



**PUBLIC WORKS DEPARTMENT
GOVERNMENT OF KERALA**

KERALA STATE TRANSPORT PROJECT - II

**EIA and EMP for
Punalur – Ponkunnam – Thodupuzha Road**

**Part I
Environmental Impact Assessment (EIA) Report**

December 2012

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LIST OF ACRONYMS

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway & Transportation Officials
ADB	Asian Development Bank
ASI	Archaeological Survey of India
CADD	Computer Aided Design and Drafting
CARD	A German Software For Highway Design
COI	Corridor of Impact
CRZ	Coastal Regulation Zone
CW	Construction Works
CWRDM	Centre for Water Resource Development and Management
EAP	Environmental Action Plan
EASISM	Environmental and Social Impact Screening Model
EIRR	Economical Internal Rate of Return
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMU	Environmental Management Unit
FIC	Financial Costs
FIDIC	Federation of Internationale des Ingenieurs Conseils
GOI	Government of India
GOK	Government of Kerala
IRC	Indian Road Congress
IUCN	International Union for Conservation of Nature
KCZMA	Kerala Coastal Zone Management Authority
KFRI	Kerala Forest Research Institute
KSCSTE	Kerala State Council for Science Technology and Environment
KSEB	Kerala State Electricity Board
KSTP	Kerala State Transport Project
MDR	Major District Roads
MoEF	Ministry of Environment and Forests
MoRTH	Ministry of Road Transport and Highways
MLA	Member of Legislative Assembly
MSL	Mean Sea Level
NATPAC	National Transportation Planning and Research Centre
NGO	Non Governmental Organization
NH	National Highway
NMT	Non Motorized Traffic
NOC	No Objection Certificates
NPV	Net Present Value
PAP	Projected Affected People
PCC	Project Coordinating Consultants
PDF	Project Displaced Families
PIU	Project Implementation Unit
PIA	Project Influenced Area
PWD	Public Works Department
R & R	Resettlement and Rehabilitation
RAP	Resettlement Action Plan
RoW	Right of Way
RW	Road Wing
SEA	Sectoral Environmental Assessment
SEIAA	State EIA Authority

SH	State Highway
SIA	Social Impact Assessment
SOI	Survey of India
SOK	State of Kerala
SOS	Strategic Option Study
SPCB	State Pollution Control Board
STEC	Science Technology And Environment Committee
WB	World Bank
WWF	World Wild Fund for Nature

CHAPTER 1. INTRODUCTION

1.1. PROJECT BACKGROUND

Government of Kerala has decided to take up improvements of state roads with external assistance through Kerala State Transport Project (KSTP) and initially identified 1000 Km of roads for up-gradation in 1999. Feasibility studies conducted later prioritized the roads to be taken for improvements. Economic and social parameters played major roles in evolving the improvement options and the total length of the road considered for the study was later limited to 579 Km to be taken up in two phases, I and II. In the first phase, 254.8 Km roads were taken up for implementation with the assistance of World Bank and the project was completed recently. The road stretches considered in phase I are listed in the Annexure 1.1 . Currently, land acquisition works for phase II stretches are almost over and it is decided to take up improvements to balance 366.930 Km of roads under strategic financing options and contracting mechanisms. The state has applied for a loan from IBRD (World Bank) for implementing KSTP II. The road stretches considered in phase II are listed in the TABLE 1.1. This document comprises detailed EIA for the Punalur – Ponkunnam - Thodupuzha (link 84) road.

Table 1.1. Roads Undertaken in Kerala State Transport Project II

SL. NO	LINK No.	ROAD NAME	LENGTH (KM)	EXISTING AVERAGE CARRIAGEWAY (CW) WIDTH (M)	PROPOSED CW WIDTH (M) (TOTAL IMPROVEMENT IS UP TO 15 M)
1	69.1	Kasaragod-Kanhangad	27.78	6.9	10
2	68.0	Pilathara-Pappinissery	20.90	6.7	10
3	74.0	Thalaserry-Valavupara	52.76	7.2	10
4	84.1-84.4	Punalur-Ponkunnam	82.11	5.9	10
5	84.5-84.8	Ponkunnam-Thodupuzha	50.32	6.4	10
6	4	Chengannor - Ettumanoor	40.880	7.8	10
7	5	Ettumanoor – Muvattupuzha	40.91	7.8	10
8	41.1 & 47	Perimbilavu – Pattambi - Perinthalmanna	47.345	--	10
Total			363.005		

The cumulative impacts of the project are the subject of a Sectoral Environmental Assessment (SEA) as the first step in the environmental approval process. The final SEA report was prepared and submitted to the World Bank and the State Public Works Department in October 2001. The SEA report indicates that corridor-specific EIA's would be prepared and circulated for review and comment for those road sections deemed to warrant such action in accordance with all appropriate GOI regulations and the World Bank's Operational Procedures. Details of these requirements are addressed in Chapter 3.

The objectives of the EIA study include but not limited to

- Evaluate potential impacts of the project
- Establish an engineering design philosophy that integrates environmental and social considerations into the project's detailed engineering design;

- Assess alternative project designs and provide input into project design;
- Design appropriate and practical mitigation and environmental management measures to be implemented during road construction and operation to avoid or minimize adverse impacts;
- Provide practical environmental and social management plans, including an Environmental Management Plan and a Resettlement Action Plan;
- Propose and design environmental enhancements to be incorporated in the project implementation plans.

1.2. EARLIER STUDIES

1.2.1. STRATEGIC OPTION STUDIES

The current project developed from the Strategic Option Study (SOS) report of April 1997. It recommended that 2810 km of roads be examined for feasibility following the investigation made of the State road network in terms of traffic flows and road capacities. The selection was made as those roads demanding the highest priority for investigation based upon the volume of traffic using each road, future traffic projections and the width and hence the capacity of the existing carriageway at that time. Excepting the Sabarimala pilgrimage season, no other environmental or social aspects were considered for the study.

1.2.2. FEASIBILITY STUDY

A feasibility study was carried out for the road network of 2810 km (68 links) identified by the SOS study except for 330 km of roads, which were later declared National Highways. However, at the time of their declaration as National Highways a number of surveys including environmental and social impact surveys had been conducted. These roads were then dropped from further study but the data already gathered were handed over to the Project Management Team (PMT)¹ as it could be useful for the National Highways division of the PWD.

1.2.3. ADDITIONAL FEASIBILITY STUDY

Following the initial feasibility study period, the Government of Kerala (GOK) proposed an additional 707 km of roads for investigation. As a result, the consultants had to carry out further reconnaissance surveys. Furthermore, since the SOS studies were conducted the entire socio-economic scenario had undergone major changes compared to other parts of India. The most notable changes were the establishment of a world-class international airport in Kochi (officially inaugurated in June 2000) and the declaration that Kerala as the first 100 % literate State in India.

1.2.4. RECONNAISSANCE WORK FOR ADDITIONAL FEASIBILITY STUDIES

The Louis Berger International (consultants) undertook further reconnaissance studies on the additional road sections. Some links could not be taken up under this project, as they required many kilometres of new roads along dense forests and sanctuaries.

¹ Formerly Project Implementation Unit (PIU)

1.2.5. SECTORAL ENVIRONMENTAL ASSESSMENT (SEA)

The SEA study undertaken has established that the Project has to obtain State level clearance from the State Pollution Control Board (PCB). Because of the World Bank's categorisation as Category A projects, a general EIA is also required for the ecological significance roads. This is the basis for the preparation of the document

1.2.6. HIGH PRIORITY ROADS

The Feasibility Study identified approximately 1000 km of high priority roads, which required detailed design and associated studies in two or more Phases. The roads that are being subjected to detailed engineering studies are shown in **Figure 1.1**. The Phase II roads are listed in **Table 1.1**. The phase II designs were also completed in April 2001 except the documentation of the environmental and social reports. Further there were many design changes in the Phase-1 roads including design changes for accommodating environmental and social aspects. As a result now the phase II designs are also being structured in the similar pattern.

1.2.7. KSTP ROAD SAFETY AUDIT REPORT

The Road Safety Audit was carried out at the request of the Government of Kerala and with the support of the World Bank and Design Consultants. There is no Road Safety Audit Manual for India or Kerala but Road Safety Audit is described in the *Manual for Safety in Road Design*, published by the Ministry of Surface Transport. The Road Safety Audit was specifically aimed at improving the 23 sections of highway in the Phase I and Phase II of the Kerala State Transport Project. The recommendations are being addressed by the Project.

1.2.8. EIA REPORTS PREPARED IN 1999

The EIA reports were prepared by the Louis Berger in 1999 for the all the project links. However, as land acquisition works could not be completed, GoK could not commence the project work.

1.2.9. ENVIRONMENTAL AND SOCIAL INDEPENDENT REVIEW REPORT, 2003

Further, in 2003, these projects were again considered for implementation. Being a Category A project, the World Bank requires an Independent Environmental and Social Review of all Environmental Assessment and Social documents including RAP by an independent Consultant. Accordingly, the review was carried out by SMEC in July 2003. Subsequently the EA documents were improved by Louis Berger in 2004, by suitably incorporating the independent review observations and addressing the important recommendations of the Phase II environmental review consultants.

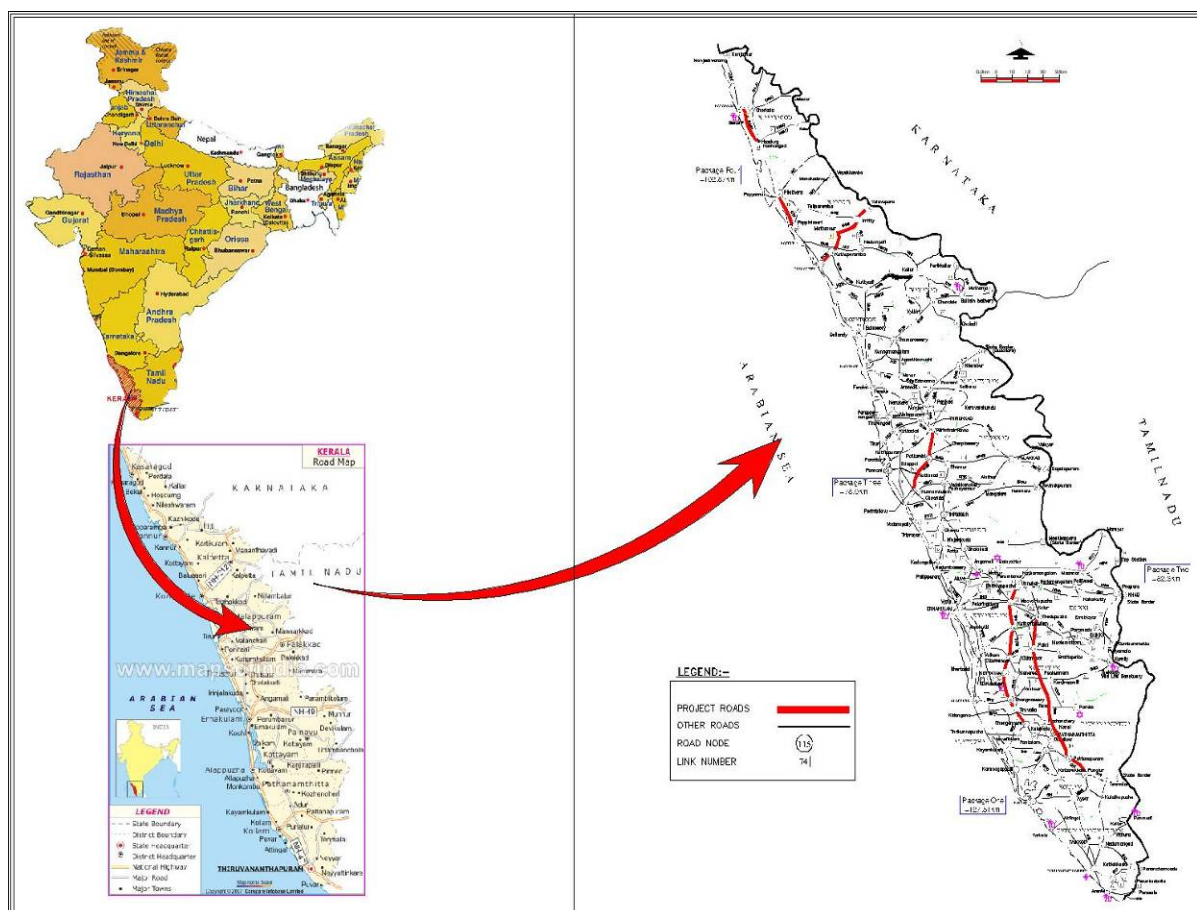


Figure 1.1. Location Map of Project Roads in KSTP II

Of these eight roads, detailed engineering designs and costing were done for the 7 roads excluding Perimbilavu – Pattambi - Perinthalmanna road in 2000 by the DPR Consultant. Later, a techno economic feasibility study of these roads was conducted by L&T RAMBOLL in 2010. L&T has taken up the study as the update of the feasibility report prepared in the year 2000. Topographic survey of the new road link Perimbilavu - Perinthalmanna also was completed by them and prepared a preliminary design and strip plan showing existing features and required land acquisition extent.

1.3. INDEPENDENT REVIEW OF EIA, 2012

Phase II of KSTP project is currently taken up for improvements under strategic financing options and contracting mechanisms by Government of Kerala. The state has applied for a loan from IBRD (World Bank) for the same. Land acquisition works for phase II stretches are almost over and it is decided to take up balance 366.93 km of roads. In this context, an independent review of EIA was undertaken by Wilbur Smith Associates Pvt. Ltd., in 2012 for the Punalur-Ponkunnam - Thodupuzha (link 84) road.

1.4. DOCUMENT ORGANISATION

Since all project roads including the three links considered in this report are part or sub projects of the same project (KSTP II), current documentation is provided in the same structure, style and format as the earlier report prepared by Louis Berger. This approach has simplified the EIA process including review and evaluation to a certain extent.

The EIA is organized in accordance with the stipulations of the Environmental Impact Assessment Notification of 2006, GOI's *Handbook of Environmental Procedures and Guidelines* (1994), *Environmental Guidelines for Rail/Road and Highway Projects* and *EIA Guidance Manual for Highway Projects*. The World Bank guidelines were also considered and incorporated according to the World Bank Operational Policy 4.01 and the recommendations from World Bank Technical Paper Number 376: *Roads and the Environment: A Handbook*. Accordingly the entire document is organised in two volumes. Since all ecologically significant roads are considered in Phase II, independent review will be carried out for Phase II as required by the World Bank.

Part I - Environmental Impact Assessment (EIA) for the project road as a supporting document. It identifies the impacts and proposes measures to minimise and mitigate them. This does not include the land acquisition and other direct social impacts to private properties and structures. Refer the link to the Resettlement Action Plan (RAP) document at the end of this chapter for more details.

Part II - Environmental Management Plan; (EMP) is prepared separately for the road. It comprises (i) a Generic Environmental Management Action Plan (Generic EMAP) for generic mitigation measures which are not directly linked to the site and (ii) a Link Specific Environmental Management Action Plan for those mitigation, which are specific to the location on site / link. Each of these is further separated to give separate EMAP for Concessionaire and others. Accordingly, there are four types of EMAP table as follows:

1. Generic EMAP table for Concessionaire
2. Generic EMAP table for Others
3. Link Specific EMAP table for Concessionaire
4. Link Specific EMAP table for Others

all stand-alone Link-specific Environmental Management and Monitoring Plans for the road prepared and submitted during February 2003 was later compiled and abridged to a single volume on WB request in order to reduce the number of bound volumes. The single volume Phase II EMP constitutes Part II of all EIA documents. Project Specific environmental management activities to be incorporated in both the construction and operational phases for each component of the Project are presented together with a monitoring plan specifying the type of monitoring proposed, the activities and/or conditions warranting environmental monitoring, the responsible agency or organization, the estimated costs and related factors.

Table 1.2. Environmental Impact Assessment (EIA) Report Parts

EXECUTIVE SUMMARY		
PART I - ENVIRONMENTAL IMPACT ASSESSMENT PUNALUR – PONKUNNAM - THODUPUZZHA ROAD	PART II - ENVIRONMENTAL MANAGEMENT PLAN FOR PUNALUR – PONKUNNAM- THODUPUZZHA ROAD	
	GENERIC EMAP	LINK SPECIFIC EMAP
	FOR CONCESSIONAIRE*	
	FOR PMT	

The later part of the Part1 EIA² document is organized according to the World Bank requirements as follows:

Chapter 2 - Project Description-a brief description of the components of the KSTP Project, the manner in which the various proposed improvements were identified, and details of the proposed action along the project corridor.

Chapter 3 - Project Policy Legal and Administrative Frame Work-Presents the legal and administrative frame work of World Bank, Government of India, Government of Kerala and PWD. This section also highlights the various clearances required for the project.

Chapter 4 - Approach and Methodology-presents the methodology followed, different steps in the KSTP Environmental Assessment process, sources of data, data to be generated during the studies etc.

Chapter 5 - Baseline Conditions -an overview of the relevant aspects of the study area. The major headings of the statement of baseline conditions and the section that follows have been devised on the basis of MOEF's suggested outline and review procedures and supplemented to address World Bank concerns in specific sections:-

5.1: Natural Environment-presents the meteorological conditions of the area.

5.2: Regional Physical Setting-presents the physiography and drainage patterns; geology and seismology; soil conditions; existing and potential erosion patterns; and information with regard to quarries, crushers; and borrow pits.

5.3: Water Resources-presents the applicable water quality standards; existing surface water bodies and groundwater conditions; water resources and cross drainage structures within the project corridors/ potentially impacted areas (PIA).

5.4: Ambient Air Quality-presents the relevant air quality standards and the existing ambient air quality conditions, including a description of the locations of monitoring stations and the sampling and testing methods employed.

5.5: Ambient Noise Levels-presents the relevant noise standards and the existing ambient noise levels, including a description of the locations of monitoring stations and the sampling and testing methods employed.

² In this document EIA means EA and EMP considered together.

5.6: Flora, Fauna and Ecosystems-presents data with regard to forests, trees and wildlife in the Project area.

5.7: Human Health and Safety-presents a discussion of health issues related to road projects, including available data with regard to the incidences of diseases and the relevance of truckers and the spread of disease as stipulated in the World Bank Guidelines. The topic has been expanded to address Road safety issues associated with the Kerala State Transport Project.

5.8: Cultural Resources-presents data with regard to shrines, monuments, temples and cultural artifacts.

5.9: Socio Economic Environment-In this section only those aspects, which helps to determine the impacts are provided.

Chapter 6 - Public Participation and Consultations-a description of coordination activities in the preparation of the EA, including coordination with Government Agencies, actions undertaken to obtain the views of local non-Government organizations (NGOs) and affected groups, and records of meetings and other activities, communications and comments.

Chapter 7 - Assessment of Potential Impacts -an examination of potential impacts related to the various construction activities during pre-construction, construction and post constructional phases. Chapter 7.0 follows basically the same sequence and numbering pattern as Chapter 5.0 to assist review.

Chapter 8 - Analysis of Alternatives-an examination of alignment, design and technical alternatives considered in the evolution of the Project

Chapter 9- Impact Mitigation and Avoidance-This Chapter is an examination of potential impact mitigation and avoidance actions related to them. This section follows essentially the same sequence and enumeration pattern as Chapter 5.0 and 7.0 to facilitate review.

Chapter 10 -Environmental Enhancement Measures-Enhancements are those, which further improve the road and will lead to the better acceptance of the project by the community. This includes tourism enhancements opportunities, parking areas for trucks, jeeps and other vehicles, bus stops, service areas, foot over bridges, aesthetically appealing road junctions, foot paths next to hospitals and educational institutions, pilgrim pathways.

1.4.1. RESETTLEMENT ACTION PLAN (RAP).

A separately bound Resettlement Action Plan (RAP) supplements the EIA. The preparation of the RAP has been completed. This report covers the Social Impacts such as Project Affected People, Project Displaced Persons, and the Action Plan for various activities associated with the land acquisition, compensation and rehabilitation.

CHAPTER 2. PROJECT DESCRIPTION

2.1. PROJECT LOCATION

The Project road Punalur – Ponkunnam - Thodupuzha is situated in the south Kerala on the eastern side parallel to MC road stretching for about 135 km length. This is the most important road with regard to Sabarimala Pilgrimage. The road is regionally known as PM road meaning Punalur - Muvattupuzha road. The link between the Thodupuzha and Muvattupuzha (17.83km) is part of the Phase I improvements. In this way KSTP considered the entire Punalur - Muvattupuzha road in two phases. The location of the present project corridor spreads over four districts viz, Kollam, Pathanamthitta, Kottayam and Idukki. The locations of the project road is shown in **Figure 2.1**. The map shows the most important roads of the region with respect to the project road under consideration.

The road from Punalur to Ponkunnam is passing through an ecologically sensitive area. However, as development is restricted within the existing ROW and no diversion of forest land is proposed, the project doesn't require forestry clearance.

The road from Ponkunnam to Thodupuzha passing through an inhabited area without any presence of forest reserves or any other ecologically sensitive areas. Two bypasses one pala and the second one at Thodupuzha are also considered in this section. There are numerous rubber plantations in the area. The other plantations like coconut plantations are also not uncommon.

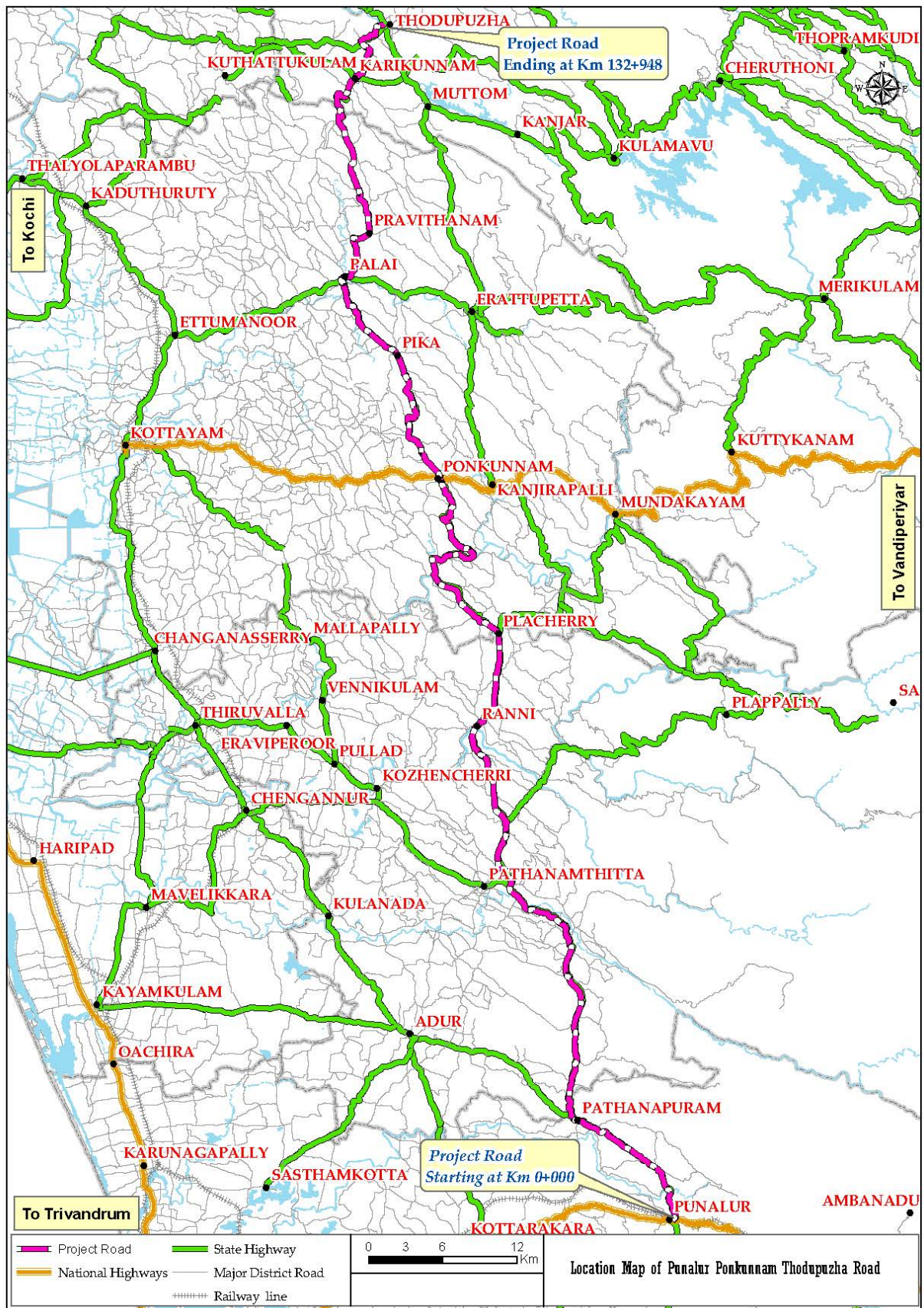


Figure 2.1. Location Map of Punalur – Ponkunnam - Thodupuzha Road

2.2. PHYSICAL DETAILS OF THE PROJECT CORRIDOR

Various surveys including those for environmental and social impacts have been carried out for the project road. These were conducted during the feasibility study in 1999. The measured average corridor width is 12.34m. The traffic load estimated along this road as average annual daily traffic, the estimated Economic Internal Rate of Return (EIRR) and the NPV/FIC ratio are provided in the DPR. The various environmental characteristics available for the physiographic locations-low land, mid land and high land (details of adjoining mid land also provided) of the road are provided in **Table 2.1**.

