission for the Project

Sl.no	Clearances	Acts	Approving Agency	Time Frame[8]	Responsibility	
					Execution	Supervision
PROJECT PREPARATION STAGE						
1.	Diversion of forest land for Non-forest use	The Forest Conservation Act (1980)	MoEF, Govt. of India	6-9 months	PIU/ DPR Consultants	PIU

[8]The right of permission vests with the Competent Authority

Sl.no	Clearances	Acts	Approving Agency	Time Frame[8]	Responsibility	
					Execution	Supervision
2.	Permission for removal of avenue tree within the RoW		Revenue Divisional Officer	3 - 6 months	PIU/ DPR Consultants	PIU
3.	Environmental Clearance (Applicable, if any State Highway project road under TNRSP–II is passing in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive area)	EIA Notification, 2006 and subsequent amendments under the Environmental (Protection) Act, 1986	SEIAA/ MOEF&CC	9 - 12 months	PIU/ DPR Consultants	PIU
4.	Wildlife Clearance (Applicable, If project road passes through National Park, Wildlife Sanctuary, Bird Sanctuary, Biosphere Reserve and Community Reserve)	Wildlife Protection Act 1972 and amendments	National Board for Wildlife and then Hon'ble Supreme Court of India	12 – 18 months	PIU/ DPR Consultants	PIU
5.	Applicable, If project If project road passes through Eco – Sensitive zones of National Park, Wildlife Sanctuary, Bird Sanctuary, Biosphere Reserve and Community Reserve	Environmental (Protection) Act, 1986 and EIA notification 2006.	National Board for Wildlife	6 months	PIU/DPR Consultants	PIU
PROJECT IMPLEMENTATION STAGE						
6.	Consent to Establish and Operate Hot mix plant, Crushers, Batching Plant and Labour Camps	Water (Prevention and Control of Pollution) Act 1974 Air (Prevention and Control of Pollution) Act. 1981	Tamil Nadu Pollution Control Board	3 months	Contractor	PIU/ Supervision Consultant
7.	Authorisation for Disposal of Hazardous Wastes	Hazardous Wastes (Management,	Tamil Nadu Pollution Control Board	2 months	Contractor	PIU/ Supervision Consultant

Sl.no	Clearances	Acts	Approving Agency	Time Frame[8]	Responsibility	
					Execution	Supervision
		Handling, and Transboundary Movement) Rules, 2016.				
8.	Permission for Sand Mining from River bed	Mines and Minerals (Development and Regulation) Act, 1957 Environmental (Protection) Act 1986 Water (P& CP) Act 1974 and Air (P& CP) Act 1981	Commissioner of Geology and Mining, GoTN Environmental Clearance from SEIAA, Go TN CTE/CTO from TNPCB	2 -6 months	Contractor	PIU/ Supervision Consultant
9.	Permission for Opening of New Quarry	Mines and Minerals (Development and Regulation) Act, 1957 Environmental (Protection) Act 1986 Water (P& CP) Act 1974 and Air (P& CP) Act 1981	Commissioner of Geology and Mining, GoTN Environmental Clearance from SEIAA, Go TN CTE/CTO from TNPCB	2 – 6 months	Contractor	PIU/ Supervision Consultant
10.	Storage of Hazardous Chemicals (Fuel Oils) and Explosives	Manufacturing Storage and Import of Hazardous Chemicals Rules 1989	Chief Controller of Explosive, Chennai	3 months	Contractor	PIU/ Supervision Consultant
11.	Permission for Withdrawal of Ground Water	Environmental (Protection) Act, 1986	Central/State Ground Water Board	3 months	Contractor	PIU/ Supervision Consultant
12.	Pollution Under Control Certificate	Central Motor Vehicles Act 1988	Transport Department (GoTN)	1 Month	Contractor	PIU/ Supervision Consultant
13.	Employing Labour	The Building And Other Construction Workers. (Regulation of Employment and Conditions of Service) Act, 1996	Labour& Employment Dept., GoTN	1 Week	Contractor	PIU/ Supervision Consultant
14.	Registration of Workers	Labour Welfare Acts.	Labour&Employment Dept., GoTN	1 Month	Contractor	PIU/ Supervision Consultant

Source: Acts, Rules and Regulation from Central and State Government

3 PROCEDURE FOR CONDUCTING ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

3.1 Introduction

The Environmental and Social Management Framework (ESMF) shall be applied once the need/justification of a project is finalized based on the engineering parameters (like traffic, economic and financial analysis, screening of the project road) to ascertain the category of Environmental and Social Impact Assessment (ESIA) as the first step.

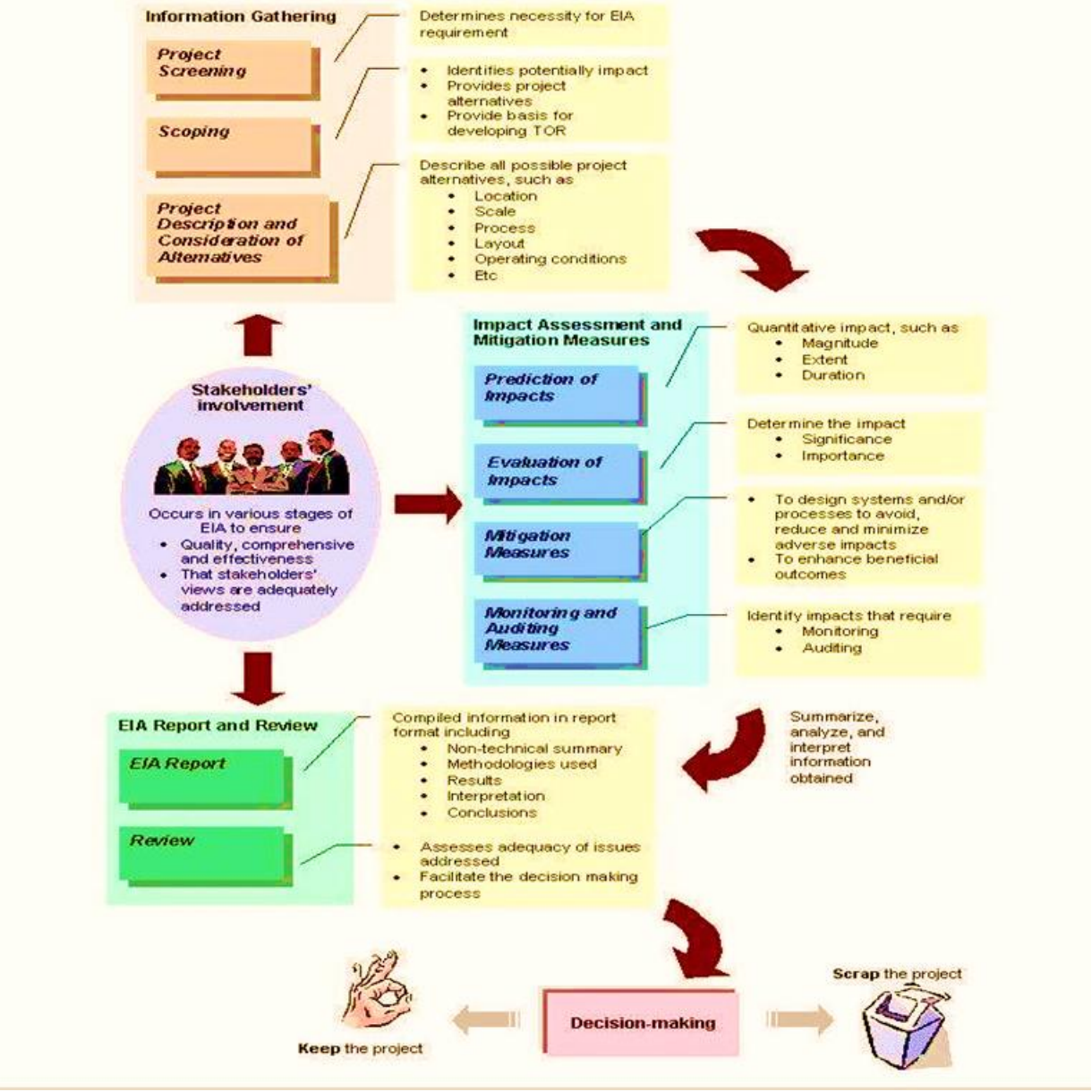


Figure 7: The EIA processes in Sequences ofApplication

Source: The manual in perspective, EIA Training Resource Manual, United Nations Environment Programme, 2002

3.2 Step 1: Screening

Screening is the process by which the appropriate level and type of ESIA is determined for a given project based on its likely environmental and social impacts. For identification of sensitive sub-projects concerning the environmental and social issues, screening and the review process shall be

worked out

This exercise will be a useful tool to identify the environmental and social issues, and integrate them into the project preparation, and not as an exclusion criterion for avoiding environmental and social impacts. The PIU (TNRSP-II) shall carry out screening exercises for all roads to determine the subsequent stages of the project before initiation of the DPR activities.

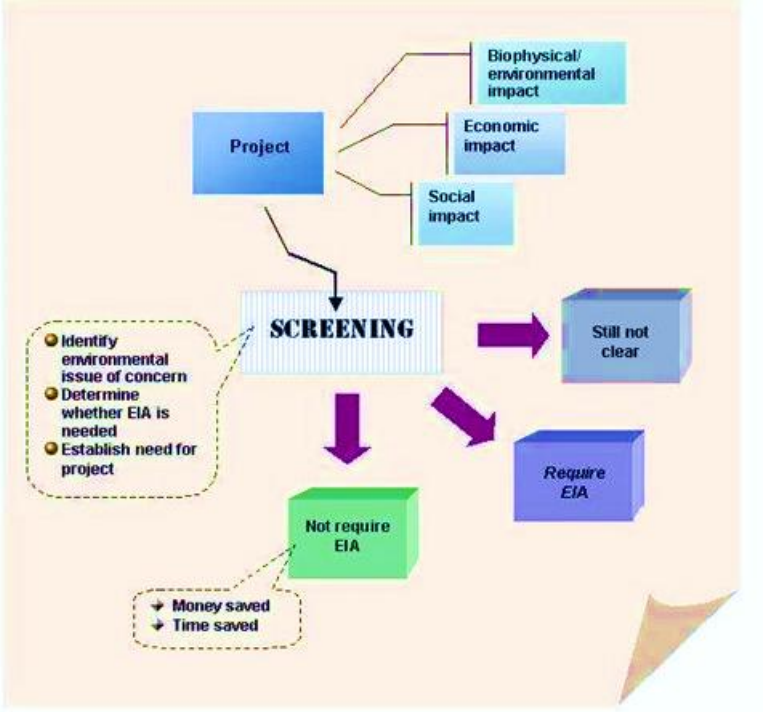


Figure 8: The Project Screening Process

The screening criteria include:

- Environmental factors, including:
  - Sensitive areas, natural habitats, protected areas
  - Felling of trees outside the protected areas
  - Clearance of vegetative cover
  - Loss of productive agricultural land
  - Cuts across perennial streams or surface water bodies
  - Vulnerability to natural hazards, landslides/slips and
  - Environmental features as marshy areas, sand dunes, etc.
- Social factors, including:
  - Land availability
  - Loss of structures
  - Loss of livelihood
  - Impacts on Indigenous population
  - Impacts on common property resources, and
  - Demand from communities for the road

The methodology for screening includes desk study, reconnaissance survey, and review based on available literature.

Desk Study: Involves the collection of secondary information and then chalk out the methodology for carrying out ESIA study and fix responsibilities of ESIA team members for preparing a complete Environmental and Social Management Plan, ESMP addressing all issues.

- Gathering and reviewing existing environmental and social data (Secondary Data) relevant to the proposed development, in the form of topo-sheets, physical maps, thematic maps

showing details of soil type, geology, seismic activity, hydrology, census information, land use plan etc.

- Collecting the various environmental, social and engineering studies conducted earlier in the project influence area.

Reconnaissance Survey: Involves the collection of first-hand information about the project area and develops a perspective of the entire team and revises the methodology and work programme.

- Verifying the data collected during the desk study, assessing the likely impacts, identifying the major/main issues and preparing the methodology for detailed investigation.

Categorization of sub-project: Involves compiling the collected primary & secondary data, checking with the legal framework of State and National level and the World Bank Safeguard Policies. Given, proposed sub-project roads under Additional Financing (AF) are improving of missing link with State Core Road Network will have varying the environment and social impacts. Hence, the type and extent of environmental and social impact assessment to be carried out to identify and mitigate the impacts also largely depends upon complexities of project activities and exact locations.

Environmental Categorisation of sub-project: To facilitate effective screening and review process, under TNRSP II Additional Financing, the sub-projects shall be categorized into E1, E2, and E3 linked to extent and severity of impacts (depending on type of activities and locational characteristics) and regulatory requirements. Guidance is provided here for the indicative categorization of projects.

(i) Sub-projects which may have significant adverse environmental impacts that are sensitive, diverse and unprecedented; thus, necessitating Environmental and Social Impact Assessment (ESIA) are categorised as E1. The proposed subproject is classified as E1 if it is likely to affect Sensitive Environmental and Social Components such as those mentioned in Table 7 below. Those projects/activities, which require environmental clearance as per the EIA notification published by the MOEF&CC will also be categorized as E1. Any subproject involving any activity related to a critical natural habitat as per WB Policy OP 4.04 will also be categorised as E1. Such subprojects would require detailed site and activity specific Environmental Assessment, project impact identification and specific mitigation measures to take care of anticipated negative impacts in addition to improving environmental performance, ensure environmental sustainability and climate resilience/adaptation.

(i) Subprojects that are expected to have potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A are categorised as E2. A subproject is categorized as E2 if its potential adverse environmental impacts are are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A project. Although the scope of assessment for an E2 project is project specific and examines the project's potential negative and positive environmental impacts, it recommends measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

(ii) Sub Projects which are expected likely to have minimal or no adverse environmental impacts are categorized as E3 projects. Hence no environmental assessment is required for

an E3 project beyond screening. However, it is expected that the design of these subprojects also incorporate measure to improve environmental performance.

Proposed category of sub-project	Description		Type of project
	Extent of Environmental impacts	Management measures	
E1	Major environmental issues expected	Project-specific EA shall be prepared by an independent agency. In case the DPR consultant undertakes the ESIA for better alignment with project details; the ESIA will be reviewed by an independent consultant only with the prior WB Board Approval. Specific mitigation/monitoring measures including those to improve environmental performance, ensure environmental sustainability and climate resilience/ adaptation.	• Projects impacting sensitive environmental components including natural habitatsimpacts are irreversible and unprecedented. Project requiring Environmental Clearance as per EIA notification 2006; Wildlife Clearance from NBWL as per The Wildlife Protection Act 1972; and Forest Clearance from MoEF&CC as per The Forest Conservation Act 1980.
E2	Moderate environmental issues expected	Project-specific EA along with the DPR. ESMP including measures to improve environmental performance, sustainability and climate resilience/adaptation.	Projects with impacts less adverse (in intensity and spread) than the E1 category and mostly generic
E3	Minor environmental impacts	Generic ESMP. These will also consider measures to improve environmental performance, sustainability, and climate resilience/adaptation as part of overall design/plan	Projects which would improve the environment without any negative impacts. - Research and Capacity building activities

Social Categorisation of sub-project: Social categorisation of subprojects would be based on the following criteria.

Proposed category of sub-project	Description		Type of project
	Extent of Environmental impacts	Management measures	
S1	Serious social issues expected	SIA and RAP	• If it involves acquisition of private land with major impacts (people lose more

			than 20 % of the productive assets) • Impacts to informal setters (squatters and encroachers) • If it involves physical displacement. • Restricted access to natural resources. Nb 3
S2	Moderate social issues expected	SIA and RAP	• If impacts are limited to less than 200 Persons or about 50 families of minor nature (people lose less than 20 percent of the productive assets). • Loss of community property
S3	No social issues expected; hence socially benign	Social Screening and Due Diligence Report	• No private land acquisition or no impacts to PAPs and informal settlers (squatters and encroachers) on public lands

In case a subproject has more than one among these subcomponents, the higher category applicable for any subcomponent would be considered as the category for the subproject as a whole.

The categorization will also consider other sensitivities of the project locations (Table 7) such as proximity to valuable environmental and social features.The Environmental and Social Specialist of TNRSP based on the screening process undertaken, and apply their experience and expertise-based judgment will support TNRSP to determine the category of sub-projects. For projects not listed in the guidance tool, categorization will be done based on its environmental and social sensitivity. Any upward/ downward scaling of categories requires proper justification and concurrence of the World Bank. In addition to addressing environmental and social issues, TNRSP commits itself to explore opportunities for environmental enhancement (including provision for Rain water harvesting, avenue tree plantation, harshening of solar energy etc.,) at sub-project level.

Table 7: List of Sensitive Environmental and Social Components

Sl.no	**Sensitive Environmental Component**
1.	Religious, heritage historic sites and cultural properties
2.	Archaeologicalmonuments/sites
3.	Scenicareas
4.	Hill resorts/Mountains/ Hills
5.	Healthresorts
6.	Biosphere reserves / Wetland
7.	National park and Wildlife sanctuaries andreserves
8.	Natural lakes/ Swamps/Seismic zones/tribalSettlements
9.	Areas of scientific and geologicalinterests
10.	Defense installations, especially those of security importance and sensitive topollution
11.	Border areas(international)
12.	Tiger reserves/Elephant reserve/Turtle nestinggrounds
13.	Habitat for migratorybirds
14.	Lakes, Reservoirs,Dams

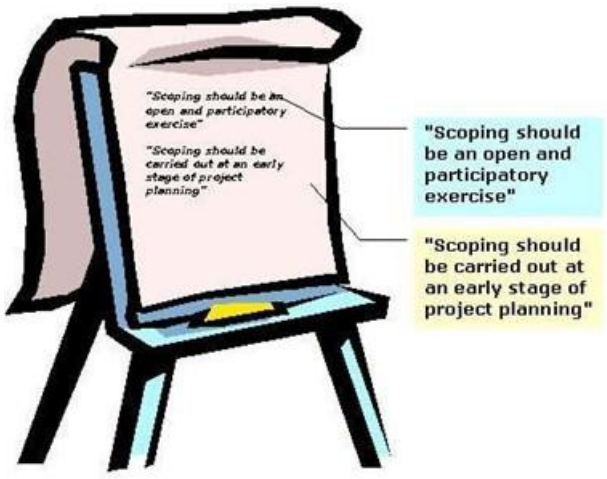
Sl.no	Sensitive Environmental Component
15.	Streams/Rivers/Estuary/Sea

3.3 Step 2: Environmental and Social Impact Assessment

The assessment process shall constitute a systematic approach to the evaluation of a project in the context of the natural, regulatory and environment of the area in which development is proposed.

3.3.1 Scoping

The next step in the ESIA will be to define the proposed project activities and the natural, regulatory (i.e. legal) and environment (including social) of the area in which development will occur. This shall be achieved through Scoping. Scoping shall determine the major environmental and social issues and impacts that will be important in decision-making and needs to be addressed in ESIA. Scoping will be conducted early in the ESIA process so that a focus on the priority issues (i.e. those that have the greatest potential to affect the natural and/or environment) can be established for the rest of the ESIA process.



Key elements/inputs to the scoping exercise will be as follows:

- Gathering and reviewing existing environmental and social information like land width, encroachment, congestion area, bye-pass/ realignment requirement, land use pattern along with bypass/realignment, drainage pattern, Major River and waterways, cultural heritage sites and eco-sensitive areas.
- Whether private eland acquisition is required or impacts to people on public lands required for the proposed road widening;
- Identifying project stakeholders; including PAP, Government and non-government agencies (utilities) Forest Department, Irrigation Department, Pollution Control Board, etc.
- Assemble and review relevant legislative requirements, environmental standards and guidelines (national and international) associated with the proposed development as well as the World Bank safeguard policies and standards.
- Gathering existing information sources and local knowledge;
- Informing stakeholders of the project and its objectives and get input on the ESIA;
- Identifying the key environmental and social concerns (community and scientific) related to a project and the relative importance of issues;
- Defining/preparing the ESIA work program, including a plan for public and stakeholder involvement;
- Carrying out monitoring of natural environment including air, water, soil, noise, etc.
- Defining the range of project alternatives to be considered.
- Determining/freezing the spatial and temporal boundaries for the ESIA studies.
- Determining the extent of impacts on natural and critical habitat and biodiversity.

The main focus of Scoping will be pertaining to the collection and analysis of pertinent data and the assessment of significant environmental and social attributes of the project. The end result will be a work program that is well focused and cost-effective. The following issues shall be addressed

through Scoping, but will not be limited to.

- To improve the quality of ESIA information by focusing on scientific efforts and ESIA analysis on truly significant issues;
- To ensure environmental and social concerns identified and incorporated early in the project planning process, at the same time as cost and design factors are considered;
- To ensure research efforts are not wasted on insignificant issues, rather focused on core issues.
- Reducing the likelihood of overlooking important issues;
- Thinning the chance of prolonged delays and conflicts later in the ESIA process by engaging stakeholders in a constructive participatory process early in the ESIA process;

3.3.2 Environmental and Social Impact Assessment

Following Scoping, legislative requirements, engineering, environmental and socio-economic data shall be assessed in greater detail to ensure that all the proposed activities and their consequences / likely impacts are considered complete.

Baseline data are collected for two main purposes:

(i) To provide a description of the status and trends of environmental factors (e.g., air pollutant concentrations) against which predicted changes can be compared and evaluated in terms ofimportance.

(ii) To provide a means of detecting actual change by monitoring once a project has beeninitiated

3.3.3 Existing Environmental and Social Conditions

To identify any potential impact and potential changes to the natural and socio-economic environments, the existing baseline environmental and social data are to be collected (Refer **Appendix 2**). Baseline data shall include but not limited to the following:

- Primary data/monitoring shall define characteristics of the existing natural environment including soil, water, air, noise, land use, flora & fauna, cultural properties, and urban/rural settlement areas (including sensitive receptors (schools, educational institutions and hospitals).
    - Monitoring to be carried at critical locations
    - Identification of residential, commercial, industrial and forest areas for monitoring
    - Air and Noise Monitoring at Junctions, major settlements, schools, and hospitals, etc.
    - Water Monitoring at river/streams/ponds and ground water sources near major settlements.
    - Soil Monitoring at major settlements, near-surface water bodies.
    - Tree inventory to be carried out, in consultation with Forest Department.
    - Inventory of Cultural Property Resources shall be done along with measurements, details, and photographs; consultation shall be done for gathering public opinion.
    - census survey[9] shall be carried out using a structured questionnaire to record the details of the present occupants within the Corridor-of-Impact (CoI), the area required for the proposed improvements and within the Right of Way (RoW), wherever RoW is greater than CoI,(Carriage width and safety margin) in order to:
        - prevent further influx of persons within the CoI/RoW;

[9] The purpose of carrying out a census of inventory of assets beyond CoI and within RoW, wherever RoW is greater than CoI, is to facilitate TNRSP to update the SIA and RP, if design changes are made in the available RoW during civil works

- to assess the magnitude of impact to private assets; and
- to assess the extent of physical and/or economic displacement. In case of affected landowners, the census will be carried out immediately after section 15(1) notification is published and a supplementary report will be prepared which will be a part of the RAP

  - Baseline socioeconomic survey[10] have to be conducted for the affected persons to establish monitoring and evaluation parameters. It will be used as a benchmark for monitoring the socio-economic status of affected persons.
  - Land Plan Schedule: The right-of-way (RoW) shall be established based on village maps and field measurement books (FMB), which will be the basis for detailed design and wherever possible the improvements shall be carried out within the available RoW to minimise land acquisition.

- Secondary Data to define meteorology, geology, seismicity, quarries, borrow areas, disposal sites, etc.
  - Details of quarry and borrow areas that are likely to be used shall be collected (Photographs, measurements, and public opinion) and a comprehensive plan for extracting material shall be prepared.
  - Meteorological data from IMD, Topo-sheets and maps from Survey of India, geological and soil data from Geological Survey of India.
  - Social data including ownership pattern, identification of tribal, vulnerable social groups, land estimates, etc.

3.3.4 Assessment of Policy and Regulations

Regulatory and administrative framework at the national and state level, applicable World Bank requirements are presented in Chapter 2: Legal Framework

3.3.5 Determining the Degree of impact

After identifying all environmental and social aspects of the project, the level of impact that may result from each of the activity-receptor interactions shall be assessed. In assessing the level of impact that activity may cause, two key elements are to be considered namely:

- **Consequence**: the resultant effect (positive or negative) of an activity's interaction with the legal, natural and/or socio-economic environments; the categorisation for a consequence is presented in **Table 8**below.

Table 8: Consequence categories and rankings

Consequence Category	Addressed
Major	Severe, alternative/avoidance will be proposed
Moderate	Less Severe, measures will be proposed to minimize the impact
Minor	Lesser Severe, mitigation and enhancement measures will be prepared
None	No impact, enhancement measures will be proposed
Positive	Positive Impact

- Likelihood: The categorization for likelihood is presented in **Table 9** below.

Table 9: Likelihood categories and rankings

[10] The survey shall cover all affected persons and the survey shall also collect gender-disaggregated data to address gender issues in resettlement

Likelihood Category	Definition
Certain	The activity will occur under normal operating condition
VeryLikely	The activity is very likely to occur under normal operating condition
Likely	The activity is likely to occur at some time under normal operating condition
Unlikely	The activity is unlikely to occur but may occur at some time under normal operating conditions
Veryunlikely	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

3.3.6 Environmental and Social Impact Prediction

Impact prediction being the most challenging and controversial stage of the ESIA process it must be dealt with utmost care.Based on baseline data collected along with engineering and social inputs, a comprehensive study shall be undertaken to identify the possible impact on environmental and social attributes. The impacts will be defined in terms of their temporal and spatial implications

3.3.6.1 Environmental Impacts

Construction Phase impacts:

(a) Air Pollution

Road construction works shall generate emissions from excavation equipment, other machinery and construction traffic. The emissions may also include greenhouse gases (GHGs) from engine fuel combustion (exhaust emissions) and evaporation and leaks from vehicles (fugitive emissions) and other emissions. The emissions from construction activities will deteriorate the ambient air quality and affect the public health; more so in densely populated areas. In addition, dust generated from the above activities will also have impacts on crops and livestock

(b) Noise Pollution

Noise will be generated by vehicular movement, excavation machinery, concrete mixing and other construction activities. Sensitive receptors such as hospitals, schools, religious places and crowded market areas are particularly vulnerable to increased noise levels.

(c) Water Pollution and usage

Runoff from the construction camp/ construction site located closer to water bodies, can potentially cause some localized increase in water turbidity. However, this increase in turbidity being localized and temporary, is not likely to cause any significant impact on overall water quality and the aquatic fauna. The construction camps and other site facilities such as offices and warehouses will also generate considerable quantities of waste effluents. Other possible causes of land or water contamination include accidental leakage or spillage of fuels, oils, and other chemicals, and waste effluents released from construction sites. These effluents can potentially contaminate the drinking water sources of the area and can also be harmful for the natural vegetation, cultivation fields, water bodies and aquatic flora and fauna.

Water would be required by the labor as well as for construction. This may have impact on the water availability for the local population who are dependent upon the same source, and the impact may also vary season-wise. Many of the areas falling under the project fall in water scarce areas and critical areas. Unregulated tapping of ground water resources may lead to further stress on the water table.

(d) Soil Contamination

Soils (including top soil) in the construction area and agricultural / grazing land will be prone to pollution from the construction sites, workers camps and other material storage areas. Fuel and hazardous material storage for certain construction / operation activities and their handling are also the potential sources for soil and water pollution. Improper siting, storage and handling of fuels, lubricants, chemicals and hazardous materials, and potential spills from may result in hazards and severely impact the soil and water quality.

(e) Site Clearance and Restoration

After the completion of the construction activities, the left-over construction material, debris, spoils, scraps and other wastes from workshops, and camp sites can potentially create hindrance and encumbrance for the local communities in addition to blocking of natural drainage and or irrigation channels.

(f) Sanitation at Workers Colony

Sewage and the domestic solid waste generated at the construction labour camps would have a negative impact on the aesthetics and environment of the surrounding area, if not disposed off in an efficient manner.

(g) Occupational Health and Safety

Road construction works shall involve medium scale excavation, operation of construction machinery, exposure to dusts, diesel engine exhaust emissions, loud noise and heat (from construction macheneries), use of vibrating tools, frequent or excessive manual handling of loads, stress and fatigue etc. These activities may pose health and safety hazards for the construction workers as well as the local community.

(h) Waste Management

During construction period, wastes of different types are anticipated from different sources like reconstruction of pavement, camp sites, vehicle repair areas, clearing and grubbing, plants operation areas etc. The waste generated is likely to have different characteristic and if not manage or handled properly is likely to have potential impacts on topography, drainage, occupational health and safety, and contamination of soil and water bodies.

(i) Forest and Wildlife

Except for Erode to Chennimalai road, all remaining six roads are not passing through or coming under eco-sensitive zone of any protected area, nor affect any forest area. The Erode-Chennimalai is located 2km from the Vellode bird sanctuary so comes under eco-sensitive zone, hence statutory clearance from NBWL will be required prior to commencement of work. No potential direct impact of the project is anticipated, but indirect impact on breeding season is likely during construction stage. The project will have direct impacts on roadside plantation during widening of road and improvement of alignment/geometry.

Operation Phase impacts:

(j) Air Pollution

The project roads are acting as a major link roads and hence on completion of the construction

works, it attracts more traffic which will lead to the increased emission and it will deteriorate the existing ambient air quality.

(k) Noise Pollution

Similar to air impact, the noise levels along the project roads, will be high due to the higher traffic volumes. Traffic noise will be a significant nuisance to the sensitive receptors such as hospitals, schools and religious places.

(l) Water Pollution

The project roads (after construction) will act as an impermeable surface area, which increases the rate of surface water runoff.Increased storm water flow rates can lead to soil erosion and localized increase in turbidity, which will impact the surface water quality

(m) Road Safety

Improvement in roads would result in increased traffic in future years and this may cause increase in frequency of accidents, if traffic is not regulated properly. Though speedy travel is one of the objectives of the project, it also increases the intensity of loss of life in case of an accident.

3.3.6.2 Social Impacts

The project roads are proposed to develop under 2 lane and 4 lane (widening and strengthening) configurations. For the 2 lane configurations, the anticipated social impacts shall be minimal in comparison with the 4 lane configurations. Possible social impacts of the project can be categorized in the following broad groups,

1) loss of immovable assets i.e. agricultural land, homestead land, trees, community infrastructure etc.;
2) loss of livelihood or income opportunity on account of loss of business establishments; and agricultural land; and
3) impact on the community in terms of loss of common property resources or access to such resources, other land used by commons etc. The impacts can be either temporary (for the duration of construction activities) or permanent.
4) Traffic safety measures during construction including traffic diversion arrangements and mitigation of impacts to close by residence, fields and properties.

For the identified social impacts, suitable compensation have to be worked out, in view of that a Resettlement Policy Framework (RPF) has been prepared as per the prevailing regulations of GoI /state and WB's OP 4.12 provisions (Chapter 2: Legal Framework).

(n) Impacts due Labor influx

Construction of the project corridors requires considerable labor workforce. Approximately it is estimated to have 50-150 construction workers for each of the project corridors, of which 30%-50% may be brought in from other states including West Bengal, Bihar and North-eastern states of India. Hence, it becomes necessary often for the contractors to provide camps / labor accommodation in insitu labor camps or rented premises near to construction sites. Often, such camps are in the form of minimal living areas with less ventilation, light, amenities, health care or emergency facilities made of cheap materials. Without adequate facilities for healthy living, such camps end up as breeding grounds of pests and disease vectors. Population pressure due to labor influx may lead to

expanded use of natural resources, such as forests and aquatic resources. Influx may induce increased localized deforestation/ shelterbelts for collection of fuel wood etc. Worker camps, without appropriate wastewater discharge, may pollute nearby water sources. The need for potable water for workers in worker camps can result in increased pressure on freshwater resources in the project or camp area. Adequate contacts provision is made to ensure that contactors provide all possible facilities to the workers including accommodation and other support to those who will be residing in the labor camps. The local and outside labor will be tracked through progress reports.