Table 2.1. Environmental Characteristics of The Link Road

Sl. No.	Environmental Parameters	Link 68
1.	Topography	Plain to Hills and valleys
2.	Geology	Alluvium Charnockites Gneiss Sandy soil Lateritic soil
3.	Annual Rainfall	2923 mm (average)
4.	Flood potential	Very common
5.	Rivers / Streams / Irrigation canals / lakes / backwaters / ponds / chira	Valapattanam, Palayangadi river, Ramapuram River Kannpuram River ,Sulthan canal
6.	Soil	River alluvium, Brown Hydromorphic, Lateritic soil.
7.	Erosion	Vigorous erosion during monsoon
8.	Mineral Resources	Limited deposits of minerals and clay in the PIA districts.
9.	Industrial Development	The PIA districts are moderately developed industrially
10.	Land Use	Predominantly built up interspersed with agricultural areas
11.	Agriculture	Coconut, Paddy, Pepper, Ginger, Tapioca
12.	Vegetation (Private / Public)	Rubber, Tamarind Jackfruit tree, Mangoes
13.	Parks, Sanctuaries	No Parks/Sanctuaries within the Project impact zone
14.	Forest Land	Forestland identified, but no diversion is required
15.	Endangered species	None identified
16.	Coastal Zone Regulation	Not Applicable
17.	Cultural resources, Historic, Religious Sites and Temples	There are 99 identified cultural properties along the project corridor. This include Temples, Mosques, Churches, Hundi and shrines
18.	Sensitive Noise Receptors	There are 59 identified sensitive noise receptors along the project road, which includes schools/colleges and hospitals
19.	Tourism	Important tourist locations such as Konni Elephant Park, Pilgrim centers like Erumely and Pamba are located adjacent to the road.

2.3. IMPROVEMENT ALTERNATIVE CONSIDERED

The improvement alternatives considered by the consultants have generally been

- Improve to a 7.0 m wide carriageway with sealed shoulders and lined drains
- Improve to a 7.0 m main carriageway with two 1.5 m wide auxiliary lanes and 2.5 m sealed shoulders (total 15 m) and Improve to dual two lane carriageways (later abandoned).

A detailed analysis of alternatives is provided in the Chapter 8. The **BOX 2.1** briefly described the need for the improvement of Project roads in Kerala.

The State road network in Kerala generally provides a communication corridor for shorter journeys between the many towns and market centres and is not intended to compete with the National Highway System which provides for longer journeys and inter-state travel at greater speeds. The proposed treatments for the road are shown in **Table 2.2**.

BOX 2.1: Need of the Kerala State Transport Project

Transport development plays a crucial role in improving the States economic performance and to enhance the well being of its population. The growing tourism and industrial sectors in particular generate substantial demand for an increased road capacity. The present poor physical condition of the road network drains the economy considerably by way of a high rate of accidents, delays and high vehicle operating costs. There is an urgent need to improve pedestrian safety especially the provision of footpaths along many of the project roads. These highways are generally paved, single to two lane roads with widely varying traffic volumes. The identified State Highways and Major District Roads as having the highest priority for attention by virtue of their reduced carriageway width and/ or pavement condition, which result in capacity constraints for the volume of traffic that they carry, and their connectivity. The coastal link 68 being a sub project of KSTP it's development is vital in this region.

2.3.1. DEFINITION OF TERMS USED IN THE PROJECT

Nodes: Nodes are numbers representing urban centres or important road junctions usually used for start or termination points of project links.

Links and Sub-links: All project roads were identified by link numbers in the Project feasibility report of April 2000. According to this the 67 Links represented 2810 km of roads as identified by the SOS for detailed feasibility studies. A sub-link is a part of any specific project road (e.g. Link 58 has sub-links 58A and 58B or 58.1 and 58.2). Sub-links were created to identify differing conditions of traffic flow or road condition / geometry for the HDM analysis. Additional links were added to accommodate the additional 707 km.

Package: Packages were formulated for the purpose of creating attractive construction contracts to larger National and International Concessionaires. A package average of 100 km of project roads made up of two or more links. Concessionaires will not take interest to contracts if they are not of sufficient size and profitability to merit attention. A Concessionaire may bid for more

than one Contract. There are six contract packages identified in the Kerala State Transport Project.

ROW: The Right of Way is the land area legally available to the State PWD. Actual Right of way can only be established after a physical verification of all adjoining properties. The ROW is sometimes encroached upon both sides. ROW details were not made available to the consultants beyond the physical appearance of the Highway, which has been open to the public for unrestricted access. This aspect has been covered in detail in the RAP.

Available Corridor: Since the legal ROW details are not available the consultants were advised by the Client to consider the existing corridor width that is physically available and hence it is referred to as Available Corridor for the purpose of project preparation.

Realignment: Realignment usually refers to an increase in the horizontal curve radius but may be generally applied to any change in the vertical or horizontal alignment of a road.

Puramboke land: Puramboke land is of questionable ownership and is treated as revenue land for various Government requirements.

Project Influenced Area (PIA); the detailed definition of the term is furnished in Chapter 4. For all normal proposes the PIA is taken as the Corridor of Impact, i.e. 7 km on either side of the road thus requiring documentation of 14 km with the road as the centreline. However for some parameters this is not sufficient and hence much bigger areas like the District (transport accessibility by air, road or rail) in certain cases and the State (population, literacy etc) as a whole in certain other cases were considered.

Private trees: These are trees situated in the private properties within the required corridor, which will have to be compensated for in monetary terms according to the Resettlement Action Plan. In addition according to the tree planting strategy, two trees will be for each private tree lost.

Public trees: Public trees are those trees that are located within the available corridor of PWD or on Puramboke Land (nobodies land but accounted as land of Revenue department)

Corridor of Impact (COI): According to the MOEF requirements the general study area is seven kilometres on either side of the Project road.

Impact Corridor (IC): The environmental data has been collected for approximately 20 metres on either side as the immediate project impact area.

Bypass: A bypass is the term usually applied to a road, which provides an alternate route around a congested urban area. This normally helps to divert through traffic away from using the urban centre.

2.3.2. THE PROPOSED IMPROVEMENT WORK

The scope of work to be undertaken within project road improvement activities will include:

- Raising the formation level,
- Widening to 10 m wide carriageway from the existing intermediate lane width, pavement-strengthening,
- Drainage improvement with lined drains in urban areas/ or heavily built up areas
- Ducts of standard size on either side to take the utilities in urban areas and
- Drains under foot path in the narrow sections of built up areas
- Footpaths will be provided only in heavily built up areas adjacent to schools, hospitals etc.
- 2.5m wide sealed shoulders were planned but the client wished the 1.5m paved slow lanes to take up part of the width.
- Widening of the carriageway and associated land acquisition to expand the highway to two lanes or to the required width.
- Most of the available corridors widths vary within each link and could not accommodate the widening to two lanes without additional acquisition of land. The available corridor width is not consistent.

Construction of new parallel bridges. Construction of new parallel bridges to the existing major bridges (span greater than six meters) and widening of minor bridges to provide a minimum width of 8 metres.

Replacement of culverts and Construction of new culverts. The replacement/ rehabilitating of culverts will accommodate two full lanes for the full formation width.

Bypass. No bypasses have been considered under the project.

Realignment. Four realignments are considered in the project. All are located in this section.

Road safety measures (Bus Stops and Parking Area). Car parking areas may be provided wherever there is space available away from junctions and pedestrian crossings. The provision of bus lay-bys is included in the design.

Implementation of a Resettlement Action Plan (RAP). The RAP has been prepared separately and the implementation of the RAP is nearly completion. A separate RAP implementation report has also been prepared.

Summary of proposed improvement activities for the road is presented in **Table 2.2**. Contract may review and get approval from engineer in charge for locations of all the improvement proposal.

Table 2.2. Improvement Proposal for Punalur – Ponkunnam - Thodupuzha Road

Sl. No.	Particulars	Details	Remarks
1	Start of the project Stretch	Junction, Punalur	Km 0+000 (Punalur)
2	End of the Project Stretch	Old Bus stand Junction, Thodupuzha	Km 132+950 (Thodupuzha)
3	Length		131.171 kms
4	Classification		State Highway SH 8

Sl. No.	Particulars	Details	Remarks
5	Proposed RoW	Cross Section	Urban/ built-up sections: Two lane + Paved shoulders + footpath cum drains Semi-Urban/ built-up section: Two lane carriageway + Paved shoulders + concrete drains Rural Sections: Two Lane + Paved Shoulders + Earthen shoulders Existing four lane stretches: Four Lane+5.5/6.5m service roads+footpath cum drains
6	Proposed Carriage Way width	Built-up Areas	10m wide (Main built ups) Existing four Lane stretches retained with new 5.5m service roads on both sides
		Rural Areas	10m
7	Pavement Details		Overlay Composition: The entire section is overlaid with 25 mm SDBC+ PCC Widening Composition 25 mm SDBC + 65 DBM+ 250 WMM+200 GSB
8	Drains	142.3 km	
9	Footpath	37.5 km including both sides(as per cross section)	
10	Passenger Shelter	118 No's	43 new bus bays proposed (including both sides)
11	Metal beam crash barrier	6200 m	High embankment location & bridges and RUB approaches
12	Pedestrian guard rail	20064 m	Proposed foot path locations, major junctions and near schools and other institutions
13	Proposed parking spaces		Existing Auto, Jeep Taxi stands at 40 locations retained. (Not included in costing) New parking spaces proposed at 15 locations at km 4/900, 12/930, 16/620, 18/710, 29/220, 29/250, 29/300, 53/580, 57/870, 63/600, 66/800,96/540,96/670,113/050,133/900.
14	Locations of Oxbow Land	38 No's.	
15	Bridge / Culvert	495 No's	Major Bridge – 5 No's Additional/Reconstruction – 2 No @ km 35+940, 67+870 Retained– 3No at km 51+460, 104+810, 132+860 Minor bridge – 15 No's Additional/Reconstruction – 8 No @km 2+530, 13+265, 18+205, 28+385, 31+800, 69+200, 113+190, 130+370 Widening – 1 No @ km 93+225 Retained– 6No at km 9+510, 16+185, 24+935, 105+700, 112+785, 117+330 RUB – 1 No Retained– 1No at km 0+263 Aqueduct – 2 No Retained– 2No at km 17+100, 46+640 Culverts – 472 No's Cleaning & Widening – 87 No's Cleaning – 5 No's New construction due to realignment – 29 No's Reconstruction – 347 No's New proposal on existing road – 9 No's
16	Traffic Signs /	Provided at appropriate locations as per standards	

Sl. No.	Particulars	Details	Remarks
	Road Marking		
17	Noise Barrier	59 Locations - At all educational buildings for an height of 2 to 3 m- total length 42m	
18	Protection	Retaining wall- 44km (including both sides	

2.4. DESIGN CROSS SECTIONS

A project description must entail the design cross sections to identify impacts for the chosen design cross sections adopted for the project road at various chainages. The relationship in general terms are very clear. A narrow cross-section against the existing wider ROW results in reduced impacts and vice versa. Generally there are thirteen types of design cross sections, the details of which are given in **annexure 2.2**

2.5. OBJECTIVES AND BENEFITS

The objectives of the Project (KSTP) are to alleviate the current unsafe and congested conditions of the project road connecting the villages and towns, with one another and to the National Highway network for the benefit of the road users at large. A modest design speed for the safe and efficient movement of people and goods is seen as the objective and the designs of consultants reflect this. If this can be achieved it will represent a considerable improvement in the human environment. Most travellers presently face considerable anxiety in their daily use of the highway system; this is applicable to all pedestrians, drivers and passengers. With proper traffic engineering and enforcement of the rules of the road regulations there should also be a marked reduction in road traffic accidents.

2.6. DESCRIPTION OF MAJOR FEATURES

Major features of the Project improvements are as follows.

2.6.1. ROAD WIDENING

A total of four main cross-sections have been proposed. These sections are designed to take the urban, semi-urban and rural areas. For example the design Type-1 Two Lane C/S is meant for at Urban Area with paved Footpath cum Hand Rail and Covered Drain and Type 2 'Two Lane C/S with paved Footpath cum Hand Rail and Covered Drain' meant for urban area is designed for the narrow corridor at urban sections. These sections are not required at rural sections where the width will be sufficient for drain and the paved/unpaved shoulders. These Figures graphically indicate the locations at which the various cross-sections will be employed. The main cross-sections apply to the various portions of the project road widening and improvement activities.

2.6.2. TREE REMOVAL AND TREE PLANTING

The KSTP project will not encourage linear avenue planting on the roadsides due to the limited width and also due to the road safety concerns. This is discussed elaborately in the document titled '**Landscaping, Tree planting and Environmental Enhancement Plan**' provided in **Annexure 3.56** of Part II Environmental Management Plan. Nevertheless the project will

provide adequate land in the abandoned sections due to numerous realignment options. The Puramboke land formed during the land acquisition process and the design options will also be used for plantations. The project incorporates a tree-planting scheme in which trees lost due to widening and other construction activities in the project will be replaced at a rate of three to one according to the provision of the Indian Forest Act.

2.6.3. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

A separately bound Environmental Management Plan is part of the EIA document. The Environmental Management plan addresses the following construction aspects. These include

- Water supply- Refers to water supply requirements at construction camps, construction, and also for the lost drinking water resources during resettlement and rehabilitation.
- Power plants- Refers to power plants required at camps, plants and at the construction sites etc.
- Raw materials- Raw materials are required for construction of camps, plants etc
- Construction camps-This include camps for managers, engineers, technicians, laborers etc.
- Housing- This refers to all housing requirement at plant sites, camps etc.
- Quarries- Refers to quarries for the construction works
- Blasting - Refers to any blasting requirement at quarries, approach roads borrow areas etc.
- Access roads – required at camps, plant sites borrow areas and quarry areas
- Hazardous materials – require at plant sites, quarries etc
- Waste (all kind of solid and liquid wastes) quantities generated- wastes will be generated at construction zones, camps, plant sites etc.

Relevance of these items is discussed at the appropriate sections in the remainder of the document.

2.6.4. RESETTLEMENT ACTION PLAN

The social impacts especially the direct social impacts involving land acquisition are dealt separately in a separately bound Resettlement Action Plan prepared for Phase II roads. In order to make the land acquisition process transparent and easier, the State Government in 2000 formulated a separate resettlement policy.

In addition to the data provided here, social impacts and procedures associated with the project are the subject of a Resettlement Action Plan (RAP), the provisions of which are incorporated herein by reference. The entire exercise has been comprehensive in terms of time required for land acquisition and all associated procedures and economic feasibility. The final design decisions have substantially reduced the PAPs and PDPs.

2.7. SUMMARY OF FEATURES

Construction works are identified for the project roads within the Kerala State Transport Project. Those for these corridors are as follows:

- Widening to the required width
- Rehabilitation/replacement of bridges and culverts
- Provision of drainage
- Raising of the formation level at likely flood sections
- Provision of pedestrian facilities and road shoulders
- Tree planting
- Parking facilities
- Mitigation measures according to the regulations
- Other Environmental enhancement actions.

2.8. COST FOR THE PROPOSED LINK ROADS IMPROVEMENT

Cost estimates were prepared following the analysis of several alternatives of road widening, realignment, and pavement composition and included in the project (KSTP) Feasibility Study. The cost details are included in the Detailed Design Report. The estimates are based on the development of costs for various construction items including:

- Typical road components;
- Quantities of road components for various alternatives;
- Land acquisition,
- Resettlement and rehabilitation (R&R) costs,
- Environmental mitigation and enhancement costs,
- Contingencies including utility relocation costs,
- Engineering supervision and administration costs.

2.9. CONTRACT PACKAGES

The project road Punalur – Ponkunnam - Thodupuzha is included in the Contract Package II. This project road has been taken up for detailed engineering following the completion of the feasibility studies.

CHAPTER 3. APPLICABLE POLICIES AND LEGAL FRAME WORK

3.1. ENVIRONMENTAL LEGISLATION FRAMEWORK OF GOVERNMENT OF INDIA

The various prevailing environmental acts and rules relevant to the PWD activities are listed here. This includes National Acts & Rules administered by the Ministry of Environment & Forests, other National legislation that are relevant and State Acts & Rules

3.1.1. THE ENVIRONMENT (PROTECTION) ACT, 1986

This act provides for the protection and improvement of environment. It extends to the whole of India. The EA identifies Central and State Government standards set for the quality of the environment; emission or discharge of environmental pollutants; procedures and safeguards for handling hazardous substances; and relevant restricted development areas. The EIA document examines processes, materials and substances with potential to cause environmental pollution. The EA assesses if relevant standards will be breached, and confirms that relevant procedures and safeguards will be followed. Document includes procedures and safeguards for the prevention of accidents, which may cause environmental pollution and remedial measures for such pollution. The EA identifies mechanisms to notify the relevant authority in the event of a discharge of pollution exceeding the standards set.

3.1.2. THE ENVIRONMENTAL IMPACT ASSESSMENT NOTIFICATION 2006

The EIA notification dated 14th September, 2006 imposes certain restrictions and prohibitions on new projects or activities, or on the expansion or modernization of existing projects or activities based on their potential environmental impacts as indicated in the schedule to the notification, being undertaken in any part of India, unless prior environmental clearance has been accorded in accordance with the objectives of National Environment Policy as approved by the Union Cabinet on 18th May, 2006 and the procedure specified in the notification, by the Central Government or the State or Union territory Level Environment Impact Assessment Authority (SEIAA).

The notification has listed out the Projects or activities requiring prior environmental clearance under Category “A” and “B” based on the spatial extent of potential impacts, and potential impacts on human health and natural and man made resources. Category “A” projects require prior environmental clearance from MoEF on the recommendations of an Expert Appraisal Committee (EAC) and Category “B” projects require prior environmental clearance from State or Union territory Level Environment Impact Assessment Authority (SEIAA) on the recommendations of a State or Union territory Level Expert Appraisal Committee (SEAC). In the absence of a duly constituted SEIAA or SEAC, a category “B” project shall be treated as a Category “A” project.

New National Highways and expansion of National Highways greater than 30 km, involving additional right of way greater than 20m involving land acquisition is categorized as “A”. All new

State Highway projects and State Highway expansion projects in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive areas are categorized as “B”. Any project specified in Category ‘B’ will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas and (iv) inter-State boundaries and international boundaries.

The Expert Appraisal Committee (EAC) shall determine the Terms of Reference for conducting the EIA based on the information furnished in the prescribed application Form 1. For grant of environmental clearance, they will carry out a detailed scrutiny of the application and other documents like the Final EIA report, outcome of the public consultations including public hearing proceedings, proceedings to which the applicant shall be invited for furnishing necessary clarifications in person or through an authorized representative. On conclusion of this proceeding, the EAC shall make categorical recommendations to the regulatory authority concerned either for grant of environmental clearance on stipulated terms and conditions, or for resubmission/rejection of the application for environmental clearance, together with reasons for the same.

The provision of above notification is not applicable for the project and hence doesn't require environmental clearance. Since proposed project envisages the expansion of the existing State Highway and it is not located in hilly terrain (above 1,000 m AMSL) or ecologically sensitive areas.

3.1.3. COASTAL REGULATION ZONE NOTIFICATION, 2011

Vide CRZ Notification 2011, the Central Government has declared the coastal stretches of the country and the water area up to its territorial water limit as Coastal Regulation Zone and imposed restrictions on the setting up and expansion of industries, operations or processes etc. in the said Coastal Regulation Zone (CRZ). Following areas fall under CRZ:

1. The land area from High Tide Line to 500mts on the landward side along the sea front.
2. Land area between HTL to 100 mts or width of the creek whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea.
3. The land area falling between the hazard line and 500mts from HTL on the landward side, in case of seafront and between the hazard line and 100mts line in case of tidal influenced water body.
4. Land area between HTL and LTL.
5. The water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies.

Categorization of CRZ

I. CRZ I

- A. The areas that are ecologically sensitive and the geomorphological features which play a role in the maintaining the integrity of the coast.
- B. The area between Low Tide Line and High Tide Line.

II. CRZ II

- A. The areas that have been developed up to or close to the shoreline.

III. CRZ III

- A. The areas that are relatively undisturbed and those do not belong to either CRZ I or II which include coastal zone in the rural areas.

IV. CRZ IV

- A. The water area from the Low Tide Line to twelve nautical miles on the seaward side.
- B. The water area of the tidal influenced water body from the mouth of the water body at the sea upto the influence of tide which is measured as five parts per thousand during the driest season of the year.

V. Areas requiring special consideration

- A. (i) CRZ area falling within municipal limits of Greater Mumbai.
(ii) The CRZ areas of Kerala including the backwaters and backwater islands.
(iii) CRZ areas of Goa.
- B. Critically Vulnerable Coastal Areas (CVCA) such as Sunderbans region of West Bengal and other ecologically sensitive areas.

Activities permissible in CRZ under this notification are regulated and clearance needs to be obtained from the State Coastal Zone Management Authority for all permissible activities and subsequently from MoEF for the projects not covered in the EIA notification, 2006 but attracting para 4(ii) of the CRZ notification.

As the project road does not fall in CRZ areas, no clearance has to be obtained from State Coastal Zone Management Authority as per CRZ Notification, 2011.

3.1.4. FOREST (CONSERVATION) ACT 1980

The Forest (Conservation) Act, 1980 prohibits diversion of forestland for non-forest use. As amended in 1988, no State Government or Authority shall make such diversions except with the prior approval of the Central Government.

Section 2 of the Act restricts the State Government on the de-reservation of forests or use of forestland for non-forest purpose. Section 3 of the Act empowers the Central Government to constitute an Advisory Committee (to advice the Government on the proposals received by it for the use of forest land for non-forest purposes).

Guidelines for diversion of Forest lands for non Forest Purpose, 2004

As per the above guidelines for compensatory afforestation, a special provision was made for central government projects which states that,

Compensatory afforestation may be raised on degraded forest land twice the extent of forest area being diverted. Certificate of Chief Secretary regarding non-availability of non-forest land for compensatory afforestation will not be insisted.

The State Governments will identify 'blank forest' or degraded forest lands for compensatory afforestation. The State Governments of Madhya Pradesh and Rajasthan will identify such degraded forest land in their States for compensatory afforestation of central projects in their respective States as indicated by the Chief Secretaries of these two States in the meeting of Committee of Secretaries held on 15.11.96.

Hence, twice the area of forest land diverted for the project has to be compensated under the Compensatory afforestation plan.

As the project road does not requires diversion of forest land for widening of existing road, it does not require forest clearance under Forest Conservation Act, 1980.

Applicability of Forest (Conservation) Act to Roadside Strip Plantations

Large-scale plantations have been taken up by different state governments under social forestry and other programmes along the linear strips of lands, which had been acquired by Government Departments like Railway, Irrigation, PWD, etc. for specific purposes like laying of roads, railway lines and canals. In order to have a better control and management of these linear patches in many places these have been notified as protected forests. In the case of road projects, although the land is under the control of the highways department, due to its protected status, clearance is required to cut roadside trees. Applicability of the provisions of the Forest (Conservation) Act, 1980 to the linear (road or canal side) plantations was modified by a notification from the GoI, MoEF, dated 18 February 1998. The new notification recognizes that the spirit behind the Forest (Conservation) Act was conservation of natural forests and not strip plantations.

In the case of roadside plantations notified to be protected, the clearance now may be given by the concerned Regional Offices of the MoEF, irrespective of the area of plantation lost. While issuing the approval, in place of normal provision for compensatory afforestation, the Regional Offices will stipulate a condition that for every tree cut at least two trees should be planted. If the concerned Regional Office does not accord the decision within 30 days of the receipt of fully completed application, the proponent agency may proceed with the widening/expansion under intimation to the State Forest Department and MoEF.

In the case of roadside plantations not yet notified as protected forests will not attract the provisions of Forest (Conservation) Act, 1980 for the purposes of widening or expansion or re-alignment. However, permission from District Collector for each district is required to obtain for the cutting and transportation of trees along the road.

3.1.5. THE WATER (PREVENTION & CONTROL OF POLLUTION) ACT, 1974

This provides for the prevention and control of water pollution and the maintaining and restoring of the wholesomeness of water. 'Pollution' means such contamination of water or such

alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The act resulted in the establishment of the Central and State level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities. The project requires consent for establishment (CFE) from the State Pollution Control Board pursuant to the Water (Prevention and Control of Pollution) Act, 1974, since the project activity involves in discharge of waste water from labour camps.

3.1.6. THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

This Act provides for the prevention, control and abatement of air pollution. It is triggered by air polluting activity in an air pollution control area or when emissions of any air pollutant into the atmosphere exceed the standards set by the Central and State Boards.

The EA identifies air pollution control areas. The document identifies all air polluting activities and sources associated with the project. EA confirms that consent will be obtained for air pollution control area. The Environmental report describes mechanisms requested for the operation of industrial equipment to notify the State Board of an unforeseen release of air pollutants exceeding the standards. Remedial measures proposed to mitigate air pollution in air pollution control areas are described.

3.1.7. NOISE POLLUTION (REGULATION AND CONTROL) RULES 2000

As a result of considering the deleterious and psychological effects of the noise pollution on the human well-being, MOEF has drawn up the above rules, which have come to force with effect from February 14, 2000. According to the provisions of the rules notified a person might make a complaint to the designated 'Authority' in the event that the actual noise levels exceed the ambient noise standards by 10dB(A) or more as compared to the prescribed standards. The designated authority will take action against the violator in accordance with the provisions of these rules or other law in force.

The EA identifies all 'industrial', 'commercial', 'residential' and 'silent' zones within the project study area. EA assesses if the levels of noise generated by the project in any area exceeded the ambient air quality standards in respect of noise as specified in the Schedule of the Rules. The EA describes noise pollution control measures to achieve compliance with the ambient air quality standards in respect of noise. The EA document considers if a loudspeaker or public address system is needed for Project.

3.1.8. BIOLOGICAL DIVERSITY ACT, 2000

This Bill prevents persons undertaking biodiversity related activities without approval from the National Biodiversity Authority. It extends to the whole of India, and approval is required from the National Biodiversity Authority. There are particular restrictions if the Project involves the participation of non-Indian persons. The EA assesses if any biological resource is required for the Project (plants, animals and micro organisms or parts thereof). EA assesses if bio-survey or bio-utilisation is needed for the Project (surveyor collection of species, etc for any purpose). EA document outlines measure to avoid or minimize effects on biodiversity. This act is not applicable for the project, since no biological resources (plants, animals and micro organisms or parts thereof) are required for the project

3.1.9. THE WETLANDS (CONSERVATION AND MANAGEMENT) RULES, 2010

The Ministry of Environment and Forests today notified the Wetlands (Conservation and Management) Rules, 2010. These Rules have been drafted by the Ministry of Environment and Forests to ensure better conservation and management and to prevent degradation of existing wetlands in India.

Wetland conservation has been accorded a high priority in India. Since 1987, the National Wetlands Conservation Programme of India has been financially supporting wetland conservation activities all over India. Under the Programme 115 wetlands have been identified for conservation and management till date. India is also a party to the Ramsar Convention under which 25 wetlands from India are included in the list of wetlands of international importance.

The Wetlands (Conservation and Management) Rules, 2010 is a positive step towards conservation of wetlands in India. The Ministry of Environment and Forests, recognising the importance of having a legal framework for the preservation and management of wetlands in India, drew up a Regulatory Framework drawing upon the recommendation of a wide spectrum of experts and stakeholders. Under the Rules, wetlands have been classified for better management and easier identification. Central Wetland Regulatory Authority has been set up to ensure proper implementation of the Rules and perform all functions for management of wetlands in India. Apart from necessary government representatives, the Authority shall have a number of expert members to ensure that wetland conservation is carried out in the best possible manner.

In order to ensure there is no further degradation of wetlands, the Rules specify activities which are harmful to wetlands such as industrialization, construction, dumping of untreated waste, reclamation etc. and prohibit these activities in the wetlands. Other activities such as harvesting, dredging etc may be carried out in the wetlands but only with prior permission from the concerned authorities. The project doesn't require clearance under this rule also.

3.1.10. ANCIENT MONUMENTS AND ARCHAEOLOGICAL SITES AND REMAINS RULES, 1959

As per the Ancient Monuments and Archaeological Sites and Remains Rules, 1959 Permission required for construction, etc and no person shall undertake any construction or mining operation within a protected area except under and in accordance with a permission granted in this behalf by the Central Government. Every application for permission under sub-rule (1) shall be made to the Central Government in Form-I at least three months before the date of commencement of the construction or operation. Provisions of this act are not applicable for the project.

3.1.11. PUBLIC LIABILITY INSURANCE ACT, 1991

The purpose of this act is to provide for public insurance liability for the purpose or providing immediate relief to the persons affected by accident occurring while handling any hazardous substances. This Act is applicable to the project and the EA confirms that appropriate insurance policy will be considered for the same. EA identifies hazardous materials associated with the project. EA document identifies the major accident hazards and describes steps to prevent accident hazards and to limit their consequences to the environment. The EA indicates commitment to provide information, training and equipment to ensure workers safety. EA describes mechanisms to notify the concerned authority in the event a major accident occurs.

3.2. ENVIRONMENTAL LEGISLATION FRAMEWORK OF THE STATE**3.2.1. KERALA STATE FOREST DEPARTMENT**

The State Forest Department is responsible for the protection of designated land and forest resources. In the case of the current project road, some designated forest reserves are identified within the PIA. The responsibility of forest department also includes the protection and management of trees located within public ROWs such as the National Highways, State Highways, consistent with the other goals and policies of the GOI. In Kerala, the trees at the sides of the PWD land are the property of the Forest Department. The Forest Department indicated that permission from the local forest office would be necessary for tree removal from the Link 84 project road ROW. To avoid delays, application will be forwarded to concerned Forest Officer for an early approval for tree removal. During construction only those trees that will be required on safety point of view will be cut and removed. The trees that will have to be removed will be marked prior to cutting. This is required, as there could be slight changes in the alignment or design because of the Concessionaire's difficulties (e.g. for moving equipment). If such changes do occur a number of trees may be saved that would have been cut otherwise. Immediately after marking the trees, an application in plain paper (no prescribed application is available) will be filed with the local forest officer for obtaining a written permission.

3.2.2. KERALA COASTAL ZONE MANAGEMENT AUTHORITY

Kerala State Coastal Zone Management Authority (KSCZMA) has been established in compliance to the Orders of the Hon'ble Supreme Court in the matter 664 of 1993. The KSCZMA has been

set up under the Environment (Protection) Act, 1986 by the Ministry of Environment and Forests. The KSCZMA main role is to enforce and monitor the CRZ Notification, 1991. All developmental activities in the CRZ area have to be recommended by the KSCZMA in accordance with the CRZ Notification, 2011 and approved CRZ of Kerala dated 27th September, 1996 (which was prepared in compliance with the Orders of the Hon'ble Supreme Court in 664 of 1993).

The KCZMA have the power to take the statutory measures for protecting and improving the quality of the coastal environment and preventing, abating and controlling environmental pollution in the coastal areas of the State of Kerala. The Authority also deal with environmental issues relating to Coastal Regulation Zone which may be referred to it by the Kerala State Government, the National Coastal Zone Management Authority or the Central Government. KCZMA is also responsible to identify ecologically sensitive areas in the Coastal Regulation Zone and formulate area-specific management plans for such identified areas. The Authority also identify coastal areas highly vulnerable to erosion or degradation and formulate area specific management plans for such identified areas. The Authority ensures compliance of all specific conditions that are stipulated and laid down in the approved Coastal Zone Management Plan of Kerala.

3.2.3. KERALA STATE POLLUTION CONTROL BOARD

The State Pollution Control Board (SPCB) plays a major role in environmental management at the State level, particularly with regard to air and water issues. The main functions are to:

- Plan and execute state-level air and water initiatives;
- Advise State Government on air, water and industry issues;
- Establish emission standards based on National minimum standards;
- Issue consent orders (permits) for industrial air and water discharges;
- Issue "No Objection Certificates" for "industrial development" (defined in such a way as to include road projects).
- Publish statistics and disseminate information; and
- Take legal action against defaulters.

Action by the Kerala State PCB requires the submission of a questionnaire/application pursuant to the Water (Prevention and Control of Pollution) Act of 1974, the Cess Act of 1977 and Air (Prevention and Control of Pollution) Act of 1981. The prescribed public hearing fee is required to the project road under discussion in this report. The State PCB generally establishes a review panel and circulates the application for public review and comment in each affected district. In this case, such a review panel may not be required. The State PCB issues a No Objection Certificate (NOC) for follow up action.

3.2.4. STATE LEVEL ENVIRONMENT IMPACT ASSESSMENT AUTHORITY (SEIAA)

SEIAA Kerala has been constituted by Government of India in November 2011, authorising to deal with environmental Clearance for projects falling under category “B” of schedule in EIA notifications 2006. SEAC Kerala has also been constituted by Government of India to assist SEIAA Kerala

3.2.5. KERALA STATE PUBLIC WORKS DEPARTMENT

A designated minister and Secretaries of IAS rank in the State administrative machinery generally manage the Kerala State Public Works Department as in other States. There are Chief Engineers separately for buildings and road sectors. In the road sector, there are Chief Engineer (National Highways) and Chief Engineer (State Roads). The project roads fall under the responsibility of the Chief Engineer (State Roads).

Project Management Team (PMT)³.

The PWD has established a Project Management Team (PMT) with Superintending Engineers, Executive Engineers, Assistant Executive Engineers, and Assistant Engineers, Environmental Engineer, Sociologist and Land Development Officer with a support staff for the implementation of the project. A Chief Executive of IAS rank heads the PMT. Recently more members were inducted as additional members for land acquisition, financial management, irrigation etc. As a part of institutional strengthening, PWD has recently constituted five divisional offices as per GO (Rt) No.240/2002/PWD by redeploying existing staff positions. Details are provided with an organogram in the phase II EMP report.

The Project Management Team (PMT) was established exclusively for the implementation of Kerala State Transport Project. Prior to this, there was no institutional capacity within the Kerala State PWD to implement the environmental and social impact mitigation measures and the Environmental Management Plan during or after construction.

3.2.5.1. STATE ROAD POLICY

The PWD has recently adopted a State Road Policy. It aims at facilitating an efficient and safe road transportation system to fulfill the demand and the aspirations of the users for improving the quality of life and concomitant economic development. The policy document seeks to cover transportation of both passengers and freight, duly taking into account the environmental, technological, fiscal aspects related to motorized transport. The policy recognizes the important backward and forward linkages as manifest in developing an efficient road infrastructure on the one hand and the criticality of road safety on the other.

3.2.5.2. KERALA HIGHWAY PROTECTION ACT

The Kerala Highway Protection Act, 1999 approved by the State Government is a positive step towards achieving better roads in the State. The highlights of this new legislation are:

³ Formerly Project Implementation Unit (PIU)

- Prevention and control of encroachment
- Control of ribbon development

Setting up of Highway Authorities for notified highways with powers to execute developmental schemes, control ribbon development and prevent encroachment. An officer not below the rank of an Executive Engineer of the PWD will be in charge of each Highway Development Authority. This act is applicable to the project.

3.2.5.3. THE KERALA ROAD FUND ACT 2001

This act provides for:

- Collection of user charges by private sector participants in road / bridge, bypasses projects etc.
- Setting up of a road fund outside the consolidated fund of the State to which will be channelised.

10% of all motor vehicle taxes

All toll revenues collected under the provisions of Kerala Tolls Act, 1986

Contributions from central Road Fund, and

Other identified sources of revenue

- Setting up the Road Fund Board, an independent statutory body having powers to
 - Approve all participation agreements
 - Allocate from the road fund subsidies/annuities/other assistance to private participants

(Source: www.pwd.kerala.gov.in)

The PWD currently has no formal environmental internal review procedures. The PWD has now established an Environmental Management Unit (EMU) to develop an in-house capacity to implement and manage environmental and social issues related to the highways as part of the KSTP. The EMU will be responsible for the mitigation measures adopted during and following construction and is formed for the implementation of this project.

3.2.5.4. ENVIRONMENTAL MANAGEMENT AS PER PWD MANUAL 2012

In order to enhance the positive environmental impacts and abate/mitigate negative environmental impacts of construction activities and related works, special section has been included for environment management in the PWD manual 2012 . Good environmental management also ensures compliance with all applicable National, State and Local Environmental legislations. The PWD manual 2012 recommends an Environmental and Social Management Unit (E&SMU) in the office of Chief Engineer Administration & Designs and at the General Divisions level. The cell will provide advice on all aspects of the environment requirements included in the Manual and also be responsible for monitoring the effectiveness of the implementation. The cell shall also conduct random environment inspection/audit during and after execution of the projects..

An Executive Engineer shall head the Environment and Social cell, and will be assisted by an Assistant Executive Engineer (Environment)/ Environmentalist and an Assistant Executive

Engineer (Social), Sociologist and other support staff. The Environmental and Social Cell shall necessarily vet all major projects costing above Rs. 15crores for which detailed project report shall be prepared by the Project Preparation Unit (PPU).

All Engineers are responsible for ensuring that the environmental requirements warranted in the Manual are met in their respective job functions. Based on the works / projects being done, PWD needs to ensure that the necessary clearances are obtained prior to implementation and the clearance conditions are complied with during implementation. In the regular works / projects of the PWD, the environmental issues need to be properly and effectively managed. In principle, PWD needs to ensure the environmental compliance and safeguards in all its regular works / projects

To operationalise these activities, a standard EMP shall form a part of the PWD standard bid documents / contract agreements and shall be adhered to by the Concessionaire who executes the work. PWD shall strive to ensure that the Concessionaire's activities deliver quality construction without compromising on environmental performance. The standard EMP applies to the activities in construction site and ancillary activities such as the transportation of materials, sourcing of material and borrow areas. The Concessionaire is responsible for ensuring all sub-contractors and any other people working on the project are aware of environmental issues and are in compliance to the EMP requirements.

In the context of the regular works / projects, PWD shall review the standard EMP and other guidance documents in order to determine whether additional Bill-of-Quantities (BOQ) items are necessary to achieve good environmental performance. If required, PWD shall ensure that these additional BOQ items are included in the standard bid documents / contract agreements.

Documentary evidence shall be available to demonstrate compliance with the standard EMP. This can include periodic progress reports, file notes, audit reports, photographs, and minutes of meetings or video. The Concessionaire shall retain them in safekeeping for perusal by the PWD. Failure to reasonably satisfy and comply with the standard EMP requirements may result in the Concessionaire receiving partial payment against the contract claims and also a noting in the Concessionaire's performance certificate.

For certain works / projects, separate environmental impact assessments have to be conducted. This may be due to the MoEF requirements or funding agency – such as the World Bank or Asian Development Bank – requirements. This may also be due to the possible impacts on eco-sensitive areas or due to the large scale environmental impacts across the state. In all such cases, separate environmental impact assessments (EIAs) will be conducted and relevant environmental management plans (EMPs) will be prepared.

Conducting EIAs and preparing EMPs are studies that are done by external consultants on behalf of the PWD. Taking into account the particular context of these works / projects, the PWD shall prepare terms of reference for conducting the EIAs and preparing the EMPs. PWD shall refer to the EIA Notification 2006 for information on various aspects of conducting EIAs,

its knowledge of the state and the dimensions of the proposed works / projects in preparing the terms of reference. Based on the report outcomes, the project planning and design shall be changed so that the environmental impacts are minimized.

Like other civil works, the project-specific EMP shall form a part of the contract agreement and shall be implemented by the Concessionaire. Supervision of project-specific EMP implementation can be carried out by the PWD or given to Supervision Consultants (SC) based on the PWD capacity and the scale of the project. The Concessionaire has to prepare his schedule for the physical implementation of the project-specific EMP and take periodic consent of the supervision authority as stipulated in the project-specific EMP. PWD has to ensure that the Concessionaire obtains the necessary environmental clearances and also adheres to the project-specific EMP requirements through the pre-construction and construction stages.

After the construction stage is completed, the project-specific EMP will include activities during the operational phase. PWD shall ensure that these activities and ensure that the project-specific EMP is complied throughout the project cycle.

3.2.6. KERALA RESTRICTION ON CUTTING AND DESTRUCTION OF VALUABLE TREES RULES.

This Act is to provide the preservation of trees in the State of Kerala. As per this act, no person shall, without the previous permission in writing of the authorized officer, cut, uproot or burn, or cause to be cut, uprooted or burnt, any tree. No person shall cut or otherwise damage, or cause to be cut or otherwise damaged, the branch of any tree and no person shall, without the previous permission in writing of the authorized officer, destroy any plant of any tree or do any act which diminishes the value of any such plant. This act is not applicable to this project.

3.2.7. KERALA FOREST ACT AND ITS AMENDMENTS UP TO 2010

This act was enacted in Kerala in 1961 to unify and amend the law relating to the protection and management of forests in the state of Kerala. This act was amended many times. Permission is needed under this act for cutting of road side trees in the project corridors.

3.2.8. PADDY FIELDS AND WETLANDS CONSERVATION POLICY OF THE STATE GOVERNMENT

The Government of Kerala discourages all conversion of paddy cultivating areas to any other purpose. This activity is governed by the Land Utilisation Order of 1961 and the Kerala conservation of paddy land and wetland act, 2008. Due to the environmental impacts, the paddy field reclamation has been controlled to a great extent by the GOK. Several restrictive measures including total ban at certain locations are part of the statewide policy. As the present project doesn't convert any paddy land, this act is not applicable to the project.

3.2.9. PROTECTION OF RIVER BANKS AND REGULATIONS OF REMOVAL OF SAND POLICY OF THE STATE GOVERNMENT

The Government of Kerala discourages un-controlled sand mining from rivers. This activity is governed by the Kerala Protection of River Banks and Regulations of Removal of Sand Act,

2002. The current project does not envisage the sand mining and hence this policy is not applicable.

3.2.10. ECOLOGICALLY FRAGILE ZONE ACT 2007

It is important to highlight the Ecological Fragile Zone Act (2005) and its amendments (2006-07) in this context. This law is aimed at conserving ecologically fragile habitats in Kerala. Mangrove forests are also offered protection under this act. The Forest Department of Kerala is in the process of documenting most of the remnant natural mangrove patches and is attempting to bring a large portion of these patches under a Reserved Forest network. The process of notification began in early 2007 and is currently ongoing. Once this has been institutionalised, it is hoped that at least some of these patches will be conserved better. Our observations in the field and regular interactions over a period of six months with the Forest Department officials who are implementing the act indicate that it is perhaps the best possible management scenario to protect mangroves. This Act is not applicable to KSTP as no mangrove are disturbed / destroyed for this project.

3.2.11. OTHER STATE LEVEL LEGISLATION AND ACTS

The additional legislations, which are followed in Kerala, are as follows:

- Kerala Forest Rules
- Kerala Private Forests (Vesting and Assignment) Act
- Kerala Forest (Vesting & Management of Ecologically Fragile Lands) Act & Rules.
- Government Order – Kerala Forest (Vesting & Management of Ecologically Fragile Lands) Rules – Constitution of Tribunal
- Kerala Preservation of Trees Act
- Kerala Forest Produce Transit Rules
- Forest Settlement Rules
- Kerala Captive Elephants (Management and Maintenance)

In the particular context of the various construction activities, the provisions of these legislations should be kept in mind for their general relevance in the context of each works in the present project, but from clearance point of view, no clearance is required under the above state rules.

3.3. SUMMARY OF APPLICABLE POLICIES AND REGULATIONS

A summary of all applicable GOI policies and regulations are provided in the **Table 3.1**. Descriptions of all legal requirements are provided in this section.

Table 3.1. Summary of Applicable GoI Policies and Regulations

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
1	Tree felling permission	Kerala State Forests Department	Felling of avenue trees	Pre construction	KSTP
2	Consent to Establish under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For the entire project road	Pre construction	KSTP
3	Consent to Establish under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)	Concessionaire
4	Consent to Operate under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)	Concessionaire
5	Permission to store Hazardous Materials under Hazardous Waste (Management and Handling) Act 1989	Kerala State Pollution Control Board	Storage and Transportation of Hazardous Materials and Explosives	Construction (Prior to work initiation)	Concessionaire
6	Explosive license under The Explosives Act (& Rules), 1884 (revised in 1983)	Chief Controller of Explosives, petroleum & Explosive Safety Organization	Storage of explosive materials	Construction (Prior to work initiation)	Concessionaire
7	PUC for vehicles for construction under Central Motor and Vehicle Act 1988	Motor Vehicle Department of Kerala	For all construction vehicles	Construction (Prior to work initiation)	Concessionaire
8	Quarry lease deeds and license under The Mines Act, 1958	Mining and Geology Department of Kerala	Quarrying and borrowing operations	Construction (Prior to work initiation)	Concessionaire
9	Extraction of sand from rivers	District level Expert committee under district collector and local govt. body	Extraction of Sand from rivers	Construction (Prior to work initiation)	Concessionaire
10	Consent for ground water extraction	Kerala Ground Water Authority	Ground water extraction for construction camps	Construction (Prior to work initiation)	Concessionaire

3.4. CLEARANCE STATUS

The State level clearances are required prior to the World Bank Approval. Details are provided as follows.

From World Bank. The World Bank is the major source of funding for the Kerala State Transport Project in conjunction with State level investments, which are required for project preparation, land acquisition and counterpart funding. The Environmental clearance from the Bank is an integral part of the loan approval process.

From Government of Kerala. The clearance from State PCB is required under air and water acts. Permission from State Forest department required for roadside tree removal.

3.5. ENVIRONMENTAL REQUIREMENTS

The various environmental requirements of World Bank, GOI for the project are described below.

3.5.1. APPLICABILITY OF VARIOUS WB SAFE GUARD POLICIES

The World Bank has 10 safeguard policies; the details and applicability of the safe guard policies to the project road are provided in the **Table 3.2**. According to this policy detailed management plan must be prepared for all triggered policies.