(o) Gender Based Violence (GBV)

To address the Gender Based Violence (GBV), the risks (issues related to women's safety and security, Physical violence, Emotional abuse, etc) shall be assessed through consultations with the women group, vulnerable communities, students, educational institution authorities etc. along the project settlements/villages. Based on the outcome of the analysis, suitable mitigation measures shall be included in the ESMP, which shall form part of the Bid Document for effective implementation. In addition, the Contractor shall prepare and implement robust measures to address the risk of gender-based violence that include

- mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct towards local community members, specifically women;
- informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted;
- introducing a Worker Code of Conduct as part of the employment contract and including sanctions for non-compliance (e.g., termination), and
- contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence
- A GBV mitigation plan will be prepared as part of ESIA/ESMP to mitigate the impacts relted to gender based violence.

Gender mainstreaming. Separate consultation will be held with women to understand their concerns and needs, and suitable measures will be proposed in ESIA/ESMP to address their concerns. The employment and training will be one of the focus areas to be focused to bring more women into non-farm labor fofrece.to increase their participate rate.

3.3.7 Analysis of Alternatives

An analysis of various alternative options for the project are to be assessed for varying level of impacts and their addressal shall be part of the ESIA. The best-fit alternative with respect to the engineering economic, social and environmental aspects are to be considered for implementation. Various alternatives that could be considered are as below:

- With or without the project.
- Analysis criteria to include environmental, social, technical/design and economic options.
- Alignment options within existing RoW
- Alternatives of Bypass
- Other engineering alternatives.

3.3.8 Stakeholder Consultation at all stages of the project

Stakeholder consultations are an integral part of the project design process. The stakeholders are to be consulted at two stages of the project, at a minimum, once in the initial stage of the project conceptualisation and an alternative analysis and another one has to be conducted after finalisation of the design. Both stages of consultations are critical for the success of the project with the community. Various stages in the consultation process are outlined below.

i. Identification of stakeholders both primary as well as secondary
    - Primary stakeholders include people having a direct impact I.e project affected persons.
    - Secondary Stakeholders include elected representative, village representatives, women's group, Voluntary organizations NGOs, experts, field level officers and staff, other government officials.

ii. Structured Consultation - All structured consultations need to be a two-way dialogue with the aim of informing the stakeholders about the potential impacts (positive/negative) and obtain their feedback and views about the project activities and the proposed mitigation measures. In doing so, all consultations need to be inclusive of all groups and gender, transparent and documented. The implementing agencies will conduct meaningful consultations with all relevant stakeholders who are directly or indirectly affected. For this purpose, PIU will prepare a consultation plan with all stakeholders. The proceedings and outcomes of these consultations will be recorded. The structure consultation will be done at three levels I.e.
    - Consultation at Village Level
    - Consultation at District Level
    - Consultation at State level

- Consultation at Village Level
    - Along with preliminary inventory and survey information, dissemination shall be done along the alignment by one by one canvassing about the project. The date and venue for detailed consultation shall be fixed.
    - The pictorial method (Pamphlet) shall be adopted to explain proposed improvements and possible environmental impact in the concerned villages.
    - Public consensus shall be arrived at for the proposed mitigation.
    - Public suggestions and grievances shall be addressed at an appropriate level.
- Consultation at District Level
    - Consultation with officers of Revenue, Forest and line department
    - Consultation with the elected representatives and other stakeholders
- Consultation at the state level
    - Consultation with senior department officers, principal secretary, and others to

formalize the procedure and mechanism of regulatory clearance, utility shifting, land acquisition, etc.

3.3.9 Environmental and Social Impacts Assessment (ESIA) Report

An ESIA document should typically include:

- **Executive Summary** concisely discusses significant findings and recommended actions.
- **Project Description** describing the existing as well as the proposed scenario with a mention on Right of Way (RoW), roadway improvements, cross drainage structures, community facilities, traffic projections, etc.
- **Legal Framework** presents the legal and administrative framework of the Government of India and the Government of Tamil Nadu. This section underlines various clearances applicable for the subproject roads at the State / Central level.
- **Baseline Environmental Status**, the existing environmental conditions along the roads to be ascertained by conducting a reconnaissance survey along with the collection of secondary information pertaining to the roads. Primary data for various environmental parameters has to be generated using suitable monitoring devices. The methodology has to strictly adhere to the guidelines stipulated by the Central Pollution Control Board.
- **Public Consultation** to be carried out to know the reactions of the local population and the project affected people (PAP). Meetings to be held with the stakeholders to record their views on the impacts caused and the suggested remedies to be adopted for the proposed subproject roads.
- **Analysis of Alternatives** to be presented shall be carried out during the feasibility stage, covered in Environmental Screening Report, and the approved alternative to be discussed in detail along with environmental attributes under the impact.

Environmental and Social Impacts, addressing all the anticipated impacts on the physical, social and environment of the roads, have been identified during the environmental and social screening exercise and environmental assessment carried out for roads under TNRSP-II. The quanta of all the identified anticipated impacts on the natural environment and social/cultural environment are presented in **Table 10** and
Table 11 respectively. The ESIA Report should be structured as per the outline in the **Annexure 3.**

Table 10: Possible Impacts on Physical Environment

Project Activity	**Planning and Design Phase**	**Pre-construction Phase**		**Construction Phase**					**Operation**	**Indirect effects of operation or Induced development**
Environmental Component Affected	Land Acquisition	Removal of Structures	Removal of Trees & Vegetation	Earthworks including Quarrying	Laying of Pavement	Vehicle & Machine Operation & Maintenance	Concrete & Crusher Plants	Sanitation & Waste (labour campus)	Project Operation	
Air		Dust generation during dismantling	Reduced buffering of air and noise pollution, hotter, drier microclimate	Dust Generation	Asphalt odour	Noise dust pollution	Noise, soot, odour, dust pollution	Odour, smoke	Noise, dust pollution	Other pollution
Land	Loss of Productive Land	Generation of debris	Erosion and loss of topsoil	Erosion and loss of topsoil	Contamination of soil	Contamination by fuel and lubricants compaction	Contamination compaction of soil	Contamination from wastes	Spill from accidents, Deposition of lead	Change in cropping pattern
Water	Loss of water resources	Siltation due to of loose earth	Siltation due to loose of the earth	Alteration of drainage, Break in continuity of ditches, Siltation, Stagnant water pools in quarries	Reduction of the groundwater recharge area	Contamination by fuel and lubricants	Contamination by leakage of fuel	Contamination from wastes overuse	Spill contamination by fuel, lubricants	Increased contamination of groundwater
Noise		Noise pollution	Noise pollution	Noise pollution	Noise Pollution	Noise pollution	Noise pollution		Noise pollution	Noise pollution
Flora		Loss of biomass		Lowered productivity, Loss of Ground for vegetation		Removal of vegetation	Lower productivity, Use as fuel wood	Felling trees for fuel	Impact of pollution on vegetation, Lowered productivity, Toxicity of vegetation	
Fauna			Disturbance, Habitat loss	Disturbance		Disturbance	Disturbance	Poaching	Collision with traffic	Distorted habitat

Table 11: Possible Impact on Social and Cultural Environment

Project Activity	Planning & Design Phase	Pre-construction Phase			Construction Phase					Operation	
										Direct	Indirect Induced development
Environmental Component Affected	Design decisions & Implementation policies	Land Acquisition	Removal of Structures	Removal of Trees & Vegetation	Earthworks including Quarrying	Laying of Pavement	Vehicle & Machine Operation & Maintenance	Asphalt and crusher plants	Labour Camps	Project Operation	-
Agricultural Land		Change in land prices	Loss of land economic value	Loss of standing crops	Loss of productive land	-	-	Dust on agricultural land, reduce productivity	-	-	Conversion of agricultural land
Building & Built Structures	-	-	Loss of structures, debris generation, noise & air pollution	-	Noise, vibration may damage to structures	-	Noise, vibration may damage to structures	Dust accumulation on building & structures	-	Vibration & noise	Change building in use & characteristics
People & Community	Anxiety & fear among community	-	Displacement of people, psychological impact on people, loss of livelihood	Loss of shade & community trees, loss of fuel wood & fodder, loss of income	Noise & air pollution	Odour& dust	Noise & air pollution, collision with pedestrians, livestock & vehicles	Air & noise pollution and discomfort	Community clashes with migrant labours	Noise pollution, risk of accident	Induced pollution
Cultural Assets	-	-	Displacement, loss of structure from RoW	Loss of sacred trees	Noise, vibration may cause damage to the structure	-	Damage from vibration & air pollution	Dust accumulation	-	Damage from vibration & air pollution	-
Utilities and Amenities	-	-	Interruption in supply	-	-	-	Damage to utilities & amenities	Dust accumulation on water bodies	Pressure on exiting amenities	-	-
Labor's Health & Safety	-	-	-	-	Blasting hazards. Increase of stagnant deep water: drowning & disease. Road safety. Plant & equipment hazards.	Asphalt and odour dust	Collisions with vehicles, pedestrians & livestock	Impact on health due to inhaling of dust	Increase in communicable diseases	The collision of pedestrians & livestock	-

3.3.10 Preparation of Resettlement Plan

The resettlement plan shall be prepared based on the findings of the census and socio economic survey (section 3.3.3) and consultations. It will include the findings of the census of affected persons, and the entitlements (as set out in the Resettlement Policy Framework) to restore losses, socio economic characteristics of the displaced persons, institutional mechanisms and implementation schedules, budgets, assessment of feasible income restoration mechanisms, development of resettlement sites and relocation, grievance redress mechanism, coordination of implementation in conjunction with civil works procurement and construction schedules and internal and external monitoring mechanisms.

3.3.11 Cumulative Environmental Impact Assessment

In the Tamil Nadu state, various roads, highways and other infrastructure development project activities have been completed in the past, under the progress in the present and planned for the future. Therefore, it is necessary to carry out the Cumulative Environmental Impact Assessment for the subprojects in TNRSP-II.

Cumulative impacts are changes to the environment caused by project activities in combination with other past, present, and future human actions. Cumulative Environmental Impact Assessment is an assessment of such impacts. In practice, assessment of cumulative impacts requires consideration of other assessment concepts, which are different from the conventional approaches used in ESIA. The concepts of commutative impact assessment are the following:

- Assessment of impacts during a longer period of time into the past and future; Consideration of impacts on valued ecosystem components (VECs) due to both the project of concern and interactions with other past, existing and reasonably foreseeable future actions;
- Evaluation of significance in the consideration of other than just local and direct impacts (such as indirect impacts, cumulative impacts, and impact interactions); and assessment of impacts over a larger (i.e. “regional”) area.

Cumulative impacts occur as interactions-between actions, between actions and the environment, and between components of the environment. These pathways between a source and an effect are often the focus of an assessment of indirect or cumulative impacts.

Cumulative impacts are incremental effects of past, present, or future activities combined with the proposed project (e.g. a habitat lost because of quarries used for road construction). Guidance and steps for carrying out Cumulative Impact Assessment is provided in Appendix-7

During up-gradation of roads under TNRSP - II, anticipated cumulative impacts have been identified based on environmental screening exercise and the same are described below:

- Cumulative impacts of vehicular traffic at junctions
- Cumulative impacts on road safety
- Cumulative impacts on Valued Ecosystem Components (VEC) (Table 7) along the roads under TNRSP-II

3.3.11.1 Cumulative Impacts of Vehicular Traffic at Junctions

An assessment of impacts due to increased traffic in future years and this will cause increased vehicular noise and air pollution at intersection, along with increased frequency of accidents if traffic is not regulated properly. In addition, the assessment should also be made for other socio-economic

impacts identified at intersections, for example establishment of commercial shops, etc. Mitigation measures should be proposed in the detailed ESIA/ESMPs.

3.3.11.2 Cumulative Impacts of Road safety

The concern for safety stems from the proposals for faster vehicular movement along the project roads. Though speedy travel is one of the objectives of the project, it also increases the intensity of loss of life in case of an accident. Road safety impact assessment must be taken up for the sub-projects. Road safety assessments should be made during the pre-construction, construction and operations phase. Location specific mitigation measures should be clearly brought out in the detailed ESIA/ESMPs of each sub-project.

3.3.11.3 Cumulative Impacts on Valued Ecosystem Components (VEC)

The valued ecosystem components (VECs), as mentioned in Table 7 should be identified in all the sub-project roads during environmental screening, such as number of trees, green tunnel, ecologically sensitive receptors, rivers/lakes, land use, drainage, topography, pollution (air, water and noise), drinking water resources, noise sensitive receptors, village ponds, etc. Besides VECs, the cumulative impacts on landuse should also be assessed. The mitigation measures proposed in the ESIA/ESMPs of the sub project should address these cumulative impacts.

During screening of the roads to be taken up under Phase-I of the Additional Financing, following aspects were considered for assessing the anticipated cumulative impacts, viz.: (a) geographical location of the 3 sub-project roads, which are spread over 2 districts; (b) improvement of roads is along existing alignments with cumulative length of less than 31 kms for3 roads; (c) the 3 sub-project do not fall in protected area, forest and wildlife corridor or natural/critical habitat; and (d) impact on natural resource base due to construction are not significant. It is assessed that except for incremental effects on natural resource base, increase in vehicular traffic, potential for road safety/accident, the project is unlikely to contribute to adverse cumulative impacts.

Assessment of the indirect and induced impacts would be made during the preparation of the ESIA for the Phase-II of the project and theanticipated cumulative impactsshall be addressed in Environmental and Social Impact Assessment reports for the roads to be taken up. Necessary environmental and social safeguards will be incorporated in ESMPs for concerned roads for mitigation of anticipated cumulative impacts. To ensure road safety in concerned roads under TNRSP-II (AF), necessary safeguards/measures have been incorporated in the design of roads. For the roads under TNRSP-II, iRAP (International Road Assessment Program) is being planned for implementation.

3.3.12 Mitigation and Monitoring Plan

Mitigation Measures

Mitigation measures shall be considered starting with the Environmental and Social Impact Assessment process. Severe impacts identified in consequence category and or likelihood category shall be further analyzed to identify additional mitigation measures that are potentially available to eliminate or reduce the predicted level of impacts. Potential mitigation measures shall include:

- Habitat compensation program
- Species-specific management program
- Engineering design solutions
- Alternative approaches and methods for achieving an activity’s objective

- Stakeholders participation in finalizing mitigation measures
- Construction practice, including labour welfare measures
- Operational control procedures
- Management systems

If identified impacts "Physical/Social/Cultural", i.e. are significant and/or important, it is necessary to identify and implement mitigation measures. Mitigation measures are selected to reduce or eliminate the severity of any predicted adverse environmental and social effects and improve the overall environmental and social performance and acceptability of the project. Where mitigation is deemed appropriate, the impacts would be addressed in the following order of priority, to:

- Eliminate or avoid adverse effects, were reasonably achievable.
- Reduce adverse effects to the lowest reasonably achievable level.
- Regulate adverse effects to an acceptable level, or an acceptable period.
- Create other beneficial effects to partially or fully substitute for, or counter-balance, adverse effects.

Mitigation is an integral part of impact evaluation. It looks for better ways of doing things so that the negative impacts of the proposal are eliminated or minimized and the benefits are enhanced. As soon as significant adverse impacts are identified, discussions should be held to see if they can be "designed out" through changes in project design, location or operation. For unavoidable measures, the Environmental and Social Management Plan should address the anticipated impact.

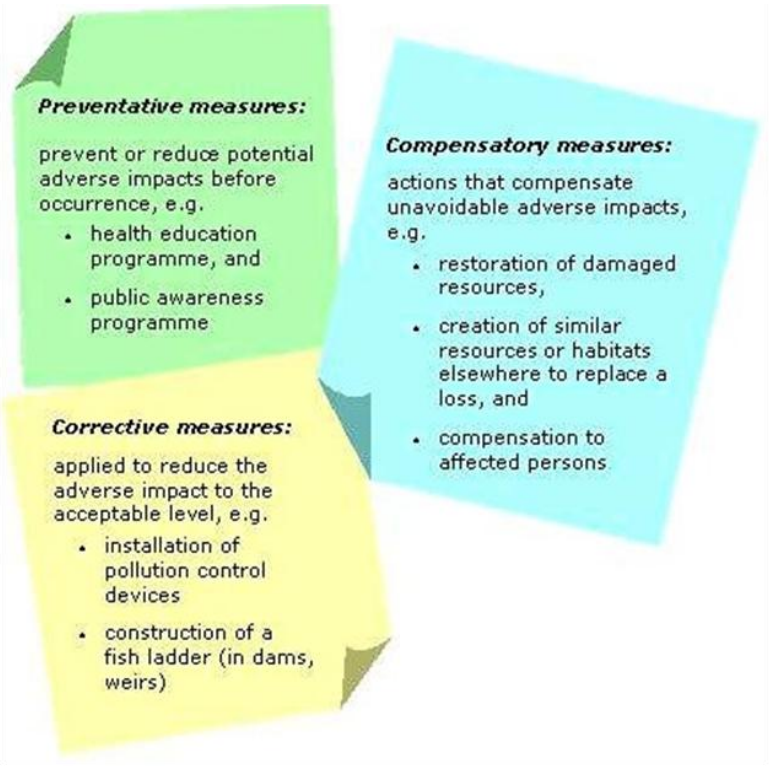


Figure 9: Measures Most Relevant To Development Projects

ESMF is an instrument that examines the issues and impacts associated when a project consists of a series of subprojects, and the impacts cannot be determined until sub-project details have been identified. The ESMF contains measures to reduce and mitigate adverse impacts and enhance positive impacts for addressing project impacts. ESMF is a commitment for the incorporation of measures in Contract Bid Document; management, verification & scrutiny of mitigation measures

and mid-course corrections as needed at the implementation stage. ESMP for mitigation of identified adverse environmental and social impacts and to enhance positive impacts is described in Chapter 4.

4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESMP should be developed to mitigate the impacts assessed during the EA process and also the likely impacts during the construction and operational phases. ESMP shall be part of the contract bid document. Unique environmental issues, specific design measures, site-specific mitigation measures with suitable design, generic environmental mitigation measures and environmental enhancement measures should be included in ESMP. A generic ESMP has been presented in **Table 12** below for reference as sample guidance based on environmental and social screening exercise of roads under TNRSP-II. This can be used as reference material for comprehending the scope of ESMP

Table 12: Environmental and Social Management Plan

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
A. PRE-CONSTRUCTION STAGE				
1.0 Pre-construction activities by PIU				
1.1 Land Acquisition	The land will be acquired following the provisions of Tamil Nadu Highway Act, 2001 and the compensation will be determined following India's new Land Acquisition and Rehabilitation and Resettlement Act, (RFCTLARR Act, 2013). The Resettlement Policy Framework (RPF) and the OP 4.12 (Involuntary Resettlement) will be followed in mitigating the impacts related to land acquisition and resettlement.	Corridor of Impact.	SDU (TNRSP), Revenue Dept., and NGOs,	PIU (TNRSP)
1.2 Tree Cutting	• As far as possible maximum efforts shall be made to minimize the number of trees proposed to be felled by adopting suitable on the spot adjustment of engineering designs. • Trees shall be removed from the Corridor of Impact (CoI) and construction sites before the commencement of construction. Prior Permission shall be obtained from the Revenue Divisional officer concerned for the felling of trees. • The trees cut shall be disposed of through auction (inclusive of tree stumps). This disposal shall be done immediately to ensure that the traffic movement is not disrupted. Progress of tree cutting shall be reported to the PIU. • The cutting of trees within the Eco sensitive zones of protected areas willrequire permission from the ForestDepartment. • For private trees, the provision as indicated in the OP 4.12 (Involuntary Resettlement) and Resettlement Policy Framework (RPF) shall be adopted	Corridor of Impact.	Environment Cell (PIU, TNRSP), Revenue Department and Forest Department. Tree Felling Contractor	• PIU (TNRSP)
1.3 Utility Relocation and Common Property Resources (CPR's)	• All community utilities and common property resources such as stand posts bore wells, wells, water supply lines, toilets, sewage lines, drainage systems, optical fiber cables, electric power supply lines, transformers, irrigation pump houses, telephone and television cables shall be relocated and restored before the commencement of the road improvement activity. • While relocating these utilities and facilities, all concerned agencies	Corridor of Impact.	PIU (TNRSP), Concerned Agencies/ Departments, Contractor	• PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	including PIU shall take necessary precautions and shall provide barricades/delineation of such sites to prevent accidents including accidental fall into boreholes, pits, drains both during demolition and construction/ relocation of such facilities. Standard safety practices shall be adopted for all such works. • Early completion of works for schools, colleges and health centers including shifting of gates and construction of boundary walls shall be planned during holidays so that the risk of accidents and disturbance to the day-to-day activity of such institutions are minimized. • Proper placement (as per codes) of passenger shelters/bus stops shall be ensured to prevent distress to the commuters and passengers. • Access to the Common Property Resources (CPR's) shall be maintained • Relocation sites for all CPRs shall be selected in consultation with concerned communities, local administrative authorities/departments.			
1.4 Relocation of Cultural and Religious Properties	• All cultural properties within the CoI, whose structure is getting affected fully, shall be relocated at suitable locations, as desired by the community; and for partially impacted structures enhancement measures shall be applied at the same sites before construction begins, depending on the availability of space, the requirement of the communities and fund availability. • No cultural properties or religious structures shall be removed or relocated without the knowledge and written consent of the concerned parties or communities and local administration as the case may be. Sites for the relocation of these religious structures shall be identified following the choice of the community. • As far as possible, the architectural elements of the structure should be conserved/reflected/translated into the design of new structures following the wishes of the community • Proper drainage and garbage disposal at such sites shall be ensured to prevent unhygienic conditions, blocking of drains, etc. at/near relocated structures. Garbage collection bins, soak pits or other appropriate measures shall be provided apart from the simple enhancement of such	Corridor of Impact.	SDU (TNRSP), NGOs, Contractor, Concerned Community	• PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	sites.			
1.5 Orientation of Implementing Agencies and Communities	• The PIU shall organize orientation sessions during all stages of the project. This shall include on-site training (general as well as specific to the context of this subproject) as well. These sessions shall involve the concerned division-level staff of the TNRSP involved in the project, Staff of the Site Engineer/ Supervision Consultant and the Contractor. • Briefing sessions shall be held for sub-project community representatives before and during implementation.		PIU (TNRSP), Site Engineer/ Supervision Consultant	PIU (TNRSP)
2.0 Pre-construction activities by the Contractor/Engineer of Supervision Consultant				
2.1 Joint Field Verification	• The Engineer - Incharge of Supervision Consultant and the Contractor shall carry out joint field verification to ascertain the necessity of saving trees, environmental and community resources wherever such representations or suggestions in writing have been received and forwarded by the project authority or by the site engineer following the local situations (in consultation with the local authority/ interest of community representation). • The complaints/suggestions together with the observations and expert opinion of the joint verification team containing the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the ESMP shall be summarized in a written document containing all the details with date, time, place, and signature of the individuals involved and this shall be sent to PIU/TNRSP for approval. • The PIU shall maintain proper documentation and justifications/reasons in all such cases where deviation from the original ESMP is proposed.	Project Corridor	• Contractor and Environmental Officer of CSC	• PIU (TNRSP)
2.2 Assessment of Impacts due to Changes/Revisions in the Project Work	The Engineer - In charge of Supervision Consultant shall assess the anticipated impacts and revise/modify the ESMP in consultation with the PIU/CPRR in accordance with the recommendations made by the field survey party in the event of changes /revisions /unanticipated impacts (including addition or deletion) in the project's scope of work	Project Corridor	Contractor and Environmental Officer of CSC	PIU (TNRSP)
3.0 Procurement of Machinery				
3.1 Crushers, Hot-	• Crushers, hot mix plants, and batching plants shall comply with the	Project	• Contractor	• Environment

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
mix Plants & Batching Plants	requirements and specifications of the relevant current emission control legislation and contract specifications. • The guidelines with respect to establishing hot mix plant, batching plant issued by the TNPC Board from time to time shall be followed. • Crushers, hot-mix and batching plants shall be located at least 1000m (1km) away from residential/ settlements, forests, wildlife movement areas, and commercial establishments, preferably in the downwind direction. • The Contractor shall submit a detailed layout plan for all such sites and seek prior approval of Engineer - Incharge of Supervision Consultant before entering into a formal agreement with a landowner for setting-up such sites. Actions by Supervision Consultant and PIU/TNRSP against any non-compliance shall be borne by the Contractor at his own cost. • Arrangements to minimize dust pollution through the provision of windscreens, mist spray units, and dust encapsulation shall have to be provided at all such sites. Specifications of crushers, hot mix plants, and batching plants shall comply with the requirements of the relevant current emission control legislation and Consent / NOC for all such plants shall be submitted to the CSC and PIU/TNRSP. • No such installation by the Contractor shall be allowed till all the required legal clearances are obtained from the competent authority and the same is submitted to the PIU/TNRSP and the Supervision Consultant. • Environmental Monitoring (dust and emission) have to be conducted to demonstrate compliance.	Corridor		al Officer of CSC and PIU (TNRSP)
3.2 Other Construction Vehicles, Equipment and Machinery	• The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment, and machinery to be procured for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. • Noise limits for construction plant and equipment that are to be procured such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A), when measured at one-meter distance from the edge of the equipment in free	Project Corridor	• Contractor	• Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	field, as specified in the Environment (Protection) Rules, 1986. • Efficient and environmentally-friendly equipment confirming to the latest noise and effluent emission control measures available in the market shall be used in the project. • The Contractor shall maintain a record of Pollution under Control (PUC) certificate for all vehicles and machinery used during the contract period, which shall be produced to the PIU/TNRSP and the Supervision Consultant for verification whenever required.			
4.0 Identification & Selection of Material Sources				
4.1 Borrow Areas	• Arrangement for locating the source of supply of material for embankment and subgrade as well as compliance with environmental requirements, as applicable, shall be the sole responsibility of the Contractor. The Environmental and Safety Engineer from the Contractor shall be required to inspect every borrow area location before approval. • Format for reporting shall be as per the Reporting Format enclosed in the ESMP for Borrow Area. The Engineer - Incharge of the Supervision Consultant shall be required to inspect every borrow area location and evaluate such proposals following environmental requirements (ESMF's Guideline-3: Borrow Areas**)** before issuing approval for use of such sites. • No borrow areas shall be opened within 500m of wildlife movement zones and forest areas. The borrow areas shall be at least 300m from schools and village access roads. • Borrow area should be located at a minimum distance of 300m from the residential/ settlement area. Proper fencing should be provided and access to the borrow areas should be restricted for the locals • The Contractor shall not borrow the earth from the selected borrow area until a formal agreement is signed between landowner and Contractor and a copy of the agreement is to be submitted to the Engineer – In-charge of the Supervision Consultant. The Supervision Consultant shall report these facts to the PIU/TNRSP along with the remarks in the prescribed format with documentary proofs. • Planning of haul roads for accessing borrows materials shall be	Ecologically sensitive area	• Contractor	• Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate it as per Borrow Area guideline given in the Environmental and Social Management Framework (ESMF) or as approved by the Engineer – In-charge of Supervision Consultant. • Haul roads shall be maintained throughout the operation period of the borrow areas by undertaking the required maintenance and repair works, which may include strengthening, pothole repairing, and diversions. Improvements shall be done to reduce inconvenience to users of these roads, residents living along the haul roads and minimize air and water pollution. • Such measures shall include, but not limited to, frequent sprinkling of water, repairing of the road, road safety provisions (controlling speed and driving standards, warning and informatory signage, flagmen, etc.), and ensuring covering of loaded vehicles by waterproof tarpaulin; consultation with public and special precautions are required when measures are implemented near schools, health centers, and settlement areas. • All borrow areas whether in private, community or govt. the land shall be restored either to the original condition or as per the approved rehabilitation plan immediately upon completion of the use of such a source.			
4.2 Quarries	• The Contractor shall identify materials from existing licensed quarries with suitable materials for construction. Apart from approval of the quality of the quarry materials, the Engineer's representative shall verify the legal status (including environmental clearance, NoC from competent authorities (TNPCB, Dept. of mines) etc.,) of the quarry operation, as to whether approval from the Department of Geology and Mining, GoTN is obtained. • No quarry and/or crusher units shall be selected or used, which is within 1000m from the forest boundary, wildlife movement path, breeding and nesting habitats, and national parks/sanctuaries. No quarry or associated	Quarry area should be located 1000m from the settlement locations •	• Contractor	• Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	plants can be set-up within 1000m from the residential/ settlement locations • Contractor shall also work out haul road network used for quarry transport and report to Engineer - Incharge of Supervision Consultant who shall inspect and in turn report to PIU/TNRSP on the suitability of such haul roads from the safety of residents, biodiversity and other environment points of views.			
4.3 Arrangement for Construction Water	• The Contractor shall source the requirement of water preferentially from surface water bodies, as rivers and tanks in the project area. The Contractor shall be allowed to pump only from the surface water bodies. Boring of any tube wells shall be prohibited. To avoid disruption/disturbance to other water users, the Contractor shall extract water from fixed locations. The Contractor shall consult the local people before finalizing the locations. • Only at locations where surface water sources are not available, the Contractor can contemplate the extraction of groundwater. Consent from the Engineer that "no surface water resource is available in the immediate area for the project" is a pre-requisite before extraction of groundwater. The Contractor shall need to comply with the requirements of the PWD – Water Resources Department. GoTN and seek their approval for doing so.	All rivers/ surface water bodies that can be used in the project	• Contractor	• Environmental Officer of CSC and PIU (TNRSP)
4.4 Fly Ash Utilisation	• To the extent possible the Contractor shall explore the possibilities of utilising the Fly ash for the construction purposes as specified in the Notification on use of fly ash (subsequent amendments). • Transportation of fly ash conditioning with water at power plant and in covered dump truck to prevent dusting enroute. • To prevent dusting at temporary stockpiles, water shall be sprayed and covered with tarpaulins or a thin layer of soil. • The fly ash handling and transportation of the same shall be done as per section 4.6 of IRC: SP: 58-2001.	Transportation and stockpiles	• Contractor	• Environmental Officer of CSC and PIU (TNRSP)
4.5 Sand (all river and stream beds	• The Contractor shall procure sand through online system as instructed by the Government of Tamil Nadu. New sand mining will be allowed	All riverbeds recommended	• Contractor	• Environmental Officer of