Table 3.2. Applicability of World Bank Safe Guard Policies to KSTP II

WB Safe-Guard Policy	Subject Category	Triggered Or Not	Reason For Its Applicability	Mitigation Measures	Documentation
OP 4.01	Environmental Assessment	Triggered	Umbrella policy	All necessary mitigation measures incorporated.	EIA and EMP required. ⁴
OP 4.04	Natural Habitats	Not triggered	No significant conversion of land use/natural habitats or mangrove areas.	Adequate mitigation measures if affected.	An EIA and EMP required.
OP 4.36	Forestry	Not triggered	Not Applicable	Not Applicable	Not Applicable
OP 4.09	Pest Management	Not triggered	Not Applicable	Not Applicable	Not Applicable
OP 4.30	Involuntary Resettlement	Triggered	Road widening will lead to loss of livelihoods, loss of land and Buildings etc	comprehensive Resettlement Action Plan	Resettlement Action Plan prepared
OP 4.20	Indigenous people	Not triggered	No separate Indigenous people development Plan is required for the Project.	Resettlement Action Plan takes adequate measures	Resettlement Action Plan prepared

⁴ EIA and EMP prepared for Phase-1 was reviewed by an independent Consultant according to the Bank norms

WB Safe-Guard Policy	Subject Category	Triggered Or Not	Reason For Its Applicability	Mitigation Measures	Documentation
OP 4.11	Cultural Property	Triggered	A number of temples, shrines, churches etc are located adjacent to road ROW.	Adequate mitigation measures if affected.	RAP implementation report.
OP 4.37	Safety of Dams	Not triggered	Not Applicable	Not Applicable	Not Applicable
OP 7.50	International waterways	Not triggered	Not Applicable	Not Applicable	Not Applicable
OP 7.60	Projects in disputed areas	Not triggered	Not Applicable	Not Applicable	Not Applicable

OP. 4.01. Environmental Assessment

O.P. 4.01 intends to help ensure the environmental and social soundness and sustainability of investment projects and to support integration of environmental and social aspects of projects into the decision making process.

OP 4.01 specifies the environmental screening to be carried out for each proposed project to determine the appropriate extent and type of EA to be carried out. Projects are classified into one of following four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

- Category A:** A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. A comprehensive Environmental impact Assessment Report is to be prepared for a Category A project.
- Category B:** A proposed project is classified as Category B if its 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 projects. These impacts 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 projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A Environmental Assessment.
- Category C:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

The Bank classifies the KSTP as Category A, largely it is understood, based on the large number of project-affected people and the biodiversity of Kerala. In other words, the Bank classification

is based on the anticipated cumulative social and environmental impacts due to the construction and operation of the Project.

Further if sensitive areas are within the potentially affected environment of a project or sub-project (as in the case of Punalur – Ponkunnam – Thodupuzha project road under discussion), if significant socio-economic impacts are anticipated or if otherwise warranted, Category A environmental documentation is required at the project-level. Clearance for the overall Programme is obtained, provided that:

- The SEA is found to conform to the cited guidelines. (Refer: Box 3.1 of App. A 3.1)
- The SEA is accompanied or followed by detailed design and project-level environmental documentation when necessary and provides assurance that the environmental issues will be properly addressed in the subsequent phases of the Programme. And
- All other feasibility, design, mitigation plans and financial responsibility requirements are acceptable.

OP. 4.04. Natural Habitats

The objective of this policy is to promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions. Natural habitats are land and water areas where (i) the ecosystems' biological communities are formed largely by native plant and animal species, and (ii) human activity has not essentially modified the area's primary ecological functions. As per O.P. 4.04, the Bank does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs. Since no such sensitive natural habitats are observed in the project villages, Operational Policy 4.04 is not applicable to the project..

OP. 4.10. Indigenous Peoples

In the Indian context, the application of O.P. 4.10 is equated with the impacts to tribal population. As there is no tribal population in the sub-project villages, this policy is not applicable to the project.

OP. 4.11. Physical Cultural Resources

This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Impacts on physical cultural resources should be addressed as an integral part of the EA process. The following projects are to be classified during the environmental screening process as Category A or B:

- Any project involving significant excavations, demolition, movement of earth, flooding, or other environmental changes; and
- Any project located in, or in the vicinity of, a physical cultural resources site.

The proposed project does not fall in any of the categories described above.

OP. 4.12. Involuntary Resettlement

The bank's policy on involuntary resettlement covers those displaced by the project's activities. For any sub-project involving land acquisition and associated impacts, a draft RAP is required, prior to the approval of sub-project and borrowers will implement the RAP in advance of sub-project implementation. Since no land acquisition is involved in this sub-project, RAP is not prepared for this sub-project.

OP. 4.36. Forests

The objective of this policy is to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests. This policy applies to the following types of Bank-financed investment projects:

- Projects that have or may have impacts on the health and quality of forests;
- Projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests; and
- Projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantations, whether they are publicly, privately, or communally owned.

The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical natural habitats. Even though the current project road passes through some forest areas, no forest area is diverted for this project and hence the proposed project does not affect any forest areas or related natural habitats.

3.6. SOCIAL IMPACTS-REQUIREMENTS

The World Bank has set out certain mandatory social impact mitigation requirements for loan projects. The Operational Policy 4.30⁵ describes the Bank's policy and procedures for projects that involve involuntary resettlement. *This policy aims to improve, or at a minimum, sustain the same standard of living of the people who will be displaced because of a development project.* The policy also requires that projects minimize the need for involuntary resettlement. Where displacement is unavoidable, resettlement plans should pay particular attention to the vulnerable groups. In addition, the World Bank has special guidelines for addressing impacts upon the indigenous communities due to infrastructure projects.

3.7. ENVIRONMENTAL STANDARDS AND CODE OF PRACTICES

3.7.1. NATIONAL ENVIRONMENTAL STANDARDS RELEVANT TO THE PROJECT

3.7.2. STANDARDS FOR AIR QUALITY

National Ambient Air Quality Standards are presented in **Annexure 3.1**. While conducting environmental monitoring during the construction stage, the ambient air quality results should be

⁵ Involuntary Resettlement, The World Bank Operational Policy 4.30, June 1990

compared with these standards and mitigation measures should be carried out if air pollution is exceeding the standards. Further, air quality modeling should be conducted for construction and operation stages of the project and mitigation measures should be carried out where air pollution is expected to be exceeding the standards.

The vehicles used for construction should meet the emission standards set by CPCB, which are presented as **Annexure 3.2**.

3.7.3. STANDARDS FOR NOISE LEVEL

National Ambient Air Quality Standards for noise are presented as **Annexure 3.3**. While conducting environmental monitoring during the construction stage, the noise level results should be compared with these standards and mitigation measures should be carried out if noise levels are exceeding the standards. Further, noise barriers should be constructed for sensitive receptors where traffic noise level is expected to be exceeding the standards during the operation stage of the project, based on noise level modeling.

The Central Pollution Control Board (CPCB) has specified that the maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity up to 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 meter from the enclosure surface. The diesel generators used for the project should meet this noise limit.

Further, the vehicles used for construction should meet the noise limits set by CPCB, which are presented as **Annexure 3.2**.

3.7.4. STANDARDS FOR WATER QUALITY

National standards for drinking water (IS:10500) are presented as **Annexure 3.4**. National Standards for inland surface waters subject to pollution (IS:2296) are presented as **Annexure 3.5**. During environmental monitoring, ground water quality results should be compared with IS:10500 and surface water quality results should be compared with IS:2296. Pollution sources should be identified and mitigation measures should be carried out where water pollution is exceeding the standards.

National standards for discharge of effluents are presented as **Annexure 3.6**. Any effluent discharge from the construction camps should meet these standards.

3.7.5. STANDARDS FOR SAMPLING AND ANALYSIS OF AIR AND WATER

Various Indian Standards (IS) published by Bureau of Indian Standards for sampling and analysis of air and water should be followed by the laboratories conducting environmental monitoring of the project.

3.7.6. CODES OF PRACTICE OF INDIAN ROAD CONGRESS

Codes of Practice of Indian Road Congress (IRC), particular to environmental issues, which are relevant to the proposed project are presented as **Annexure 2.3**. These guidelines should be followed by the implementing agency during road construction.

CHAPTER 4. APPROACH AND METHODOLOGY

4.1. BASIC APPROACH

The earlier EIA report has been prepared and presented as per requirements of the Environmental Impact Assessment notification, 2006 of Ministry of Environment and Forests (MoEF) under the Environment Protection Act, 1986 and World Bank Operational Policy 4.01. The guidelines of the Indian Road Congress (1989) and Environmental guidelines for Rail / Road / Highway projects of MoEF have also been followed. This report was reviewed independently and updated to reflect the present scenario. Thus, the current report is an updated version of earlier report.

The EIA process generally involves a number of steps in a logical sequence to be followed in order to have a clear insight into each and every aspect of the project. The findings of the Environmental Impact Assessment provided important feedback to the design/technical team especially in terms of the environmentally sensitive areas, utilities / facilities affected, water logged stretches and drainage patterns. It helped to modify the designs at locations where impacts had to be avoided and incorporate mitigation measures wherever the impacts were unavoidable due to other constraints. The major steps and their sequence adopted for the EIA of the present study are as follows.

The main concerns that have influenced the methodology of KSTP in general were many; nevertheless together with engineering studies and the Environmental Impact Assessment process there remain few typical concerns to address.

- Very high magnitude of social impact upon widening to full IRC standard road designs.
- Determination of practically possible optimum level of widening to a more or less fair width to cater for predicted traffic within the design life.
- High number of accidents especially those involving pedestrians.
- Very high land cost on the sides of the project road

4.2. STEPS IN THE PROCESS

4.2.1. ENVIRONMENTAL SCREENING

The Environmental Impact Assessment of the proposed improvements for the project road began with the adoption of an Environmental Screening procedure during the feasibility stage. The purpose of the screening was to review the proposed project activities and broadly identify the key environmental issues related to the project such as environmentally sensitive receptors along the alignment, change of land use; impacts on surface water bodies, availability of borrow areas, impacts on community facilities, impacts on ecologically sensitive areas, etc. The information gathered during the screening process helped in identifying the areas of concern along the stretch and critical issues to be studied in detail. As the project has already been screened, no screening has been done during updation stage.

4.2.2. SCOPING

The scope of study for this assessment was determined by the requirements of the World Bank, earlier experience of the consultants on similar projects and discussion with experts. In addition, critical environmental issues identified during the screening process were also added to the scope of the study.

4.2.3. DELINEATION OF PROJECT IMPACT ZONE

To study the impacts of the project, two major zones have been identified that shall give fair idea of the impact on the project corridor:

- Direct Impact Zone (DIZ): This consists of a strip of land on either side of the centre line of the proposed alignment. 500 m width on either side of the centre line has been adopted for detailed inventory of environmental features.
- Indirect Impact Zone (IIZ): This consists of a strip of land of 15 Km width on either side of the proposed carriageway. Here, the existence of sensitive features was identified and possible impacts on them due to the project corridor were assessed.

4.2.4. RECONNAISSANCE SURVEYS

The environmental and the design team of the Consultants visited the project road alignment and information on each kilometer was collected using formats specifically prepared for each environmentally sensitive feature. The chainage-wise tree count mentioned in the earlier report for the entire stretch was also verified and updated on the basis of present design considerations. In October 2012, the environmental team carried out reconnaissance surveys for updating the earlier documentation of the environmental investigations and issues. In addition to field investigations and observations, further consultations were held with local officials and available environmental documentation was assembled for review.

4.2.5. SECONDARY DATA COLLECTION

Secondary information was collected from Survey of India Toposheets and District Planning Maps, Forest Working Plans, District Gazetteers, District Census Handbooks and other Government publications as well as earlier project reports prepared for the project region.

4.2.6. BASELINE ENVIRONMENTAL MONITORING

Fresh environmental monitoring was carried out for determination of ambient air quality, water quality, and noise level at various locations along the proposed alignment to establish the baseline status of these environmental parameters along the project area.

4.2.7. ESTABLISHING BASELINE ENVIRONMENTAL PROFILE

Documentation of the baseline conditions was updated. The data collected through the reconnaissance surveys and environmental monitoring were entered into specific data entry formats for ease of analysis. Qualitative analysis was also carried out for parameters requiring descriptive data. Baseline environmental profile of the project impact zone was established by the compilation of all the above-mentioned information.

4.2.8. IDENTIFICATION AND EVALUATION OF POTENTIAL IMPACTS

Impacts of the project on various environmental components were identified at pre-construction, construction and operation phases of the project on the basis of assessment of proposed project activities and analytical review of baseline environmental status of the project impact zone. Further, the impacts were categorized into permanent or temporary and highly significant, moderately significant, less significant and non significant based on the character and magnitude of impacts.

4.2.9. ASSESSMENT OF ALTERNATIVES

The analysis of alternatives assumes very high significance for an Environmental Impact Assessment (EIA). The 'no action option' is to be considered among various options available. The process will ultimately help to determine which option is comparatively better than the other various options. In all studies at least few options are considered prior to the final selection of the alternative nevertheless the documentation is rarely carried out. The documentation will further improve the thought process towards various options considered. Various alternatives were assessed during the entire process of the study and a detailed study on identified alternatives were carried out during feasibility report preparation to minimize the impacts on environmental and social profile of the project impact zone

4.2.10. FINALISATION OF ALIGNMENT

Physical verification of the alignments in terms of the number of trees along the Highway and the presence of schools, hospitals and shrines was surveyed. The presence of built-up areas along most of the roadside made this the single largest parameter for alignment options. However in the case of various project roads social parameters determined the options. This was independently analysed to establish the viable design options. Most of the alignments were influenced by this criterion.

4.2.11. MITIGATION AND ENVIRONMENTAL ENHANCEMENT MEASURES

Environmental concerns were identified in the early stages of project preparation. This has enabled to streamline the design process and to avoid or otherwise mitigate potential impacts. Others will require appropriate actions in the construction and operational phases. Positive actions, not only avoid adverse impacts, but also capitalise on opportunities to correct environmental degradation or improve environmental conditions and were determined as documented in Chapter 9.

4.2.12. IDENTIFICATION OF THE REQUIREMENTS OF ENVIRONMENTAL REGULATIONS

Various government policies, laws, regulations and guidelines applicable to the project were reviewed with respect to identified environmental impacts. This established the need of various environmental clearances required for the project from respective government agencies.

4.2.13. INTEGRATION OF IMPACTS IN THE DESIGN PROCESS

The environmental impacts identified through the earlier tasks were used in the design formulation process to integrate environmental issues and for early identification of suitable mitigation measures. This task helped in identification of the required shifts in alignment based on environmental sensitive features and cultural resources along proposed alignment.. The consideration of environmental issues was an integral part of Highway Project preparation-a process generally referred to by the World Bank as "mainstreaming the environment". The design and decision-making process was undertaken so that environmental and resettlement and rehabilitation issues prompted appropriate actions. Such actions included a shift in alignments or a curve improvement based on road safety considerations. Such adjustments were weighed against benefits derived from reductions in village congestion, and improvements in road safety, and were incorporated in the design process. It was also necessary to ensure the maximum practical avoidance of sensitive areas (e.g. shrines, hospitals and forest areas) and adverse impacts upon the project affected persons, etc.

4.2.14. PREPARATION OF ENVIRONMENTAL MANAGEMENT PLAN

Much of the environmental degradation that happens during the construction stage of a highway can be prevented or controlled, if there is an appropriate system in place. Hence, this EMAP table has been specifically designed to capture all the impacts that take place during the entire life cycle of a project from design to operation stage. Accordingly, a thorough activity analysis was carried out listing out all the project activities, based on which an impact identification matrix was prepared to understand the impacts upon various environmental parameters such as land, water, air, noise, flora and fauna. Lastly, socio-economic impact upon people and solid waste generation was also considered as separate impacts.

Based on this exercise, a totally new Environmental Management Plan (EMP) has been prepared suggesting various mitigation measures to avoid or minimize the impacts of the project on the environment during the pre-construction, construction and operation phases. Two sets of guidelines were prepared and incorporated in the Generic EMAP table of EMP reports to enable the Concessionaire to implement the project with least impact upon the environment– (i) Guidelines for entire project stretch including the project facilities like camps and sites and (i) Guidelines exclusively for siting, management and restoration of project facilities like camps and sites. **Table 4.1** gives the list of these guidelines:

Table 4.1. Guidelines in Generic EMAP

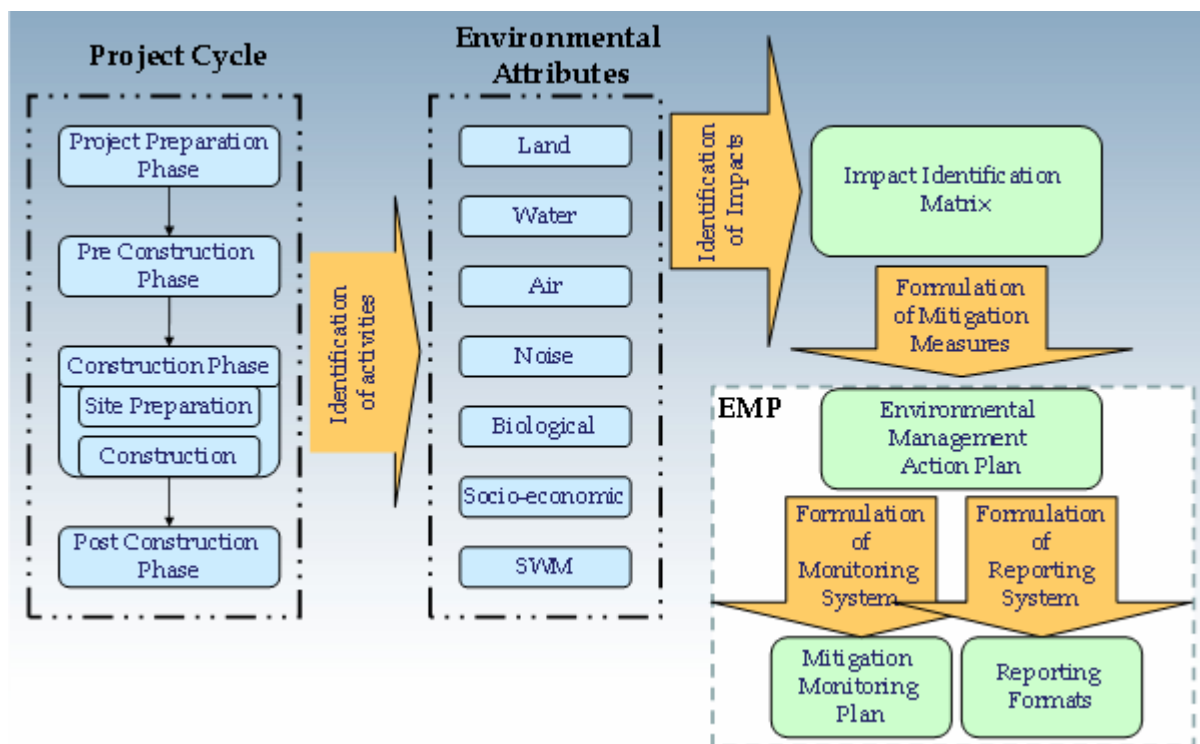
Sl. No.	Title
A	Guidelines for entire project stretch
1.	Guidelines for preparing comprehensive waste management plan
2.	Guidelines for top soil conservation and reuse
3.	Guidelines for Provision of Noise Barriers
4.	Guidelines to Ensure Worker's Safety during Construction
5.	Guidelines for Preparation of Traffic Management Plan
6.	Guidelines for Storage, Handling, Use and Emergency Response For Hazardous

Sl. No.	Title
	Substances
7.	Environmental monitoring plan
B	Guidelines for project facilities
1.	Guidelines for siting, management and redevelopment of construction camps
2.	Guidelines for siting, management and redevelopment of labour camps
3.	Guidelines for siting, management and redevelopment of quarrying and stone crushing operations
4.	Guidelines for siting, management and redevelopment of borrow areas
5.	Guidelines for siting and management of debris disposal site

The guidelines for project facilities have been structured with following objectives:

- (i) It facilitates the selection of a site with least environmental impact,
- (ii) It looks into the satisfaction of the land owner in case of leased out / rental out lands,
- (iii) It guides the Concessionaire with step by step measures in setting up of an efficient and environment friendly camp / site,
- (iv) It ensure smooth, safe and efficient functioning of these camps and sites
- (v) It guides the Concessionaire in preparing a camp / site management and restoration plan to be submitted to IE (prior to setting up of the camp/site)
- (vi) It facilitates restoration of the site at the closure stage in a very environment friendly manner.

EMP assigns the responsibilities for various actions identified to limit the adverse impacts of the project. An environmental monitoring plan and an institutional framework have been proposed as part of the EMP for proper implementation and monitoring of mitigation measures. The cost for implementing the proposed environmental mitigation measures and carrying out the environmental monitoring has been worked out and is presented as part of the EMP for necessary budgetary allocations as part of the project cost .In order to implement various environmental requirements during pre construction, construction and operational phases, all mitigation and enhancement measures have been clearly built in to the Environmental Management Plan. All necessary mitigation and enhancement costs have been part of the BOQ.



4.2.15. LESSONS FROM REVIEW OF EMP IMPLEMENTATION, KSTP PHASE - I

The major findings from the review of implementation of EMP for KSTP – Phase – I, conducted by Wilbur Smith Associates in 2010 are given below:

Sl. No.	Issues in implementation of EMP	Measures incorporated in EMP for KSTP Phase-II
1.	Lack of commitment by Concessionaires IE is helpless to take action against Concessionaire	Penalty clause is included in the contract document
2.	Lack of awareness	Training by IE and KSTP
3.	Too many reporting formats	A simplified reporting and monitoring system has been evolved with fewer reporting frequency.
4.	Impractical instructions in EMP	Unfeasible measures have been simplified – for eg. Criteria of siting project facilities has been relaxed considering the topographic features of Kerala. Specific guidelines are added to enable the Concessionaire implement the EMP very effectively.

A new monitoring and reporting system has been designed keeping above issues in mind, so that it ensures a smooth implementation of the EMP. The same is detailed in EMP Report.

4.2.16. CONTINUOUS PUBLIC CONSULTATION AND PARTICIPATION

Consultations with community or other stakeholders are an integral part of the Project activities. The official level consultations started with the Kerala State Transport Project (KSTP) environmental investigations at the beginning of the project as early as in 1999. These consultations were considered for the environmental screening study carried out as a part of the

Feasibility study reported in April 2000. The outcome of these consultations has been considered in the preparation of various submissions including the earlier Environmental Impact Assessment Report. Consultation in this DPR and EIA updation stage is required for dissemination of project information, for finalising subproject sites and alignment and for disseminating information on incorporation of social and environmental safeguards in the subproject design. Consultations with concerned officials, agencies and potentially affected persons continued throughout the EIA updation process and is supposed to continue as the project proceeds. The details of various consultations have been recorded for review and is provided in the chapter 6 - Public participation and consultation.

CHAPTER 5. BASELINE ENVIRONMENT

The baseline environmental aspects of the link 84 are provided in this Chapter. The data pertaining to the environmental scenario of the project location and Project Influence Area (PIA) is provided as defined in the **Chapter 4**. This Chapter describes the relevant physical, biological, social and environmental components along the project corridor. The project road is the most important road relating to Sabarimala pilgrimage. Hence the improvement of this road would address the requirement of the Sabarimala pilgrims during November, December and January period every year.

The Environmental Data sheets, presenting all important features of project corridor has been presented in a separate volume in **Table 2.1** of stand-alone document EMP Report. The Corridor of Impact as defined by the MOEF is documented for this study. In addition to the SEA findings, the Environmental Assessment carried out also indicated that this road qualifies for a comprehensive Environmental Impact Assessment (EIA) as per the GOI and MOEF guidelines. Baseline data and the existing conditions in the potentially impacted area are provided according to the World Bank and the GOI requirements. The discussions of potential impacts and mitigation measures that follow in Sections 7.0, and 9.0, follow the same sequence and numbering pattern.