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
used directly or indirectly for the project)	subject to Contractor's compliance with MoEF&CC's requirement in EIA notification 2006 amended in January 15, 2016 (http://environmentclearance.nic.in/View_order.aspx?rid=36) and Sand Mining Framework 2018 (https://www.mines.gov.in/writereaddata/UploadFile/sandminingframework260318.pdf) and approval by Environmental Specialist of Independent Engineer. • To avoid accidents and caving in of sand banks at mining sites, sand shall be removed layer by layer. Digging deeper than the permissible limit has to be completely avoided by the Contractor. Such quarry shall be barricaded 10m away from the periphery on all sides except the entry point, to prevent the accidental fall of domestic cattle, wildlife, and human beings.	for sand extraction for the project		CSC and PIU (TNRSP)
4.6 Labour Requirements	• The Contractor shall use unskilled labor drawn from local communities to avoid any additional stress on the existing facilities (medical services, power, water supply, etc.) • The recruitment of women and members of vulnerable groups shall be prioritized. • The Contractor shall provide training to build the skills of locally-recruited labour. • All staff, skilled and unskilled labour employed on a site shall be required to sign Codes of Conduct that shall ensure compliance with the Environmental, Social, Health and Safety provisions of civil works and consultancy contracts.	• Along the project corridor at construction sites	• Contractor • Supervision Consultant	• Environmental Officer of CSC and PIU (TNRSP)
5.0 Setting up construction sites				
5.1 Construction Camp Locations – Selection, Design & Layout	• Construction camps shall not be proposed: o Within 1000m of Ecologically sensitive areas/ zones o Within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The layout of construction camps has to be prepared and approved by the Engineer – Incharge of the Supervision Consultant. • The location for stockyard for construction materials shall be identified at	All Construction Workers Camps including areas in the immediate	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	least 1000 m from watercourses. The waste disposal and sewage system for the camp shall be designed, built and operated such that there will be no contamination to the soil, groundwater and also ensure that there is no odor generation. • Unless otherwise arranged by the ULB's, arrangements for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by Engineer shall be provided by the Contractor.	vicinity		
5.2 Arrangements for Temporary Land Requirement	• The Contractor as per prevalent rules shall carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/ hot mix plants /traffic detours /borrow areas etc. • The Engineer shall ensure that the site is cleared before handing over to the owner (after construction or completion of the activity) and it is included in the contract.	Areas temporarily acquired for construction sites / hot mix plants / borrow areas / diversions / detours	Contractor	Environmental Officer of CSC and PIU (TNRSP)
B. CONSTRUCTION STAGE				
6.0 Construction Stage Activities by Contractor				
6.1 Site Clearance				
6.1.1 Clearing and Grubbing	• Site clearance including clearance of marked trees for felling and removal has to be carried out much before the actual road construction takes place. • Structures and utilities (cabins, commercial properties, hoardings, overhead power transmission lines, cable connections, telephone lines, bore wells, stand posts, wells, statues, temples, etc.) shall be compensated/relocated as per RAP and ESMP provisions before tree felling; clearing or grubbing activities are to be undertaken as these activities may damage structures (private and govt.) and essential facilities/utilities of public use. • All works shall be carried out in a manner such that the damage or disruption to flora is minimum. Only ground cover/shrubs that impinge	Corridor of Impact	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	directly on the permanent works or necessary temporary works shall be removed with prior approval from Engineer - Incharge of Supervision Consultant. • The Contractor, under any circumstances, shall not cut or damage trees. Vegetation above 30 cm girth shall be considered as trees and shall be compensated.			
6.1.2 Dismantling of Bridgework / Culverts	All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials, and appendage as well as the method of operation from impeding cross-drainage at rivers, streams, water canals, and existing irrigation and drainage systems, or causing flooding.	At locations were bridge works and culverts are proposed.	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.1.3 Generation & disposal of Debris	Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction as follows: • Eighty percent (80%) of the sub-grade excavated from the existing road surface, excluding the scarified layer of bitumen, shall be reused in the civil works after improving the soil below the subgrade through the addition of sand and suitable cementing material for qualitative up-gradation. • The dismantled scraps of bitumen shall be utilized for the paving of crossroads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the corridor or in any other manner approved by the Engineer - Incharge of Supervision Consultant. • At locations identified for disposal of residual bituminous wastes, the disposal shall be carried out over a 60 mm thick layer of rammed clay to eliminate the possibility of leaching of wastes into the groundwater. • The Contractor shall suitably dispose of unutilized non-toxic debris either through filling up of borrows areas located in the wasteland or at pre-designated disposal sites (ESMF's Guideline-8: Waste Management And Debris Disposal), subject to the approval of the Engineer - Incharge of Supervision Consultant. • Debris generated from pile driving or other construction activities along	Throughout Project Corridor	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	the rivers and streams drainage channels shall be carefully disposed of in such a manner that it does not flow into the surface water bodies or form puddles in the area. • The pre-designated disposal locations shall be part of the Comprehensive Solid Waste Management Plan (ESMF's Guideline-8: Waste Management And Debris Disposal) to be prepared by the Contractor in consultation and with approval of Engineer - Incharge of Supervision Consultant and approval local competent authority.			
6.1.4 Non-bituminous construction wastes disposal	The location of disposal sites shall be finalized before completion of the earthworks on any particular section of the road. The Engineer shall approve these disposal sites conforming to the following ○ Need to avoid areas with shallow groundwater ○ These are not located within the designated forest area ○ The dumping does not impact natural drainage courses ○ No endangered/rare flora is impacted by such dumping. ○ Settlements are located at least 1000 m away from the site.	Disposal site locations	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.1.5 Bituminous wastes disposal	The disposal of stratified bituminous wastes (ESMF's Guideline-8: Waste Management And Debris Disposal) shall be done by the contractor for reuse in the road formation especially village roads after getting approval from Village Panchayat Presidents and in consultation with Environmental Specialist (PIU)	Throughout Project Corridor	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.1.6 Stripping, stacking and preservation of topsoil	• The topsoil from all sites including roadside widening and working area, cutting areas, quarry sites, borrows areas, construction camps, haul roads in agricultural fields (if any) and areas to be permanently covered shall be stripped to a specified depth of 150mm and stored in stockpiles for reuse. • A portion of the temporarily acquired area and/or RoW edges shall be earmarked for storing topsoil. The locations for stacking shall be pre-identified in consultation and with approval of Engineer - Incharge of Supervision Consultant. The following precautionary measures shall be taken by the Contractor to preserve the stockpiles until they are re-used: • Stockpile shall be arranged such that the slope does not exceed 1:2 (vertical to horizontal), and height is restricted to 2 m.	Throughout Project Corridor	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	• To retain soil and to allow percolation of water, the edges of the pile shall be protected by silt fencing. • Multiple handling is to be kept to a minimum to ensure that no compaction occurs. • Such stockpiles shall be covered with empty gunny bags or shall be planted with grasses to prevent loss during rains. • Such stockpiled topsoil shall be utilized for o Covering reclamation sites or other disturbed areas including borrow areas (not those in barren areas) o Topdressing of road embankment and fill slopes o Filling up of tree pits and in the agricultural fields of farmers, acquired temporarily that need to be restored. • Residual topsoil, if there is any, shall be utilized for the plantation works along the road corridor. • The utilization as far as possible shall be in the same area/close to the same area from where the topsoil was removed. • The stripping, preservation, and reuse shall be carefully inspected, closely supervised and properly recorded by the Supervision Consultant.			
6.1.7 Accessibility	• The Contractor shall provide safe and convenient passage for vehicles, pedestrians, and livestock to and from roadsides and property access connecting the project road by providing temporary connecting road and foot path, as necessary. • The Contractor shall take measures necessary to prevent access to the works, borrow pits and quarry sites by members of the public and animals. • Construction activities that shall affect the use of side roads and existing accesses to individual properties, whether public or private, shall not be undertaken without providing adequate provision approved by the Supervision Consultant. • The Contractor shall ensure that the public and animals are prevented from entering the construction works. • The Contractor shall take care that the crossroads are constructed in such	All along the project corridor, all access roads.	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	a sequence that construction work over the adjacent crossroads are taken up in a manner that traffic movement in any given area does not get affected.			
6.1.8 Planning for Traffic Diversions and Detours	• Detailed traffic control plans shall be prepared by the Contractor and the same shall be submitted to the Engineer - Incharge of Supervision Consultant for approval. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including layouts for signs and barriers, night time safety measures, details of traffic arrangement after cessation of work each day, safety measures are undertaken for the transport of hazardous materials and arrangement of flagmen, etc. to regulate traffic congestion. • The Contractor shall provide specific measures for the safety of pedestrians and workers as a part of traffic control plans. • The Contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • Appropriate and safe speed limits through working areas and along detours shall be established and enforced. • The Contractor shall also inform the local community of changes in traffic routes and pedestrian access arrangements with assistance from the Supervision Consultant and TNRSP.	All along the project corridor, all access roads	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.2 Construction Materials				
6.2.1 Earth from Borrow Areas for Construction	• No borrow area shall be opened without permission of the Engineer – Incharge of Supervision Consultant. • Borrow pits shall not be dug continuously in a stretch. The location, shape, and size of the designated borrow areas shall be as approved by the Engineer and following the IRC recommended the practice for borrow pits for road embankments (IRC 10: 1961). • The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas • The unpaved surfaces used for the haulage of borrow materials shall be	All along the project corridor, all access roads sites temporarily acquired & all borrow areas	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	maintained dust-free by the Contractor. Since dust rising is the most significant impact along the hauled roads, a sprinkling of water shall be carried out twice a day along such roads during their period of use.			
6.2.2 Quarries	• The Contractor shall obtain materials for quarries only after the approval of the Department of Geology and Mining, GoTN. A copy of this consent must be submitted to TNRSP/PIU through Engineer –Incharge of Supervision Consultant. • The Contractor shall develop a Comprehensive Quarry Redevelopment Plan, as per the Mining Rules of the State and submit a copy to TNRSP and Supervision Consultant before the opening of the quarry site. • The quarry operations shall be undertaken within the rules and regulations in vogue.	All along the project corridor and all haul roads	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.2.3 Blasting	• The use of explosives if so provided or ordered or authorized, the Contractor shall comply with the requirements of the following Sub-Clauses of MoRTH 302 besides the law of the land, as applicable. • The Contractor shall at all times take every possible precaution and shall comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives. The Contractor shall at all times when engaged in blasting operations, post sufficient warning flagmen, to the satisfaction of the Engineer. • The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. • Blasting shall be carried out only with the permission of the Engineer and by appropriately trained person. All the statutory laws, regulations, rules, etc., about the acquisition, transport, storage, handling and use of explosives shall be strictly followed. • Blasting shall be carried out during fixed hours (preferably during mid-day) or as permitted by the Engineer. The timing shall be made known to all the people within 1000m (200m for pre-splitting) from the blasting site in all directions.	All blasting and Pre-splitting Sites.	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	• A Blast Management Plan that sets out procedures and measures needed for the safe implementation of blasting activities at each blasting site shall be prepared by the Contractor and approved by the Engineer – incharge of Supervision Consultant			
6.2.4 Water Extraction	Procurement of water is to be carried out as per "Arrangement for Construction Water". The Contractor shall minimize the wastage of water during construction.	All water bodies recommended being used in the project	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.2.5 Transporting Construction Materials	• All vehicles delivering materials to the site shall be covered to avoid spillage of materials. • All existing highways and roads used by vehicles of the Contractor, or any of his sub -Contractor or suppliers of materials and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles • The unloading of materials at construction sites close to settlements shall be restricted to daytime only. • Transportation vehicles shall be cleaned before leaving the site	All along the Project corridor and all haul roads	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.3 Construction work				
6.3.1 Disruption to other users of Water	• While working across or close to any perennial water bodies, the Contractor shall not obstruct/ prevent the flow of water. • Construction over and close to the non-perennial streams shall be undertaken in the dry season and if such activity is likely to disrupt, constrain or impact the community use of the water body, adequate prior information (at least two weeks in advance) shall be provided to such community. Such water bodies may be limited to ponds, water harvesting structures (WHS), feeder channels to the pond, irrigation sources, etc. • If the supply of water or access to a source is being completely cut off, then the Contractor shall make necessary arrangements to provide water in the interim period. A water quality test shall be done before providing/supplying water.	Water withdrawal locations	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	• Wherever excavation results in diversion of water flow shall be required as per the engineering designs, the Contractor shall ensure that such diversion channels have no stepper slopes than 1:2 (V to H). Proper slope protection measures have to be taken as approved by the Engineer - Incharge of Supervision Consultant and TNRSP/PIU. • The Contractor shall take prior approval from PWD –Water Resource Department, GoTN and Supervision Consultant for any such activity. The PIU/TNRSP shall ensure that Contractor has served the notice to the downstream users of water well in advance where such diversion of the flow is likely to affect the downstream population subject to the condition that under no circumstances the downstream flow shall be stopped putting the wildlife, the aquatic fauna, and the shoreline settlement under distress.			
6.3.2 Drainage and Flood Control	• The Contractor shall ensure that any construction materials like earth, stone, ash or appendage is disposed of such that it does not block the flow of water of any watercourse and cross drainage channels. • Where necessary adequate mechanical devices to bailout accumulated water from construction sites, campsites, storage yard, excavation areas are to be pre-settled and arranged well in advance of the rainy season besides providing temporary cross drainage systems. Areas with accumulated water shall be securely fenced and guarded. • The Contractor shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run-off of sediments is controlled. Silt fencing shall be installed before the onset of the monsoon at all the required locations, as directed by Engineer - Incharge of Supervision Consultant and PIU/TNRSP. • The Contractor shall also ensure that no material blocks the natural flow of water in any watercourse or cross drainage channel. Before monsoon, the Contractor shall provide either permanent or temporary drains to prevent water accumulation or flooding in surrounding residential, commercial and agricultural areas.	Surface water sources/ drains/ Nalahs/ Ponds etc	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
6.3.3 Siltation of Water Bodies and Degradation of Water Quality	• The contractor shall construct silt fencing at the base of the embankment construction near all water bodies (including wells) and around the stockpiles at the construction sites. • Silt fencing shall be provided before the commencement of earthwork and shall continue till the stabilization of the embankment slopes is complete on the particular sub-section of the road. • The Contractor shall also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies/water channels with a fall exceeding 1.5 m.	Surface water sources/ drains/ Nalahs/ Ponds etc.	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.3.4 Slope Protection and Control of Soil Erosion	• The Contractor shall construct slope protection works as per design, or as directed by the Engineer - Incharge of Supervision Consultant to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fiber mats, mulches, grasses, slope drains and other devices as required under specific local conditions. • Contractor shall ensure the following: o After construction of road embankments and cuttings, the side slopes of all cut and fill areas shall be graded and covered with stone pitching, grass and shrub as per design specifications. o Turfing works shall be taken up as soon as possible provided the season is favourable for the establishment of grass sods. o Catchment drains shall be installed at the top of cut and fill slopes o Other measures of slope stabilization shall include mulching netting and seeding of batters and drain immediately on completion of earthworks with the sowing of seeds of grass, shrub and bushes 30cm interval from line to line across the slope and sprinkling of water on such slopes after completion of the earthwork. o In borrow pits, the depth shall be regulated so that the sides of the excavation shall not be steeper than 1 vertical to 2 horizontal, from the edge of the bank. o Stabilization of embankments and cuttings with appropriate technique/s shall commence soon after the embankment	High raise embankment and surface water bodies locations	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	formation, to be in place in advance of the rainy season.			
6.4 Pollution Control				
6.4.1 Water Pollution				
6.4.1.1 Water Pollution from Construction Wastes	• The Contractor shall take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. The contractor shall avoid construction works close to the streams or water bodies during monsoon. • All waste arising from the project is to be disposed of in the manner that is acceptable to the Tamil Nadu State Pollution Control Board (TNPCB) or as directed by Engineer – Incharge of Supervision Consultant. The Engineer – Incharge shall certify that all liquid wastes disposed of from the sites meet the discharge standards.	Surface water sources/ drains/ Nalahs/ Ponds etc.	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.1.2 Water Pollution from Fuel, Lubricants, Bituminous Products and Chemicals	• The contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and refuelling shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors shall be provided for vehicle parking, wash down and refuelling areas as per the design provided. • In all, fuel storage and refueling areas are located on agricultural land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after cessation of such storage. • The contractor shall arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites approved by the Engineer – Incharge. All spills and collected petroleum products shall be disposed of following MoEF&CC and TNPCB guidelines. • Engineer – Incharge shall certify that all arrangements comply with the guidelines of TNPCB/ MoEF&CC.	Surface water sources/ drains/ Nalahs/ Ponds etc.	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.2 **Air Pollution**				
6.4.2.1 Dust Pollution	• The Contractor shall take every precaution to reduce the level of dust (PM_{10} and $PM_{2.5}$) from crushers, material storage yards, haul roads and construction sites (including earthwork, dismantling, scarification and	Construction area/ site, Construction	Contractor	Environmental Officer of CSC and PIU

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	material mixing sites) by sprinkling of water, mist spray, encapsulation of dust source and erection of screen /barriers. • Hot mix plant and batch mix plant shall be fitted with dust extraction units and mist spray to keep down the dust emission levels. The PM_{10} value at a distance of 40m from a unit located in such a cluster should be less than 100 $\mu g/m^3$. • The Contractor shall provide necessary certificates to confirm that all crushers used in the project conform to relevant dust emission control legislation. Air pollution monitoring shall be conducted as per the Environmental Monitoring Plan (EMoP) and results shall be used to strengthen/rectify problematic areas. If other existing crushers are used, such units need to have a valid license from the TNPCB.	camps, Materials Loading/ unloading facilities		(TNRSP)
6.4.2.2 Emission from Construction Vehicles, Equipment and Machineries	• The contractor shall ensure that all vehicles, equipment, and machinery used for construction are regularly maintained and conform to the emission standards specified by the TNPCB. Certification issued for such contrivances obtained from designated/approved authority shall be submitted along with the specified reporting format. • The contractor shall maintain a separate file and submit Pollution under Control (PUC) certificates for all vehicles/equipment/machinery used for the project. Monitoring results shall also be submitted to Supervision Consultant and PIU/TNRSP as per the Environmental Monitoring Plan in the specified format.	Construction camps, Materials Loading/ unloading facilities	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.3 **Noise Pollution**				
6.4.3.1 Noise Pollution: Noise from Vehicles, Plants and Equipment's	The Contractor shall confirm the following: • All plants and equipment used in construction shall strictly conform to the MoEF&CC/ TNPCB noise standards. • All vehicles and equipment used in construction shall be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall `be replaced.	Sensitive locations including Schools, Hospitals, and Temples	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	• Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one-meter distance from the edge of equipment in the free field), as specified in the Environment (Protection) Rules, 1986. • Maintenance of vehicles, equipment, and machinery shall be regular and up to the satisfaction of the Engineer to keep noise levels at the minimum. • Idling of temporary trucks or other equipment shall not be permitted during periods of unloading or when they are not in active use. (MoRTH - Section: 201.2) • At the construction sites within 150m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching shall `be stopped during the night time between 9.00 pm to 6.00 am. • No noisy construction activities shall be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors. • The contractor shall provide noise barriers to the suggested locations of select schools/ Temples/health centers. • Monitoring shall be carried out at the construction sites as per the monitoring schedule and results shall be submitted to Engineer-Incharge of Supervision Consultant. The engineer shall be required to inspect regularly to ensure the compliance of ESMP. (Refer MoRTH - Section 111.3)			
6.4.4 **Safety**				
6.4.4.1 Personal Safety Measures for Labour, Material handling, Painting, etc.	• The contractor shall continually monitor that the implementation of health and safety complies with measures set out in the contract. Risk assessments for ongoing and new activities shall be carried out at regular intervals. • All personnel working on the site shall receive induction training in health and safety, and regular safety training as related to their tasks. • The Contractor's CHS and OHS Plan shall include modules and frequency	Construction sites	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	of training for different category of employees in the project. • The contractor shall provide all necessary safety appliances such as safety goggles high visibility vests, helmets, gloves, safety belts, earplugs, masks, boots, etc. to workers and staff. • Protective footwear, gloves and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete, etc. • Welder's protective eye-shields and gloves to workers engaged in welding works • Protective goggles and clothing to workers engaged in stone breaking activities and workers shall be seated at sufficiently safe intervals • Earplugs to workers exposed to loud noise (above 75dB (A)), and workers working in crushing compaction, or concrete mixing operation. • Adequate safety measures for workers during the handling of materials at the site are taken up. • The Contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. • The Contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed for the work of painting with products containing lead in any form. • The Contractor shall also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. • The contractor shall provide facemasks to the workers when the paint is applied in the form of a spray or a surface having dry lead paint is rubbed and scrapped. • The Contractor shall mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These shall be reflected in the Construction Health & Safety and Occupational Health and Safety Plan to be prepared by the Contractor during mobilization and shall be approved by Engineer.			
6.4.4.2 Traffic and	• The Contractor shall take all necessary measures for the safety of traffic	All along the	Contractor	Environmenta

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
Safety & Pedestrian Safety	during construction and shall provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Engineer - Incharge for the information and protection of traffic approaching or passing through the section of any existing crossroads. • The Contractor shall ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. • Pedestrian Safety shall be ensured. Pedestrian circulation shall be demarcated before start & unsafe areas shall be cordoned off	project corridor and all haul roads		l Officer of CSC and PIU (TNRSP)
6.4.4.3 The risk from Electrical Equipment(s)	The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that - • No material shall be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights shall be provided to protect the public in construction zones. • All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be free from patent defect, shall be kept in good working order, shall be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer - Incharge. • Precautionary measures shall be taken when working close to the underground or overhead cables	All construction equipment	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.4.4 First Aid	The contractor shall arrange for - • A readily available first aid unit an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone • Availability of qualified medical attendant including suitable transport at all times to take an injured or sick person(s) to the nearest hospital • Equipment and trained nursing staff at the construction camp.	All construction equipment	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.5 **Cultural Property**				
6.4.5.1 Chance Found	• All fossils, coins, articles of the value of antiquity, structures, and other remains or things of geological or archaeological interest discovered on	Along the project road.	Contractor	Environmental Officer of

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
Archaeological Property	the site are the property of the Government and shall be dealt with as per provisions of the relevant legislation. • The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall, immediately upon discovery thereof and before removal acquaint the Engineer-Incharge of such discovery and carry out the Supervision Consultant instructions for dealing with the same, waiting which all work shall be stopped. • The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.			CSC, , State Archaeological Department and PIU (TNRSP)
6.4.6 **Labour Camp Management**				
6.4.6.1 Location of Construction labor camps: Accommodation	• The Contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labor to standards and scales approved by the Engineer- Incharge. • The contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp. • Construction camps shall not be proposed within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic facility provision of each labor camp shall be submitted to Engineer before their construction. Lighting shall be provided in the camp area and facilities • The construction shall commence only upon the written approval of the Engineer - Incharge.	Along the project corridor at the location of construction labor camps	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.6.2 Potable Water	• The Contractor shall construct and maintain all labor accommodation in such a fashion that uncontaminated water is available for drinking, cooking, and washing. within the precincts of every workplace in an accessible place, as per standards set by the Building and Other Construction Workers (Regulation of Employment and Conditions of	Construction labor camps	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	Service) Act, 1996). The contractor shall also guarantee the following: o Supply of sufficient quantity of potable water (as per IS) in every workplace/labor campsite at suitable and easily accessible places and regular maintenance of such facilities. o If any water storage tank is provided that shall be kept such that the bottom of the tank is at least 1m from the surrounding ground level. o If water is drawn from any existing well, which is within 30mt. the proximity of any toilet, drain or other sources of pollution, the well shall be disinfected before water is used for drinking. o All such wells shall be entirely covered and provided with a trap door, which will be dustproof and waterproof. o A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. o Testing of water shall be done every month as per the parameters prescribed in IS 10500:1991. • Compliance with ESMP shall be reported to Engineer - Incharge every week. Engineer - Incharge shall inspect the labor camp periodically, to ensure compliance of the ESMP.			
6.4.6.3 Sanitation and Sewage System	The Contractor shall ensure that - • The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occur and no pollution to the air, groundwater or adjacent watercourses take place • Separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women • Adequate water supply is to be provided in all toilets and urinals • All toilets in workplaces are with the dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition • Night soil is to be disposed of by putting a layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight. • Adequate health care is to be provided for the workforce during the	Construction labor camps	Contractor	Environmental Officer of CSC and PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	entire phase.			
6.4.6.4 Waste Disposal	The contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed of hygienically as per the Comprehensive Solid Waste Management Plan approved by the Engineer - Incharge. Unless otherwise arranged by ULB's, the Contractor has to make arrangements for disposal of night soils (human excreta) either by suitably approved by the local medical health or municipal authorities or as directed by Engineer - Incharge as provided by the Contractor.	Construction labor camps	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.6.5 Stock-yards	• Location for stockyards for construction materials shall be identified at least 1000 m from the watercourse and separated and sufficiently away from the labor camps. • Separate enclosures shall be planned for storing construction materials containing fine particles such that sediment-laden water does not drain into nearby storm water drain & underground sewerage pipes.	Construction labor camps	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.6.6 Fuel storage and refueling areas	• The Contractor shall ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance, and refueling sites are located at least 500 m from rivers and irrigation canal/ponds • All location and lay-out plans of such sites shall be submitted by the Contractor before their establishment and shall be approved by the Engineer. • In all fuel storage and refueling areas, if located on agriculture land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after completion of such storage and refueling activities. Fuel storage shall be provided with bunds. • The plan for the construction campsite shall also include the process of collection and disposal of spent oil and grease. The collection and disposal methods for the spent oil and grease submitted as part of the construction camp plan should be duly approved by the Engineer - Incharge.	Construction labor camps	Contractor	Environmental Officer of CSC and PIU (TNRSP)
6.4.7 **Contractor Demobilization**				
6.4.7.1 Clearing of	• Contractor to prepare site restoration plans for approval by the Engineer.	All	Contractor and	PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
Construction of Camps & Restoration	The plan has to be implemented by the contractor before demobilization. • On completion of the works, all temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer. • Residual topsoil shall be distributed on adjoining/proximate barren/rocky areas as identified by the Engineer in a layer of a thickness of 75mm - 150mm.	Construction Workers' Camps	Environment Officer of CSC	
6.4.7.2 Redevelopment of Borrow Areas	Redevelopment of borrow areas shall be taken up following the plans approved by the Engineer.	At all borrow area locations suggested for the project.	Contractor and Environment Officer of CSC	PIU (TNRSP)
6.4.8 Environmental Enhancement and Special Issues				
6.4.8.1 Enhancement measures	• Enhancement of all incidental spaces shall be planned and carried out before completion of construction, along the project road. Some of the enhancement measures to be considered along the project roads include avenue tree plantation, restoration of water bodies, providing public amenities, planting of shrubs in medians, rainwater harvesting, adequate storm water drainage, Landscaping at junctions to improve aesthetics, etc.	At suitable locations along the project road	Contractor and Environment Officer of CSC	PIU (TNRSP)
6.4.8.2 Roadside Plantation Strategy, Tree Planting & Protection	• The Contractor/identified agency (were specifically identified) shall do the plantation at the median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project. The Contractor/ identified agency shall plant Indigenous plant varieties to the extent possible, guidance from the forest department shall be taken for the same. • Minimum 80 percent survival rate of the saplings shall be acceptable by end of 5 year maintenance period. Otherwise the Contractor shall replace dead plants at his own cost. The Contractor shall maintain the plantation until they handover the project site to TNRSP. • Giving due protection to the trees that fall in the shoulders /corridor of impact/ trees planted outside clear zone shall be the prime focus during	All tree plantation/ greenery areas of the project	Contractor / Forest Department and Environment Officer of CSC	PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
	Construction/post-construction. • Re-plantation of at least ten times the number of trees (1:10) cut should be carried out along the project road. Since the major portion of the project road may pass through open lands, planting of trees along the entire stretch of the road is recommended as an enhancement measure, which would also serve as a mechanism to delineate ROW and prevent future encroachments/squatters into the right of way, wherever possible. • Growth and survival of trees planted shall be ensured and monitoring is done at least for 3 years. Survival status shall be reported every month to Engineer - Incharge. • The Engineer - Incharge shall inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.			
6.4.8.3 Transplantation	All trees up to 30 cm girth at breast height and naturally occurring medicinal shrubs within the RoW shall be uprooted mechanically with ball of earth intact for relocation and transplantation at various pre-identified locations such as degraded sites, embankments of road-side water bodies, temples, near-by market places, religious properties, schools and along road corridors for preventing loss of diverse vegetative cover and for reducing growth period.	Along the project road	Contractor / Forest Department and Environment Officer of CSC	PIU (TNRSP)
6.4.8.4 Flora and Chance found Fauna	• The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. • The contractor shall ensure that laborers and workers do not poach, and anti-poaching clause will be included on the contract and code of conduct. Information education campaign, etc. • If any wild animal is found near the construction site at any point in time, the Contractor shall immediately upon discovery thereof acquaint the Engineer - Incharge and execute the Engineer's instructions for dealing with the same. • The Engineer-Incharge shall report to the nearby forest office (range office or divisional office) and shall take appropriate steps/ measures if required in consultation with the forest officials.	Along the project road	Contractor / Forest Department and Environment Officer of CSC	PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
6.4.8.5 Sensitive Areas	• The sensitive areas like schools, hospitals are provided with permanent noise barriers before the start of work to minimize the dust and noise impacts due to vehicle movement (during / post-construction). Their effectiveness to be checked during the operation phase. • Construction activities shall be confined within the present available RoW, regularly strict monitoring/supervision should be done to minimize/control air-noise pollution and abatement of dust particles at the minimum level possible using well maintain modern machineries. Crushers, Hot-mix Plants and Batching Plants should be placed at least 10km aerial distance away from the sanctuary boundary.	Concerned locations	Contractor / Forest Department and Environment Officer of CSC	PIU (TNRSP)
C. **OPERATION STAGE (Activities to be Carried Out by the TNRSP/Forest Department, GoTN)**				
6.5 Monitoring and Evaluation of Environmental Mitigation Measures provided in the Project	• The PIU/ TNRSP shall monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project.	All along the project corridor	Contractor (DLP) and PIU	PIU (TNRSP)
6.6 Maintenance of Drainage	• PIU/ TNRSP shall ensure that all drains (side drains and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding without damaging the land, properties, spurs and check dams erected to stabilize the course and flow of all such drainage channels. • PIU/ TNRSP shall ensure that all the sediment/oil and grease traps set up at the truck and bus lay bye are cleared once in every three months.	All along the project corridor	Contractor (DLP) and PIU	PIU (TNRSP)
6.7 Pollution Monitoring	• The frequency of monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination are to be continued at pre-designated locations as identified in the Environmental Monitoring Plan and if necessary, at additional locations for comparative study of pre and post-operation data to ensure further improvement/modification in similar future works. • PIU/TNRSP shall appoint a specific pollution monitoring agency for this purpose.	All along the project corridor	Contractor (DLP) and PIU	PIU (TNRSP)

Project Activities	Management Measure	Location	Responsibility	
			Planning and Execution	Supervision and Monitoring
6.8 Atmospheric Pollution	• Ambient air concentrations of various pollutants shall be monitored as envisaged in the Environmental Monitoring Plan at pre-designated locations to compare the levels with the pre-construction data. • Additional data at other locations may be collected as per any site-specific requirement.	All along the project corridor	Contractor (DLP) and PIU	PIU (TNRSP)
6.9 Noise Pollution	• Noise pollution shall be monitored as per the Environmental Monitoring Plan at sensitive locations where pre-construction noise data was collected. The functioning of the noise barriers has to be specifically supervised and monitored for further improvement/replication at other affected points if necessary. • Signage indicating 'no horn zones' near sensitive locations shall be maintained and kept clean. Monitoring the effectiveness of the pollution attenuation barriers shall be taken up thrice in the operation period.	All along the project corridor	Contractor (DLP) and PIU	PIU (TNRSP)
6.10 Soil Erosion and Monitoring of Borrow Areas	• Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried out before monsoon, during monsoon, and after winter rains to record and monitor the effectiveness of such structures after the completion of project, to evaluate the beneficial effects of each type of activity together with the cost involved.	Borrow areas	Contractor (DLP) and PIU	PIU (TNRSP)
6.11 Avenue Trees	• The PIU/TNRSP with the assistance from Forest Department, GoTN shall do survival monitoring of avenue trees for every quarter.	All along the project corridor	PIU and Forest Department	PIU (TNRSP)
6.12 Road Safety and 6.13 Maintenance of Assets	• Monitor data on any road traffic accidents, and identify and implement any remedial measures that may be necessary. • No advertisement/hoardings shall be allowed within the Right of Way limits of the project road. • Regular maintenance and cleaning of assets such as signboards, bus stops, drains, etc. shall be undertaken.	All along the project corridor	Contractor (DLP) and PIU	PIU (TNRSP)

4.1 ESMP in Bid Documents

- Preparation of ESMP cost estimates that need to be incorporated in Bid Documents.
- Environmental and Social Management Plan (ESMP) along with the good environmental construction guidelines that have to be incorporated in the bid document's work requirements.
- Preparation of work requirement (addendum/corrigendum to MoRTH specifications) and Corrigendum / Addendum to FIDIC as Special provisions to be incorporated in Bid Document. Penalty clauses for not complying with ESMP requirements to be incorporated. Indicative penalty clauses proposed in the upgradation projects are presented below.

Clause for Nonconformity to EMP - Protection of the Environment

The Contractor shall implement all mitigation measures for which responsibility is assigned to him as stipulated in the EMP Report. Any lapse in implementing the same will attract the damage clause as detailed below:

i. All lapse in obtaining clearances/permissions under statutory regulations and violations of any regulations with regard to eco-sensitive areas shall be treated as a majorlapse.
ii. Any complaints of public, within the scope of the Contractor, formally registered with the CSC, Highways Department or with the GoTN and communicated to the Contractor, which is not properly addressed within the period intimated by the CSC / Highways Department, GoTN shall be treated as a majorlapse.
iii. Non-conformity to any of the mitigation measures stipulated in the EMP Report (other than stated above) shall be considered as a minorlapse.
iv. On observing any lapses, CSC shall issue a notice to the Contractor, to rectify thesame.
v. Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
vi. If a major lapse is not rectified upon receiving the notice CSC shall invoke reduction, in the subsequent interim paymentcertificate.
vii. For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum of 0.5% of the contract value.
viii. If the lapse is not rectified within one month after withholding the payment, the amount withheld shall beforfeited.