5.1. METEOROLOGICAL AND CLIMATIC CONDITIONS

The entire Kerala region experiences a uniform climate with respect to physiographic location. No distinct winter and summer season are experienced in Kerala. Temperature, Rainfall and Humidity of the area are presented here. The seasonal variation of temperature and relative humidity in Kerala are not significant. The temperature inversions and winds are major factors influencing air quality. The frequency and intensity of rainfall cause drainage and flooding problems leading to the severe deterioration of the road fabric. The climate of Kerala can be broadly grouped into the following seasons in **Table 5.1**. Climatic condition of project districts is shown in **Figure 5.1** to **Figure 5.4**.

Table 5.1. Climate of the Project Area

Sl. No	Monsoon Type	Period	Intensity
1	SW Monsoon	June, July, August and September	Very Heavy Rainfall (Up to 70 % of the total rains)
2	NE Monsoon	October, November and December	Heavy rainfall
3	Non Monsoon	January, February, March, April and May	Occasional rains

(Source: Meteorological Centre, Thiruvananthapuram)

This classification is adopted in the Environmental Assessment process; since the dynamics of the two monsoon seasons are different, the two monsoon seasons cannot be treated together. Normally the classification pre-monsoon, monsoon and post-monsoon seasons are taken for general purposes. The general term ‘monsoon’ always represents the entire monsoon period from June to December.

5.1.1. TEMPERATURE

In Kerala, during winter and summer a small relative variation of temperature are experienced hence it is neither very cold in winter nor very hot in summer. The mean maximum daily temperature within the considered corridor, even in the coldest month (January) rarely falls

below 21° C. The 'hot' season is from March to May when temperature reaches 37-38 ° C, the annual temperature variation is only 5 ° C.

5.1.2. RAIN FALL IN THE REGION

The onset of the monsoon normally occurs in early June in Kerala. Widespread heavy downpours are recorded until well into September. Usually 70-85 percent of the total annual rainfall occurs during June, July, August and September. The southwest monsoon lasts from the end of May until September, with peak average monthly rainfall in June (330mm) at Kovalam (Thiruvananthapuram). The northeast monsoon is in October and November with a peak average monthly rainfall in October of 280 mm at Kovalam (Thiruvananthapuram). The minimum average monthly rainfall of 20 mm occurs in January.

The average annual rainfall (from 1988-1995) of the PIA districts of the road is presented in **Table 5.2.**

Table 5.2. Average Annual Rainfall for State and Districts

District	Average	1988	1990	1995	2005	2010
Kerala State	2961	2653	2780	2952	2990.2	3024
Kollam	3739	2181	2018	2968	2428	2789
Pathanamthitta	2414	-	2834	3029	3349	3243
Kottayam	3263	2802	2913	3354	3386	3671
Idukki	2889	3813	3782	3555	5707	3569

(Source: Meteorological Centre, Thiruvananthapuram)

Table 5.3. Wind Direction and Speed for the Districts

Location	Predominant Wind Direction	Sheltering Effect	Maximum Wind Speed km/Hour	Number Of Calms Morning / Evening
Punalur	NW	Yes	<5	86/11
Kochi	NW	Coastal-No	20	50/7
Alappuzha	NW	Coastal-No	20	2/0.3
Thiruvananthapuram	NW	Coastal-No	20	49/9

(Source: Resource atlas of Kerala, 1984)

The percentage humidity is generally high in the regions and it varies between 90-95% in July August and 60% in January. The high level of humidity coupled with the relatively high temperature results in high unbearable sweating in human beings. The evapo-transpiration of the dense vegetation could be the main factor for the high humidity.

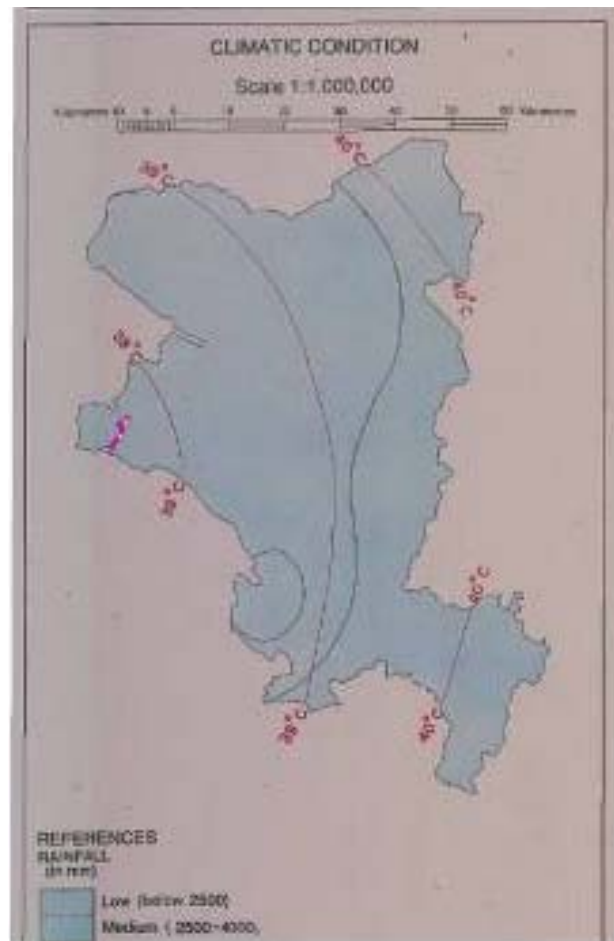


Figure 5.1. Map of the Idukki District Showing Climatic Condition

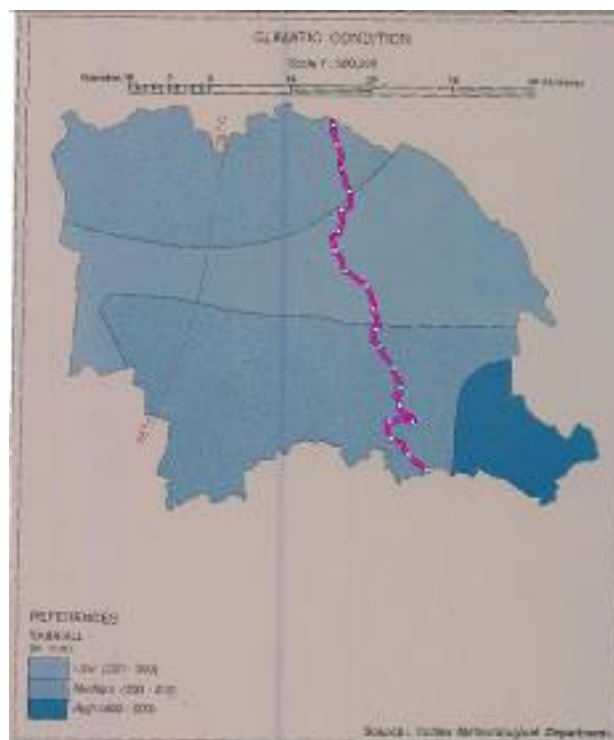


Figure 5.2. Map of the Kottayam District Showing Climatic Condition

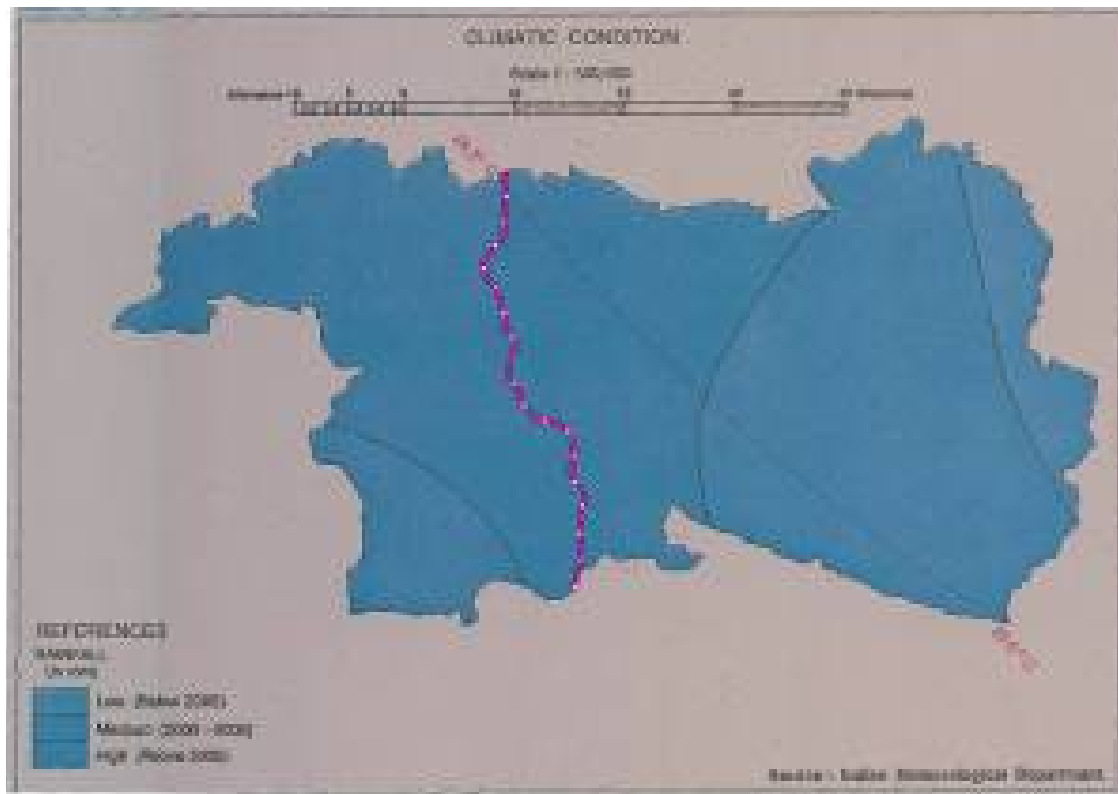


Figure 5.3. Map of the Pathanamthitta District Showing Climatic Condition

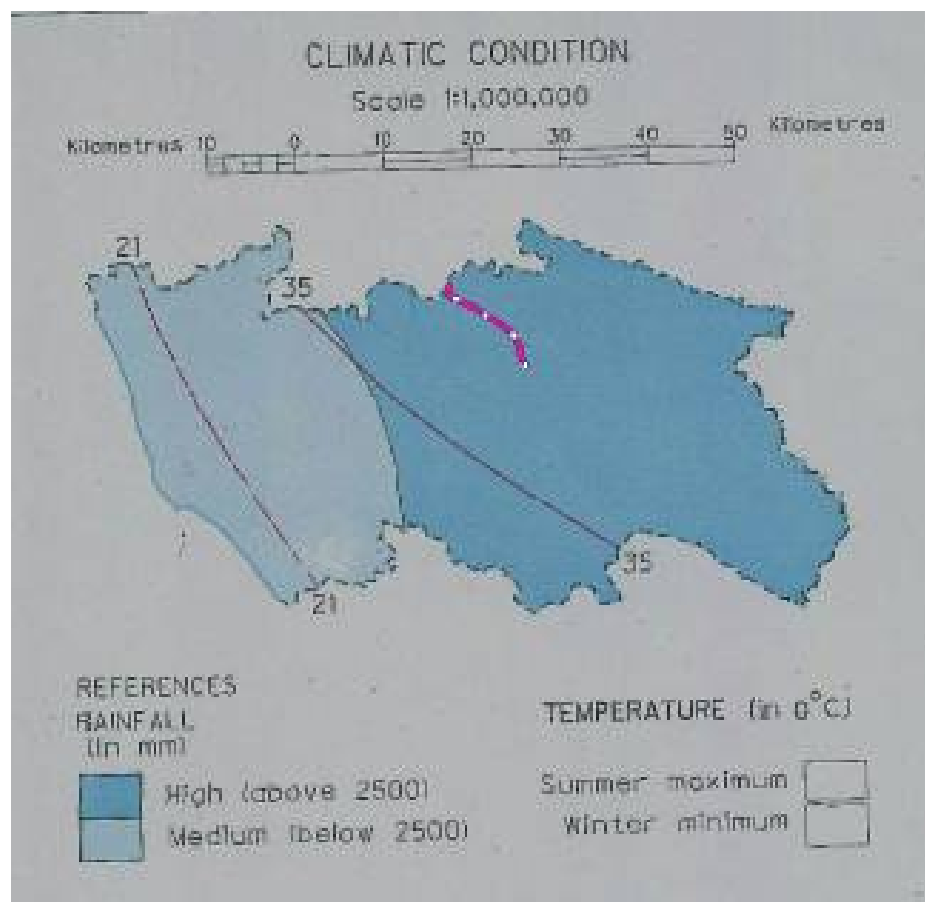


Figure 5.4. Map of the Kollam District Showing Climatic Condition

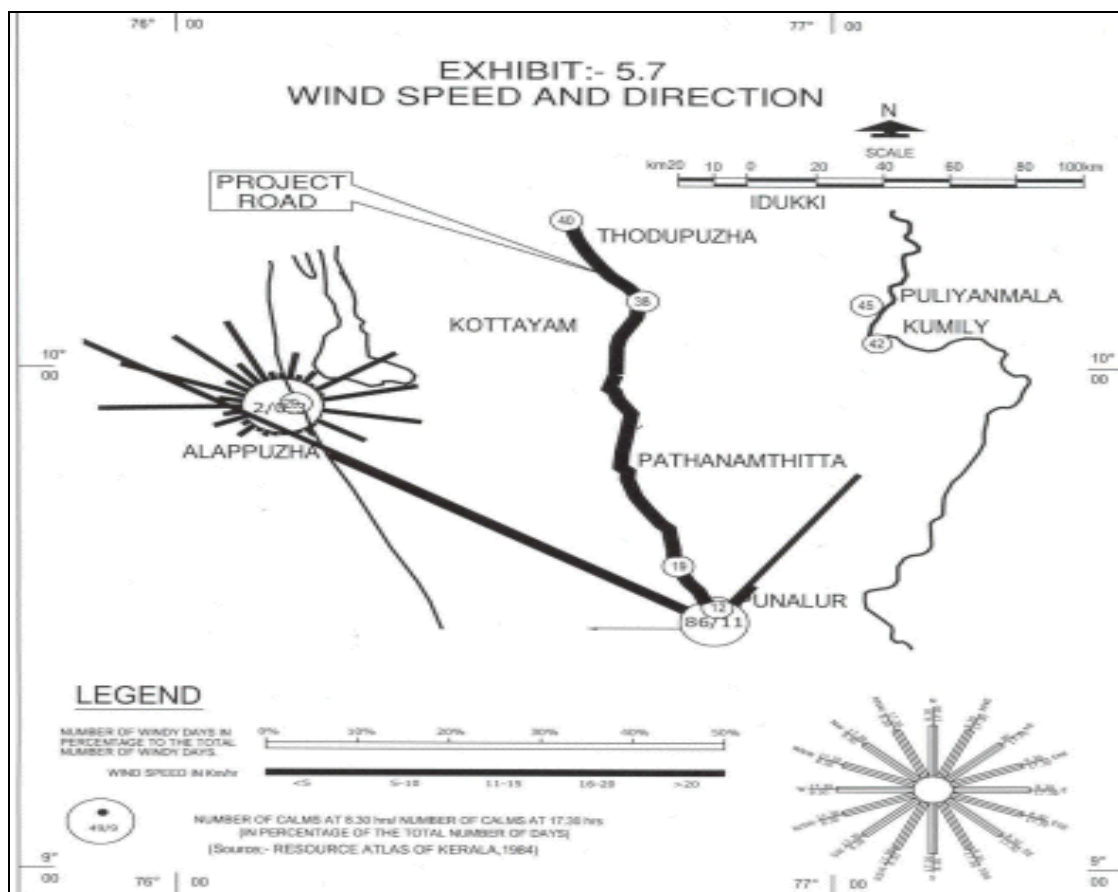


Figure 5.5. Wind Speed and Direction in PIA

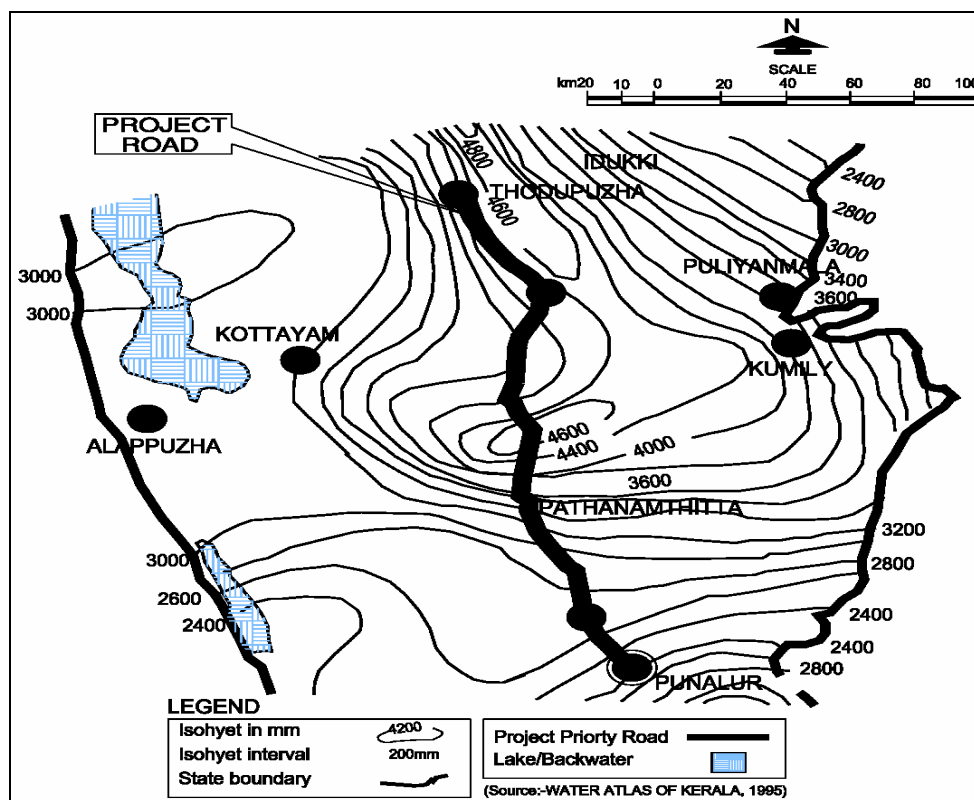


Figure 5.6. Project Road in Relation to Isoheytal of the Region

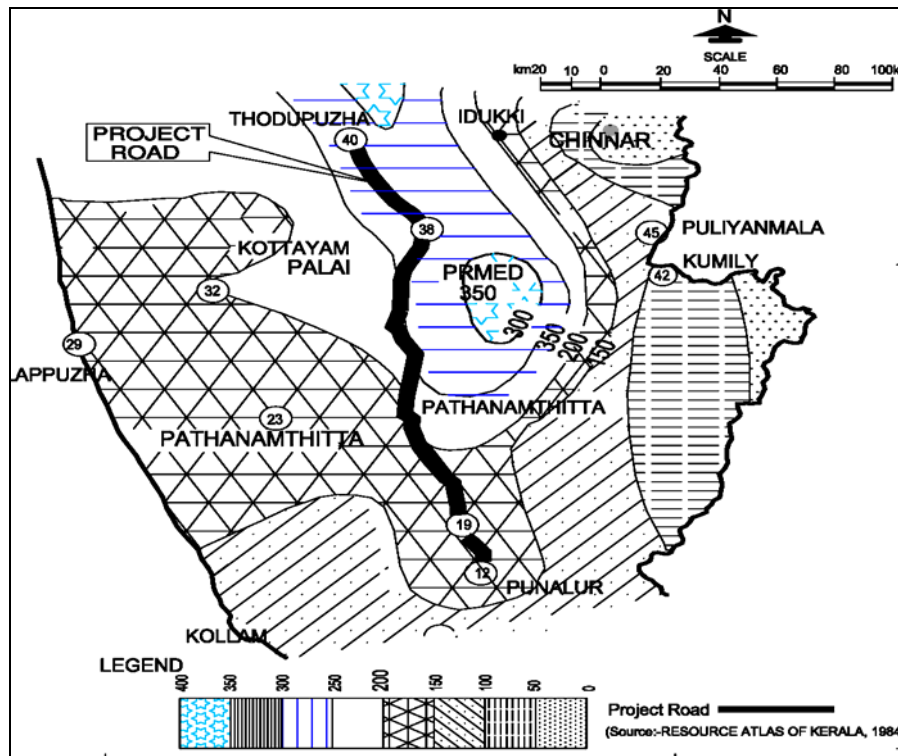


Figure 5.7. Project Road in Relation to South West Monsoon

5.2. REGIONAL PHYSICAL SETTINGS

5.2.1. PHYSIOGRAPHY

The project districts may be broadly divided into three natural topographic divisions. These are from west to east, the coastal plains called the lowlands (<7m msl), central undulating terrain called midlands (7m-76m), and the forest clad high ranges (forming part of Western Ghats) called the highlands (>76m).

The project road however passes through Midland and highlands only and the elevation of the Project-Influenced Area from the mean sea level (m.s.l) is 15 -165 m. The topography is undulating with an average elevation of about 50m above m.s.l. The mid land area is characterized by rugged topography formed by small hillocks separated by deep valleys. The general slope of the area ranges from 0 – 10% and slopes generally towards west. The hill ranges can be subdivided into foot hills, plateau region and high ranges. The foot hill region is a narrow strip of land where midland region grades into the plateau regions.



Figure 5.8. Forest Area at Ponthanpuzha along the Project Road

The **Figure 5.8** shows the forest area in the project road.

5.2.2. GEOLOGICAL CHARACTERISTICS

All PIA districts are located in the hard rock terrain mostly covered by crystalline rocks of Archaean and Pre-cambrian ages. The common country rocks include charnockites, granites and khondalites. The schist's and gneisses also occur in some areas of the PIA. The charnockites are the most prominent rock types among the crystalline rocks. The top layer is often converted to lateritic (hard) and laterite soil by residual concentration and enrichment of the country rocks mentioned above in the prevailing climatic conditions. **Figure 5.9** to **Figure 5.10** shows the geology and mineral distributions for Idukki, Kottayam, Pathanamthitta and Kollam districts respectively.