4.2 Environmental Monitoring Plan

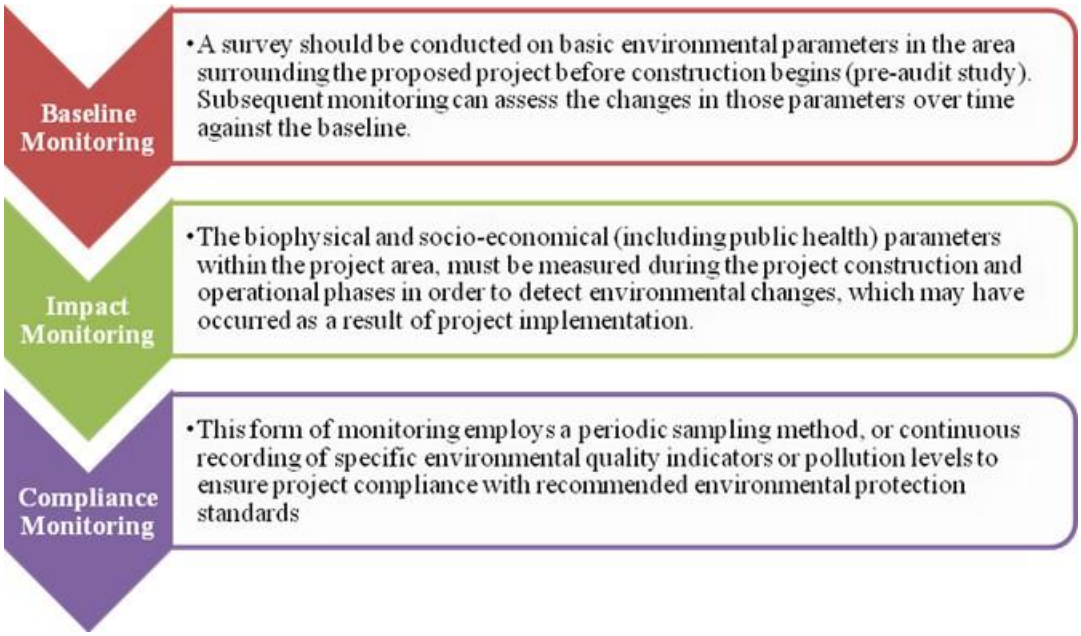
4.2.1 Monitoring Parameters and Standards

Environmental monitoring is defined as "an activity undertaken to provide specific information on the characteristics and functions of environmental and social variables in space and time".

The environmental monitoring programme will be devised to ensure that the envisaged purpose of the project is achieved and results in the desired benefit to the target population. To ensure the effective implementation of the ESMP, an effective environmental monitoring programme must be designed and carried out. Broad objectives of the monitoring programme will be:

- To evaluate the performance of mitigation measures proposed in the ESMP
- To suggest improvements in the management plans, if required
- To satisfy the statutory and community obligations

Types of Environmental Monitoring



The monitoring programme contains a monitoring plan for all performance indicators, reporting formats, and necessary budgetary provisions. The monitoring plan for performance indicators and reporting system is presented in the following sections.

4.2.2 Monitoring Plans for Environment Condition

The Environmental monitoring of the parameters involved and the threshold limits specified are discussed below:

- **Ambient Air Quality Monitoring (AAQM)**

The air quality parameters namely Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X), Carbon Monoxide (CO), Fine Particulate Matter ($PM_{2.5}$), Respirable Particulate Matter (PM_{10}), Ammonia (NH_3), Ozone (O_3), Lead (Pb), Benzo (a) pyrene (BaP), Arsenic (As) and Nickel (Ni) shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards as given in **Table 13**.

Table 13: Ambient Air Quality Standards (National)

Sl. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
1	Sulphur Dioxide (SO_2), $\mu g/m^3$	Annual * 24 hours**	5 80	20 10	• Improved West and Gaeke • Ultraviolet fluorescence

Sl. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
2	NitrogenDioxide (NO_2),µg/m^3	Annual* 24 hours**	40 80	30 80	• Modified Jacob &Hochhieser (Na-Arsenite) • Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM_{10} µg/m^3	Annual* 24 hours**	60 100	60 100	• Gravimetric • TOEM • Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM_{25}µg/m^3	Annual* 24 hours**	40 60	40 60	• Gravimetric • TOEM • Beta attenuation
5	Ozone (o_2) µg/m^3	8 hours* 1 hours**	100 180	100 180	• UV photometric • Chemiluminescence • Chemical Method
6	Lead (Pb) µg/m^3	Annual* 24 hours**	0.50 1.0	0.50 1.0	• AAS/ICP method after sampling on EMP 2000 or equivalent filter paper • ED-XRF using Tefloa filter
7	Carbon Monoxide (CO) µg/m^3	8 hours* 1 hours**	02 04	02 04	• Non Dispersive Infra-Red (NDIR)spectroscopy
8	Ammonia (NH_3) µg/m^3	Annual* 24 hours**	100 400	100 400	• Chemiluminescence • Indophenol blue method
9	Benzene (C_6H_6) µg/m^3	Annual*	05	05	• Gas chromatography based continuous analyser • Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) particulate phase only,ng/m^3	Annual*	01	01	• Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As) ng/m^3	Annual*	06	06	• AAS/ICP method after • sampling on EMP 2000 or equivalent filter paper
12	Nickel (Ni) ng/m^3	Annual*	20	20	• AAS/ICP method after • sampling on EMP 2000 or equivalent filter paper

**Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals*

***24 hourly or (8 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.*

- **Noise Quality Monitoring**

The noise levels shall be monitored at already designated locations in accordance with the Ambient Noise Quality standards given in**Table 14**.

Table 14: Ambient Noise Quality Standards (National)

Area Code	Category of Zones	Limits of Leq in dB(A) Day*	Night*
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zone **	50	40

** Daytime shall mean from 6.00 am to 10.00 pm and Night shall mean from 10.00 pm to 6.00 am*

***Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions, and courts. The use of vehicle horns, loudspeakers and bursting of cracking are banned in these zones.*

- **Water Quality Monitoring**

Water quality parameters such as pH, BOD, COD, DO, Coliform count, total suspended solids, total

dissolved solids, Iron, etc. shall be monitored at all identified locations during the construction stage as per standards prescribed by Central Pollution Control Board and Indian Standard Drinking water specifications IS 10500, 2012, presented in **Table 15**.

Table 15: National Standard of Water

Sl. No	Parameters	IS:2296 (Class C)	Method to be Adopted
1	pH	6.5-8.5	pH meter
2	BOD (3 days 27^0C)	3.0	DO-Azide modification of Winkler's method
3	Temperature (^{0}C)	NS	Thermometer
4	Dissolved oxygen	4	Azide Modification of Winkler's method
5	Color (Hazen)	300	Visual Comparison method
6	Fluorides (F)	1.5	SPANDS method
7	Chlorides (Cl)	600	Argentometric Titration
8	Total Dissolved Solids	1500	Gravimetric Analysis
9	Sulphates (SO4)	400	Barium Chloride method
10	Iron (Fe)	50	Phenanthrolin method
11	Oil and Grease	0.1	Partition – Gravimetric method
12	Nitrates	50	Chromotropic acid
13	Chromium (Cr6+)	0.05	Atomic Absorption Spectrophotometry
14	Cadmium (Cd)	0.01	Atomic Absorption Spectrophotometry
15	Lead (Pb)	0.1	Atomic Absorption Spectrophotometry
16	Copper (Cu)	1.5	Atomic Absorption Spectrophotometry
17	Cyanide (CN)	0.05	Chloramine-T-method
18	Selenium (Se)	0.05	Atomic Absorption Spectrophotometry
19	Arsenic (As)	0.2	Atomic Absorption Spectrophotometry
20	Phenols	0.005	Spectrophotometer
21	Detergents	1.0	Spectrophotometer
22	DDT	Absent	Spectrophotometer
23	Total Coliform (MPN/100 ml)	5000	Multiple Tube Fermentation Technique

NS: Not specified; Brackets ([ ]) indicates extended limits. All the values in mg/l if otherwise mentioned

Table 16: Water Quality Criteria

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	• Total Coliforms Organism MPN/100ml shall be 50 orless • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20°C 2mg/l orless
Outdoor bathing (Organised)	B	• Total Coliforms Organism MPN/100ml shall be 500 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	• Total Coliforms Organism MPN/100ml shall be 5000 or less • pH between 6 to 9 • Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wildlife and Fisheries	D	• pH between 6.5 to 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less

Designated-Best-Use	Class of Water	Criteria
Irrigation, Industrial Cooling, Controlled Waste disposal	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micromhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l
	Below-E	• Not Meeting A, B, C, D & E Criteria

4.2.3 Environmental Monitoring Locations

In addition to the critical locations selected during the design stage, the environmental monitoring will also be done at the construction campsite and any other plant site during the construction stage. A list of critical locations for caring out monitoring should be presented in the ESIA report.

4.3 Monitoring and Post Auditing

Construction monitoring, including field inspections and surveys, should be carried out by an Environmental Specialist to ensure that environmental protection requirements are being met. The monitoring and reporting are to be in line with the reporting system developed for the project and is presented as **Appendix 5**. It is important to plan and budget for environmental construction monitoring as part of the project. If construction is to be contracted out, PIU (TNRSP-II) to reconfirm that specific environmental requirements during construction (as already specified) are built into construction bidding documents and contracts to ensure, they are met (e.g. requirements for local hiring, the penalty for not adhering to EMP clause requirements, etc.).

Post-construction monitoring is used to identify environmental changes resulting from the implementation of the project. In the context of EIA, post-construction monitoring programs are carried out to achieve the following results:

- To ensure that the facility is meeting all environmental regulatory requirements and that commitments made in the EIA document and/or the conditions of approval are being met;
- To test impact hypotheses, and to verify the predictions and assessment of environmental effects, thus contributing to better assessments in the future;
- To evaluate the performance effectiveness of mitigation;
- To compare actual and predicted changes to the environment, so that immediate actions can be taken to mitigate unanticipated impacts;
- To strengthen confidence by both the government and the public in the EIA process, the decisions made the road design, etc.

The monitoring programs to be carried out during the construction and operation of the undertaking are normally described in the EIA document.

4.4 Implementation of ESMP

The Environmental and Social Management Plan process does not stop once a project (planning and design) got approval for implementation. During the implementation of project PIU (TNRSP-II), Construction Supervision Consultant, CSC (if any) and Contractor will be responsible for ensuring that the environmental and social commitments made to regulatory agencies, lending agencies, and other stakeholders during the ESIA process are met. To execute ESMP is a cumulative responsibility of all three parties involved, the indicative responsibility mechanism has been presented in the**Table 17**, as developed for the upgradation of selected roads.

Table 17: Institutional Responsibilities for ESMR Implementation

System	Designation	Responsibilities
Coordinating/ Facilitating Agency	Project Director, PIU TNRSP-II	• Overview of the projectimplementation • Ensure timely budget for theESMP • Coordination with the different state-level committee, to obtain RegulatoryClearances • Participate in state-levelmeetings • Monthly review of theprogress.
	Chief Engineer/ Superintending Engineer PIU	• Overall responsible for ESMPimplementation • Reporting to various stakeholders (World Bank, Regulatory bodies) on the status of ESMPimplementation • Coordination with PIU Staff (Environmental Specialist). • Responsible for obtaining RegulatoryClearances • Review of the progress made bycontractors • Ensure that environmental safeguards in ESMP are executed as per specification andschedules.
	Environment and R&R Specialist (PIU)	• Assisting SE in the overall implementation ofESMP • Review of periodic reports on ESMP implementation and advising PIU in taking correctivemeasures. • Conducting periodic field inspection of ESMP implementation • Assisting SE in reporting various stakeholders (World Bank, Regulatory bodies) on the status of EMP implementation • Preparing an environmental training program and conducting the same for field officers and engineersof contractor
Implementing/ Monitoring Agency	Engineer (Supervision consultant SC)	• Responsible for supervision of effective implementation of ESMP measures by thecontractor • Review progress reports and periodic reporting toPIU about the status of EMP implementation • Work in close coordination with ERRS (PIU)and contractor
	RAP implementation NGO	• Conducting awareness campaigns for all construction personnel (including labourers, supervisors, engineers, and consultants) about HIV/AIDS/STDs in the construction and labourcamps. • Facilitating the medical testing/ routine check-upfor labours as suggested in the HPP
Contractor	Environmental Manager of Contractor	• Responsible for ensuring the implementation of ESMP as per provision in thedocument. • Directly reporting to the Project Manager of the Contractor • Discuss the various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly

System	Designation	Responsibilities
		• Assist the project manager to ensure social and environmentally sound and safe construction practices are adopted • Conduct periodic environmental and safety training for contractor's engineers, supervisors and workers along with sensitization on social issues that may arise during the construction stage of the project • Assist the PIU on various environmental monitoring and control activities including pollution monitoring; and • Prepare and submit monthly reports to PIU onthe status of implementation safeguard measures

5 GOOD ENVIRONMENTAL CONSTRUCTION GUIDELINES

Comprehensive environmental construction guidelines have been prepared to guide the planning and implementing agency in preparing the project-specific environmental code of conduct for the contractor. The list of good environmental practices is as follows. All guidelines listed are presented as **Appendix 6** for reference and implementation into the Environmental Management Plans for the specific projects

Table 18: Guideline for Good Environmental Practices

Guidelines	Activities
Guideline-1	Site Preparation
Guideline-2	Construction and Labour Camps
Guideline-3	Borrow Areas
Guideline-4	Topsoil Salvage, Storage and Replacement
Guideline-5	Quarry Management
Guideline-6	Water for Construction
Guideline-7	Slope Stability and Erosion Control
Guideline-8	Waste Management and Debris Disposal
Guideline-9	Water Bodies
Guideline-10	Drainage
Guideline-11	Construction Plants & Equipment Management
Guideline-12	Labour and Worker's Health and Safety
Guideline-13	Cultural Properties
Guideline-14	Tree Cutting and Afforestation
Guideline-15	Forests and Other Natural Habitats
Guideline-16	Air and Noise Pollution

Annexure

Appendix 1

FORM – "A""

Form for seeking prior approval under section 2 of the proposals by the State Governments and other authorities

PART-I
(to be filled up by user agency)

1. Projectdetails:
   (i) Short narrative of the proposal and project/scheme for which the forest land is required.
   (ii) Map showing the required forest land, boundary of adjoining forest on a 1:50,000 scalemap.
   (iii) Cost of the project:
   (iv) Justification for locating the project in forestarea.
   (v) Cost-benefit analysis (to beenclosed).
   (vi) Employment likely to begenerated.
2. Purpose-wise break-up of the total land required:
3. Details of displacement of people due to the project, ifany:
   (i) Number of families.
   (ii) Number of Scheduled Castes/Scheduled Tribefamilies
   (iii) Rehabilitation plan. (to beenclosed)
4. Whether clearance under Environment (Protection) Act, 1986 required?(Yes/No).
5. Undertaking to bear the cost of raising and maintenance of compensatory afforestation and/or penal compensatory afforestation as well as cost for protection and regeneration of Safety Zone, etc. as per the scheme prepared by the State Government (undertaking to beenclosed).
6. Details of Certificates/documents enclosed as required under theinstructions.

Signature
(Name in Blockletters)
Designation
Address (of UserAgency)

Date:-_____
Place:-_____

State serial No.ofproposal_____
(To be filled up by the Nodal Officer with date ofreceipt)

PART-II
(To be filled by the concerned Deputy Conservator of Forests)

State serial No. ofproposal_____

7. Location of theproject/Scheme:
   (i) State/UnionTerritory
   (ii) District.
   (iii) Forest Division
   (iv) Area of forest land proposed for diversion (inha.)
   (v) Legal status offorest
   (vi) Density ofvegetation.
   (vii) Species-wise (scientific names) and diameter class-wise enumeration of trees (to be enclosed. In case of irrigation / hydel projects enumeration at FRL, FRL-2 meter & FRL-4 meter also to be enclosed.)
   (viii) Brief note on vulnerability of the forest area toerosion.
   (ix) Approximate distance of proposed site for diversion from boundary offorest.
   (x) Whether forms part of National Park, wildlife sanctuary, biosphere reserve, tiger reserve, elephant corridor, etc. (If so, the details of the area and comments of the Chief Wildlife Warden to beannexed).
   (xi) Whether any rare/endangered/unique species of flora and fauna found in the area- if so detailsthereof.
   (xii) Whether any protected archaeological/heritage site/defence establishment or any other important monument is located in the area. If so, the details thereof with NOC from competent authority, ifrequired.
8. Whether the requirement of forest land as proposed by the user agency in col. 2 of Part-I is unavoidable and barest minimum for the project. If no, recommended area item-wise with details of alternativesexamined.
9. Whether any work in violation of the Act has been carried out (Yes/No). If yes, details of the same including period of work done, action taken on erring officials. Whether work in violation is still inprogress.
10. Details of compensatory afforestationscheme:
   (i) Details of non-forest area/degraded forest area identified for compensatory afforestation, its distance from adjoining forest, number of patches, size of each patch.
   (ii) Map showing non-forest/degraded forest area identified for compensatory afforestation and adjoining forestboundaries.
   (iii) Detailed compensatory afforestation scheme including species to be planted, implementing agency, time schedule, cost structure,etc.
   (iv) Total financial outlay for compensatory afforestationscheme.
   (v) Certificates from competent authority regarding suitability of area identified for compensatory afforestation and from management point of view. (To be signed by the concerned Deputy Conservator ofForests).
11. Site inspection report of the DCF (to be enclosed) especially highlighting facts asked in col. 7 (xi, xii), 8 and 9above.
12. Division/District profile:
   (i) Geographical area of thedistrict.
   (ii) Forest area of thedistrict.
   (iii) Total forest area diverted since 1980 with number ofcases.
   (iv) Total compensatory afforestation stipulated in the district/division since 1980 on (a) forest land including penal compensatoryafforestation,
   (b) Non-forest land.

(v) Progress of compensatory afforestation ason(date)_____on
(a) forest land
(b) Non-forestland.

13. Specific recommendations of the DCF for acceptance or otherwise of the proposal with reasons.

Signature
Name Official
Seal

Date:-_____
Place:-_____

PART-III
(To be filled by the concerned Conservator of Forests)

14. Whether site, where the forest land involved is located has been inspected by concerned Conservator of Forests (Yes/No). If yes, the date of inspection & observations made in form of inspection note to beenclosed.
15. Whether the concerned Conservator of Forests agree with the information given in Part-B and the recommendations of Deputy Conservator ofForests.
16. Specific recommendation of concerned Conservator of Forests for acceptance or otherwise of the proposal with detailedreasons.

Signature
Name

Official Seal
Date:-_____
Place:-_____

PART-IV
(To be filled in by the Nodal Officer or Principal Chief Conservator of Forests or Head of Forest department)

17. Detailed opinion and specific recommendation of the State Forest Department for acceptance of otherwise of the proposal withremarks.

(While giving opinion, the adverse comments made by concerned Conservator of Forests or Deputy Conservator of Forests should be categorically reviewed and critically commented upon).

Signature
Name &Designation
(OfficialSeal)

Date:-_____
Place:-_____

PART- V

(To be filled in by the Secretary in charge of Forest Department or by any other authorised officer of the State Government not below the rank of an Under Secretary)

18. Recommendation of the StateGovernment:
(Adverse comments made by any officer or authority in Part-B or Part-C or Part-D above should be specifically commented upon)

Signature
Name &Designation
(OfficialSeal)

Date:-_____
Place:-_____

INSTRUCTIONS (for Part-I):-

1. The project authorities may annex a copy of the approved project/plan in addition to filling Col. 1 (i) e.g. IBM approved mining plan for major minerals/CMPDI plan with subsidence analysis reports,etc.
2. Map has to be in original duly authenticated jointly by project authorities and concernedDCF – Col. 1 (ii).
3. Complete details of alternative alignments examined especially in case of project like roads, transmission lines, railway lines, canals, etc. to be shown on map with details of area of forest land involved in each alternative to be given - Col. 1(iii).
4. For proposals relating to mining, certificate from competent authority like District Mining Officer about non-availability of the same mineral in surrounding/nearby non-forestareas.
5. In case the same company/individual has taken forest land for similar project in the State, a brief detail of all such approvals/leases be given as an enclosure along with current status of theprojects.
6. The latest clarifications issued by the Ministry under Forest (Conservation) Act, 1980 may be kept in mind. In case such information do not fit in the given columns, the same shall be annexedseparately.

GENERAL INSTRUCTIONS:-

1. On receipt of proposal, Nodal Officer shall issue a receipt to the user agency indicating there in the name of the proposal, user agency, and area in hectare, serial number and date of receipt.
2. If the space provided above is not sufficient to specify any information, please attach separate details/documents.
3. While forwarding the proposal to the Central Government, complete details on all aspects of the case as per Form prescribed above read with the clarifications issued by the Ministry of Environment and Forests, Government of India, New Delhi should be given. Incomplete or deficient proposals shall not be considered and shall be returned to the State Government in original.
4. The State Government shall submit the proposal to the Central Government within stipulated time limits. In case of delay while forwarding, the reasons for the same to be given in the forwarding/coveringletter.

Appendix 2

Environmental and SocialBaseline for Tamil Nadu

As the project corridors are spread all across the state of Tamil Nadu, the environmental and social baseline has been assessed for the entire state. Information collected from secondary and primary sources has been utilized for evaluating the existing environmental and social condition.

1.1 PHYSICAL AND BIOLOGICAL BASELINEPROFILE

1.1.1 Climate

The climate of Tamil Nadu is essentially tropical. In May and June, the hottest months, maximum daily temperatures in Chennai average about 38 °C, while minimum temperatures average in the low 20^{o} C. In December and January, the coolest months, temperatures usually rise from about 21°C into the mid-about 30 °C daily. The average annual precipitation, falling mainly between October and December, depends on the southwest and northeast monsoons and ranges between 630 mm and 1900 mm a year. The mountainous and hilly areas, especially in the extreme western part of the state, receive the most precipitation, while the lower-lying southern and southeastern regions receive the least rainfall.

1.1.2 Physiography

Tamil Nadu can be divided into Four physiographic regions namely, 1. Coastal plains, 2.Eastern Ghats, 3.Central plateau, 4. Western Ghats. The northern and western parts of the state are mainly hilly areas of the Western Ghats with an average elevation of 1220 m, and going up to 2440 m, which is the highest point. The Eastern Ghat mountain ranges run parallel to the Bay of Bengal. The coastal plains of Tamil Nadu lie between the Eastern Ghats and the Bay of Bengal. The Eastern Ghats are not as high as the Western Ghats. These mountain ranges also have local names along the discontinuous hill ranges. the Eastern Ghats scales to the highest at 1680 m.

1.1.3 Soil

The predominant soil types in Tamil Nadu are red soils, black soils, coastal soil and laterite. Thetypes of soils in Tamil Nadu are as givenbelow:

- Alluvial soil
- Blacksoil
- Red soil
- Lateritesoil
- Arid desertsoil
- Forest and mountainsoil
- Saline or alkalinesoil

Alluvial Soil - Sediments deposited by the flowing river is alluvial soil. It occurs in the deltas of Cauvery. These soils are deficient in nitrogen & humus. Such soils are suitable for growing all types of cereals, pulses, sugarcane, vegetables oils seeds. In Tamilnadu, Ramanthapuram, Thanjavur, Kanniyakumarioil are rich in this type ofsoils.

Black Soil - Black soils are formed from the lavas of mountain suitable for cotton cultivation. Black colour is due to the presence of iron. Soil is deficient in nitrogen, phosphates and organic matter, but rich in potash, lime, aluminium, calcium & magnesium. Lemon and sun flower grows well in the soil. In Tamil Nadu, Coimbatore, Madurai, Chengalpattu, Tirunelveli, Salem, Dharmapuri, Nilgirs, Virudhunagar, Sivagangai&Dindigul are rich in this soil.

Red Soil- It consists red-oxide. Red colour soils are formed from the crystalline & metamorphic rocks, rich in iron but deficient in nitrogen, phosphorus. It has a light texture. Crops like rice, ragi, tobacco and vegetables are grown, found in all districts, Salem, Dharmapuri, Coimbatore, Trichy, Thanjavur, Ramanathapuram, Madurai, Tirunelveli, Dindigul,Nilgiris.

Laterite Soil – This soil found in the areas of high rainfall (Parts of the Nilgirs District) & temperature regions. These soils contains high content of iron oxide. These are deficient in nitrogen, phosphorus & potash. These soils are suitable for rice, ragi sugarcane, rubber and cashew cultivation.

Arid Deserts Soil - In Tirunelveli district, this type of soils are found. These soil are infertile.

Forest and Mountain Soil – This type of soil found in Mountain regions, of Yelagiri, Shervorys, Kalvarayen, Agathiyer, &Anamalai regions. These are suitable for coffee, tea, rubber cardamom &cloves.

Figure 1: Drainage Map of Tamil Nadu

Saline or Alkaline Soil – This type of infertile soil found in some areas of Vellore, Thirvannamali, Cuddalore&Villupuram districts.

1.1.4 Drainage

The major rivers flowing through the State are the Palar, Cheyyar, Ponnaiyar, Cauvery, Moyar, Bhavani, Amaravati, Vaigai, Chittar, and Tamaraparni. The Cauvery is the eighth largest river of the Indian subcontinent and is 760 km long. There are about 37 small rivers and rivulets in the State. Drainage map of Tamil Nadu is shown in **Figure1.**

1.1.5 Floral

The principal forest types in Tamil Nadu are the Tropical Rain Forests, Dry Deciduous Forests, Dry Thorn Forests, Montane Shola, Grassland and Mangroves. Tamil Nadu has a recorded area of 22877 sqkm under forests which constitute 17.59% of the geographical area of the State. The forest map of the state is shown in **Figure 1.** Geographic area recorded as "forests" in Government records as given below:

Reserved Forest	20292 km^2
Protected Forest	1782 km^2
Unclassified Forest	803 km^2
Total	22877 km^2
Of State's Geographic Area	17.59 %
Of Country's Forest Area	2.95 %

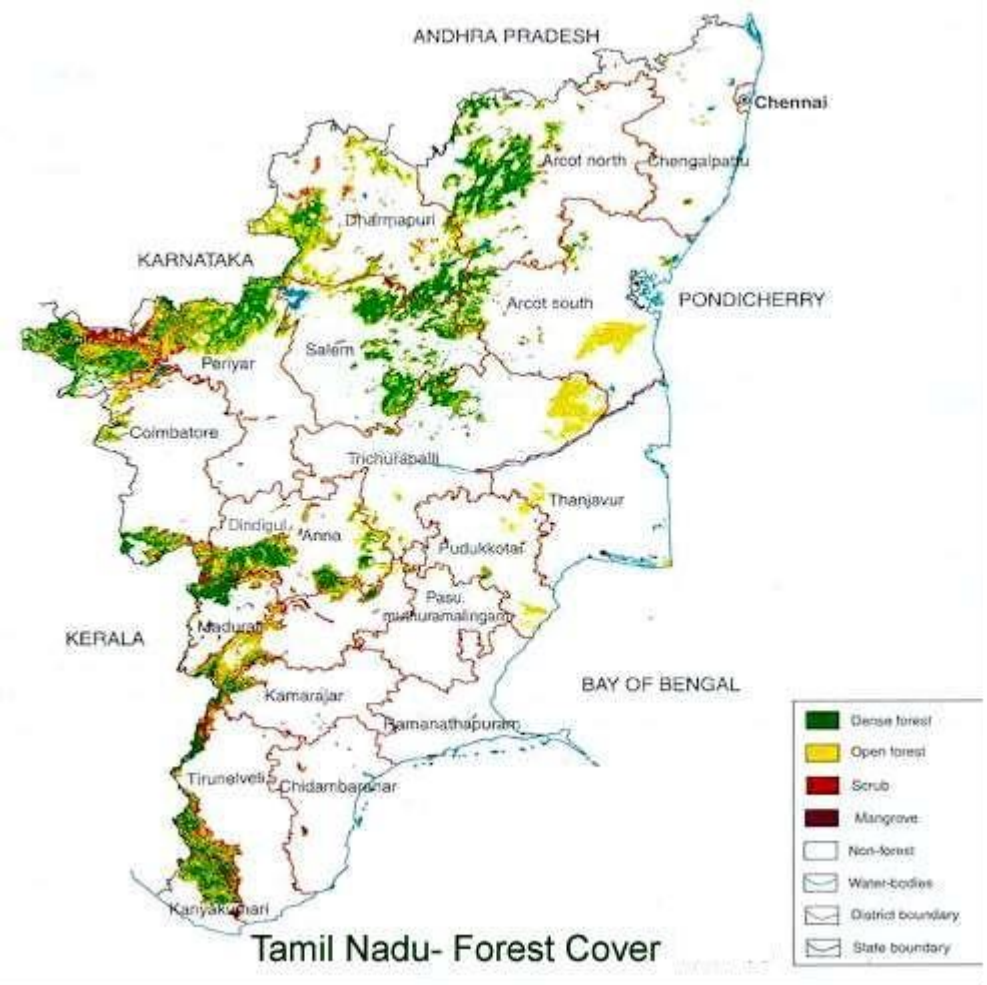


Figure 2: Forest Map of Tamil Nadu

1.1.6 Flora & Fauna /Wildlife Wild Biodiversity of Tamil Nadu

One sixth of landmass of Tamil Nadu is covered with forests. The total recorded forest cover of the State is 22877 KM² constituting 17.59% of geographic area. This includes 3386 km²of very dense forest, 8544 km² of moderately dense forest and 5651 km² of open forest. Tamil Nadu ranks 11th among the Indian States and Union Territories with reference to total forest cover. Tamil Nadu ranks 13th among the Indian States and Union Territories with reference to total recorded forestarea.

1.1.7 Floral Diversity

The Angiosperm diversity of India includes 17,672 species. With 5640 species, Tamil Nadu ranks 1st among all the States in the Country. This includes 533 endemic species, 230 red-

listed species, 1559 species of medicinal plants and 260 species of wild relatives of cultivated plant. TheGymnosperm diversity of the country is 64 species of which Tamil Nadu has 4 species of indigenous Gymnosperms and about 60 introduced species. The Pteridophytes diversity of India includes 1022 species of which Tamil Nadu has about 184 species. Tamil Nadu wild plant diversity also includes vast number of Bryophytes, Licheus , Fungi, Algae and Bacteria.