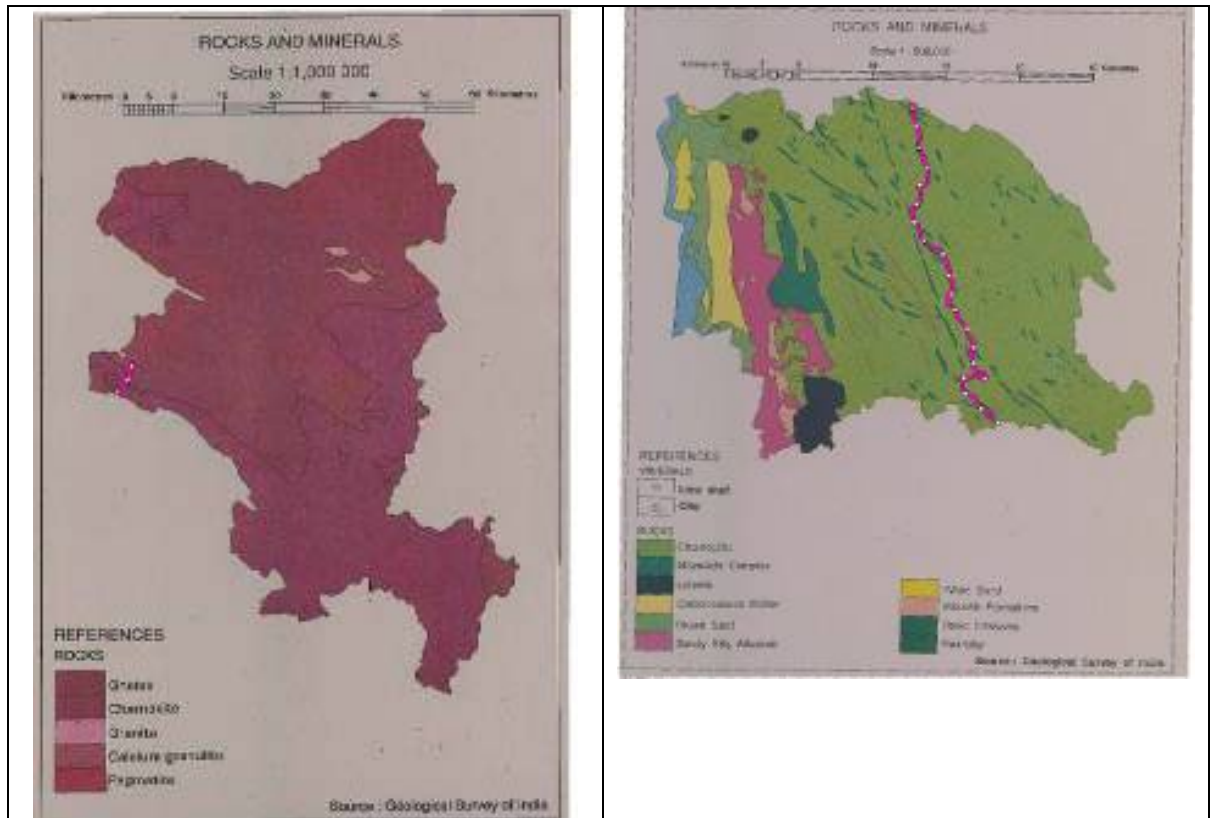


Figure 5.9. Maps of the Idukki & Kottayam Districts Showing Rocks and Minerals

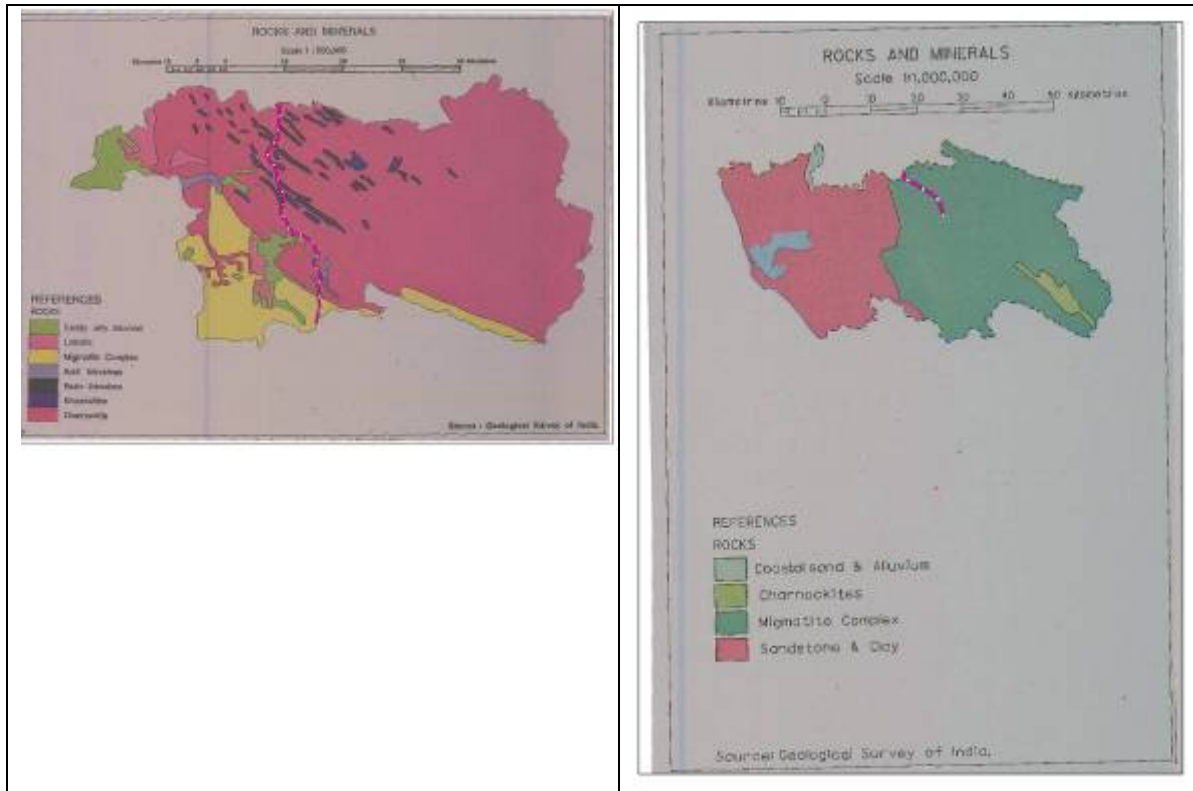


Figure 5.10 Maps of the Pathanamthitta and Kollam Districts Showing Rocks and Minerals

5.2.3. SEISMIC CHARACTERISTICS

The entire Kerala region experienced earth tremors during 2000-2002. Except two tremors that occurred in south Kerala, all other tremors were of minor scale. The project corridor is within the Seismic Zones III as defined by the Indian Standard (IS) 1893-1984 Seismic Zoning Classification. The classification ranks potential seismic risk on a scale from I to V in which Zone I is the most stable and Zone V with basic horizontal seismic coefficient (α_0) of 0.08 is considered to be the least stable. The basic horizontal seismic coefficient (α_0) for Zone III is 0.04.

5.2.4. SOILS

There are four major soil types found in the district. They are forest loam, lateritic soil, brown hydromorphic soil and alluvial soil.

Forest loam: Forest loam is the product of weathering of the rock under forest cover. They are characterised by a surface layer very rich in organic matter. They are generally acidic, high in nitrogen and poor in bases, due to heavy leaching. They are dark reddish brown to black with loamy to silty loam texture. In denuded areas leaching and deposition of humus in lower layer is common.

Brown hydromorphic soil. This is most commonly found in areas of wetlands and is moderately rich in organic matter, nitrogen and potash but deficient in lime and phosphates.

Laterite. This is a typical weathering product under humid tropical conditions. In general this soil is acidic in nature and poor in available nitrogen, potash, phosphorous and organic matter. It is well drained, widely cultivated; a variety of crops like coconut, tapioca, rubber, arecanut, pepper, cashew etc can be grown successfully. Gravely soil of lateritic origin is generally available in the district.

The fertility of the soil is generally poor with low available nitrogen and phosphorous. The brown hydromorphic soil is confined to valley portions between undulating topography. These soils are formed as a result of transportation and sedimentation of materials from adjoining hill slopes. These soils are brownish black in colour. The surface texture varies from sandy loam to clay. The alluvial soil is seen as narrow strips along the banks of rivers in the project districts. They are more common along the banks of rivers. The surface texture of the soil ranges from sandy loam to clay and these soils is fertile.

Quality of the soil along the road has been tested at four stations for Pb, Oil and grease. These are provided below in **Table 5.4**. In all four stations the Pb content is not detectable. Oil and grease were within limits. **Figure 5.11** to **Figure 5.12** shows the Soil characteristics of Idukki, Kottayam, Pathanamthitta and Kollam districts respectively.

Table 5.4. Soil Quality Analysis along the Project Corridor

Station	Concentration of Parameters	
	Lead in $\mu\text{g/g}$	Oil & grease mg/l (10% solution)
Pathanapuram	ND	4.0
Konni	ND	2.0
Ranni	ND	ND
Punalur	ND	6.0

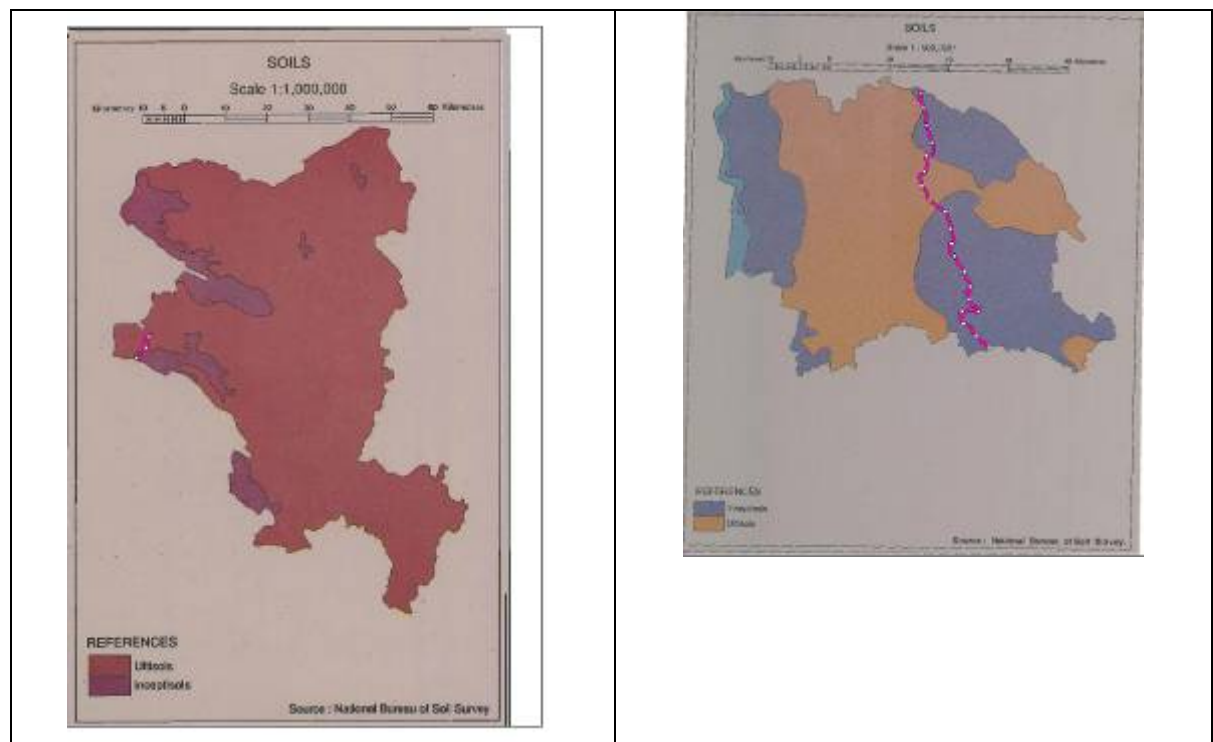


Figure 5.11. Maps of the Idukki & Kottayam Districts Showing Soil Characteristics

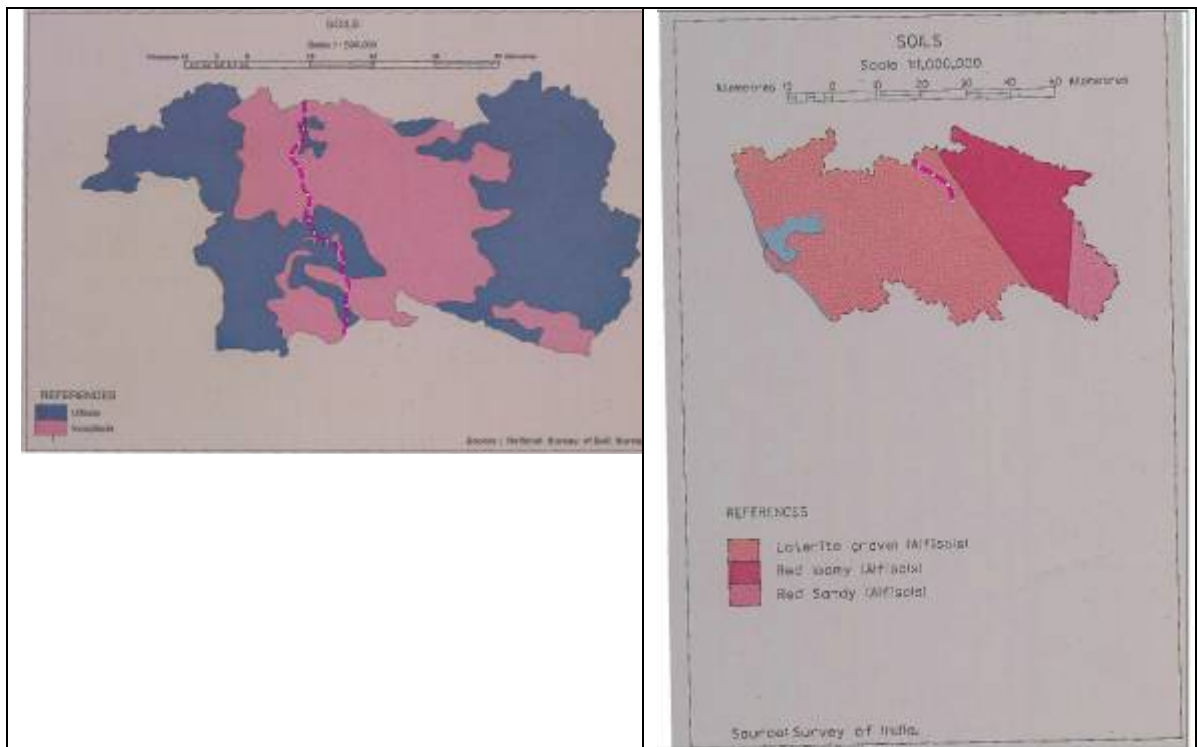


Figure 5.12. Maps of the Pathanamthitta and Kollam Districts Showing Soil Characteristics

5.2.5. EROSIONAL CHARACTERISTICS

Along the Punalur – Ponkunnam -Thodupuzha road, the road crosses two physiographic regions of the State. The mid land region is erosion prone while the highland is susceptible to land slides and land slips. The slided area usually undergoes heavy erosion immediately after the landslide / land slip. The project road passes through dense vegetated areas stabilised over a period of time. This will protect the land from being eroded to a great extent. Almost all development activity including road improvement works on soil results in higher rates of erosion. The project corridor is uniformly erosion prone on a minor scale. No newly disturbed areas have been noticed in the project corridor.

5.2.5.1. LAND EROSION DUE TO MONSOON

During monsoon season all PIA rivers and streams carry considerable amount of sediment load to the sea from highlands and mid lands. The higher level of precipitation in the PIA district leads to erosion, landslides and landslips in the upper catchments. The landslides and landslips further aggravate the rate of erosion. Almost all development activity including road improvement works on soil results in higher rates of erosion. The project corridor is uniformly erosion prone on a minor scale. No newly disturbed areas have been noticed in any part of the project corridor. The rate of ribbon developments along the sides of the project corridor is slow but continuous.

5.2.6. QUARRY AND CRUSHING OPERATIONS

The main material sources have been identified using information collected from the Kerala Highway Research Institute of the State PWD, which has been supplemented by identifying other potential sources and checking their suitability. On reviewing the previous reports, it is observed that approved borrow areas from local PWD for embankment/subgrade fill material is not available, however soil for embankment/subgrade are available from private sources within 5

km distance along the project road. Summary of the few borrow area is given below in **Table 5.5.**

Table 5.5. Summary of Borrow Area

SL. No	Location	District	Quantity Available
1	4 km from Manimala junction towards Changanaserry	Kottayam	11,65,491
2	7 km from Ponkunnam towards Punalur	Kottayam	25,000
3	5 km from Pathanamthitta towards Punalur	Kottayam	2,02,300
4	2 km from Ranni junction towards Ponkunnam	Kottayam	20,234
5	7 km from Ranni junction towards Punalur	Kottayam	40,460
6	12 km from Pala towards Thodupuzha	Ernakulam/ Kottayam	28,000
7	5.9 km from Thodupuzha	Ernakulam/ Kottayam	20,000
8	9.5 km from Ponkunnam	Kottayam	30,000
9	1 km from Pala junction towards Ramapuram	Kottayam	60,703
10	6.5 km from Pala junction towards Parathodu; 1 km towards Earattupetta	Ernakulam/ Kottayam	37,500

(Source: Field Reconnaissance)

Metal quarry for coarse/fine aggregates- Available type of coarse aggregates in the vicinity of the project road is crushed rock from igneous rocks of granites or granitic type, which are generally well suited as materials for road construction. Summary of the metal quarry as reviewed from the earlier reports are as below-

Table 5.6. Summary of Quarry

Quarry/ Material Source Name	Location/District	Production Capacity (M ³ /Year)	Product Material
Caltier S. I.	Punalur / Pathanamthitta	51,678	40mm, 6 mm crushed stone and stone dust
J & S Granite Co.	Pathanamthitta / Pathanamthitta	46,510	20 mm, 6 mm, crushed stone and stone dust
Johnson rocks	Konny / Pathanamthitta	1,03,356	20 mm, 12 mm crushed stone and stone dust
Kadavil Granites	Tholikkodu / Pathanamthitta	16,537	20 mm, 6 mm crushed stone and stone dust
Kadvatodu	Pathanapuram / Kollam	18,604	River sand
Kalluvilla Granites	Payyanamon junction / Pathanamthitta	51,678	20 mm, 6 mm crushed stone and stone dust
Kaniamuri Kadavu	Manimala / Kottayam	20,671	River sand
Kannamthanam Metal Crusher	Pathanamthitta town / Pathanamthitta	1,55,034	20 mm, 6 mm crushed stone and stone dust
Karmala Industries	Konni / Pathanamthitta	15,503	20 mm crushed stone
		6,201	6 mm crushed stone
		3,101	Stone dust
Kochi Kadavu	Pathanapuram / Kollam	27,906	River sand

Quarry/ Material Source Name	Location/District	Production Capacity (M ³ /Year)	Product Material
Koramannil Kadavu	Manimala / Pathanamthitta	14,470	River sand
Kumbazha Kadavu	Kumbazha / Pathanamthitta	31,007	River sand
Mallelil Industries	Konni / Pathanamthitta	46,510	20 mm, 6 mm crushed stone and stone dust
Melanoor	Manimala / Kottayam	20,671	River sand
Muttat Kadavu	Pathanapuram / Kollam	20,671	River sand
Muttoli Kadavu	Pala / Kottayam	20,671	River sand
P. T. C. Granites	Manjeri junction, 8 km from Konni / Pathanamthitta	1,03,356	20 mm, 12 mm, 6 mm crushed stone and stone dust
Palat	Manimala / Kottayam	31,007	River sand
Piravantoor	3.8 km from Punalur junction towards Kariyara / Kollam	10,336	River sand
Plakkattu Granite Industries	Payyanamon / Pathanamthitta	20,671	40 mm crushed stone
		10,335	24 mm crushed stone
		1,03,356	20 mm crushed stone
		59,429	12 mm crushed stone
		54,262	6 mm crushed stone
		10,335	Stone dust
Pulimukku Swami Padi	Kumbazha / Kollam	18,604	River sand
Sharus Crusher plant	Manimala / Kottayam	51,678	20 mm, 6 mm crushed stone and stone dust
Southern Rock and Aggregate Mining Co.	Ranny / Pathanamthitta	93,020	40mm, 25mm, 20mm, 6mm crushed stone and stone dust
Wimrock Granite	Pathanamthitta town / Pathanamthitta	1,24,027	40mm, 20mm, 12mm, 6mm crushed stone and stone dust
Madapparam-bil Granites	Thodupuzha / Idukki	1,56,275	20mm, 6mm crushed stone and stone dust
ABYS Hollow Bricks	Paika junction / Kottayam	10,335	20mm, 6mm crushed stone and stone dust
Bismillah Crusher Metal	Pala / Kottayam	15,503	20mm, 6mm crushed stone and stone dust
Chembilavu Kadavu	Pala / Kottayam	10,336	River sand
Kinattukara Metal Crusher Unit	Paika / Idukki	1,29,195	40mm crushed stone
Kottakappalli	Pala / Kottayam	20,671	River sand
Maliakkal Crusher	Ponkunnam / Kottayam	16,537	20mm, 6mm crushed stone and stone dust
Sixth mile kadavu	Pala / Kottayam	10,336	River sand
Thazhathupar-ambil crusher	Pala / Kottayam	49,611	20mm, 12.5mm, 6mm crushed stone and stone dust
Vattamattathil	Karinkunnam / Idukki	10,852	20mm, 12mm, 6mm crushed stone and stone dust
Near Thodupuzha	Idukki	9,757	River sand

(Source: Field Reconnaissance)

5.2.6.1. AVAILABILITY OF CONSTRUCTION MATERIALS

The project needs considerable quantity of construction material that includes crushed rock, sand, soil etc. The sand mining issue has necessitated the need for crushed sand and quarry dust against river sand. Until recently there were no restrictions on river sand. The unabated sand mining for various construction requirements has led to severe environmental problems all over the State. The collapse of Ranni river bridge along the Project road is said to be due to the uncontrolled sand mining near the bridge. Soils suitable for the construction of embankments and sub-grades are available in the PIA districts. The project engineering team had carried out a number of studies for construction material requirement for various specific requirements such as for use as sub grade, granular material for construction of embankments etc. There are no departmental borrow areas hence most of the material will be from the private sources. The details of borrow sources identified and the characteristic properties of soils from these sources were ascertained through laboratory testing of samples. If suitable materials are not available this can be made locally by blending soil, aggregate/shingles and sand in suitable proportions to satisfy the specification requirements. Throughout the PIA districts, there are a number of private crusher operators who supply crushed aggregates of different grades. Since there are many sections along the project road that requires cutting of hill, it is expected to enable filling of new alignment passing through deep valley.

Soil materials. Granular soils suitable for the construction of embankments and sub-grades are available within a reasonable distance for use on the project road. The soils available along the alignment are suitable for use in the sub grade. For most of the project road in plain / rolling country, soil will need to be obtained from private sources since departmental borrow areas are not available. The details of borrow sources identified and the characteristic properties of soils from these sources were ascertained through laboratory testing of samples. There are no major cut sections along the project road.

Sub-base material. Naturally occurring murrum/gravel is rarely available for direct use as sub-base material which satisfies grading and strength properties. Suitable sub base material can, be made locally by blending soil, aggregate/shingles and sand in suitable proportions to satisfy the specification requirements.

Base course material. Stone of suitable quality for use as aggregates for pavement courses as well as for concreting is available along the project road within reasonable haul distances. There are a number of private crusher operators who supply crushed aggregates of different grades. From laboratory tests conducted, it has been observed that aggregates available from local stone crushers generally satisfy the specification requirements.

Fine Aggregate. River sand of suitable quality is available for use in the project road within reasonable distances. Due to over exploitation, the Government has heavily controlled the river sand mining. Quarry dust and quarry sand are available from private stone crusher owners, and this can also be used as fine aggregate for bituminous mixes.

Borrow Pits. Areas suitable for borrow pits (i.e., sources of material for the construction of embankments and use as fill) have been located in accordance with the Indian Roads Congress Specifications.

5.3. WATER RESOURCES

5.3.1. SURFACE WATER RESOURCES

The surface water bodies along the project road are listed in **annexure 3.46** of EMP report. Availability of surface water in the PIA is mainly through the perennial and non-perennial

streams/rivers with in the PIA. Except the major rivers, all other smaller streams are non-perennial. All rivers are rain fed and in summer the springs are the sources of flowing water. The forest particularly forest loam hold huge quantity of water during rainy season and this water is released slowly. During summer months, this is the main source of water in the rivers in the form of springs and seepages. All rivers have catchments in dense forest areas. A number of seasonal waterfalls were observed along the project corridor. These rivers originate from the lower reaches of Western ghats and flows into the Arabian Sea. During monsoon the river often over flows; flooding adjacent areas. After monsoon season, except the lower estuarine portion closer to the sea, the upper reach goes dry.

The details of the project corridor that cross various river systems are presented in the **Annexure 3.46** of the Part II EMP Report. All drainage sections are indicated by the accompanying *Environmental Data Sheets* of Part II EMP Report.