1.1.8 Protected Areas

The protected area of the country is 156006 km² constituting 4.75% of the geographic area and 20.03% of the recorded forest area. The protected areas of Tamil Nadu extend to 7072.95 Sq.Kmconstituting 2.54% of the geographic area and 30.92% of the states forest area. Tamil Nadu ranks 14th among all the States and Union Territories of India in terms of protected area. There are 15 wildlife sanctuaries over 606389.657 ha and 15 bird sanctuaries over 17666.16 ha, 5 National Parks over 82751.57 ha, 4 Tiger Reserves, 4 Elephant Reserves and 3 Biosphere Reserves for in situ conservation of wild fauna and flora. There is two Conservation Reserves in Tamil Nadu. The list of protected area is given in the **Table 1.**

LIST OF PROTECTED AREAS IN TAMIL NADU

1) WILDLIFE SANCTUARIES IN TAMIL NADU

S.No.	Name of the Wildlife Sanctuary	Area (ha.)	District	Year of Formation
1	Mudumalai Wildlife Sanctuary	21776	Nilgiris	1940
2	Mundanthurai Wildlife Sanctuary (R.F. 35228.38 + R.L.22979.20)	58207.58	Tirunelveli	1962
3	Point Calimere Wildlife Sanctuary	1728.81	Nagapattinam	1967
4	Indira Gandhi Wildlife Sanctuary	84149	Coimbatore	1976
5	Kalakad Wildlife Sanctuary	22358	Tirunelveli	1976
6	Vallanadu Black Buck Sanctuary	1641	Tuticorin	1987
9	Sathyamangalam Wildlife Sanctuary	141160.9	Erode	2008, 2011
10	Megamalai Wildlife Sanctuary	26910.81	Theni and Madurai	2009
11	Point Calimere Wildlife Sanctuary Block A and Block B	12407.27	Thanjavur and TiruvarurNagapattinam	2013
12	Kodaikanal Wildlife Sanctuary	60895.48	Dindigul and Theni	2013
13	Gangaikondan Spotted Deer Sanctuary	288.4	Tirunelveli	2013
14	Cauvery North Wildlife Sanctuary	50433.48	Dharmapuri, Krishnagiri	2014
15	Nellai Wildlife Sanctuary	35673.33	Tirunelveli	2015
	Total	606389.657		

2) BIRDS SANCTUARIES IN TAMIL NADU

S.No.	Name of the Birds Sanctuary	Area (ha.)	District	Year of formation
1	Vedanthangal Birds Sanctuary	30.0	Kancheepuram	1936
2	Vettangudi birds Sanctuary	38.4	Sivagangai	1977
3	Pulicat Lake Birds Sanctuary	15367	Tiruvallur	1980
4	Karikili Birds Sanctuary	61.21	Kancheepuram	1989
5	Kanjirankulam Birds Sanctuary	104	Ramanathapuram	1989
6	Chitrangudi Birds Sanctuary	7.63	Ramanathapuram	1989
7	Koonthankulam-Kadankulam Birds Sanctuary	129.0	Tirunelveli	1994
8	Vellode Birds Sanctuary	77.18	Erode	1997

S.No.	Name of the Birds Sanctuary	Area (ha.)	District	Year of formation
9	Udayamarthandpuram Birds Sanctuary	45.28	Tiruvarur	1998
10	Melaselvanur-Kilaselvanur Birds Sanctuary	593.08	Ramanathapuram	1998
11	Vaduvoor birds Sanctuary	128.1	Tiruvarur	1999
12	Karaivetti Birds Sanctuary	453.71	Ariyalur	2000
13	Theerthangal Bird Sanctury	29.29	Ramanathapuram	2010
14	Sakkarakottai Tank Birds Sanctuary	230.49	Ramanathapuram	2012
15	Oussudu Lake Birds Sanctuary	331.785	Villupuram	2015
	Total	17666.16		

3) NATIONAL PARKS IN TAMIL NADU

S.No.	Name of the National Park	Area (ha.)	District	Year of formation
1	Guindy National Park	270.57	Chennai	1978
2	Gulf of Mannar Marine Park (21 Islands) Reserve Land - 623.12 Ha + Sea area - 51978.88 Ha	52602.00	Ramanathapuram&Tuticorin	1986
3	Indira Gandhi National Park	11710.00	Coimbatore	1989
4	Mukurthi National Park	7846.00	Nilgiris	2001
5	Mudumalai National Park	10323.00	Nilgiris	2005
	Total	**82751.57**		

4) CONSERVATION RESERVES IN TAMIL NADU

S.No.	Name of the Conservation Reserve		Area (ha.)	District	Year of formation
1	Thiruppudaimaruthur Conservation Reserve	Birds	2.84	Tirunelveli	2005
2	Suchindrum-Theroor Conservation Reserve	–Managudi	484.77	Kanniyakumari	2015
		Total	**487.61**		

5) ABSTRACT

S. No.	Sanctuary and National parks	Total No.	Total Area
1	Wildlife Sanctuaries	15	606390
2	Birds Sanctuaries	15	17666.2
3	National Parks	5	82751.6
4	Conservation Reserves	2	487.61
Total			707295

6) BIO-SPHERE RESERVES IN TAMIL NADU

S. No	Name of Reserve	Area (ha.)
1	Nilgiris Biosphere Reserve	253800
2	Gulf of Mannar Biosphere Reserve	1050000
3	Agasthiyarmalai Biosphere Reserve	167236
	Total	1471036

7) ELEPHANT RESERVES IN TAMIL NADU

Sl. No	Name of Elephant Reserve	District	Name of the Division.	Area (ha.)
1	Nilgiris – Eastern Ghat (Nilgiri Elephant Reserve)	Nilgiris Erode, Dharmapuri	Mudumalai Wildlife Sanctuary, Gudalur Forest Division, Nilgiris North Forest Division, Sathyamangalam Forest Division, Erode Forest Division, Dharmapuri Forest Division,,Hosur Forest Division, Nilgiris South Forest Division,.	466245
2	Nilambur Valley Elephant	Coimbatore,	Coimbatore Forest Division,,Mukkuruthi National Park,	56557

Sl. No	Name of Elephant Reserve	District	Name of the Division.	Area (ha.)
	(Nilambur Reserve) Silent Coimbatore Reserve Elephant	Nilgiris	Nilgiris South Forest Division,.	
3	Periyar Elephant Reserve (Srivilliputhur Elephant Reserve)	Theni, Virudhunagar, Tirunelveli	Srivilliputhur Squirrel Wildlife Sanctuary, Theni Forest Division, Tirunelveli Forest Division,	124910
4	Anamalai – Parambikulam Elephant Reserve (Anamalai Elephant Reserve)	Coimbatore, Dindigul	Indira Gandhi Wildlife Sanctuary, Forest Kodaikanal Division, Dindigul Division, Forest	145723

8) TIGER RESERVES IN TAMIL NADU

S.No.	Name of the Tiger Reserve	Core Area (sq.km.)	Buffer Area (sq.km.)	Total Area (sq.km.)
1	KalakadMundanthurai Tiger Reserve	895	706.542	1601.542
2	Anamalai Tiger Reserve	958.59	521.28	1479.87
3	Mudumalai Tiger Reserve	321	367.59	688.59
4	Sathyamangalam Tiger Reserve	793.493	614.912	1408.405
	TOTAL	2968.083	2210.324	5178.407

Source: Forest Department, GoTN

1.1.9 Faunal Diversity

The faunal diversity of Tamil Nadu includes 165 species of fresh water Pisces, 76 species of Amphibians, 177 species of reptiles, 454 species of birds and 187 species of mammals. According to the CAMP reports the red-listed species include 126 species of Pisces, 56 species of Amphibians, 77 species of reptiles, 32 species of birds and 40 species of mammals. The endemic fauna includes 36 species of Amphibians, 63 species of reptiles, 17 species of birds and 24 species of mammals. Schedule I animals include 22 species of mammals, 42 species of birds and 9 species of reptiles. Schedule II animals include 13 species of mammals. Schedule III animals include 5 species of mammals. Schedule IV animals include 5 species of mammals, 367 species of birds, 109 species of reptiles and 23 species of Amphibians. Schedule V animals include 13 species of mammals and 1 species of birds.

1.2 SOCIO-ECONOMIC BASELINE PROFILE

1.2.1 Area andPopulation

Tamil Nadu has an area of about 130,058 km^2. The state is divided into 37 districts. Total population of Tamil Nadu as per 2011 census is 72,147,030 of which male and female are 36,137,975 and 36,009,055 respectively. In 2001, total population was 62,405,679 in which males were 31,400,909 while females were 31,004,770. The total population growth in this decade was 15.61 percent while in previous decade it was 11.19 percent. The population of Tamil Nadu forms 5.96 percent of India in 2011. In 2001, the figure was 6.07percent.

1.2.2 Population Density

Total area of Tamil Nadu is 130,058 sq. km. Density of Tamil Nadu is 555 per sq km which is higher than national average 382 per sq.km. In 2001, density of Tamil Nadu was 480 per sq km, while nation average in 2001 was 324 per sq.km.

1.2.3 Sex ratio

Sex Ratio in Tamil Nadu is 996 *i.e.* for each 1000 male, which is above national average of 940 as per census 2011. In 2001, the sex ratio of female was 986 per 1000 males in Tamil Nadu state.

1.2.4 Literacy

Literacy rate in Tamil Nadu has seen upward trend and is 80.09 percent as per 2011 population census. Of that, male literacy stands at 86.77 percent while female literacy is at 73.14 percent. In 2001, literacy rate in Tamil Nadu stood at 73.45 percent of which male and female were 83.28 percent and 64.91 percent literaterespectively. In actual numbers, total literates in Tamil Nadu stands at 51,837,507 of which males were 28,040,491 and females were 23,797,016.

1.2.5 Urbanisation

As per Census Record 2013, Out of total population of Tamil Nadu, 48.40% people live in urban regions. The total figure of population living in urban areas is 34,917,440 of which 17,458,910 are males and while remaining 17,458,530 are females. The urban population in the last 10 years has increased by 48.40 percent. Sex Ratio in urban regions of Tamil Nadu was 1000 females per 1000 males. For child (0-6) sex ratio the figure for urban region stood at 952 girls per 1000 boys. Total children (0-6 age) living in urban areas of Tamil Nadu were 3,512,530. Of total population in urban region, 10.06 % were children (0- 6). Average Literacy rate in Tamil Nadu for Urban regions was 87.04 percent in which males were 91.80% literate while female literacy stood at 82.31%. Total literates in urban region of Tamil Nadu were 27,335,312.

1.2.6 Scheduled Caste and Scheduled Tribes

The Scheduled Castes (SCs) and Scheduled Tribes (STs) comprise about 7.2 percent and 1.1 percent, respectively, of Tamil Nadu's population (according to the 2011 census). The total population of Tamil Nadu, as per the 2011 Census is 72,147,030. Of this, 5194586 (7.2 per cent) are Scheduled Castes (SCs) and 793617 are Scheduled Tribes (STs). The SC population constitutes 7.2 per cent of the country's SC population. Seventy-six (76) SCs have been notified in Tamil Nadu by the Scheduled Castes and Scheduled Tribes Order (Amendment) Act, 1976. Of these, fifteen SCs namely, Ayyanavar, Bharatar, Kakkalan, Kavara, Kootan, Mannan, Padannan, Panan, Paravan, Pathiyan, Thandan, Vannan, Vetan and Vettuvan have been notified with area restriction in Kanniyakumari district and Shencottahtaluk of Tirunelveli district. Kanakkan have been notified in Nilgiri district only.

Appendix 3

ESIA Report Structure

Executive Summary
1 Introduction
  1.1 Project Rationale
  1.2 Need for the Project
  1.3 Purpose of the ESIA
  1.4 Structure of ESIA Document
2 Project Corridor – Omalur to Mecheri (SH 222)
  2.1 Description of the Project Corridor
  2.2 Project Road Salient Features
  2.3 Proposed Design Interventions
  2.4 Road Construction Standards, Norms and Guidelines
3 Legal and Institutional Framework
  3.1 National and State Rules and Regulations
  3.2 World Bank safeguard/ Operational policies
  3.3 Summary of Clearance Requirement
4 Baseline Environmental Status
  4.1 Physical Environment
  4.2 Biological Environment
  4.3 Social Environment
5 Public Consultation
  5.1 Focus Group Discussion (FGD)
  5.2 Structured Public Consultation
6 Analysis of Alternatives
  6.1 With and Without project alternatives
  6.2 Highway design alternatives
  6.3 Scope for Reclaiming and Reuse Material from Existing Road Pavement
7 Potential Environmental and Social Impacts and Mitigation Measures
  7.1 Environmental Impact Assessment
  7.2 Social Impact Assessment
  7.3 Gender Action Plan
8 Environmental and Social Management Plan (ESMP)
9 Implementation Arrangement for ESMP and RAP
  9.1 Implementation of ESMP
  9.2 RAP Implementation
10 Grievance Redressal Committee (GRC)
11 Environmental Monitoring Plan
  11.1 Performance Indicators
  11.2 Reporting System
12 ESMP Budget

Appendix 4

Entitlement Matrix for Land Acquisition and resettlement impacts

SNo	Impact Category	Entitlements		Implementation Guidelines
Section I. TITLE HOLDERS - Loss of Private Property				
1	Loss of Land (agricultural, homestead, commercial or otherwise)	a	Land will be acquired on payment of compensation as per RFCTLARR Act 2013. or Land will be acquired with the consent of the landowner, while ensuring that such consented sale value is 25% more than the compensation amount which would otherwise have been awarded, if the said land was acquired invoking the provisions of the TNHA (where compensation is determined in accordance with RFCTLARR Act, 2013).	Higher of (i) market value as per Indian Stamp Act, 1899 for the registration of sale deed or agreements to sell, in the area where land is situated; or (ii) average sale price for similar type of land, situated in the nearest village or nearest vicinity area, ascertained from the highest 50% of sale deeds of the preceding 3 years; The market value calculated as above in Rural areas shall be multiplied by a factor as notified by GoTN[11]. Plus 100% solatium and 12% additional market value[12] from date of 15(2) notification to award. Title holders whose land is severed, will have the option of surrendering the severed portion of the remaining unviable land
		b	Agricultural landowners whose livelihood is lost due to the land acquired will be entitled for Rs. 5,25,200 as onetime payment in lieu of annuity policy.	Any affected family whose livelihood is primarily dependant (loses one third of the annual family income due to the acquisition of the said agricultural land) on the agricultural land acquired alone will be treated as livelihood loss.
2	Loss of residential structure		**In addition to Compensation for land and Assistances listed above under S.No.1**	
		a	Cash compensation at PWD plinth area rates for structure without depreciation and with 100% solatium	When the project activities affect part of a structure belonging to titleholder, then the structure-owner will be entitled for compensation for the entire structure[13],

[11] Vide Gazette Notification of The Tamil Nadu Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2017 read with G.O.(Ms) No.300, Revenue &Disaster Management (LA-I(1)), dated 20.09.2017 - Multiplying factor of 1.25 for land in rural area which lies within 30km from urban area, factor of 1.5 for land in rural area which lies beyond 30km and within 50km from urban area and factor of 2.0 for land in rural area which lies beyond 50km from urban area.

[12] The 12% additional market value will be computed on the basic market value of land and will not include the multiplication factor in line with G.O. Ms. No. 29 of Revenue and Disaster Management Department, Land Administration Wing [LA-I(1))] Section dated 24.01.2019

[13] Provided that the un-affected portion of the structure is either (i) unsafe or (ii) not usable/liveableor (iii) adequate set-back is not available. In such cases, the compensation for the entire structure will be paid after obtaining an undertaking (sworn affidavit) from the structure owner, that s/he woulddemolish the entire/full structure within 30-days from the receipt of structure compensation; and if the un-affected portion of the structure is found to be safe and usable/liveable, and if structure-owner's demand of compensation for the full structure is considered to be unreasonable by DE(H), then in such cases the DE(H) shall reject such demand of the structure owner giving due reason and justification.

SNo	Impact Category	Entitlements		Implementation Guidelines
		b	Right to salvage affected materials	
		c	One time assistance of Rs.30,050 to all families who lose a cattle shed	
		d	One time assistance of Rs.30,050 for each affected family of an artisan or self-employed and who has to relocate.	
		e	An alternative house as per IAY specifications in rural areas and a constructed house/flat of minimum 50 sq.m. in urban areas or cash in lieu of house if opted (the cash in lieu of house will be Rs.1,70,000 in line with GoI IAY standards in rural areas and Rs.1,80,290 in case of urban areas), for those who do not have any homestead land and who have to relocate.	Stamp duty and registration charges will be borne in case of new houses or sites. Patta will be issued in the name of the wife/women of the family The site will be provided with all infrastructural amenities in line with RFCTLARR Act.
		f	One time subsistence allowance of Rs.43,270 for affected families who require to relocate due to the project	
		g	Shifting assistance of Rs.60,100 for those who have to relocate	
		h	One time Resettlement Allowance of Rs.60,100 for those who have to relocate	
		i	Residential structure owners , who are deriving rental income from the affected structure in the land acquired and whose livelihood is lost due to acquisition of land will be entitled for Rs.5,25,200as onetime payment in lieu of annuity policy	Any affected family whose livelihood is primarily dependant (loses one-third of the annual family income due to the acquisition of the said residential structure) on the rental income from the acquired residential building will be treated as livelihood loss.
3	Loss of Commercial structure		**In addition to Compensation for land and Assistances listed above under S.No.1**	
		a	Cash Compensation at PWD plinth area ratesfor structure without depreciation with 100% solatium	When the project activities affect part of a structure belonging to titleholder, then the structure-owner will be entitled for compensation for the entire structure[14],
		b	Right to salvage affected materials	
		c	One time grant of Rs.30,050 for loss of trade/self-employment for the business owner	If the business owner is different from the structure owner, the onetime grant for loss of trade/self-employment, will be paid to the

[14]Provided the un-affected portion of the structure is either (i) unsafe or (ii) not usable/liveable or (iii) adequate set-back is not available. In such cases, the compensation for the entire structure will be paid after obtaining an undertaking (sworn affidavit) from the structure owner, that s/he would demolish the entire/full structure within 30-days from the receipt of structure compensation; and if the un-affected portion of the structure is found to be safe and usable/commercially viable, and if structure-owner's demand of compensation for the full structure is considered to be unreasonable by DE(H), then in such cases the DE(H) shall reject such demand of the structure owner giving due reason and justification.

SNo	Impact Category	Entitlements		Implementation Guidelines
				business owner.
		d	One time subsistence allowance of Rs.43,270 for affected families who require to relocate due to the project	
		e	Shifting assistance of Rs.60,100 for those who have to relocate	
		f	One time Resettlement Allowance of Rs.60,100 for those who have to relocate	
		g	Commercial structure owners, who are deriving business income and/or rental income from the affected structure in the land acquired and whose livelihood is lost due to the acquisition, will be entitled for Rs.5,25,200as onetime payment in lieu of annuity policy.	Any affected family, whose livelihood is primarily dependant (loses one-third of the annual family income due to the loss of the business operation carried out from the acquired commercial structure) business derived on the income from the acquired commercial structure will be treated as livelihood loss; and any affected family whose livelihood is primarily dependant (loses one-third of the annual family income due to the loss of the acquired commercial structure) on the rental income derived from the acquired commercial structure will be treated as livelihood loss.
4	Impact to tenants (residential / commercial /agricultural)	**4.1** a	**Residential** 1-month notice to vacate the rental premises	
		b	Rental allowance at Rs. 3,610 per month in rural areas and Rs.4,810 per month in urban areas, for six months	
		c	Shifting assistance of Rs.12,020	
		4.2 a	**Commercial** 1-month notice to vacate the rental premises	
		b	Rental allowance at Rs.4,810 per month in rural areas and Rs.7,210 per month in urban areas, for six months	
		c	Shifting assistance of Rs.12,020	
		d	Commercial tenants will receive the one time grant of Rs.30,050 for loss of trade/self-employment provided under 3(c) above in lieu to the owner	
		4.3 a	**Agricultural Tenants** In case of agricultural tenants advance notice to harvest crops or compensation for lost crop at market value of the yield determined by the Agricultural Department	
5	Impact to trees, standing crops, other properties, perennial and non-perennial crops:	a	Three months (90 days) advance notification for the harvesting of standing crops (or) lump sum equal to the market value of the yield of the standing crop lost determined by the Agricultural Department	

SNo	Impact Category	Entitlements		Implementation Guidelines
		b	Compensation for trees based on timber value at market price to be determined by the Forest Department for timber trees and for other trees (perennial trees) by the Horticultural Department with 100% solatium.	
		c	Loss of other properties such as irrigation wells will be compensated at scheduled rates of Public Works Department (PWD) with 100% solatium.	
Section II. Additional Assistance for Women (Title and Non-title holders)				
6	Loss of Land / house / shop	a	Reimbursement of stamp duty and registration charges, for purchase of property out of the compensation/R&R assistance in the name of women in the family either solely or jointly within 3-years from LA award/R&R award.	
Section III. NON TITLE HOLDERS - Impact to squatters / Encroachers				
7	Impact to Squatters	**7.1** a	**Loss of House** Compensation at PWD plinth area rates without depreciation for structure	
		b	Right to salvage the affected materials	
		c	House construction grant of Rs.84,130 for all those who have to relocate. Additional house site grant of Rs.60,100 to those who do not have a house site,	Where there is self-relocation of a group of affected families or project assisted relocation, then in such resettlement sites, the project will provide all infrastructural amenities as required.
		d	One time subsistence allowance of Rs.21,630	
		e	Shifting assistance of Rs.12,020	
		7.2 a	**Loss of shop** Compensation at PWD plinth area rates without depreciation for structure	
		b	Right to salvage the affected materials	
		c	One time rehabilitation grant of Rs.24,040 for reconstruction of affected shop	
		d	One time subsistence allowance of Rs.21,630	
		e	Shifting assistance of Rs.12,020	
		f	**Impact to Kiosks** One time rehabilitation grant of Rs.18,000/- for major affected kiosks	
		7.3 a	**Cultivation** 2-month notice to harvest standing crops or market value of compensation for standing crops	
8	Impact to Encroachers	**8.1** a	**Cultivation** 2-month notice to harvest standing crops or market value of compensation for standing crops, if notice is not given.	Market value for the loss of standing crops will be decided by the Spl. DRO in consultation with the Agriculture or Horticulture Department.

SNo	Impact Category	Entitlements		Implementation Guidelines
		8.2 a	**Structure** 1-month notice to demolish the encroached structure	
		b	Compensation at PWD plinth area rates without depreciation for the affected portion of the structure	
Section IV. Loss of Livelihood Opportunities				
9	Loss of employment in non-agricultural activities or daily agricultural wages or other wage workers	a	Subsistence allowance equivalent to minimum agricultural wages for 3 months	Only agricultural labourers who are in fulltime / permanent employment of the landowner, or those affected full time employees of the business, will be eligible for this assistance. Seasonal agricultural labourers will not be entitled for this assistance.
Section V. Impact to Vulnerable DPs				
10	Vulnerable famiies	a	Training for skill development. This assistance includes cost of training and financial assistance for travel/conveyance and food.	One adult member of the displaced family, whose livelihood is affected, will be entitled for skill development. The LARRU with support from the NGO will identify the number of eligible vulnerable displaced persons based on the 100% census of the displaced persons and will conduct training need assessment in consultations with the displaced persons so as to develop appropriate training programmes suitable to the skill and the region. Suitable trainers or local resources will be identified by LARRU and NGO in consultation with local training institutes.
		b	One time assistance of Rs.6,010 for all those major impacted families	
		c	Displaced vulnerable families will be linked to the government welfare schemes, if found eligible and not having availed the scheme benefit till date.	
Section VI. Additional Provision for consistency due to change in applicable policy				
11	Landowners	The difference in amount due to 12% Additional Market Value on the adoption of multiplication factor is allowed as a Special ex-gratia grant under R&R assistance to the Project Affected Persons (PAPs) for LA awards passed after 24.01.2019.		
Section VII. Unforeseen Impacts				
Unforeseen impacts encountered during implementation will be addressed in accordance with the principles of this policy				

Appendix 5

Environmental Monitoring Formats

Format EM1: Selection of Disposal Site Locations

From _____ To _____

(Give chainage and nearest settlements from both ends)

Criteria on which information for each site is to be collected	Site 1	Site 2	Site 3	Site 4
Area covered (m^2)				
Total Material that can be dumped within the site (m^3)				
Depth to which disposal is feasible (m)				
Distance of nearest watercourse (m)				
Nearest Settlement (m)				
Date/s of Community Consultation/s				
Whether the community is agreeable to siting of dumping site (Y/N)				
Date of Permission from Village Council President (VCP)				
Proposed future use of the Site				

Selected Site (tick any one column only)
Certified that the above information is correct to the best of my knowledge and belief.

Contractor

Signed: Date:
Name & Designation:

Recommendation on the suitability of the site

Decision Taken(tickone): Approved/NotApproved

Engineer – In-Charge

Signed: Date:
Name and Designation of Deciding Authority

Enclosures
(Tick as appropriate)
1 Maps of eachlocation
2 Photographs
a Each disposallocation
b Each communityconsultation
3 Photocopies of permissions fromVCPs

Format EM2: Construction Camp and Storage Area

ConstructionStage: Report- Date___Month__Year___

(Site Layout of Construction camp and working drawings of dwelling units with allied facilities to be attached with format) Format to be submitted before target date (decided by PIU) of establishing camps

Location ofCamp(km_____)

Sl. No	Item	Unit	Details	Remarks
1	**Detail of item camp**			
a	Size of Camp	m x m		
b	Area of Camp	sq.m		
c	Distance from Nearest Settlement			
d	Distance from Nearest Water Source	Type/Size/Capacity/Present Use/Ownership		
e	Date of camp being operational dd/mm/yy			
f	Present land use			
g	No other trees with girth > 0.3m.			
h	Details of Storage area(Availability of impervious surface)	m x m		
i	Availability of separate waste disposal from storage area	Cum		
2	**Details of top soil stacking**			
a	Quantity of top soil removed	Cum		
b	Detail of storage of topsoil	Describe stacking arrangement		
3	**Details of Workforce**			
a	Total No of Labourers	no's		
b	Total no of Male Workers	no's		
c	No of Male Workers below 18 years of age	no's		
d	Total No of Female Workers	no's		
e	No of Female workers below 18 years of age	no's		
f	No of children	no's		
4	**Details of Dwelling Units**			
a	No of dwellings/huts	no's		
b	Minimum Size of Dwelling	m x m		
c	No of openings per dwelling	nos		
d	Minimum size of opening	m x m		
e	Walls	specifications		
f	Roofing	specifications		
g	Flooring	specifications		
h	Drinking Water Tank	specifications		
i	Capacity of Drinking water Tank	cum		
j	Size of Drinking Water Tank	m x m x m		
k	Total no of WC	no's		
l	No of Wcs for female workers	no's		
m	Minimum Size of WC	m x m x m		
n	Total No of Bathrooms for female workers	no's		
o	Size of septic tank for WC/Baths	m x m x m		
p	Capacity of Water Tank for WCs/ Bathrooms and general purpose			
q	Fencing around camp	Y/N		
5	**Details of Facilities**			
a	Availability of security guard 24 hrs a day	Yes/No		
b	Details of First Aid Facility	Yes/No		
c	Availability of Day Care Centre	Yes/No		
d	Availability of dust bins (capacity 60 ltr)	no's		

Certified that the furnished information is correct the quality of work is as per god practice and all relevant information as required is attached

Contractor **Engineer – In -Charge**

Format EM3: Reporting for Borrow Areas

Construction Stage Report:DateMonth_____Year_____Site Layout of Borrow Area and Proposed Borrow Area Redevelopment Plan to be attached with Format to be submitted before target date as (decided by PIU) for establishing Borrow Areas Borrow Area No.BA_____
Location of BorrowArea(Km_____)

Sl. No	Item	Unit	Details	Remarks by CSC, if any
1	**Details of Borrow Area**			
a	Date of BorrowArea becomingoperational dd/mm/yy			
b	Current Landuse			
c	Distance from Nearest Settlement	Km		
d	No of settlements within 200m of Haul Road	No.		
e	No of settlements within 500m of Borrow Area	No.		
f	Total Capacity	cum		
g	No of Trees with girth more than 0.3 m	No.		
h	Length of Haul Road	km		
i	Width of Haul road	m		
j	Type of Haul Road	metal/ dirt		
k	Size of Borrow Area	sq.km		
l	Area of Borrow Area	km x km		
m	Quantity Available	cum		
n	Distance of Nearest Water Source	Type/Size/Capacity/ Present Use/Ownership		
o	Quantity of top soil removed	cum		
p	Detail of storage of topsoil			
q	Daily/occasional use of the Borrow Area by the community, if any	-		
r	Probable reuse of Borrow pit-ask community	-		
s	Drainage channels/slope/characteristics of the area	-		
2	**Enhancement Elements**			
a	Quantity of top soil removed	sq.m		
b	Detail of storage of topsoil	sq.m		
c	Adjoining land use/Natural elements			
d	Near by catchment for storing water			
e	Erosion Control Programme			
f	Preventive measures for			
i	Leaching			
ii	Mosquito Breeding			
iii	Water run-off/contamination			
iv	Any other environmental degradation			
3	**Details of workforce**			
a	Total No of Labourers	No.		
b	Total no of Male Workers	No.		
c	No of Male Workers below 18 years of age	No.		
d	Total No of Female Workers	No.		
e	No of Female workers below 18 years of age	No.		
4	**Details of redevelopment, Plan to be enclosed**			

Certified that the furnished information is correct the quality of work is as per good practice and all relevant information as required is attached

Contractor **Engineer – In -Charge**

Format EM4: Tree Felling

S.No	Links	Physical Target				Completion Target		
		Total	Target	Target Achieved	% of task completed	Target Date	Date of Completion if task completed	Reason for Delay if any
		Unit						
1		no's						
2		no's						
3		no's						
4		no's						

Contractor **Engineer – In -Charge**

EM 5 Topsoil Conservation Monitoring

Contract_____

ReportNo. _____ Date_____

Location (Chainage)	Original Use of Topsoil removed	Measures for preventing spillage of topsoil on Haul Roads(Earthen/ Metalled)	Present Method of Storage	Anticipated period of Storage (Months)	Distance of nearest Water course (m)	Present Slope of Pile (V:H)	Whether silt fencing provided?	Is any other covering / measure provided? If yes, what is it?	Improvements required	Extent of Compliance as on date of report

Certified that the above is true.

Signed_____

Contractor

Verified

Signed_____

Engineer – In-charge

EM 6 Redevelopment of Borrow Areas

Operation Stage:Report:Date____Month_____Year_____ to be monitored by PIU during operationperiod

Details of remarks to be appended wherever necessary.

Sl. No	Activity	Particulars	Drawbacks Identified			Improvements Required		
			Construction	Financial	Others (Ask Community)	Technical	Financial	Remarks/ Suggestions
1	Details of Borrow area and Surrounding Landuse							
2	End use of the borrow area							
3	Whether rehabilitation has been carried out in line with owners request							
4	Erosion Control Measures							
5	Number of trees planted							
6	Reuse of topsoil							
7	Preventive measures taken for -Mosquito Breeding -Water runoff/ contamination -Other Environmental Degradation							
8	Any problems faced by owner							
9	Any problems faced by the local community							
10	If it has been developed as a fish pond,							
a	Details of available catchment for storing water							
b	Economic Benefits/Utility							
11	If it has been developed as an orchard							
a	Details of suitability of soil and water.							
B	Type of Plantation							
c	Economic Benefits/Utility							
12	Any Other End use							
a	Particulars							
b	Economic Benefits/Utility							

Contractor **Engineer – In -Charge**

EM 7 Checklist for Construction Safety

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
Safety during Construction Stage							
1	Appointment of qualified Construction safety officers						
2	Approval for Construction Safety Management Plan by the Engineer.						
3	Approval for Traffic Management/Control Plan in accordance with IRC: SP: 55-2001						
4	Maintenance of the existing road stretches handed over to the Contractor.						
5	Provision of Temporary Traffic Barriers/ Barricades/caution tapes in constructionzones						
6	Provision of traffic sign boards						
7	Provision for flags and warning lights						
8	Provision of metal drum/empty bitumen drum delineator, painted in circumferential strips of alternate black and white 100mm wide 2 coats fitted with reflectors 3 Nos of 7.5cm diameter						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work and access (ladders with handrail) for works at a height of more than 3.0 m						
11	Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of more than 3.0 m depth.						
12	Demarcations (fencing, guarding and watching) at construction sites						
13	Provision for sufficient lighting especially for night time work						
14	Arrangements for controlled access and entry to Construction zones						
15	Safety arrangements for Road users / Pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular Inspection of Work Zone Traffic Control Devices by authorized contractor personnel						
18	Construction Workers safety - Provision of personnel protective equipments						
19	A. Helmets						
	B. Safety Shoe						
	C. Dust masks						
	D. Hand Gloves						
	E. Safety Belts						
	F. Reflective Jackets						
	G. Earplugs for labour						
20	Workers employed on bituminous works, stone crushers, concrete batching plants etc. provided with protective goggles,gloves, gumboots etc.						
21	Workers engaged in welding work shall be provided with welder protective shields						

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition						
24	Regular health check-up for labour/ Contractor's personnel						
25	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camps.						
26	The Contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers and flag persons for traffic control						
27	Provision for insurance coverage to the contractor's personnel						

Contractor **Engineer – In -Charge**

Format EC1: Target Sheet for Pollution Monitoring

Construction Stage:Report - Date_____ Month_____ Year_____

(Locations at which monitoring to be conducted as per EMP)

Sl. No	Chainage	Details of Location	Duration of Monitoring	Instruments Used	Completion Target		Reason for Delay if any
					Target Date	Date of Completion if taskcompleted	
Air Monitoring							
1							
2							
3							
4							
5							
Water Monitoring							
1							
2							
3							
4							
5							
Noise Monitoring							
1							
2							
3							
4							
5							

Certified that the Pollution Monitoring has been conducted at all the locations specified in the EMP

Contractor **Engineer – In -Charge**

Format EC 2: Target Sheet for Pollution Monitoring

Operation Stage:Report - Date_____ Month_____ Year_____

(Locations at which monitoring to be conducted)

Sl. No	Chainage	Details of Location	Duration of Monitoring	Instruments Used	Completion Target		Reason for Delay if any
					Target Date	Date of Completion if task completed	
Air Monitoring							
1							
2							
3							
4							
5							
Water Monitoring							
1							
2							
3							
4							
5							
Noise Monitoring							
1							
2							
3							
4							
5							

Certified that the Pollution Monitoring has been conducted at all the locations specified in the EMP

Contractor **Engineer – In -Charge**

Appendix 6

Guidelines for EnvironmentalManagement

GUIDELINE-1: SITE PREPARATION

1. GENERAL

The preparation of site for construction involves: (i) clearing of land required for construction; and (ii) management of activities such as traffic during construction. These activities have been detailed out for road construction activities separately.

2. ROAD CONSTRUCTION

2.1 Site Preparation Activities

After obtaining the consent of the community on the alignment, the Project Implementation Unit (PIU) of the Divisional Office shall be responsible to stake out the alignment by establishing working benchmarks on ground. It shall be the responsibility of the PIU to take over the possession of the proposed RoW and hand over the land width required clear of all encumbrances to the Contractor. Activities pertaining to the clearance of land and relocation of utilities need to be initiated by the PIU well in advance to avoid any delays in handing over of site to the Contractor. Assistance of the Revenue Department shall be sought in accomplishing the task. To summarize, the PIU's responsibilities before handing over the site to the contractor include:

- Clearance of encroachments within proposed RoW;
- Initiation of process for legal transfer of land title;
- Alignment modification or Relocation of common property resources in consultation with the local community;
- Alignment modification or Relocation of utilities in consultation with the various government departments; and
- Obtain clearances required from government agencies for
    - Cutting of trees; and
    - Land Diversion of forestlands, etc.

2.2 Site Preparation Activities by the Contractor

Site preparation shall involve formation of the road base wherein it is ready for construction of protective/drainage works, carriageway, shoulders, parapets and other road furniture. The PIU shall transfer the land for civil works to the Contractor after peg marking of the alignment.

The Contractor shall verify the benchmarks soon after taking possession of the site. The Contractor, prior to initiation of site preparation activities, shall highlight any deviations/discrepancies in these benchmarks to the PIU in writing. The contractor shall submit the schedules and methods of operations for various items during the construction operations to the PIU for approval. The Contractor shall commence operations at site only after the approval of the schedules by the PIU.

The activities to be undertaken by the contractor during the clearing and grubbing of the site are as follows:

The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following measures: (i) Limiting the surface area of erodible earth material exposed by clearing and grubbing; (ii) Conservation of top soil and stock piling as per the measures suggested as part of **Guideline 4**, "Top Soil Salvage Storage and Replacement"; and (iii) Carry out necessary backfilling of pits resulting from uprooting of trees and stumps with excavated or approved materials to the required compaction conforming to the surrounding area.

To minimize the adverse impact on vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed. Cutting of trees and vegetation outside the working area shall be avoided under all circumstances. In case the alignment passes through forest areas, The Forest Ranger shall be consulted for identification of presence of any rare/endangered species within the proposed road way. Protection of such species if found shall be as per the directions of the Forest Department.

The locations for disposal of grubbing waste shall be finalized prior to the start of the works on any particular section of the road. The selection of the site shall be approved by the PIU. The criteria for disposal of wastes shall be in accordance with the measures given in Guideline on, "Waste Management and Debris Disposal" (**Guideline 8**).

In locations where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion and sedimentation control features can follow immediately, if the project conditions permit.

Dismantling of CD structures and culverts shall be carried out in a manner as not to damage the remaining required portion of structures and other surrounding properties. The disposal of wastes shall be in accordance with the provisions given in **Guideline 8**, "Waste Management and Debris Disposal". The following precautions shall be adopted: (i) The waste generated shall not be disposed off in watercourses, to avoid hindrance to the flow, and (ii) All necessary measures shall be taken while working close to cross drainage channels to prevent earthwork, stonework as well as the method of operation from impeding cross drainage at rivers, streams, water canals and existing irrigation and drainage systems.

The designated sites duly approved by Implementing Agency shall be cleared of its existing cover for setting up of the construction sites, camps and related infrastructure facilities, borrow areas and other locations identified for temporary use during construction. The contractor shall comply with all safety requirements in consideration as specified in the **Guideline 12** on, "Labour& Worker's Health and Safety". Before initiation of site preparation activities along these lands to be used temporarily during construction, it shall be the responsibility of the Contractor to submit and obtain approval of the site redevelopment plan from the implementing agency. The letter/contract agreement between the owner(s) of the land parcel for temporary usage shall include site redevelopment to its original status. The guidelines for the same are furnished in the Guideline on, "Construction Plants & Equipment Management"; guideline, "Construction and Labour Camps"; and "Borrow areas".

2.3 Traffic management during construction

Traffic management during construction is an activity specific to the contractors. Contractors must ensure a reasonably smooth flow of traffic during construction. The following are the general principles to be followed for traffic management during construction:

- Partial pavement construction **over long lengths will not be permitted.** The contractor should concentrate his activities over sections such that he can complete continuous fronts of up to a maximum of 1 km before starting the adjacent front. The contractor may open more than one continuous 1 km front provided that he has the separate resources to do so. The resources working on a 1 km front may not be shifted to another front until no longer required on that front.
- The construction activities should be staggered over sub-sections to the extent that the use of plant and equipment is optimized to maximum efficiency and to avoid idling. For road widening operations, excavation **adjacent to the existing road shall not be permitted on both titles simultaneously.** Earthworks must be completed to the level of the existing road before excavation work on the opposite side will be permitted.
- The construction operations taking place on a particular front must be managed efficiently such that delays between successive pavement layers are minimized.

- Before the start of the monsoon season (June) the contractor shall ensure that the pavement over any front is complete, full width, at least upto Dense Bituminous Macadam, DBM level, but preferably with Asphaltic Concrete, AC wearing course. The contractor **should not start any sections of pavement that he cannot complete by the start of the monsoon season.**
- In the absence of permanent facilities, temporary drainage and erosion control measures, as required by the Specifications, are to be implemented prior to the onset of the monsoon.

In cases where separate traffic diversions are not essential or cost effective the construction methodology should be in accordance with the guidelines following:

On a 1km section, the pavement construction (except new alignments) should be limited to 500m sub-sections with a minimum of 1 to 1.5 km between successive sub-sections to ease traffic management and safety issues. The earthworks in the widening portions are not limited in, this respect. Excavation on both sides of the existing, road over the same sub-section simultaneously shall not be permitted for reasons of safety to the traffic, particularly at night.

Sub-sections longer than 500 m may be authorized by the Engineer if two-way traffic flow can be comfortably managed and the Contractor can demonstrate his ability to maintain dust control, proper road edge delineation, proper signage and traffic control. Where single file traffic is permitted ('only applicable to final wearing course operations), the sub-sections shall be reduced to a maximum length whereby safe traffic regulation can be physically managed. Single file traffic may not be permitted at certain locations or times of the day when traffic volumes are such that excessive congestion shall occur.

GUIDELINE-2: CONSTRUCTION AND LABOUR CAMPS

1. INTRODUCTION

The scope of this guideline pertains to the siting, development, management and restoration of construction and labour camps to avoid or mitigate impacts on the environment. The area requirement for the construction camp shall depend upon the size of contract, number of labourers employed and the extent of machinery deployed. The following sections describe the siting, construction, maintenance, provision of facilities in the camps and finally rehabilitation of the construction and labour camps. These are described in three stages, pre-construction, construction and post-construction stage. The issues related to construction camps are similar in the case of road construction and hence have been taken together.

2. PRE-CONSTRUCTION STAGE

Identification of site for construction and labour camps is the first task. The Contractor shall identify the site for construction camp in consultation with the individual owners in case of private lands and the concerned department in case of Government lands. The suitable sites shall be selected and finalized in consultation with the PIU. **Table 1** gives the lands that could be avoided for construction camps and conversely those that could be preferred.

Table 1: Selection Criterion for Construction Camps.

Avoid the following …	Prefer the following …
• Lands close to habitations. • Irrigated agricultural lands. • Lands belonging to small farmers. • Lands under village forests. Lands within 100m of community water bodies and water sources as rivers. • Lands within 100m of watercourses. • Low lying lands. • Lands supporting dense vegetation. • Grazing lands and lands with tenure rights. • Lands where there is no willingness of the landowner to permit its use.	• Waste lands. • Waste Lands belonging to owners who look upon the temporary use as a source of income. • Community lands or government land not used for beneficial purposes. • Private non-irrigated lands where the owner is willing. • Lands with an existing access road.

The contractor will work out arrangements for setting up his facilities during the duration of construction with the land owner/concerned department. These arrangements shall be in the form of written agreement between the contractor and the land owner (private/government) that would specify:

a) photograph of the proposed camp site in original condition;

b) activities to be carried out in the site;

c) environmental mitigation measures to be undertaken to prevent land, air, water and noise pollution;

d) detailed layout plan for development of the construction and labour camp that shall indicate the various structures to be constructed in the camp including temporary, drainage and other facilities (**Figure 1** gives a layout plan for a construction camp); and

e) Restoration plan of camp site to previous camp conditions.

The arrangements will be verified by the PIU to enable redressal of grievances at a later stage of the project.

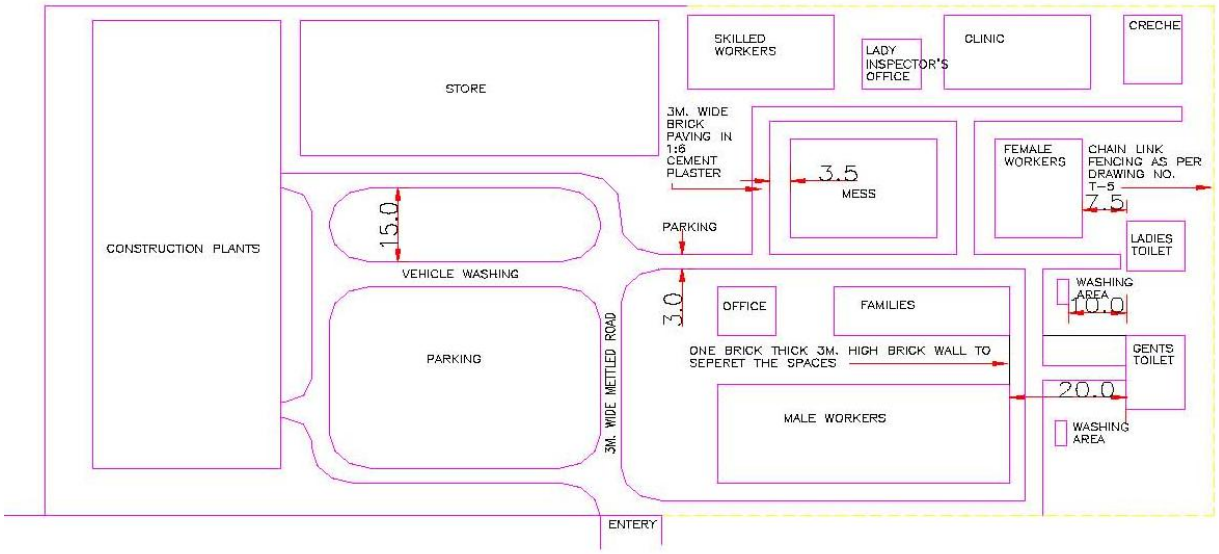


Figure 1: Layout Plan for Construction Camp

2.1 Setting up of labour camp

The contractor shall provide, free of cost in the camp site, temporary living accommodation to all the migrant workers employed by him for complete construction/maintenance work is in progress. A minimum area of 6 sq.mts per person shall be provided. The rooms of labour shall be well lighted and ventilated. The facilities to be provided for the labour are discussed below:

a) Drinking Water

Towards the provision and storage of drinking water at the construction camp, the contractor shall ensure the following provisions

- The contractor shall provide for a continuous and sufficient supply of potable water in the camps, in earthen pots or any other suitable containers.
- The contractor shall identify suitable community water sources for drinking. Only in the event of non-availability of other sources of potable water, the Contractor shall obtain water from an unprotected source only after the testing for its potability. Where water has to be drawn from an existing open well, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with dust proof trap door.
- Every water supply or storage shall be at a distance of not less than 15m from any wastewater / sewage drain or other source of pollution. Water sources within 15m proximity of toilet, drain or any source of pollution will not be used as a source of drinking water in the project.
- A pump shall be fitted to covered well used as drinking water source, the trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once a month.

b) Washing and Bathing Facilities

In every site, adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of contract labor employed therein. Separate and adequate bathing shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions.

c) Toilets Facilities

Sanitary arrangements, latrines and urinals shall be provided in every work place separately for male and female workers. The arrangements shall include:

- A latrine for every 15 females or part thereof (where female workers are employed).
- A latrine for every 10 males.

- Every latrine shall be under cover and so partitioned as to secure privacy, and shall have a proper door and fastenings.
- Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers “For Men Only” or “For Women Only” as the case may be.
- The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times and should have a proper drainage system;
- Water shall be provided in or near the latrines and urinals by storage in suitable containers.

d) Waste Disposal

- Disposal of sanitary wastes and excreta shall be into septic tanks.
- Kitchen waste water shall be disposed into soak pits/kitchen sump located preferably at least 15 meters from any water body. Sump capacity should be at least 1.3 times the maximum volume of wastewater discharged per day. The bottom of the pit should be filled with coarse gravel and the sides shored up with board, etc. to prevent erosion and collapse of the pit. New soak pits shall be made ready as soon as the earlier one is filled.
- Solid wastes generated in the kitchen shall be reused if recyclable or disposed off in land fill sites.

e) Medical and First Aid Facilities

Medical facilities shall be provided to the labour at the construction camp. Visits of doctor shall be arranged twice a month wherein routine checkups would be conducted for women and children. A separate room for medical checkups and keeping of first aid facilities should be built. The site medical room should display awareness posters on safety facilitation hygiene and HIV/AIDS awareness.

- First Aid Box will be provided at every construction campsite and under the charge of a responsible person who shall always be readily available during working hours. He shall be adequately trained in administering first aid-treatment. Formal arrangement shall be prescribed to carry injured person or person suddenly taken ill to the nearest hospital. The first aid box shall contain the following.
    - 6 small sterilized dressings
    - 3 medium size sterilized dressings
    - 3 large size sterilized dressings
    - 3 large sterilized burns dressings
    - 1 (30 ml) bottle containing 2 % alcoholic solution of iodine
    - 1 (30 ml) bottle containing salvolatile
    - 1 snakebite lancet
    - 1 (30 gms) bottle of potassium permanganate crystals
    - 1 pair scissors
    - Ointment for burns
    - A bottle of suitable surgical antiseptic solution
    - In case, the number of labour exceeds 50, the items in the first aid box shall be doubled.

f) Provision of Shelter during Rest

The work place shall provide four suitable sheds, two for meals and two for rest (separately for men and women). The height of the shelter shall not be less than 3.0m from the floor level to the lowest part of the roof. These shall be kept clean.

g) Crèches

In case 20 or more women workers are employed, there shall be a room of reasonable size for use of children under the age of six years. The room should have adequate light and realisation. A caretaker is to be appointed to look after the children. The use of the room shall be restricted to children, their mothers and the caretaker.

2.2 Storage of Construction Material in Construction Camps

For storage of Petrol/Oil/Lubricants, brick on edge flooring or sand flooring will be provided at the storage places of Petrol/Oil/Lubricants to avoid soil and water contamination due to spillage. These should be kept away from labour residential areas. The storage of cement shall be at Damp-proof flooring, as per IS codes. All materials shall be stored in a barricaded area. In case of electrical equipments, danger signs shall be posted. The batch mix plant is to be located away from the residential area and not in the wind direction. Separate parking areas for vehicles and also workshop areas need to be provided.

2.3 Firefighting arrangement

- The following precautions need to be taken:
- Demarcation of area susceptible to fires with cautionary signage;
- Portable fire extinguishers and/or sand baskets shall be provided at easily accessible locations in the event of fire;
- Contractor shall educate the workers on usage of these equipments.

2.4 Interactions with host communities

To ensure that there is no conflict of the migrant labor with the host communities, the contractor shall issue identity cards to labourers and residents of construction camps.

3. CONSTRUCTION STAGE

Construction camps shall be maintained free from litter and in hygienic condition. It should be kept free from spillage of oil, grease or bitumen. Any spillage should be cleaned immediately to avoid pollution of soil, water stored or adjacent water bodies. The following precautions need to be taken in construction camps.

- Measures to ensure that no leaching of oil and grease into water bodies or underground water takes place.
- Wastewater should not be disposed into water bodies.
- Regular collection of solid wastes should be undertaken and should be disposed off safely.
- All consumables as the first aid equipment, cleaning equipment for maintaining hygiene and sanitation should be recouped immediately.
- The debris/scrap generated during construction should be kept in a designated and barricaded area.

The PIU will monitor the cleanliness of construction campsites and ensure that the sites are properly maintained throughout the period of the contract.

4. POST CONSTRUCTION STAGE

At the completion of construction, all construction camp facilities shall be dismantled and removed from the site. The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works. Various activities to be carried out for site rehabilitation include:

- Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas.
- Soak pits, septic tanks shall be covered and effectively sealed off.
- Debris (rejected material) should be disposed off suitably (Refer **Guideline - 10** on “Waste Management and Debris Disposal”).
- Ramps created should be levelled.
- Underground water tank in a barren/non-agricultural land can be covered. However, in an agricultural land, the tank shall be removed.

- If the construction camp site is on an agricultural land, top soil can be spread so as to aid faster rejuvenation.
- Proper documentation of rehabilitation site is necessary. This shall include the following: −Photograph of rehabilitated site;
    - Land owner consent letter for satisfaction in measures taken for rehabilitation of site;
    - Undertaking from contractor; and
    - Certification from Engineer in-charge of the PIU.

In cases, where the construction camps site is located on a private land holding, the contractor would still have to restore the campsite as per this guideline. Also, he would have to obtain a certificate for satisfaction from the landowner.

GUIDELINE-3: BORROW AREAS

1. INTRODUCTION

Embankment fill material is to be procured from borrow areas designated for the purpose. Borrow areas cause significant adverse environmental impacts if appropriate mitigation measures are not taken. The scope of this guideline includes measures that are required during project planning and design stage, pre-construction, construction stage and post construction stage. Borrow areas are related only to road construction activities.

2. PROJECT PLANNING AND DESIGN STAGE

Design measures for reduction in the quantity of the earthwork will have to be undertaken to reduce the quantity of material extracted and consequently decrease the borrow area requirement. Borrow area siting should be in compliance with IRC: 10-1961. The DPR shall contain (i) Guidelines for locating site of borrow areas (ii) The arrangements to be worked out with the land owner/community for the site and (iii) Sample designs for redevelopment of borrow areas.

3. PRE-CONSTRUCTION STAGE

The contractor shall identify the borrow area locations in consultation with the individual owners in case of private lands and the concerned department in case of government lands, after assessing suitability of material. The suitable sites shall be selected and finalized in consultation with the PIU. Borrowing to be avoided on the following areas:

- Lands close to toe line.
- Irrigated agricultural lands (In case of necessity for borrowing from such lands, the topsoil shall be preserved in stockpiles. The subsequent Guidelines discuss in detail the conservation of topsoil.
- Grazing land.
- Lands within 0.8km of settlements.
- Environmentally sensitive areas such as Reserve Forests, Protected Forests, Sanctuary, wetlands (including beel). Also, a distance of 500 m should be maintained from such areas.
- Designated protected areas / forests.
- Unstable side-hills.
- Water-bodies.
- Streams and seepage areas.
- Areas supporting rare plant/ animal species;
- Ensure unsuitable soft rock is not prominent within the proposed depth of excavation which will render rehabilitation difficult.

3.1 Arrangements for Borrow Area

The Contractor will work out arrangements for borrowing with the land owner/concerned department. The arrangements will include the redevelopment after completion of borrowing. The arrangements will be verified by the PIU to enable redressal of grievances at a later stage of the project. The Engineer of PIU shall approve the borrow area after inspection of the site to verify the reclamation plan and its suitability with the contractor and landowner. The contractor shall commence borrowing soil only after the approval by the PIU. The contractor shall submit to the PIU the following before beginning work on the borrow areas.

- Written No-objection certificate of the owner/cultivator;
- Estimate extent of earth requires;
- Extent of land required and duration of the agreement;
- Photograph of the site in original condition; and
- Site redevelopment plan after completion.

The depth of excavation should be decided based on natural ground level of theland and the surroundings, and rehabilitation plan. In case higher depth of excavation is agreed with backfilling by unsuitable excavated soil (from roadway), then filling should be adequately compacted except topsoil, which is to be spread on the top most layer (for at least 20m thick). The guidelines for location, depth, size and shape of the borrow areas are available in the following:

- Clause 305.2.2.2 of MoRTH specification for roads and bridge works of IRC;
- Guidelines for environmental impact assessment of highway projects, Indian Roads Congress, 1989: (IRC: 104-1988);
- IRC: 10-1961-Recommended practice for borrow pits for road embankments constructed by manual operations, as revised in 1989;
- IRC SP: 58-2001 guideline for use of fly ash in road construction;
- EIA manual of MoEF, 2001;
- MoEF notification on utilisation of fly ash dated 27 August, 2005.

3.2 Documentation of Borrow Pit

The contractor must ensure that following data base must be documented for each identified borrow areas that provide the basis of the redevelopment plan.

- Chainage along with offset distance;
- Area (Sq.m);
- Photograph of the pit from all sides;
- Type of access/width/kutcha/puccaetc from the carriageway;
- Soil type;
- Slope/drainage characteristics;
- Water table of the area or identify from the nearest well, etc;
- Existing landuse, for example barren/agricultural/grazing land;
- Location/name/population of the nearest settlement from borrow area;
- Present usage of borrow area; and
- Community facility in the vicinity of borrow pit.

3.3 Redevelopment Plans for Borrow Pits

The following checklist provides guidelines in order to ensure that redevelopment of borrow areas must comply with MoRTH, clause 305.2.2.2 and EMP requirement. Borrow areas can be developed as:

- Ponds (various types) (eg: Drinking Water only; Washing and for other Domestic Chores; Only for Cattle; Mixed Uses etc.) (a large pond can be divided into two parts - each having a defined use)
- Farmland
- Water Recharging Zones
- Pastureland
- Fish Ponds (pissiculture)
- Waste disposal Sites (depending upon the location, distance from settlements, pollution risks, safety, associated environmental risks and hazards, regulations/ permissions of appropriate authority and other such factors)
- Plantation Zones
- Recreational Zones (depending upon location, size, potential of the site, willingness of the local bodies to develop it)
- Wildlife Refuge and Drinking Area (applicable only in case of sensitive environs with appropriate planning and understanding including regulation of depth for safety of animals etc.)

The rehabilitation measures for the borrow areas shall be dependent on the following factors:

- Land use objectives and agreed post-borrowing activities;
- Physical aspects (landform stability, erosion, re-establishment of drainage);
- Biological aspects (species richness, plant density,) for areas of native re vegetation;
- Water quality and soil standards; and
- Public safety issues.

Rehabilitation should be simple and maintenance free. Depending on the choice of the individual land owner/community, the contractor shall prepare redevelopment plans for the borrow areas. The options can be: (i) Restoring the productive use of the land (ii) Development of detention ponds in barren areas.

Option I: Suitable in locations with high rainfall **and productive areas**
Topsoil must be placed, seeded, and mulched within 30 days of final grading if it is within a current growing season or within 30 days of the start of the next growing season. Vegetative material used in reclamation must consist of grasses, legumes, herbaceous, or woody plants or a combination thereof, useful to the community for the fuel and fodder needs.

Plants must be planted during the first growing season following the reclamation phase.

Selection and use of vegetative cover must take into account soil and site characteristics such as drainage, pH, nutrient availability, and climate to ensure permanent growth. The vegetative cover is acceptable if within one growing season of seeding, the planting of trees and shrubs results in a permanent stand, or regeneration and succession rate, sufficient to assure a 75% survival rate.

Option II: In barren land, the borrow areas can be redeveloped into detention ponds.
These will be doubled up as water bodies and also for removal of sediment from runoff flowing through the ponds. Design of the detention basin depends upon the particle size, settling characteristics, residence time and land area. A minimum of 0.02 mm size particle with a settling velocity of 0.02 cm/sec (assuming specific gravity of solids 2.65) can be settled in the detention basin.

Following parameters are to be observed while setting up a detention pond:

- Pond should be located at the lowest point in the catchment area. Care should be taken that the horizontal velocity should be less then settling velocity to prevent suspension or erosion of deposited materials.
- Minimum Effective Flow Path: 5 times the effective width
- Minimum Free Board: 0.15 m
- Minimum Free Settling Depth: 0.5 m
- Minimum Sediments Storage Depth: 0.5 m
- Maximum interior slope: 2H : 1V
- Maximum exterior slope: 3H : 1V

The inlet structure should be such that incoming flow should distribute across the width of the pond. A pre-treatment sump with a screen should provide to remove coarse sediments. Settled sediment should be removed after each storm event or when the sediment capacity has exceeded 33% of design sediment storage volume. Accumulated sediment must be disposed of in a manner, which will prevent its re-entry into the site drainage system, or into any watercourse.

4. CONSTRUCTION STAGE

No borrow area shall be operated without permission of the Engineer. The procurement of borrow material should be in conformity to the guidelines laid down in IRC: 10-1961. In addition, the contractor should adopt precautionary measures to minimise any adverse impacts on the environment. Checklists for monitoring borrow areas operation and management has been prepared (**Table 1**).

Table 1: Checklist for Monitoring Borrow Area Operation and Management

Attributes	Requirements
Access Road	Access road shall be used for hauling only after approved
Top soil preservation	To soil, if any, shall be stripped and stored at corners of the area before the start of excavation for material collection; Top soil should be reused / re-laid as per agreed plan; In case of riverside, borrow pit should be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood. In no case shall be borrow pit be within 1.5m from the Toe line of the proposed embankment.
Depth of excavation	For agricultural land, the total depth of excavation should be limited to 150cm including top 30 cm for top soil preservation; For river side borrow area, the depth of excavation shall be regulated so that the inner edge of any borrow pit, should not be less than 15m from the toe of the bank and bottom of the pit should not cut the imaginary line of 1:4 projected from the edge of the final section of the embankment. To avoid any embankment slippage, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer.
Damage to surrounding land	Movement of man and machinery should be regulated to avoid damage to surrounding land. To prevent damages to adjacent properties, the Contractor shall ensure that an undisturbed buffer zone exists between the distributed borrow areas and adjacent land. Buffer zone shall be 3 m wide or equal to the depth of excavation whichever is greater.
Drainage control	The Contractor shall maintain erosion and drainage control in the vicinity of all borrow pits and make sure that surface drains do not affect the adjacent land or future reclamation. This needs to be rechecked by the engineer of the PIU.
Dust Suppression	Water should be sprayed on kutcha haul road twice a day or as may be required to avoid dust generation during transportation of material; Depending on moisture content, 0.5 to 1.5% water may be added to excavated soil before loading during dry weather to avoid fugitive dust emission.
Covering material for transport material	Material transport shall be provided with tarpaulin cover
Personal Protective Equipment	Workers should be provided with helmet, gumboots and air mask and their use should be strictly enforced.
Redevelopment	The area should be redeveloped within agreed timeframe on completion of material collection as per agreed rehabilitation plan.

5. POST CONSTRUCTION STAGE

All reclamation shall begin within one month of abandonment of borrow area, in accordance with the redevelopment plan. The site shall be inspected by the PIU after implementation of the reclamation plan. Certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that “the land is restored to his satisfaction”. The final payment shall be made after the verification by PIU.

6. CHECKLIST FOR INSPECTION OF REHABILITATION AREA

Inspection needs to be carried out by the PIU for overseeing the redevelopment of borrow areas as per the plan. The checklist for the inspection by the PIU is given below.

- Compliance of post-borrowing activities and land use with the restoration plan;
- Drainage measures taken for inflow and outflow in case borrow pit is developed as a detention pond;
- Levelling of the bottom of the borrow areas;

- In case the borrow area is on private property, the contractor shall procure written letter from landowner for satisfaction on rehabilitation. In case of no rehabilitation is desired by the landowner, the letter should include statement “no responsibility of R&BD on contractor in the event of accident.

- Condition of the reclaimed area in comparison with the pre-borrowing conditions.

GUIDELINE-4: TOPSOIL SALVAGE, STORAGE AND REPLACEMENT

1. INTRODUCTION

Loss of topsoil is a long term impact along roads due to (i) site clearance and widening for road formation (ii) development of borrow areas (iii) temporary construction activities such as construction camps, material storage locations, diversion routes etc. The environmental measures for both these activities during all stages of construction activity are discussed in the subsequent sections.

2. PROJECT PLANNING & DESIGN STAGE

At the project preparation stage, the following shall be estimated: (i) Extent of loss of top soil due to widening and siting of construction activities (ii) Estimates of borrow area requirements and (iii) Area requirement for topsoil conservation. The bid document shall include provisions that necessitate the removal and conservation of topsoil at all locations opened up for construction by the Contractor.

3. PRE-CONSTRUCTION STAGE

The arrangements for temporary usage of land, borrowing of earth and materials by the Contractor with the land owner/concerned department shall include the conservation / preservation of topsoil.

4. CONSTRUCTION STAGE

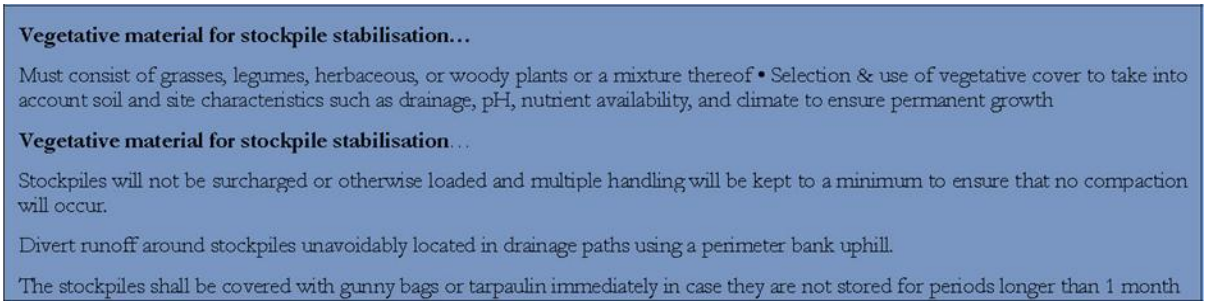
It shall be the responsibility of the Contractor to strip the topsoil at all locations opened up for construction. The stripped topsoil should be carefully stockpiled at suitable accessible locations approved by the PIU. At least 10% of the temporarily acquired area shall be earmarked for storing topsoil. In case of hilly and desert areas, topsoil with humus wherever encountered while opening up the site for construction shall be stripped and stockpiled. The stockpiles shall be located at:

- Areas away from Grade, Subsoil & Overburden materials;
- Areas away from pit activities and day-to-day operations;
- Areas that do not interfere with future pit expansion; and
- Areas away from drainage paths and uphill of sediment barriers.

The stockpiles for storing the topsoil shall be designed such that the slope should not be less than 1:2 (Vertical to horizontal), and the height of the pile is restricted to 2m. A minimum distance of 1m is required between stockpiles of different materials.

In cases where the topsoil has to be preserved for more than a month, the stockpile is to be stabilised within 7 days of forming. The stabilisation shall be carried out through temporary seeding. It consists of planting rapid-growing annual grasses or small grains, to provide initial, temporary cover for erosion control.