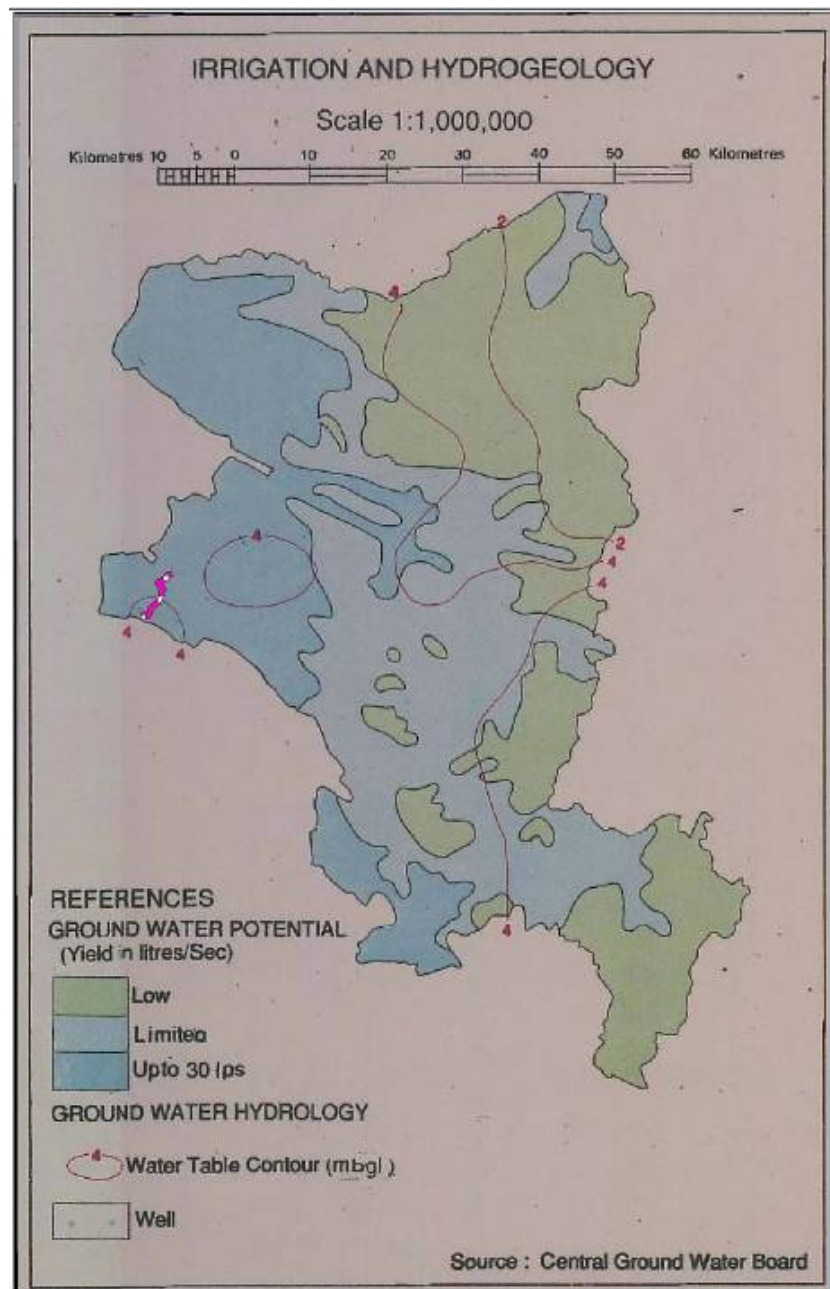


Figure 5.13. Map of Idukki District Showing Irrigation and Hydrogeology

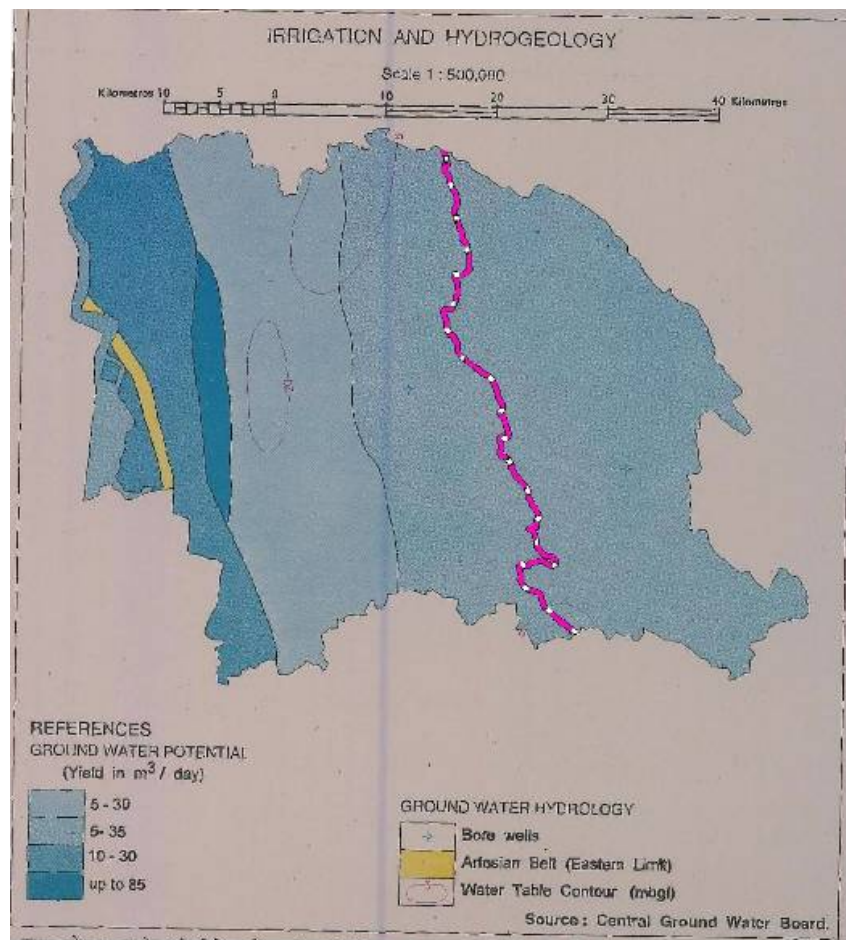


Figure 5.14. Map of Kottayam District Showing Irrigation and Hydrogeology

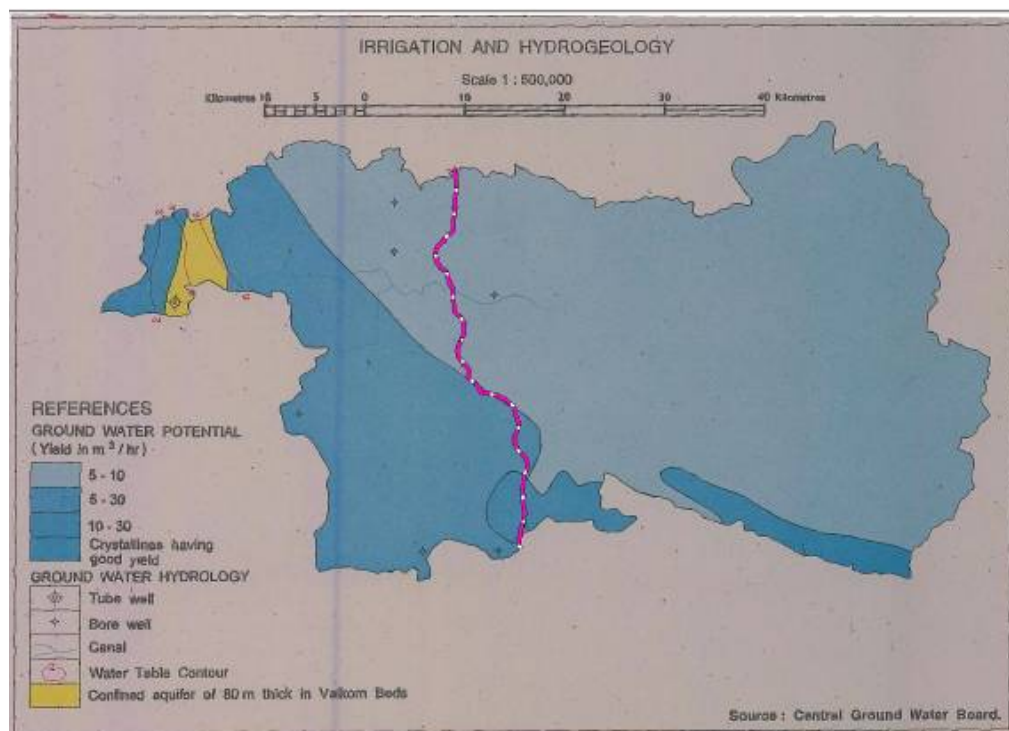


Figure 5.15. Map of Pathanamthitta District Showing Irrigation and Hydrogeology

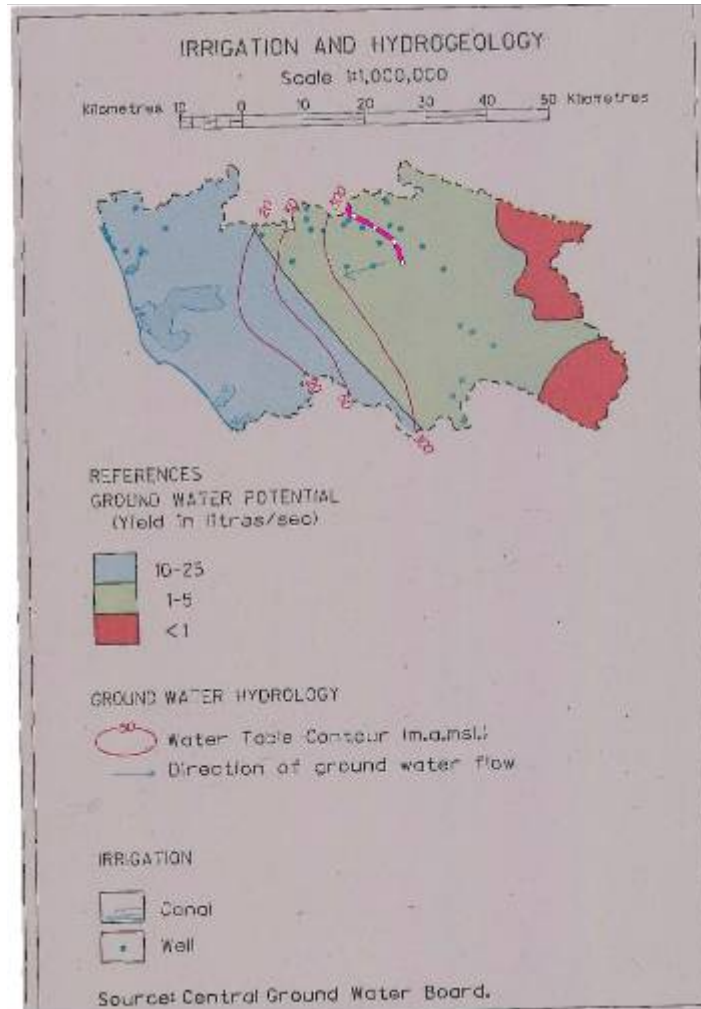


Figure 5.16. Map of Kollam District Showing Irrigation and Hydrogeology

Table 5.7. Major Rivers Draining the PIA Districts

Sl. No	Name of the River	Length (km)	Catchment Area (sq. km)		
			Kerala	Karnataka	Total
1	Kallada River	121	1699	-	1699
2	Achancoil River	128	1484	-	1484
3	Pamba River	176	2235	-	2235
4	Manimala River	90	847	-	847
5	Meenachil River	78	1272	-	1272

(Source: Water Resources Atlas of Kerala)

The various rivers and their tributaries that flow through the PIA districts are shown in the **Table 5.7**. In the PIA, all these rivers are comparatively shorter with respect to its total catchments and length. These rivers originate from the lower reaches of Western Ghats and flow into the Arabian Sea. During monsoon period, the river often over flows and floods adjacent areas of the project road. After monsoon season, except the lower estuarine portion closer to the sea, the upper reach goes dry. The details of the project corridor that cross various river systems, sections having drainage issues etc., are indicated in the accompanying Environmental data sheet, Part II EMP Report. Bridge locations are also listed in data sheets. The most likely flood prone areas along the project road are given in **Annexure 3.45** of Part II - EMP Report.

5.3.2. DRAINAGE

Side drains are not available through out the project road. The available drains are partly or completely choked due to the absence of regular maintenance. The choked drains some times lead to flash floods in the market areas.

The number of cross drainage structures and their locations with respect to road chainages are given in the environmental data sheets. An analysis of CD structures showed that the average CD structures per kilometre are found to be 3.00 per kilometre for the link 84. Among the five major bridges in the project road, two are proposed for reconstruction. As part of improvements to the project road, four slab culverts of opening width 6m are required to be widened and raised as their vent opening is found not sufficient and they are not functioning properly. Out of 472 culverts present, 445 culverts are observed to be slab culverts, 17 are pipe, and 3 are Box culverts. 7 culverts are in buried condition 17 pipe culverts are existing along the project road which has diameter varying from 0.4m to 1.0m and are in poor condition. Out of these 17 culverts, 13 culverts are proposed for reconstruction and 9 new culverts are also proposed. The details of these are included in the chapter 7 of Design report.

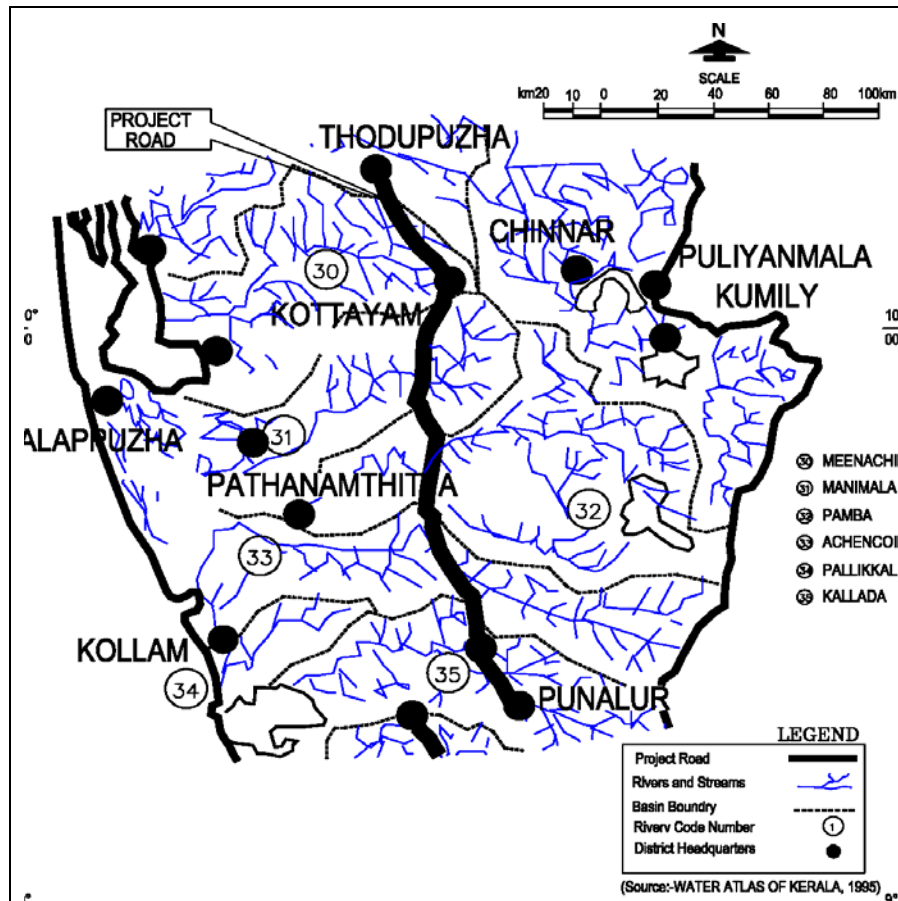


Figure 5.17. Project Road in Relation to River Basins of the Region

5.3.3. GROUNDWATER IN THE PROJECT INFLUENCED AREA

Apart from the water table aquifer in the weathered top layer, groundwater in the area also occurs in the fractures and fissures of the hard rock. While the open hand wells are to tap water table aquifers, the fractures and fissures that store and transmit groundwater are tapped using bore wells. In the valleys water table aquifers with limited availability of water is available. Till recently the open wells from the water table aquifers were the main source of drinking water.

Groundwater from hard rock aquifers are tapped by bore wells and dug cum bore wells. Another important source of water is the perennial springs.

Idukki: Ground water in the Idukki district is mostly developed through dug wells, dug-cum-bore wells and deep bore wells for domestic and irrigation purposes. Most of the households have their own wells to meet the domestic requirements and in the hill ranges depends on springs. Recently in most of the areas ground water is developed through bore wells for domestic and irrigation purposes. Since five out of eight blocks in the district is under safe category and the stage of ground water development of the district is 37.48% there is a fair scope for further ground water development. Acute water scarcity is being faced in hilly areas in summer period due to the drying up of dug wells and springs. Dug wells and springs in the hilly areas and topographic highs get dries up if monsoon is delayed or if there is no summer shower.

Kottayam: Groundwater in the Kottayam district is also abundantly developed through dug wells, dug cum bore wells, and bore wells for domestic and irrigation needs. In the valley fill and laterites areas, groundwater is developed mostly through dug wells. Due to technological developments in recent days the groundwater is developed through bore wells for irrigation and domestic purposes particularly midlands and in eastern uplands. The net annual groundwater availability is 470.86 MCM where as the draft for all uses is 133.60 MCM. All the blocks fall under safe category. The stage of groundwater development reveals that huge amount of water is available for future development. Hence further development is possible in all the blocks, of the district. The water scarcity being faced in the hilly areas in summer period due to drying up of dug wells. Dug wells in midland region get dried up if monsoon is delayed or if there is no summer showers. The increased dependence on bore wells in midland areas leads to drying up of dug wells in lateritic mounds and slopes which affects the drinking water needs of farmers and poor people.

Pathanamthitta: Groundwater in the district is mostly developed through dug wells and bore wells for domestic, agricultural and industrial purposes. Apart from this the Kerala Water Authority is developing the resources for the principal water supply in the rural area and for supplementing the urban water supply schemes. A good percentage of the house holds in the district have their own drinking water wells. The groundwater development in the district as elsewhere in Kerala is mostly through dug wells. Recently the bore well culture has picked up and gained momentum in the district. In the crystalline terrain the groundwater is developed through dug wells, dug cum bore wells and bore wells. Along the valley fills and laterite terrain the groundwater is developed through dug wells. The groundwater development in the district is feasible through different abstraction structures tapping the shallow phreatic aquifers in the hard rocks, laterite, alluvium and deep fractured crystalline rocks. Depending upon the hydrogeological set up and requirement, the development can be planned with suitable structures. It can be seen that the stage of groundwater development in the district is only 31.75% leaving a vast scope for future development. The major problem in the district is the non availability of ground water in the dug wells located along the hill slopes of the mid land area. It is not due to over development but due to the natural discharge on the sloping bedrock topography. Even though the rainfall is quite high and is spread over the year, acute water scarcity is felt in the mid land and high areas of the district during the five months of January to May.

Kollam : The district is blessed with abundant groundwater resources in phreatic, semi-confined and confined conditions. Groundwater is mainly used for drinking and industrial purposes. The ground water in the district is mostly developed through dug wells for domestic and agricultural purposes and to a limited extent for industrial and irrigation purposes. Recently the bore well

culture has gained momentum. Ground water development should be coupled with management of rain water harvesting and surface water.

The estimation of groundwater resources in different blocks of the district for the year 2004 has indicated that groundwater development in the district is around 45.82%. However four blocks in the district are in semi critical category. Vettikavala, Pathanapuram, Anchalamoodu and Mukhathala were categorized as semi critical and the rest of the blocks were safe. A considerable amount of groundwater is being developed from the midland area of the district from a number of wells for water supply and irrigation purposes. Saline water ingress is observed in the shallow alluvial aquifer in the western part of the district which is in hydraulic connection with the backwater.

The shallow phreatic aquifers in alluvium are developed through dugwells and filter point wells. Filter point wells are more economical in the alluvium areas in comparison to dug wells. However, filter points can be constructed only in very restricted areas where the saturated sand thickness in the shallow zone exceeds 5 m. In the recent years due to fall in water level, the dug wells were deepened in many parts of the district and deepening of the wells were resorted to increase the yield of the dug wells.

Table 5.8. Status of Ground Water in the PIA Districts

Category	Number of Blocks per District			
	Idukki	Kottayam	Pathanamthitta	Kollam
Safe block	5	11	9	9
Semi critical/critical blocks	2	0	0	4
Over exploited block	0	0	0	0
Total Blocks	8	11	9	13

5.3.4. WATER QUALITY

The baseline water quality studies are an integral part of any Environmental Assessment studies. Baseline environmental monitoring for various environmental attributes were conducted by the consultants in May 2012 for the project, as per the guidelines of CPCB. NABL accredited and MoEF approved, M/s Enviro Designs Eco Labs, Ernakulam conducted the environmental monitoring for the project.

The baseline status of surface and ground water quality along the project road has been established through sampling and analysis of various water quality parameters as part of the environmental monitoring conducted by the Consultants. The sampling locations were selected at representative locations based on existing land use and type of water body. Surface water samples were selected from rivers, while ground water samples were taken from open wells. The details of the same are presented in **Table 5.9** and depicted in **Figures 5.18** and **5.19**.

Sampling for water quality monitoring was conducted at all the locations once in May 2012. The surface water samples were collected and analysed as per the procedures specified in IS: 2296 and ground water samples were analysed as per the procedures specified in IS: 10500.

The prime objective of the baseline surface and ground water quality study was to establish the existing water quality of the study area to evaluate the anticipated impact of the proposed project and to suggest appropriate mitigation measures for implementation. This will also be useful for assessing the conformity to the standards of surface water quality during the construction and operation phase of the project. The monitoring results of the project road for surface water quality and ground water quality are presented in **Table 5.10** and **Table 5.11**.