After spreading the topsoil on disturbed areas, it must be ensured that topsoil is seeded, and mulched within 30 days of final grading. During construction, if erosion occurs from stockpiles due to their location in small drainage paths, the sediment-laden runoff should be prevented from entering nearby watercourses. The Contractor shall preserve the stockpile material for later use on slopes or shoulders as instructed by the Engineer.



5. POST CONSTRUCTION STAGE

The topsoil shall be re-laid on the area after taking the borrow earth to maintain fertility of the agricultural field, finishing it to the required levels and satisfaction of the farmer. The area to be covered with vegetation shall be prepared to the required levels and slope as detailed in the DPR. The stockpile material shall be spread evenly to a depth of 5-15cm to the designed slopes and watering the same as required. The growth of the vegetation shall be monitored at frequent intervals. All temporary arrangements made for stockpile preservation and erosion control are to be removed after reusing the stockpile material. The top soil can also be used for the following purposes:

a. Covering the borrow areas;
b. Embankment and turfing;
c. Median; and
d. Rehabilitation of construction and labour camp.

GUIDELINE-5: QUARRY MANAGEMENT

1. INTRODUCTION

This guideline pertains to the measures to be taken to address environmental concerns in quarry areas. The general practice adopted is to procure materials from existing quarries operating with the requisite permits. The measures to be taken for operation and management for quarries during all stages of construction have been discussed in this Guideline.

2. PROJECT PLANNING AND DESIGN STAGE

The PIU shall provide in the DPR / bid document, a list of licensed quarries operating within the district and adjoining districts. In addition, the DPR shall contain the following: (i) Quantity of materials available in quarries (ii) Lead from the various existing quarries and (iii) Adequacy of materials for the project in these quarries. **Table 1** and **2** give the format for preparing a list of quarries.

Table 1 Details of Sand Quarry

Sample No.	Source of sand	Name of quarry area	Site Identification/ Location			Approximate Quantity (cum)	Approximate basic cost of the material (Rs.)	Remarks
			Nearest Chainage (Km.)	Left/ Right	Offset from nearest chainage (km)			

Table 2 Details of Quarry Area for Aggregates

Sample No.	Chainages (Km.)	Left/ Right	Name of Quarry Area	Name of Crusher	Lead from nearest chaniage (Km.)	Basic cost of the material (Rs.)	Available land/terrian	Surrounding land Terrian	Remarks

Only in the event of non-availability of existing quarries, the Contractor shall open a new quarry in accordance with Mines and Minerals (Development & Regulation) Act, 1957. The bid document shall include the exhaust quarry reclaim plan per needs of the landowner / community.

3. PRE-CONSTRUCTION STAGE

The Contractor shall select an existing licensed quarry identified in DPR for procuring materials. The Contractor shall establish a new quarry with the prior consent of the PIU only in cases when: (i) Lead from existing quarries is uneconomical and (ii) Alternative material sources are not available. The Contractor shall prepare a Redevelopment Plan for the quarry site and get it approved by the PIU.

The construction schedule and operations plans to be submitted to the PIU prior to commencement of work shall contain a detailed work plan for procuring materials that includes procurement, transportation and storage of quarry materials.

4. CONSTRUCTION STAGE

4.1 Development of Quarry Area

To minimize the adverse impact during excavation of material following measures are need to be undertaken:

- Adequate drainage system shall be provided to prevent the flooding of the excavated area
- At the stockpiling locations, the Contractor shall construct sediment barriers to prevent the erosion of excavated material due to runoff.
- Construction of offices, laboratory, workshop and rest places shall be done in the up-wind of the plant to minimize the adverse impact due to dust and noise.
- The access road to the plant shall be constructed taking into consideration location of units and also slope of the ground to regulate the vehicle movement within the plant.
- In case of storage of blasting material, all precautions shall be taken as per The Explosive Rules, 1983.

4.2 Setting up of Crushers and other equipments

The following measures shall be undertaken for setting up of crushers are other equipments.

- The contractor shall obtain “No Objection Certificate (NoC)” from the Assam State Pollution Control Board.
- All vehicles must possess Pollution Under Control (PUC) Certificate and shall be renewed accordingly
- All machinery, equipments, and vehicles shall comply with existing CPCB noise and emission norms.
- The PIU must ensure that contractor shall submit the copy of NoC and PUC Certificate before the start of work.

4.3 Quarry operations

The followings precautions shall be undertaken during quarry operations. vii) Overburden shall be removed and disposed as per **Guideline 8** “Waste Management and Debris Disposal”.

- During excavation slopes shall be flatter than 20 degrees Guideline 8 on to prevent their sliding
- In case of blasting, the procedure and safety measures shall be taken as per The Explosive Rules, 1983
- The Contractor shall ensure that all workers related safety measures shall be done as per measures for, “Labour& Workers Health & Safety” (**Guideline 12**).
- The Contractor shall ensure maintenance of crushers regularly as per manufacturer’s recommendation.
- Stockpiling of the excavated material shall be done as per stockpiling of topsoil explained in **Guideline 4**, “Topsoil Salvage, Storage& Replacement.”
- During transportation of the material, measures shall be taken as per **Guideline 11** “Construction Plants and Equipment Management” to minimize the generation of dust and to prevent accidents
- The PIU and the concerned authority shall review the quarry site for the management measures during quarry operation, including the compliance to pollution norms.

5. POST CONSTRUCTION STAGE

A quarry redevelopment plan shall be prepared by the Contractor. All haul roads constructed for transporting the material from the quarries to construction site shall be restored to their original state.

The PIU and the concerned authority shall be entrusted the responsibility of reviewing the quarry site for the progress of implementation of Redevelopment Plan.

The plan shall include:

- Photograph of the quarry site prior to commencement
- The quarry boundaries as well as location of the materials deposits, working equipments, stockpiling, access roa and final shape of the pit.
- Drainage and erosion control measures at site
- Safety measures during quarry operation
- Design for redevelopment of exhaust site.

Two options for redevelopment of quarry areas are given below:

Option A: Revegetating the quarry to merge with surrounding landscape. This is done by conserving and reapplying the tops for the vegetative growth.

Option B: Developing exhausted quarries as water bodies. The pit shall be reshaped and developed into pond, for harvest rainwater. This option shall only be considered where the location of quarry is at the lowest point, i.e. surrounding areas/natu drainage slopes towards it.

GUIDELINE-6: WATER FOR CONSTRUCTION

1. INTRODUCTION

The scope of this guideline includes the procurement of water required for construction of roads. Except bituminous works, water is required during all stages of road construction such as Embankment Sub-Grade; Granular sub-base (GSB) and Water Bound Macadam (WBM). Management of water in various stages of construction is given in the following sections.

2. PROJECT PLANNING & DESIGN STAGE

- The Detailed Project Report for both road constructions shall contain the following information:
- Estimate of water requirement during different seasons based on construction schedule of various stages of construction.
- Identification of potential sources of water for construction,
- Arrangements to be worked out by the contractor with individual owners, when water is obtained from private sources, and
- Whether scarcity of water would have any impact on schedule of construction.

In water-scarce regions, provide the following additional information in Project Reports…

- Exploring possibilities for use of existing perennial sources, through interactions with water user groups as the villagers, relevant Government Departments, keeping in view that the water extraction does not infringe upon the usufruct rights of the existing water users.
- Identification of potable water source for domestic use of workers and for use in cement - based construction such as cement concrete roads, culverts and other cross drainage works.
- Identification of alternate water sources, water-harvesting techniques will be explored to avoid water extraction from the existing community sources.

In water scarce regions, if water-harvesting structures are to be constructed, suitable locations and mechanism for siting these structures will be identified. These are envisaged to be permanent water tanks for collection of stream water. Detailed drawings of water harvesting structures based on site conditions will need to be worked out and presented in the DPR. No extra payment shall be generally made for these works and the Contractor has to include the cost of these items in his offer while quoting his tendered rate.

Scheduling Construction in Water Scarce Areas: As part of the project preparation, the PIU shall conduct an assessment of water requirement and availability in water scarce regions. As far as possible, schedule for construction in these water scarce areas shall be prepared such that earthwork for embankment is carried out just before monsoon, so that water requirement for subsequent construction works such as granular sub-base and water bound macadam are met in monsoon and post monsoon season. Carrying out these activities even during the monsoon is possible as the rainfall may not be high enough to disrupt construction.

3. PRE-CONSTRUCTION STAGE

Prior to commencement of extraction of water for construction, the contractor shall work out arrangements as specified in the DPR.

In water-scarce regions, provide the following additional information in Project Reports…

- Exploring possibilities for use of existing perennial sources, through interactions with water user groups as the villagers, relevant Government Departments, keeping in view that the water extraction does not infringe upon the usufruct rights of the existing water users.
- Identification of potable water source for domestic use of workers and for use in cement - based construction such as cement concrete roads, culverts and other cross drainage works.
- Identification of alternate water sources, water-harvesting techniques will be explored to avoid water extraction from the existing community sources.
  from any septic tank/soak pit or other source of pollution.
- **In case of water harvesting structures** (if required), the Contractor shall in consultation with the residents, identify suitable locations for siting the structure and construct the same.
- **In case of perennial sources,** the Contractor shall adhere to all administrative procedures pertaining to procurement of water from such sources.

4. CONSTRUCTION STAGE

During construction, the Contractor shall be responsible to monitor the following:

- The arrangements worked out with the Panchayat/individual land owners for water extraction is adhered to;
- Extraction of water is restricted to construction requirement and domestic use of construction workers;
- Water requirement for curing of concrete shall be minimized by pooling of water over the concrete or by covering with wet gunny bags; and
- The potable water used for drinking purposes of construction workers shall be as per the Indian Standard for Drinking Water IS: 10500, 1991.

GUIDELINE-7: SLOPE STABILITY AND EROSION CONTROL

1. INTRODUCTION

Stability of slopes is a major concern in locations of high embankment. In cases of high embankment, water retention at the embankment base initially causes toe failure and subsequently failure of the whole embankment. Soil erosion is consequent to high runoff on hill slopes. Embankments made up of silty and sandy soils get eroded, in the absence of vegetative cover, when the slopes are steep say more than 20 Degree.

The scope of this guideline includes measures to minimize the adverse environmental impacts due to slope instability and soil erosion. The adverse environmental impact can be: (i) Damage to adjacent land, (ii) Silting of ponds and lakes disturbing the aquatic habitat (iii) Erosion of rich and top fertile top layer of soil (iv) Contaminationof surface water bodies and (v) Reduction in road formation width due to erosion of shoulders/berms.

2. PROJECT PLANNING AND DESIGN STAGE

During the detailed project preparation phase, the following investigations shall be carried out prior to finalisation of alignment.

- Topographical;
- Hydrological;
- Geo-technical; and
- Geological Investigation (in case of roads in hill areas and areas of high seismic activity)

In addition to the slope stability analysis the alignment should be such that (i) steep as well as heavy cuts are avoided, (ii) Flora and fauna of the area are not disturbed and (iii) Natural drainage pattern is not obstructed.

For high embankments, geo-technical investigations (determination of C, φ, density etc.) of the available material need to be done to check its suitability as fill material.

In case of the CD structures, measures for preventing siltation and scouring shall be undertaken as per Guideline on, “Drainage”.

Following guidelines shall be followed in desert areas while using cohesion-less soils for embankment construction.

- The alignment should follow the natural ground level to the extent possible and the embankment shall be restricted to minimum to achieve ruling grades.
- Slope of the embankment should be 3 (H): 1(V) or flatter.
- The corners of the embankment should be rounded for better aerodynamic performance.

3. PRE-CONSTRUCTION STAGE

Interceptor ditches are constructed along hilly slopes or areas with high rainfall to protect the road bench and hillside slope from erosion due to heavy rainfall and runoff. Interceptor ditches are very effective in the areas of high intensity rainfall and where the slopes are exposed. These are the structures designed to intercept and carry surface run-off away from erodible areas and slopes, thus reducing the potential surface erosion. The PIU must ensure that the layout and siting of ditches is as per specifications.

4. CONSTRUCTION STAGE

When alternative material such as fly ash is used for embankment formation, it needs to be ensured that sufficient filter bed is provided along with the top cap. All tests as per IS: 2720 (Parts: 4, 5, 8 & 40) and IRC: SP: 20-2002 are to be conducted on the embankment to keep a check on the

compaction achieved. Slope stabilisation techniques and erosion control measures such as vettiver grass, stone pitching, use of geotectile and turfing.

Box-1: Detailed specifications for Vegetative cover

Description:

The vegetative cover should be planted in the region where the soil has the capacity to support the plantation and at locations where meteorological conditions favours vegetative growth.

Site Preparation:

- To prevent the seeds from being washed away subsequent to sowing, the area should be protected with surface roughening and diversions.
- Soil samples should be taken from the site and analysed for fertiliser and lime requirements.

Seed Application:

- The seed should be sown uniformly as soon as preparation of the seedbed has been completed.
- No seed should be sown during windy weather. The best time for needing would be during monsoon.

Maintenance:

During first six weeks, the planting should be inspected by the PIC, to check if the growth is uniform and dense. Appropriate moisture levels shall be maintained. There may be requirement of watering the plantings regularly during the dry seasons.

5. POST CONSTRUCTION STAGE

All the exposed slopes shall preferably be covered with vegetation using grasses, brushes etc. Locally available species possessing the properties of (i) good growth (ii) dense ground cover and (iii) deep root shall be used for stabilization.

In case of steep and barren slopes, in order to retain the seedling to the ground asphalt mulch treatment shall be given. Seedling are covered with asphalt emulsion and spread into a thin layer. The asphalt film gradually disintegrates and a carpet of green vegetation and deep-rooted species of grass and clovers, takes its place. Anchoring shall be carried out as per IRC: SP: 48-1998.

Regular inspection of check dams and repositioning/replacement of dislodged or stolen stones need to be carried out.

Repair and maintenance of eroded side drain inverts is to be done in order to arrest retrogation of levels in side drains. Slopes of high embankment can give a fertile base for growth of vegetative cover / sodding.

In arid areas, in order to avoid the deposition of sand over or near the road surface, shrubs are to be planted at an appropriate distance from the formation. The shrubs should not be abutting the road and the distance for carrying out plantation shall be determined based on prevalent wind speeds as well as quantity of sand being carried amongst various other factors. There should be a clear gap between the roadway and shrubs to allow the wind to pick up its velocity and carry along with it any sand that is deposited.

GUIDELINE-8: WASTE MANAGEMENT AND DEBRIS DISPOSAL

1. INTRODUCTION

This guidance describes procedures for handling, reuse and disposal of waste materials during road construction. The Guideline describes waste management measures in all stages of construction. Also, the Guideline discusses the measures to be taken for debris disposal.

2. PROJECT PLANNING AND DESIGN STAGE

As part of DPR preparation, the PIU shall carry out the following measures

- Finalize road design and alignment to minimize waste generation through balancing of cut and fill operations and minimizing excess cuts requiring disposal.
- Identify the type of wastes as well as sources of waste during construction and suggest options for possible reuse
- Provide guidelines to the contractor for locating waste disposal sites for non-toxic wastes
- Identify existing landfill sites if available for disposal of toxic materials.
- Incase no existing landfill sites are available, identification of landfill site as well as identification of the clearance requirements.
- Identify sites of disposal of debris.

3. PRE-CONSTRUCTION STAGE

The contractor shall identify the activities during construction, that have the potential to generate waste and work out measures for reducing, reusing and proper disposing of the generated waste in the construction schedule to be submitted to the PIU. A sequential listing of the activities during road construction and the nature of wastes together with the possible options for reuse are specified in **Table-1**. For the disposal of excess cut and unsuitable (non-toxic) materials, the contractor shall identify the location for disposal in consultation with the community / concerned department. Any toxic materials shall be disposed in existing landfill sites that comply with legislative requirements. Prior to disposal of wastes onto private/community land, it shall be the responsibility of the Contractor to obtain a No-objection Certificate (NOC) from the land owner/community. The NOC shall be submitted to the PIU prior to commencement of disposal.

The Contractor shall educate his workforce on issues related to disposal of waste, the location of disposal site as well as the specific requirement for the management of these sites.

Practices to avoid – waste disposal …
• Tipping of waste into stream channels, water bodies, forests and vegetated slopes • Non-cleaning of wastes after day's work • Leaching of wastes • Littering in construction camps / sites • Storing wastes on private land

4. CONSTRUCTION STAGE

The contractor shall either reuse or dispose the waste generated during construction for roads depending upon the nature of waste, as specified in **Table 1**. The reuse of waste shall be carried out by the contractor only after carrying out the specific tests and ascertaining the quality of the waste materials used, and getting the same approved by the PIU. Wastes that were not reused shall be disposed off safely by the contractor. The contractor shall adopt the following precautions while disposing wastes:

- Bituminous wastes shall be disposed off in 60mm thick clay lined pits and covered with 30cm good earth at top, so as to facilitate growth of vegetation in long run.
- In case of filling of low-lying areas with wastes, it needs to be ensured that the level matches with the surrounding areas. In this case care should be taken that these low lying areas are not used for rainwater storage
- In case oil and grease are trapped for reuse in a lined pit, care shall be taken to ensure that the pit should be located at the lowest end of the site and away from the residential areas.

The waste management practices adopted by the Contractor, including the management of wastes at construction camps etc shall be reviewed by the PIU and the Pollution Control Board (PCB) during the progress of construction.

5. POST CONSTRUCTION STAGE

On decommissioning of construction sites, the Contractor shall hand over the site free of all debris/wastes to the satisfaction of PIU. In case of any temporary disposal of wastes on private land, certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that "the land is restored to his satisfaction". The same is to be submitted to the PIU before final payment is claimed.

Table 1: Type of wastes and scope for reuse- road construction

S. No	Activity	Type of waste	Scope for possible reuse	Disposal of waste
I	**CONSTRUCTION WASTES**			
1.	Site Clearance and grubbing	Vegetative cover and top soil	Vegetating embankment slopes	
		Unsuitable material in embankment foundation	Embankment Fill	Low lying areas Land fill sites
2.	Earthworks			
a)	Overburden of borrow areas	Vegetative cover and soil	Vegetating embankment slopes	
b)	Overburden of quarries	Vegetative cover and soil	Vegetating embankment slopes	
		Granular material	Embankment Fill, Pitching	
c)	Accidental spillages during handling	Dust		
d)	Embankment construction	Soil and Granular Material	Embankment Fill	
e)	Construction of earthen drains	Soil	Embankment Fill	
3.	Concrete structures Dust			
a)	Storage of material	Dust, Cement, Sand	Constructing temporary structure, embankment fill	
		Metal Scrap		Scrap Yard
b)	Handling of materials	Dust		
c)	Residual wastes	Organic matter	Manure, Re-vegetation	
		Cement, sand	Constructing temporary structure, embankment fill	
		Metal scrap	Diversion sign, Guard Rail	
4	Reconstruction works			
a)	Dismantling of existing pavement	Bitumen Mix, granular material	sub-base	
		Concrete	Road Sub-base, reuse in concrete, fill material and as rip rap on roads	
		Guard rail sign post, guard stone	Reuse for same	
b)	Dismantling of cross drainage structures	Granular material & bricks	Constructing temporary structure, embankment fill	
		Metal scrap	Diversion sign, Guard Rail Culvert	

S. No	Activity	Type of waste	Scope for possible reuse	Disposal of waste
		Pipes	Culvert	
5	Decommissioning of sites			
a)	Dismantling of temporary structures	Granular material and bricks	Constructing temporary structure, embankment fill	
6	Maintenance operation			
a)	Desilting of side drains	Organic matter and soil	Re-vegetation	
II	OIL AND FLUIDS			
1	Construction machinery – maintenance and refueling	Oil and Grease	Incineration, illumination (use of machinery oil not preferred for cooking purpose)	
2	Bituminous works			
a)	Storage	Bitumen	Low Grade Bitumen Mix	
b)	Mixing and handling	Bitumen	Low Grade Bitumen Mix	
		Bitumen Mix	Sub-base, Paving access & cross roads	
c)	Rejected bituminous mix	Bitumen Mix	Sub-base, Paving access & cross roads	
III	**DOMESTIC WASTES**			
1	Construction camps	Organic waste,	Manure	
		Plastic and metal scrap		Scrap Yard
		Domestic effluent	Irrigation	

6. DISPOSAL OF DEBRIS

For the purpose of disposal of debris, dumping sites need to be selected. The criteria for selection of dumping sites include:

- No residential areas are located downwind side of these locations;
- Dumping sites are located at least 1000 m away from sensitive locations;
- Dumping sites do not contaminate any water sources, rivers etc; and
- Dumping sites have adequate capacity equal to the amount of debris generated;
- Public perception about the location of debris disposal site has to be obtained before finalizing the location;
- Permission from the Village Panchayat is to be obtained for the dumping site selected;
- Productive lands are avoided; and
- Available waste lands shall be given preference

GUIDELINE-9: WATER BODIES

1. INTRODUCTION

Water bodies may be impacted when the road construction is adjacent to it or the runoff to the water body is affected by change of drainage pattern due to construction of embankment. The following activities are likely to have an adverse impact on the ecology of the area:

- Earth moving;
- Removal of vegetation;
- Vehicle/Machine operation and maintenance;
- Handling and laying of asphalt; and
- Waste disposal from construction camps.

Impacts on water bodies impairs …

- Change in Catchment area of the water body
- Drainage system
- Flood level and water logging
- Flora and fauna dependant on the water body
- Ground water recharging
- Animal husbandry as water bodies are used by animals
- Water quality &
- Runoff (increase/ decrease)

2. PROJECT PLANNING AND DESIGN STAGE

All efforts are to be taken to avoid the alignments passing adjacent or close to water bodies. Where possible, it should be realigned away from the water body without cutting its embankment, decreasing the storage area or impairing the catchment area. Adequate drainage arrangements as per IRC guidelines have to be provided. Stream bank characteristics and hydrology of the area are to be studied before finalizing the alignment, the profile and cross-drainage structures.

Complete filling of water body with soil is not contemplated in the project. The DPR and its cost estimates have to accommodate costs of rehabilitation (to be estimated as lump sum at DPR stage) of water bodies impacted by the project. Water body rehabilitation shall be as per the Rehabilitation Plan prepared by the Contractor which should have approval of the PIU. Details of the tasks to be performed as per the sequence of activities during the project planning and design are as follows:

- Consultations with the people regarding alternate routes that were devised to avoid the pond. If alternate routes are not available, consent of the villagers is to be sought for affecting the pond and also the measures that would be taken to mitigate the impacts.
- Final design is to be prepared indicating the pond location in the alignment drawings.
- If impacting the pond, the extent of impact is to be clearly indicated on a separate drawing showing blown up portion of the pond. The drawing should aid the contractor in setting up exact lines for cutting the pond.
- All necessary measures for mitigation of impacts and precautionary measures while working close to the water body are to be incorporated into the DPR and cost estimates. The measures to be incorporated shall be as per this guideline.

3. PRE-CONSTRUCTION STAGE

The Contractor after an assessment of the likely impacts on the water body and review of the provisions of this guideline shall prepare a detailed work plan at the pre-construction stage. The Contractor shall prepare a Rehabilitation Plan for rectifying the likely impact to be caused and approval of PIU shall be sought prior to commencement of work. The Rehabilitation Plan should include:

- Locations of erosion protection works and silt fencing to prevent sediment laden runoff entering the water body;
- Location of side drains (temporary or otherwise) to collect runoff from the embankment before entering the water body in accordance with IRC guidelines;
- Work program in relation to the anticipated season of flooding/overflowing of the water body;

- Obstructions likely to cause temporary flooding and information to seek clearance to remove the obstruction; and
- Drawings in Rehabilitation Plan should indicate the landscape details along with species to be planted in the surrounding environs of the water body.

The rehabilitation of water body should be with the objective of restoring it to its original state or to a better state with necessary enhancement of its environs. Rehabilitation Plan shall include:

- Reconstruction and stabilization of embankment in case it is impacted;
- If storage area is lost, then the water body is to be deepened to regain an equivalent volume;
- Further enhancement of the water body as a focal point with place for seating and provision of shade; and
- Costs of rehabilitation

Concurrence of the community has to be sought on the Rehabilitation Plan prepared by the Contractor. Concerns of the community have to be incorporated into the plan before submitting it for approval of the PIU.

Working near Water Bodies – Precautions

- Avoid locating roads on pond embankment
- Collect road runoff before entering the water bodies
- Runoff to be filtered of sediments before letting into water bodies
- Avoid debris disposal into water bodies
- Avoid disposal of oil/grease/other contaminants into water bodies

The PIU shall scrutinize the Rehabilitation Plan, verify the implementation on site and finally approve the plan. The Rehabilitation Plan should be implemented by the Contractor immediately after completion of construction at the stretch near the water body.

When there is interruption to regular activities of villagers near water body due to construction or rehabilitation work, following are the Contractor's responsibilities:

- Restriction on use of water, if any, should be intimated to the community in advance;
- Alternate access to the water body is to be provided in case there is interruption to use of exiting access. The access provided should be convenient for use of all the existing users whether community or cattle; and
- If the water body affected is a drinking water source for a habitation, alternate sources of water are to be provided to the users during the period for which its use is affected.

4. CONSTRUCTION STAGE

It should be ensured by the contractor that the runoff entering the water body is free from sediments

Silt fencing and/or brush barrier shall be installed in the drainage channels for collecting the sediments before letting them into the water body Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated. Cutting of embankment reduces the water retention capacity and also weakens it, hence:

- The contractor should ensure that the decrease in water retention should not lead to flooding of the construction site and surroundings causing submergence and interruption to construction activities.
- Any perceived risks of embankment failure and consequent loss/damage to the property shall be assessed and the contractor should undertake necessary precautions as provision of toe protection, erosion protection, sealing of cracks in embankments. Failure to do so and consequences arising out of embankment failure shall be the responsibility of the contractor. The PIU shall monitor regularly whether safe construction practices near water bodies are being followed.

Alternate drain inlets and outlets shall be provided in the event of closure of existing drainage channels of the water body. Movement of machinery and workforce shall be restricted around the water body, and no waste from construction camps or sites shall be disposed into it.

5. POST CONSTRUCTION STAGE

With the completion of construction, the PIU has to ensure implementation of rehabilitation/restoration plan for the water body, as indicated by the Contractor in the bid submission. The precincts of the water body have to be left clean and tidy with the completion of construction. Drainage channels of adequate capacity shall be provided for the water body impacted.

GUIDELINE-10: DRAINAGE

1. INTRODUCTION

Inadequate and faulty drainage arrangements during road construction result in obstruction to natural drainage pattern. The problem is further aggravated in the low-lying areas and flood plains receiving high intensity rainfall, which can lead to the instability of embankment, damage to pavement, sinking of foundation, soil erosion, safety hazards and disruption in traffic. Provision of cross-drainage and longitudinal drainage increases the life of the road and consequently reduces water logging and related environmental impacts. The functioning of the drainage system is therefore a vital condition for a satisfactory road.

However, construction or upgradation of CD structures and longitudinal drains is likely to increase sediments, scour the banks, change water level and flow, and also affect the ecology of the surrounding area. The guideline shall address the environmental concerns related to drainage aspects during different stages of the project execution.

2. PROJECT PLANNING AND DESIGN

Drainage shall be broadly divided as (i) Cross-Drainage and (ii) Longitudinal Drainage both surface & subsurface drainage. The alignment shall be routed such that minimum drainage crossings are encountered. Also the geometric design criteria as per IRC 73, guidelines for effective surface drainage should be ensured.

All drains crossing the alignment shall be identified on site and marked on map while undertaking transect walk. Basic information on the width of channel, frequency of traffic holdup and flow would provide inputs into screening of alternate alignments as well as fixing the alignment. Consultations with the community shall provide information on the HFL in the area.

In areas of high and medium intensity rainfall (>400 mm/year), flood prone areas and hilly areas, detailed hydrological studies will need to be conducted. The studies shall be conducted as per IRC: SP-13: 1973 “Guidelines for the Design of Small Bridges & Culverts” and IRC: SP-33:1989 “Guidelines on Supplemental Measures for Design, Detailing & Durability of Important Bridge Structures”.

Design of cross-drainage structures shall be based on the inputs from the hydrological studies as per clause 12.2.3 and in other areas, the C-D structure design shall be as per IRC: SP-13. Design of C-D structure shall be such that:

- Normal alignment of the road is followed even if it results in a skew construction of culverts and stream bank protections are incorporated.
- Afflux generated is limited to 30 cm in plains with flat land slopes.
- It is fish friendly – fish passage is not interrupted either in upstream or downstream direction.
- Adequate scour protection measures for stream bank, roadway fill as head walls, wing walls and aprons are included.
- Reinforced road bed (of concrete or rock) for protection against overflow in case of low water crossing (floods/causeways) is included.
- The design of C-D structure (minor and major bridge) should have stairs leading to the bed of the drainage channel, for regular inspection of the sub-structure.
- Schedule of construction of C-D structures should be confined to dry months to avoid contamination of streams.

Longitudinal drains are to be designed to drain runoff from highest anticipated rainfall as per rainfall data for the past 20 years or 50 years as per hydrological analysis in high rainfall areas (annual rainfall >1000 mm) and hill areas. For design of longitudinal drains in other areas, the design shall be as per IRC: SP-20:2002.

Outfall of the roadside drains shall be into the nearby stream or culvert. The outfall should be at such a level that there would be no backflow into the roadside drain. Wherein pond/low lying areas exist in the vicinity, the flow may be diverted into them after removal of sediment for possible ground water recharge.

In case of high embankment (>1.0m) or bridge approaches, lined channels shall be provided to drain the surface runoff, prevent erosion from the slopes and avoid damage to shoulders and berms. Detailed specifications shall be as per IRC: SP-20:2002. The type of drains that can be constructed include bricklined, pucca with RCC, covered drain with RCC slabs and piped drain.

3. PRE-CONSTRUCTION STAGE

Following measures are to be undertaken by the contractor prior to the commencement of CD/Bridge construction:

- The downstream as well as upstream user shall be informed one month in advance
- The contractor shall schedule the activities based on the nature of flow in the stream.
- The contractor should inform the concerned departments about the scheduling of work. This shall form part of the overall scheduling of the civil works to be approved by PIU.
- Erosion and sediment control devises are to be installed prior to the start of the civil works.
- Interceptor drains to be dug prior to slope cutting to avoid high runoff from slopes entering construction sites in case of hill roads
- Runoff from temporary drains and interceptor drains to be directed into natural drains in hill roads
- In case of up-gradation of the existing CD Structures, temporary route / traffic control shall be made for the safe passage of the traffic, depending upon the nature of the stream
- All the safety/warning signs are to be installed by the contractor before start of construction

In case of utilization of water from the stream, for the construction of the CD structures, the contractor has to take the consent from the concerned department (refer Guideline on “Water for Construction”)

4. CONSTRUCTION PHASE

Drainage structures at construction site shall be provided at the earliest to ensure proper compaction at the bridge approach and at the junction of bridge span and bridge approach. Velocity of runoff to be controlled to avoid formation of rills/gullies as per guideline, “Slope stability & erosion control”

While working on drainage channels, sediment control measures shall be provided. Silt fencing (as per the detailed specifications of guideline, “Slope Stability & Erosion Control”) shall be provided across the stream that carries sediment.

The sediments collected behind the bunds shall be removed and after drying, can either be reused or disposed off as per guideline, “Waste Management and Debris Disposal”. Safety devises and flood warning signs to be erected while working over streams and canals.

5. POST CONSTRUCTION

Inspection and cleaning of drain shall be done regularly to remove any debris or vegetative growth that may interrupt the flow. HFL should be marked as per hydrological data on all drainage structure. Temporary structure constructed during construction shall be removed before handing over to ensure free flow through the channels. The piers and abutments should be examined for excessive scour and make good the same if required. The upstream and downstream areas should be cleared of all CD works.

In case of Causeway following aspect shall be taken into consideration:

- Dislocation of stones in stone set pavements, scouring of filler material due to eddy currents.
- Floating debris block the vents. Incase of large amount of floating material, debris arrestor shall be provided in upstream side.

- Damage to guide stones, information board shall be inspected and replaced accordingly.

Schedule of Inspection shall be drawnup for checking cracks, settlements and unusual backpressures. It must be ensured that all the rectification shall be undertaken as and when required. Following are broadly the items to be checked:

- Settlement of piers/abutments & settlement of approach slabs have to be checked;
- Cracks in C-D structures or RCC slabs;
- Drainage from shoulders to be ensured;
- Ditches & drains to be kept clean of debris or vegetation growth; and
- Repairs to parapet of culverts whenever required are to be undertaken.

GUIDELINE-11: CONSTRUCTION PLANTS & EQUIPMENT MANAGEMENT

1. GENERAL

During execution of the project, construction equipments, machinery and plants are likely to cause adverse impact on the environment. The impact can be due to the emissions, dust, noise and oil spills that concern the safety and health of the workers, surrounding settlements and environment as a whole. This guideline describes the activities during the project stages where pollution control measures are required.

2. PROJECT PLANNING AND DESIGN STAGE

Selection criteria for setting up a plant area and parking lot for equipments and vehicles shall be done as per siting criteria for construction camp specified in Guideline on "Construction and Labour Camps".

3. PRE-CONSTRUCTION STAGE

The Contractor must educate the workers to undertake safety precaution while working at the plant / site as well as around heavy equipments. Before setting up the crusher, hot-mix plant and generator, the Contractor shall acquire "No Objection Certificate (NOC)" from the Assam State Pollution Control Board for the same. The Contractor shall ensure all vehicles must possess Pollution under Control (PUC) Certificate, which and shall be renewed regularly. The Contractor must ensure that all machinery, equipments, and vehicles shall comply with the existing Central Pollution Control Board (CPCB) noise and emission norms. The PIU must ensure that the Contractor shall submit a copy of the NOC and PUC Certificates before the start of work. The Contractor shall design the service road with protection measures as black topping at vulnerable points as in low lying areas.

4. CONSTRUCTION STAGE

The Contractor shall undertake measures as per **Table 1** to minimize -the dust generation, emissions, noise, oil spills, residual waste and accidents at the plant site as well as during transportation of material to construction site.

Table 1: Measures at Plant Site

Concern	Causes	Measures
Dust Generation	Vehicle Movement	• Water sprinkling • Fine Materials shall be Transported in Bags or Covered by Tarpaulin during Transportation • Tail board shall be properly closed and sealed to be spill proof
	Crushers	• Regular Water Sprinkling to keep the dust below visibility level
	Concrete-Mix Plant	• Educate the workers to follow/adopt good engineering practices while material handling
Emissions	Hot-Mix Plant	• Site Selection as per Clause 6.5.2, Section 6.5, IRC's Manual for Construction & Supervision of Bitumen Work • Regular maintenance of Dust Collector as per manufacture's recommendations
	Vehicles	• Regular maintenance as per manufacture's recommendation
	Generators	• Exhaust vent of long length and emission to confirm to PCB norms.
	Heavy Load Vehicles	• Exhaust silencer, Regular maintenance as per manufacture schedule
Noise	Crushers	• Siting as per guideline, "Construction and Labour Camps"
	Generators	• All generators should have mandatorily acoustic enclosures

Concern	Causes	Measures
		and confirms to PCB norms.
Oil Spills	Storage and Handling	• Good practice, guideline, "Waste Management and Debris Disposal"
Residual waste	Dust Collector and Pits	• Guideline , "Waste Management and Debris Disposal"
Concrete waste	Concrete-Mix plant	• Guideline, "Waste Management and Debris Disposal"
Bitumen and bitumen mix	Hot-mix Plant	• Guideline, "Waste Management and Debris Disposal"
Stone chips	Crushers	• Guideline, "Waste Management and Debris Disposal"
Safety	Trajectory of Equipments	• No worker shall be present in the vicinity of the equipments
	Movable Parts of Equipments	• Caution Sign, awareness among workers
	Plant Area / Site	• Caution Sign, Safety Equipments
	Accidents /Health	• First Aid Box, Periodic Medical Checkup Break down of
	Break down of vehicles	• Arrangement for towing and bringing it to the workshop

During site clearance, all cut and grubbed materials shall be kept at a secured location so that it does not raise any safety concerns. During excavation, water sprinkling shall be done to minimize dust generation. Frequent water sprinkling shall be done on the haul roads to minimize dust generation. In case of loose soils, compaction shall be done prior to water sprinkling. Cautionary and informatory sign shall be provided at all locations specifying the type of operation in progress. The contractor must ensure that there is minimum generation of dust and waste while unloading the materials from trucks. The construction waste generated shall be disposed as per Guideline on, "Waste Management and Debris Disposal". The equipments, which are required to move forward and backward, shall be equipped with alarm for backward movement. It shall be ensure that the workers shall remain away from the working areas at such times. Also, equipments at construction camp should be barricaded and kept away from residential quarters of workers.

The PIU shall carry out periodic inspections to ensure that all the pollution control systems are appropriately installed and comply with existing emission and noise norms.

Safety Measures During Bitumen Construction Work…

- The Contractor shall ensure that bitumen storing, handling as well as mixing shall be done at hot-mix plant or designated areas[1] to prevent contamination of soil and ground water.
- Skilled labour shall be used while hand placing the pre-mixed bitumen material. The hand placing of pre-mixed bituminous material shall be done only in following circumstances:
  - For laying profile corrective courses of irregular shape and varying thickness
  - In confined spaces where it is impracticable for a paver to operate and
  - For filling potholes
- The Contractor shall provide safety equipments i.e. gumboots and gloves to the workers while handling bitumen.
- While applying Tack Coat, spraying of bitumen shall be done in the wind direction. The labour shall wear jacket while spraying the bitumen.
- All the bituminous work shall be done as per IRC's Manual for Construction and Supervision of Bituminous Works.

5. POST-CONSTRUCTION STAGE

The PIU shall ensure that all the haul roads are restored to their original state. Incase any inner village road is damaged while transporting the procured material; the contractor shall restore the road to its original condition. The PIU must ensure that the decommissioning of plant shall be done in environmentally sound fashion and the area to bring its original state.

Designated area refers to paved surfaces and barren parcels of land, with adequate drainage and disposal system. It must be ensure that these are away from agriculture land, water body and other sensitive areas.

GUIDELINE-12: LABOUR AND WORKER'S HEALTH AND SAFETY

1. INTRODUCTION

The safety and health concerns of the workers and the community are impacted due to the hazards created during the construction of road. **Box: 1** gives the safety concerns during construction. This Guideline describes the hazards and measures that need to be taken to mitigate the impacts.

2. PROJECT PLANNING AND DESIGN STAGE

To address health and safety concerns, the DPR shall contain selection criteria for setting up:

- Construction Camps (as per guideline);
- Borrow Areas (as per guideline); and
- In case of opening new quarry areas (as per guideline).

To address the safety concerns to road user during operational phase, the DPR shall contain the following:

- Selection and location of regulatory as well as informatory signs as per IRC: 67-2001, depending upon the geometry of the road.

Box 15.1: Sa **Box 1: Safety Concerns during Construction**

Community due to:

- Improper scheduling of construction activities especially near the settlements and sensitive areas;
- Parking of equipments and vehicles at the end of the day likely to cause accidents to the general public especially during night hours;
- Transportation of uncovered loose material or spillage of material increases the chances of accidents to road users and surrounding settlements.

Workers due to:

- Improper handling of materials like bitumen, oil and other flammable material at construction sites, likely to cause safety concerns to the workers;
- Lack of safety measures such as alarm, awareness and safety equipment result in accidents, especially working with or around heavy machinery / equipments.

3. PRE-CONSTRUCTION STAGE

In order to incorporate public health and safety concerns, the PIU and the Contractor shall disseminate the following information to the community:

- Location of construction camps, borrow areas and new quarry areas;
- Extent of work;
- Time of construction;
- Diversions, if any;
- Precaution measures in sensitive areas;
- Involvement of local labours in the road construction;
- Health issues - water stagnation, exposure to dust, communicable disease; and
- Mechanism for grievances.

Health Concerns are adversely impacted.....

Public due to:

- Unhygienic conditions due to water logging (improper drainage of waste water), either by improper decommissioning of Construction Camps and parking lots, or improper disposal of construction wastes, leading to the breeding of vectors that are likely to impact the health of the general public
- Interaction between workers and host community is likely to increase the risk of spread of communicable diseases.

Workers due to:

- Low quality drinking water as well as inappropriate storage of drinking water likely to cause water borne diseases among workers.
- Absence of proper sanitary facility likely to act as a breeding ground for vectors raising health concerns among workers.

The information dissemination could be through the local newspaper, billboards, panchayats meetings, etc. The Contractor must educate the workers to undertake the health and safety precautions. The contractor shall educate the workers

regarding:

- Awareness on HIV/AIDS awareness and usage of safety measures such as condoms;
- Awareness on hygienic sanitary practices;
- Personal safety measures and location of safety devices;
- Interaction with the host community;
- Protection of environment with respect to:
  - Trampling of vegetation and cutting of trees for cooking;
  - Restriction of activities in forest areas and also on hunting;
  - Water bodies protection;
  - Storage and handling of materials;
  - Disposal of construction waste.

4. CONSTRUCTION STAGE

During the progress of work, following are the safety requirements that need to be undertaken by the contractor at the construction site:

- Personal Protective Equipments (PPE) for the workers. **Table 1** gives the safety gear to be used by the workers during each of the construction activities.
- All measures as per bidding document shall be strictly followed.
- Additional provisions need to be undertaken for safety at site:
  - Adequate lighting arrangement;
  - Adequate drainage system to avoid any stagnation of water;
  - Lined surface with slope 1:40 (V:H) and provision of lined pit at the bottom, at the storage and handling area of bitumen and oil, as well as at the location of generator (grease trap); and
  - Facilities for administering first aid.

FIRST AID FACILITIES

- First Aid Kit, distinctly marked with Red Cross on white back ground and shall contain minimum of following:
  - 6 small-sterilized dressings
  - 3 medium and large sterilized dressings
  - 1 (30 ml.) bottles containing 2 % alcoholic solution of iodine
  - 1(30 ml) bottle containing salvolatile
  - 1 snakebite lancet
  - 1 pair sterilized scissors
  - 1 copy of first-aid leaflet issued by the Director General, Factory Service & Labour Institute, Government of India
  - 100 tablets of aspirin
  - Ointment for burns
  - A suitable surgical antiseptic solution
- Adequate arrangement shall be made for immediate recoupment of the equipments, whenever necessary.
- A trained personnel incharge of first aid treatment to be readily available during working hours at construction site
- Suitable transport to the nearest approachable hospital should be made available.
- Tetanus injection must be made compulsory for all workers every 6 months.

Table 1: Worker Safety Measures

Sl. No.	Activity	Safety Requirement
1.	Setting out and levelling	• Luminous jackets; • Helmets; • Boots for protection against insect bite; and Dust Mask
2.	Tree cutting	• Helmet Boots • Luminous safety jackets
3	Reinforced yard/ carpentry/ reinforcement cutting/ bending work.	• Hand gloves
4.	Shuttering work	• Goggles Hand gloves
5.	Plant and Machinery	• Hand gloves • Boots • Helmets • Dust Mask
6.	Material handling	• Hand gloves • Dust mask

Sl. No.	Activity	Safety Requirement
7.	Batching plant	• Goggles • Hand gloves • Dust mask
8.	Weeding	• Goggles
9.	Binding reinforcement	• Safety belt • Boots
10.	Manual concrete laying	• Gum boots • Hand gloves • Helmet
11.	Piling	• Helmet • Hand gloves, gumboots.

The following measures need to be adopted by the contractor to address public safety concerns:

- The Contractor shall schedule the construction activities taking into consideration factors such as:
  - Sowing of crops;
  - Harvesting;
  - Local hindrances such as festivals etc.; and
  - Availability of labour during particular periods.
- All the cautionary signs as per IRC: 67-2001 and traffic control devices (such as barricades, etc) shall be placed as soon as construction activity get started and shall remain in place till the activities get completed.
- Following case specific measures need to be followed during the progress of the activity:
  - Incase of blasting, the Contractor must follow The Explosives Rules, 1983.
  - Incase of construction activity adjoining the water bodies, measures shall be taken as per measures suggested in Guideline on “Water Body”.
  - If construction of road is within the settlement, the contractor must ensure that there shall not be any unauthorized parking as well as storage of material, adjacent to road.
  - Approved chemicals should be sprayed to prevent breeding of mosquitoes and other disease-causing organisms, at all the water logging areas

The PIU shall carry out periodic inspections in order to ensure that all the measures are being undertaken as per the guideline.

5. POST-CONSTRUCTION STAGE

During this stage a major concern is on road user safety. Following are the measures that need to be undertaken by the PIU to ensure safer roads:

- Inspection and maintenance of installed regulatory and informatory signs.
- Ensure that the location of signage does not obstruct the visibility
- Incase of hill roads, maintenance of parapet wall as well as of overtaking zones.

The PIU must ensure that during the maintenance operation of road, road materials are stored at a location such that they shall not create any risk to road users.

The construction site shall be cleaned of all debris, scrap materials and machinery on completion of construction for the safety of public and road users, as per the measures given in Guideline on “Construction and labour Camp” and “Waste Management and Debris Disposal.”

GUIDELINE-13: CULTURAL PROPERTIES

1. INTRODUCTION

The cultural properties located close to the road are likely to be impacted by the road construction. Most of the properties are avoided in general during finalization of alignment. This Guideline discusses the mitigation measures for cultural properties.

2. PROJECT PLANNING AND DESIGN STAGE

Measures for mitigation of impacts on cultural properties during project preparation shall be as per the following steps:

- Identification of locally significant cultural properties should be done;
- Assessment of likely impacts on each cultural property due to project implementation;
- The extent of impact on the identified culture property should be assessed and possible measures for avoidance should be devised based on the site investigation. Incase impact is not avoidable, identification of alternative routes or possibility of relocation of the culture property shall be assessed in consultation with the local public, based on the economic feasibility.

Incase of relocation, relocated site should be suggested by the local people and the size of relocated structure should at least be equal to the original structure. A written consent letter is to be obtained from the community regarding the relocation site of the cultural property in the form of resolution on the letter pad of the sarpanch/gram panchayat or with the signatures of community members.

A detailed design of the relocated structure and its site plan along with the necessary BoQ are to be presented DPR. The relocation and other avoidance measures should be carried out before the start of the road work

It must be ensured by the PIU that the BoQ and rates are incorporated into the contract document.

Information to be collected…

- Location
- Direction (North/ South/East/West) With Respect to Road
- Distance of the structure from existing centerline of the road
- Type of Property eg: temple/mosque/shrine/dargah etc
- Plan of the structure
- Importance of the structure – historical/social/archeological
- Ownership of the property
- Probable loss to the property
- Specific periods/durations in which large congregations as festivals/mela take place causing hindrance to vehicular movement
- Choice of community, issue of relocation

3. CONSTRUCTION STAGE

Major impacts on the properties during this stage are mainly due to movement of construction machinery as well as due to construction activity in the vicinity of the cultural property. Following are precautionary measures that need to be undertaken by the contractor while working near these structures:

- Restrict movement of heavy machinery near the structure
- Avoid disposal or tipping of earth near the structure
- Access to these properties shall be kept clear from dirt and grit

During earth excavation, if any property is unearthed and seems to be culturally significant or likely to have archeological significance, the same shall be intimated to the Engineer. Work shall be suspended until further orders from PIU. The State Archeological Department shall be intimated of the chance find and the Engineer shall carry out a joint inspection with the department. Actions as appropriate shall be intimated to the Contractor along with the probable date for resuming the work.

The PIU must ensure that the contractor implements the precautionary measures as suggested. Also, the PIU must conduct monitoring for the enhancement of cultural property.

GUIDELINE-14: TREE CUTTING AND AFFORESTATION

This Guideline discusses the issue of tree cutting and afforestation. Loss of trees creates adverse environmental impacts. In order to mitigate there impacts, suitable measures have been suggested as part of this Guideline. These measures have been given for each of the stages of the road construction activities.

1. PROJECT PLANNING AND DESIGN STAGE

During alignment finalisation, due consideration shall be given to minimise the loss of existing tree cover, encroachment of forest areas / protected areas etc as specified in guideline on**,** "Site preparation". Tree felling, if unavoidable, shall be done only after compensatory plantation of ten saplings for every tree cut is done.

The plantation/afforestation would be done by the Contractor. It should be ensured that plantation is carried out only in areas where water can be made available during dry seasons and the plant can be protected during the initial stages of their growth. The species shall be identified giving due importance to local flora (suggested in **Table 1**). It is recommended to plant mixed species in case of both avenue or cluster plantation.

The plantation strategy shall suggest the planting of fruit bearing trees and other suitable trees. Development of cluster plantations will be encouraged in the community lands, at locations desired by the community. The choice of species will be based on the preferences of the community. The PIU shall oversee the plantation to check the following:

- Whether trees are obstructing live of right at junctions;
- Whether trees are at the inside of the junctions;
- Whether trees are within 5 mts of the proposed centerline.

2. POST-CONSTRUCTION STAGE

The maintenance of the saplings (including activities much as weeding, watering, planting of replacement saplings, etc application of manure etc) shall be the responsibility of the forest department. The PIU shall ensure the following:

- Shoulder of roads to be kept clear of weeds/undesirable undergrowth; and
- Branches of trees do not obstruct clear view of the informatory and cautions signs.

Table 1: Common Species (or) Localized Species of Tamil Nadu

Sl.no	Local name	Botanical name
1.	Neem	*Azadirachtaindica*
2.	Pungan	*Pongamiaglabra*
3.	Kadam Tree	*Neolamarkiacadamba*
4.	Bullet Wood	*Mimusopselangii*
5.	Fry Wood Tree	*Albizialebbeck*
6.	Tamarind	*Tamarindusindica*
7.	Indian Almond Tree	*TerminaliaCatappa*
8.	North Indian Rose wood Tree	*Dalbergiasissoo*
9.	Flame of the Forest	*ButeaMonosperma*
10.	Dita Bark Tree	*Alstoniascholaris*
11.	Mahua	*MadhucaLongifolia*
12.	Bael	*Aeglemarmelos*
13.	Indian tulip tree	*Thespesiapopulnea*
14.	Joy perfume tree	*Magnolia champaca*
15.	Arjun tree	*Terminaliaarjuna*
16.	Bahera	*Terminaliabellerica*
17.	Peepal tree	*Ficusreligiosa*
18.	Purple orchid tree	*Bauhinia variegata*

19.	Banyan tree	*Ficusbenghalensis*
20.	Mango	*Mangiferaindica*
21.	Jamun	*Syzigiumcumini*
22.	Indian Laural Fig	*Ficusretusa*

GUIDELINE-15: FORESTS AND OTHER NATURAL HABITATS

1. INTRODUCTION

This guideline envisages measures to be undertaken during blacktopping / widening of road sections passing through natural habitats. These measures shall be undertaken in addition to the measures laid down in the other Guidelines.

Natural Habitats means…
• National Park
• Reserve Forest
• Sanctuaries
• Notified Wetlands
• Fisheries and Aquatic Habitats

Conservation of natural habitats is essential for long-term sustainable development. A precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development has been adopted for the project.

2. PROJECT PLANNING AND DESIGN

To minimize the adverse impact on the ecology of the natural habitats, selection of alignment should be as per guideline. An officer of at least the rank of a forest ranger shall be deputed for detailed inventory of ecological features along the road. The nature and type of impact on natural habitats due to road construction shall be identified. Magnitude of the impact to the extent feasible on the ecological features shall also be assessed.

Ecological Features…	Adverse Impacts…
• Area of natural habitat; • Type and number of endangered species of flora and fauna; • Stream and water bodies; • Breeding ground and seasons; • Migration season of bird species; and • Animal crossing.	• Diversion of forest land; • Cutting of trees; • Trampling of vegetation; • Contamination of water due to the usage of water from the source within the natural habitat; • Loss of breeding grounds; and • Interruption to animal crossings during the construction.

Impacts identified on the natural habitats shall be minimized to the extent required. Minimization shall be through precautionary measures or through appropriate mitigation measures. Following are the measures should be undertaken along the road passing through natural habitats:

- Constricting the road width to 6.0 m and embankment height to 0.5 m to minimize the extent of diversion of forest land and cutting of trees
- Drainage Structures shall be designed strictly in accordance with guideline on “Drainage”.
- Rumble strips shall be provided at every kilometer along the length of the natural habitat and invariably at the start and end of the natural habitat
- Signage (viz. speed limit, animal crossing, switch of headlight etc) shall be provided as per IRC: 67-2001 Code of Practice for road sign (first revision)

In addition to the above measures, specific impacts identified on site shall be mitigated as per the recommendation of the forest department / officer in charge of the identified natural habitat.

In case proposed alignment falls within the catchments of a water body or a stream, a flush causeway shall be constructed without impacting the drainage system. The length of the causeway shall be as per the existing water spread. The causeway shall be strictly in compliance with IRC:SP-20:2002. In no circumstances a water body within the natural habitat shall be cut across or filled for the purpose of laying the road.

3. PRE-CONSTRUCTION STAGE

No Construction Camps, Stockyards, Concrete Batching or Hot Mix Plants shall be located within the natural habitat or within 1km (1000m) from its boundary. Contractor in consultation with forest ranger or any other concerned authority shall prepare a schedule of construction within the natural habitat. Due consideration shall be given to the time of migration, time of crossing, breeding habits and any other special phenomena taking place in the area for the concerned flora or fauna.

4. CONSTRUCTION STAGE

Procurement of any kind of construction material (as quarry or borrow material) from within the natural habitat shall be strictly prohibited. No water resources within the natural habitat shall be tapped for road construction. Use of mechanized equipment shall be kept minimum within the natural habitat. Contractor must ensure that there will be no parking of vehicles machine and equipment within the natural habitat. Disposal of construction waste within the natural habitat shall be strictly prohibited and as far as possible reuse shall be undertaken as per **Table -1** type of waste of guideline, “Waste Management and Debris Disposal”.

5. POST CONSTRUCTION STAGE

The road passing through the natural habitat shall be declared as a silence zone. Compensatory tree plantation within the available Right of Way shall be done in accordance with guideline, on “Tree Cutting and Afforestation”. The PIU must ensure maintenance of drainage structure shall be undertaken as per guideline, “Drainage”

GUIDELINE-16: AIR AND NOISE POLLUTION

1. INTRODUCTION

This guideline deals with the mitigation of adverse impacts due to air and noise pollution. Both of these have been discussed in the subsequent sections respectively.

2. AIR POLLUTION

The types of air pollution due to construction activities might include generation of dust, emission from hot mix plants and batching plants, odour from constructionlabour camps, emission from construction machinery/vehicles etc. The measures for mitigation of impacts from each of these are given below.

Generation of Dust

- All vehicles delivering materials to the site shall be covered to avoid spillage of materials.
- The Contractor shall take every precaution to reduce the level of dust emission from the hot mix plants and the batching plants up to the satisfaction of the Engineer in accordance with the relevant emission norms.
- All existing highways and roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres.
- Spillage shall be cleared immediately by manual sweeping and removal of debris or if so directed by the Engineer, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed completely. Additionally, if so directed by the Engineer, the road surfaces shall be hosed or watered using necessary equipments.
- Plants, machinery and equipment shall be so handled (including dismantling) so as to minimize generation dust.
- All earthwork shall be protected in a manner acceptable to the Engineer to minimise generation of dust.
- The hot mix plant is sited at least 1000m from the nearest habitation. The hot mix plants shall be fitted with dust extraction units in order that the exhausts comply with the requirements of the relevant current emission control legislation.
- Generation of dust should be suppressed during unloading of construction material and also during storage of the construction material.

Emission from Hot-Mix Plants and Batching Plants

- Hot mix plants and batching plants shall be located sufficiently away from habitation, agricultural operations or industrial establishments. Where possible such plants will be located at least 1000m away from the nearest habitation.
- The exhaust gases shall comply with the requirements of the relevant current emission control legislation. All operations at plants shall be undertaken in accordance with all current rules and regulations protecting the environment.

Odour from Construction Labour camps

- Construction labourers camp shall be located at least 500 m away from the nearest habitation.
- The waste disposal and sewerage system for the camp shall be properly designed, built and operated so that no odour is generated. Compliance with the Factory Act, the construction workers (regulation of employment and conditions of service) Act, 1996 and all other relevant legislation shall be strictly adhered to.

Emission from Construction Vehicles, Equipment and Machinery

- The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall conform to the relevant Indian Standard (IS) norms.

- All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that pollution emission levels\comply with the relevant requirements of SPCB & the Engineer.

Pollution from Crusher

- All crushers used in construction shall confirm to relevant dust emissions control as legislated. Clearance for siting shall be i obtained from the SPCB. Alternatively, only crushers already licensed by the SPCB shall be used.
- Dust screening vegetation will be planted on the edge of RoW for all existing roadside crushers.
- If crusher owned by contractor, the suspended particulate matter contribution value at a distance of 40m from a controlled isolated as well as from a unit located in a cluster should be less than 600 ug/Nm^3. The monitoring is to be conducted at least twice a month for all the 12 months in a year during the crushing operation for the project.

3. NOISE POLLUTION

Noise from Vehicles, Plants and Equipment

- The plants and equipment used in construction (including the aggregate crushing plant) shall strictly conform to the GoI noise standards.
- All vehicles and equipment used in construction shall be fitted with exhaust silences. During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site.
- Noise limits for construction equipment used in this project (measured at one meter from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB(A), as specified in the Environment (Protection) Rules, 1986.
- Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum.
- In construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing and batching, mechanical compaction, etc., will be stopped between 2200 hours to 0600 hours. In silence zone (areas up to 100 m around such premises as hospitals, educational institutional, courts, forests and natural habitats. No hot-mix, batching or aggregate crushing plant will be allowed. No construction shall take place within 100m around hospitals between 21.00 hours to 06.00 hours.
- Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall wear earplugs.

Noise from Blasting (or) Pre splitting Operations.

- Blasting shall be carried out only with permission of the Engineer. All the statutory laws, regulators, rules, etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.
- Blasting shall be carried out during fixed hours (preferably during mid-day), as permitted by the Engineer. The timing should be made known to all the people within 500m (200m for pre-splitting) from the blasting site in all directions. People, except those who actually light the fuse shall be excluded from the area of 200m (50m for pre-splitting) from the blasting site in all directions at least 10m minutes before the blasting.

Appendix 7

Guidance for Cumulative Impact Assessment under TNRSP-II (Additional Financing)

Scope of Work
The ToR for the CIA should specify 5 steps as follows:

- **Step 1**: Describe the proposed project, its setting and other projects and activities that may give rise to cumulative effects. The consultant will use EIA and other available documents. These cumulative impacts assessment will need to sequence planned developments of the project in and ancillary and regional infrastructure development in the time horizon of the project. The consultants will need to propose geographic and temporal boundaries for the CIA based on the screening of potential impacts on key environmental components. The geographic context should include the Corridor of impacts of the roads.
- **Step 2**: Identify key project-related contributions to cumulative effects on selected resources of concern, such as vehicular traffic; road safety; valued ecosystem components (VECs) like water resources, biodiversity, pollution, etc.; land-use change; livelihood of local communities, etc.
- **Step 3**: Assess the level of cumulative effects.
- **Step 4**: Determine the significance of cumulative effects.
- **Step 5**: Provide recommendations: Analyze reasonable, feasible options for mitigating or avoiding contribution to any significant cumulative effects, following the national legal system related to the cumulative impact assessment (or the lack therof)).

Main Tasks.

Step 1: Describe the development and its setting.

1. **Project Description**. The first step in the CIA is to describe the project and its phases, including key components that may give rise to cumulative effects. This will include the following:

    - Phases and timing of the project;
    - Description of the scheme and project area of influence;
    - Description of offsite facilities including transportation, access roads, industries, mining;
    - Identify environmentally sensitive areas, including protected areas, key stakeholders and affected people.

2. **Past, present, and probable future projects.** Once project issues have been identified, analyze past, present and probable future projects and activities within a defined temporal and spatial framework. The evaluation of other projects and activities should consider the following:

    - Include those projects of known footprint that can be assessed;
    - Consider a time frame that extends backwards to a pre-development scenario and forwards as realistically as possible;
    - Include projects that are approved, awaiting approval, announced or under design;
    - Include those projects whose environmental and social impacts and contribution to cumulative effects can be reasonably predicted, particularly projects with direct impacts on water resources, land and biodiversity; and,
    - Discuss pending projects with regulators and incorporate the concerns of affected stakeholders.

Prepare a map or schematic of all existing and planned projects with the basic information on location, resource intake, discharges, ancillary infrastructure, operation, etc.

- Define geographic and temporal boundaries for the CIA based on screening of potential impacts on key environmental components. The geographic context could include administrative boundaries or corridor of impact (CoI). It is noted that there might be different contexts for each VEC (see below). The definition will also need to include the scale of maps and other tools to present data that will be collected during the study.

3. **Define VECs**. If the ESIA already exists it should have already identified some key issues of concern associated with the pre-construction, construction and operation phases of the project. Typical VECs to include in impacts include the following:

   - Impacts on water resources (water use, quality, quantity);
   - Impacts on biodiversity and wildlife;
   - Impacts on land use;
   - Loss of archaeological and cultural resources;
   - Impacts of wastes on environment;
   - Impacts on noise, air quality;
   - Impacts on the livelihood of local communities;
   - Visual Impacts.

   The VECs should be defined based on the assessment of impacts on the above aspects and consultations with stakeholders. VECs could be (but are not limited to): water resources, land erosion, wildlife, cultural resources, air quality etc. Each VEC will need to have indicators, thresholds, historical trends on the status of the VEC in the time-frame proposed.

Step 2: Identify key project-related contributions to cumulative effects on selected resources of concern.

4. The CIA should identify key impacts of project activities throughout all phases (pre-construction, construction and operation) in conjunction with other projects and activities. The following questions should be answered:

   - Are other projects and activities in the defined project area affecting the VECs?
   - Do the effects of the project overlap or increase the effects on the resource?
   - Do the effects of the project have a potential to affect the long-term sustainability of the resource?

Step 3: Assess the level of cumulative impacts.

5. The next step in the CIA process is to assess the level of cumulative impacts. This uses a similar methodology to that employed in the EIA, but the difference is that it assesses the impacts of other projects and activities, in addition to the project in a defined spatial and temporal framework. For each resource/issue in question, the cumulative effects should consider typical components of an EIA assessment – extent, frequency, duration, magnitude, uncertainty and probability. Techniques will need to relay on qualitative data and already available quantitative data; no significant field work for quantitative data collection is envisaged.

Step 4: Determine the significance of cumulative impacts.

6. Once the cumulative impacts are determined, their significance must be considered relative to an established threshold limit, an established legal guideline or policy, or a qualitative assessment based on professional opinion and consultation. In any case, the significance of the cumulative impacts must be defensible. The significance of the cumulative impacts and the contribution of the project must be subsequently evaluated by project decision makers. The consultant will need to define the level of “significance” or scale and apply it consistently. The significance should be

assessed across past, present and future projects on the trends of each VEC. The significance of the project interventions' contribution to the cumulative impacts should be defined in one of the following ways:

- The project has a measurable effect on the resource;
- The project acts in conjunction with the effects of past present or future projects and activities; and
- The project in conjunction with other projects and activities shifts the resource to an unacceptable level or exceeds a threshold such that the impact is considered significant, in that:
    - The project's contribution to cumulative effects is responsible for exceeding the threshold and therefore is significant or,
    - The project is contributing with the effects of other projects and activities and the project contribution may or may not be significant, depending on the level of the contribution.

Step 5: Formulate recommendations.

7. The CIA should reach a conclusion on whether the contribution, if any, to the cumulative impacts by the project is significant or not. An action plan (with time, institutional responsibilities, budget) should be developed based on this conclusion, and clearly define what mitigation measures need to be incorporated into the project Environmental Management Plan, and what mitigation/environmental management measures should be carried out above the project level. The management plan will be in three parts: (i) management plan for additional measures needed to be included in the project that have not been included in the EIA; (ii) recommended measures for the future projects in the area; and (iii) measures addressing needs for institutional and legal frameworks and acquisition of knowledge. The recommendations will need to also include proposed adaptive management approaches for impacts that still will have high level of uncertainty or lack sufficient information for an adequate assessment.

8. Mitigation/environmental management measures that are needed but beyond the scope of the project, will be presented to relevant (government) agencies/entities in the form of a workshop, and finalized based on the views by the agencies. Their endorsement/acknowledgement on the recommendations from the CIA should be sought.