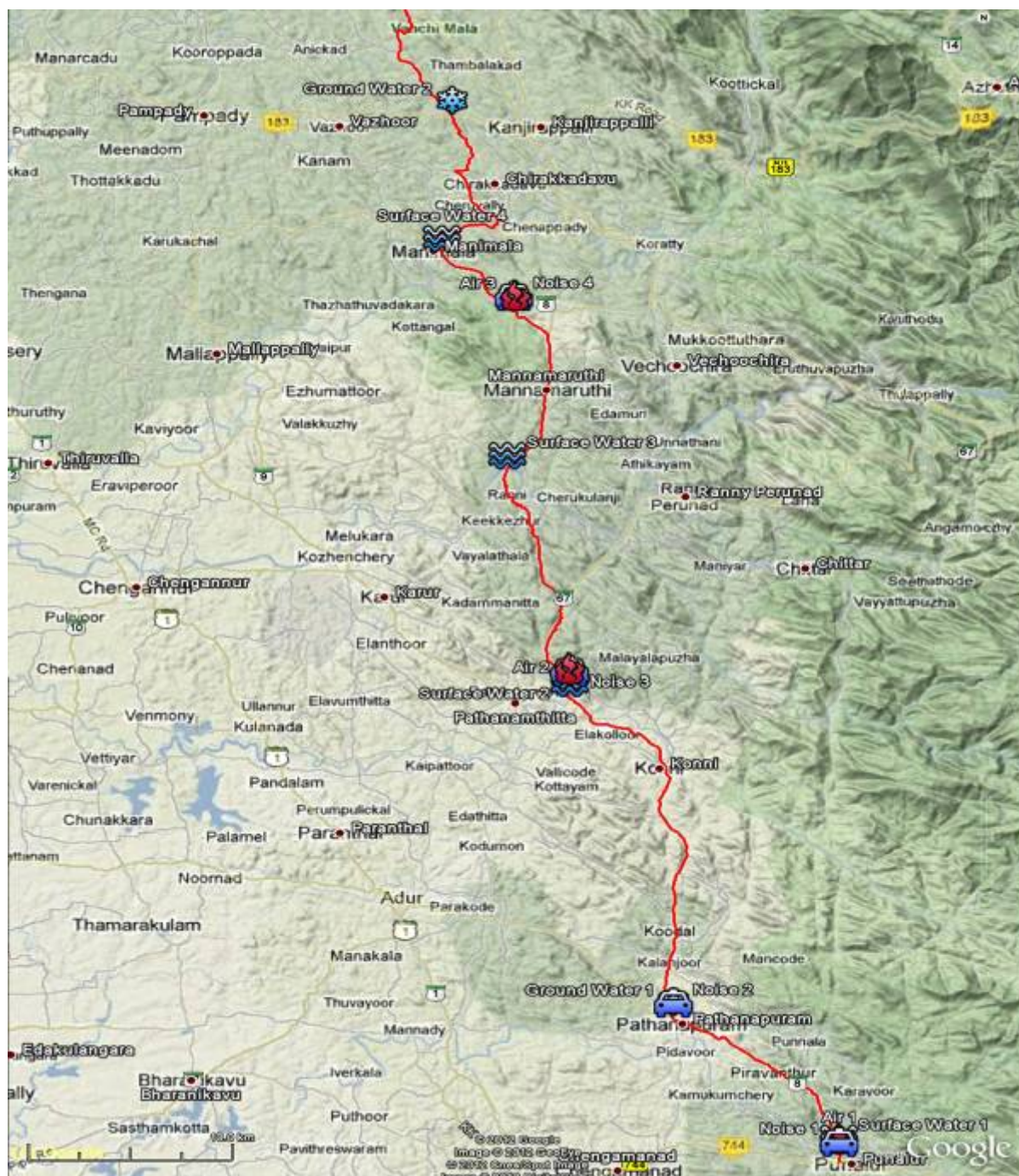


Figure 5.18. Monitoring Locations of Punalur - Ponkunnam Road

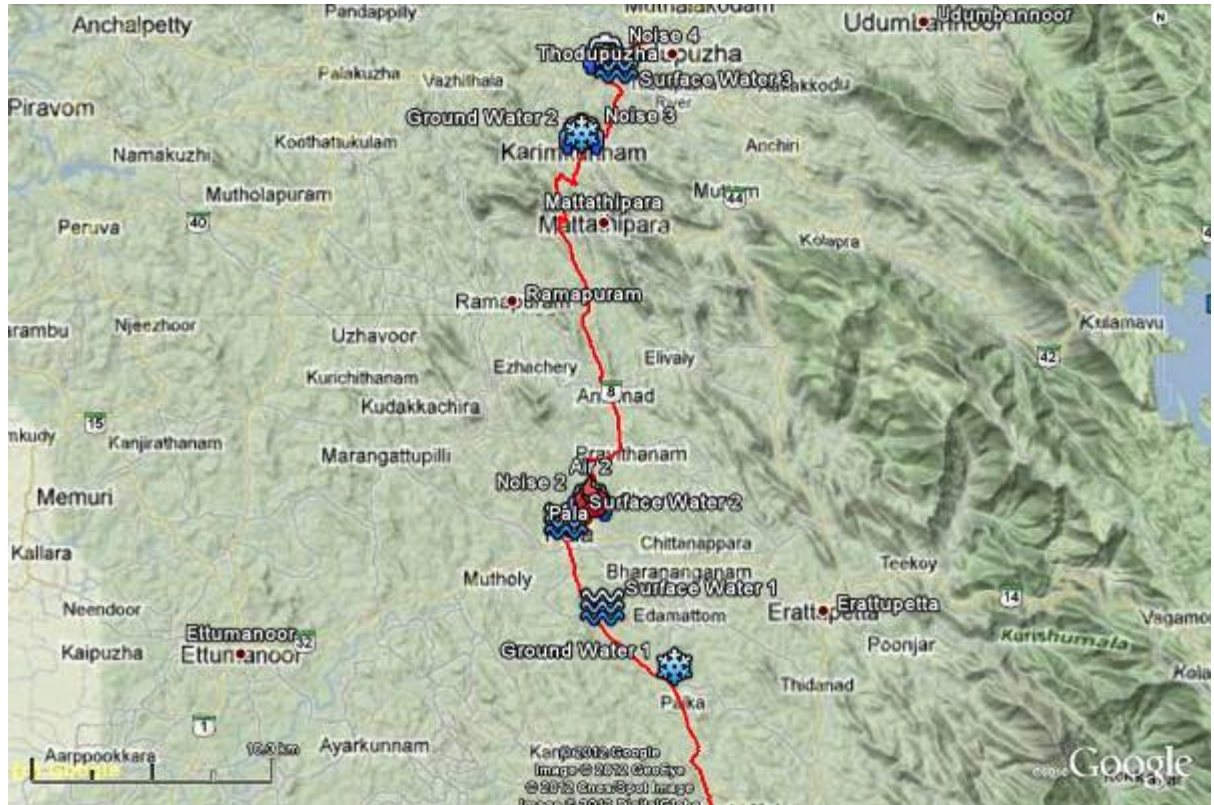
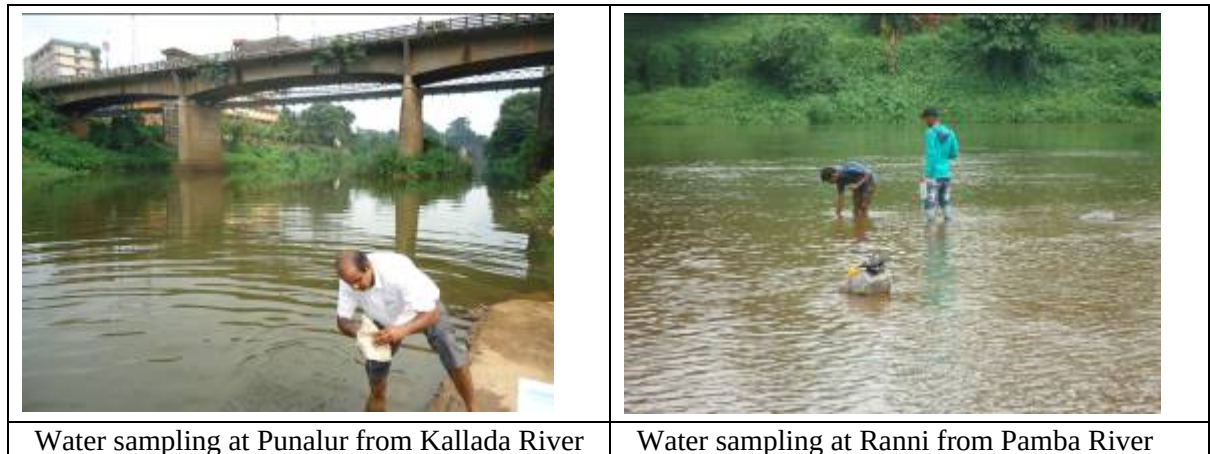


Figure 5.19. Monitoring Locations of Ponkunnam - Thodupuzha Road

Table 5.9. Details of Sampling Locations

Sample Code	Sampling Locations	
	Punalur – Ponkunnam Road	Ponkunnam – Thodupuzha Road
Surface Water Sampling Locations		
SW 1	Kallada River at Punalur	Stream near Poovarani Temple
SW 2	Achenkovil River at Kumbazha	Meenachil River at Pala
SW 3	Pamba River at Ranni	Irrigation Canal near Kolani
SW 4	Manimala River at Manimala	
Ground Water Sampling locations		
GW 1	Well at Pathanapuram	Well at Paika
GW 2	Well at Ponkunnam	Well at Karimkunnam

Source: Reconnaissance survey.



Water sampling at Punalur from Kallada River

Water sampling at Ranni from Pamba River

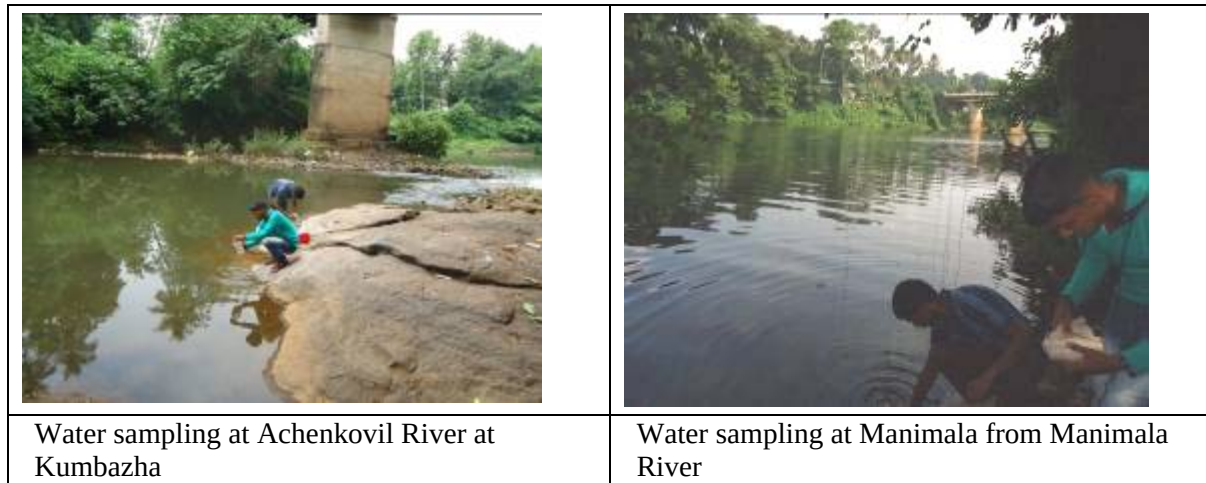


Figure 5.20. Water Sampling in Punalur - Thodupuzha Road

Table 5.10. Water Quality Analysis Results of Punalur – Ponkunnam Road

Sl No	Parameter	Unit	Value Reported						Desirable Limit as per IS 10500: 1991	Limit as per IS 2296: 1982 Class C
			Ground Water		Surface Water					
			GW 1	GW 2	SW 1	SW 2	SW 3	SW 4		
1.	Colour	Hazen	4.0	4.0	4.0	7.0	4.0	4.0	5	300
2.	Odour	--	Unobjectionable						Unobjectionable	-
3.	Taste	--	Agreeable						Agreeable	-
4.	Turbidity	NTU	BDL	BDL	3.3	1.3	1.2	BDL	5	-
5.	pH	--	5.25	5.63	6.61	6.73	6.69	6.82	6.5-8.5	6.5-8.5
6.	Dissolved Oxygen (Min)	mg/l	5.9	5.5	7.1	6.8	7.4	7.1	-	4
7.	BOD (3 days 27°C)	mg/l	1.1	1.4	2.4	1.4	1.6	1.9	-	3
8.	Total Dissolved Solids	mg/l	108	120	48	52	44	72	500	1500
9.	Total Hardness as CaCO ₃	mg/l	28	22	16	16	12	16	300	-
10.	Iron as Fe	mg/l	BDL	BDL	0.1	0.42	0.15	0.06	0.3	50
11.	Chloride as Cl	mg/l	49.9	30.9	12	17.99	10	12.0	250	600
12.	Mineral Oil	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.01	0.1
13.	Sulphate as SO ₄	mg/l	BDL	BDL	BDL	4.0	2.91	3.64	200	400
14.	Nitrate as NO ₃	mg/l	4.65	2.38	0.05	BDL	BDL	0.30	45	50
15.	Total Coliforms	MPN/100ml	<2	<2	1600	1600	1600	1600	10	5000
16.	E.Coli	MPN/100ml	Absent				Present	Absent	0	-

(Source: Environmental monitoring, 2012)

For link road between Punalur to Ponkunnam, it has been inferred from the monitoring results that, pH level in GW1 and GW2 are found to be 5.25 and 5.63 respectively, showing slightly acidic condition. Concentration of E. coli is present in SW3, this is may be due to direct discharge of sewage into Pamba river. Apart from this, rest of all surface and ground water parameters are falling within limits of IS:2296 and IS:10500 standards respectively.

Table 5.11. Water Quality Analysis Results of Ponkunnam – Thodupuzha Road

Sl No	Parameter	Unit	Method	Value Reported					Desirable Limit as per IS 10500: 1991	Limit as per IS 2296: 1982 ClassC
				Ground Water		Surface Water				
				GW 1	GW 2	SW 1	SW 2	SW 3		
1.	Colour	Hazen	IS 3025 (Pt 4) – 1983	4.0	3.0	4.0	4.0	4.0	5	300
2.	Odour	--	IS 3025(Pt 5) – 1983	Unobjectionable					Unobjecti onable	-
3.	Taste	--	IS 3025 (Pt 8) – 1984	Agreeable					Agreeable	-
4.	Turbidity	NTU	IS 3025 (Pt 10) – 1984	0.3	BDL	1.6	4.2	1.1	5	-
5.	pH	--	IS 3025(Pt 11) – 1983	5.14	4.63	6.36	6.54	7.03	6.5-8.5	6.5-8.5
6.	Dissolved Oxygen (Min)	mg/l	IS 3025 Clause 50	2.3	---	---	5.0	60	-	4
7.	BOD (3 days 27oC)	mg/l	IS 3025(Pt 44) – 1993	NIL	---	----	2.5	NIL	-	3
8.	Total Dissolved Solids	mg/l	IS 3025(Pt 16) – 1984	52	80	32	64	48	500	1500
9.	Total Hardness as CaCO3	mg/l	IS 3025 (Pt 21) 1983	12	44	12	12	16	300	-
10.	Iron as Fe	mg/l	IS 3025 (Pt 53)-2003	BDL	BDL	0.10	0.13	0.26	0.3	50
11.	Chloride as Cl	mg/l	IS 3025(Pt 32) - 1988	16	25.99	12	16	12	250	600
12.	Mineral Oil	mg/l	IS 3025 (Pt 39) – 1991	BDL	BDL	BDL	BDL	BDL	0.01	0.1
13.	Sulphate as SO4	mg/l	APHA 4500-E	8.01	7.64	11.28	10.37	BDL	200	400
14.	Nitrate as NO3	mg/l	IS 3025(Pt 34) – 1988	0.59	5.54	0.06	0.17	0.06	45	50
15.	Total Coliforms	MPN/ 100ml	IS 1622 – 1981	1600	50	300	1600	60	10	5000
16.	E.Coli	MPN/ 100ml	IS 1622 – 1981	Pre	Abs	Abs	Abs	Pre	0	-

(Source: Environmental monitoring, 2012)

Monitoring results for link road between Ponkunnam to Thodupuzha shows that, pH level in GW1 and GW2 are found to be 5.25 and 5.63 respectively, showing slightly acidic condition. Concentration of Total coliforms and E. coli is present in GW1, this may be due to unhygienic condition near the open well. Water sample drawn from irrigation canal near Kolani (SW3) shows presence of E.coli. Apart from this, rest of all surface and ground water parameters are falling within limits of IS:2296 and IS:10500 standards respectively.

All the Surface water sources are already protected from saline water intrusion as they are located in midland/highlands far away from the coastal belt.

5.3.5. EFFECTS OF FLOODS IN THE REGION

The heavy rains often results in flash floods in the highlands destroying crops, habitation, roads (**Figure 5.21**) and other infrastructure in the area. The likely flood sections in the project area are shown in **Table 5.16**. These flash floods are generally not seen in the forest areas. The project road from Punalur up to Ponkunnam has vast areas of dense forests in the PIA. Approximately

90 % of the rainfall is precipitated during the six monsoon months, the high intensity storms during the monsoon months result in heavy discharges in all rivers.

Immediately after the monsoon season all water bodies will show a steady decline in surface flows due to a very steep gradient from the highland to coastal lowland through mid land up to the sea. The traffic disruption due to flood is generally for a very small period



Figure 5.21. Flooded Area along the Project Road at Chethomkara

Table 5.12. Flood Prone Sections in the Project Area

Location	Chainage		Length (m)	Mitigation Measures
	From	To		
Punalur to Ponkunnam				Suitably raised the embankment, improved cross drainage and longitudinal cross drainage
Nellipally	2.900	3.050	150	
Kalanjoor	17.550	17.625	75	
Kollampadi	24.125	24.250	125	
Elavallloor	34.225	34.325	100	
Kumbazha	38.775	38.850	75	
Mandamaruthi	58.275	58.375	100	
Plachery	61.625	61.725	100	
Thekkedathukavala	78.600	78.675	75	
Ponkunnam to Thodupuzha				
Parathanam	124.000	124.500	500	

5.4. AMBIENT AIR QUALITY

The baseline status of the ambient air quality has been established through a scientifically designed network of Ambient Air Quality Monitoring (AAQM) stations selected at five representative locations based on land use and wind direction. Ambient air quality monitoring was conducted in May, 2012. The parameters measured during the monitoring along with their frequency of sampling are given in Table 5.13.

Table 5.13. Ambient Air Quality Parameters and Frequency of Sampling

Parameters	Sampling Frequency
Particulate Matter 2.5 , PM _{2.5}	Continuous Sampling for 24 hrs
Particulate Matter 10, PM ₁₀	
Sulphur dioxide, SO ₂	continuous sampling for 8 hrs (three 8 hour samples in 24 hours)
Oxides of Nitrogen, NO _x	
Carbon Monoxide, CO	

Source: Environmental Monitoring, 2012

Pre calibrated Respirable Dust Samplers (RDS) of Envirotech Instruments were used for monitoring of Particulate Matter 2.5 (PM_{2.5}), Particulate Matter 10 (PM₁₀) and gaseous pollutants like SO₂ and NO₂. Analysis techniques used for different air quality parameters are presented in **Table 5.14**.

Table 5.14. Techniques used for the Analysis of Ambient Air Quality Parameters

Sl. No	Parameter	Technique	Technical Protocol	Minimum Detectable Limit
1	Particulate Matter 2.5 (PM _{2.5})	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-4)	1.0 µg/m ³
2	Particulate Matter 10 (PM ₁₀)	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-23)	1.0 µg/m ³
3	Sulphur Dioxide	Modified West and Gaeke	IS - 5182 (Part-2)	4.0 µg/m ³
4	Nitrogen Oxide	Modified Jacob & Hochheiser	IS - 5182 (Part-6)	4.0 µg/m ³
5	Carbon Monoxide	Non Dispersive Infra Red Spectroscopy (NDIR)	IS-5182 (Part-10)	1.145 mg/m ³

Source: Environmental Monitoring.

The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. This will be useful for assessing the conformity to standards of the ambient air quality during the construction and operation phase of the project. The important sources of air pollution in the region are vehicular traffic and domestic fuel burning activities.

The corridor passes through the midland and highland region with evergreen lush vegetation in the area. With a relatively low density of population, there are no major urban centres along the project corridor. Traffic during most of the year is very low in many sections except during the Sabarimala Pilgrimage season starting from mid October to mid January. However for the pilgrimage season no ambient air quality data is available for the PIA region of the project corridor. Most of the monitoring is around the Sabarimala pilgrim centre and Pamba region, which is 40-80km away from the nearest project corridor at Mannarakulanji.

The traffic during the pilgrimage is the main source of air pollution in the area. Over the years GOK is improving the various roads leading to the Sabarimala pilgrimage centre. Each and every road in Kerala experiences an increase in traffic during this period, depending upon the location of the road (north, south, east or west), status of the road (SH, NH, MDR etc) and proximity to Sabarimala.

Details of monitoring results are presented in **Table 5.15** along with the revised CPCB ambient air quality standards. The results indicate that all air quality parameters are well within the CPCBs revised NAAQ standards at all the locations. Therefore, during construction period, it is recommended to minimize the particulate matter by sprinkling the water during peak working hours. Apart from that, there are no major air polluting sources in the project area and generally, the air quality of the area is found to be good.

Table 5.15. Ambient Air Quality along the Project Road

Sampling Locations	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)
Punalur to Ponkunnam					
Punalur (Commercial area)	29.2	73.7	13.33	12.4	1.27
Kumbazha near Pathanamthitta (Residential area)	19.6	59.5	10.17	9.63	1.00
Ponthanpuzha near Manimala (Forest)	12.1	54.2	6.63	6.7	0.67

Sampling Locations	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)
area)					
Ponkunnam to Thodupuzha					
Ponkunnam (Commercial area)	22.9	72.8	11.77	9.97	1
Pala (Residential area)	16.6	55.8	10.53	9.1	0.70
Revised CPCB Standards					
Industrial, Residential, Rural & other Areas	60	100	80	80	2
Ecologically Sensitive Areas (Notified by Central Government)	60	100	80	80	2

(Source: Environmental monitoring, 2012)

5.5. AMBIENT NOISE LEVEL

A noise monitoring survey was conducted at eight representative locations based on the land use of the area with the objective of assessing baseline noise levels, which can be later used to assess the impact of the total noise generated by the proposed project activities. Noise level monitoring was carried out continuously for 24 - hours with one hour interval at each location in May 2012 using a Luthron sound level meter capable of measuring the Sound Pressure Level (SPL) in dB(A). Hourly Leq values were computed by the noise integrating sound level meter and statistical analysis was done for measured noise levels at four locations in the study area. The Leq day, and Leq night calculated for four locations in the project road are presented in **Table 5.16**. The values are compared with the standards prescribed by CPCB for various zones.

Out of the eight locations of noise monitoring, four locations represent silent zone, two locations represent residential areas, and two locations represent commercial area/zone. Except Punalur, noise level for day time in all locations is exceeding the prescribed limits of CPCB whereas noise level for night time in all the locations is within the standard limits except at MVM Hospital at Pathanapuram. The increase in noise level during day time is mainly due to vehicular traffic, honking at junctions, public activities, and industrial activities. The results essentially draw attention towards the necessity of noise pollution control measures along the project corridor.

Table 5.16. Ambient Noise Level along the Project Road

Location	Category of Area / Zone	Noise level Values Leq dB(A)		Applicable CPCB Standard Leq dB(A)	
		Day	Night	Day	Night
Punalur- Ponkunnam					
Punalur	Commercial	64.9	40.6	65	55
MVM Hospital, Pathanapuram	Silent zone	67.2	42.6	50	40
M.D. L.P. School, Kumbazha	Silent zone	59.9	39.1	50	40
Ponthanpuzha near Manimala	Residential	57.5	40.6	55	45
Ponkunnam - Thodupuzha					
Ponkunnam	Commercial	67.1	41.3	65	55
Pala	Residential	58.1	40.4	55	45
Govt. L.P. School, Karimkunnam	Silent zone	58.4	39.9	50	40
Govt. L.P. School, Kolani, Thodupuzha	Silent zone	57.9	40	50	40

(Source: Environmental monitoring, 2012)

The details of sensitive noise receptors along the project road are given in EMP **Annexure 3.44** and a summary is given in the **Table 5.17**.

Table 5.17. Summary of Sensitive Noise Receptors along the Project Road

Road	Total No. of Schools	Total No. of Hospitals
Punalur -Ponkunnam	32	7
Ponkunnam - Thodupuzha	19	2

5.6. FLORA AND FAUNA

5.6.1. FOREST AREAS

The PIA has vast areas of dense reserved forest as provided in **Table 5.18**. Most of the reserves immediately adjacent to the Project road are highly degraded.

Table 5.18. Designated Forest by Division & Areas (Ha)

Sl No	Division	Reserve	Land Proposed	Vested Forest	Total
1.	Tenmalai	29,432.07	0.00	1,216.54	30,648.61
2.	Punalur	28,005.07	0.00	16.90	28,021.97
3.	Konni	32,064.30	1,102.10	0.00	33,166.40
4.	Ranni	105,028.94	716.70	161.10	105,906.74
5.	Achancovil	26,879.40	0.00	20.60	26,900.00
6.	Kottayam	65,548.60	525.70	3,140.90	69,215.20
Total (I)		286,958.38	2,344.50	4,556.04	293,858.92
Wild Life Divisions					
7.	Idukki	28,960.20	0.00	0.00	28960.20
8.	Thekkadi	77,700.00	54.38	0.00	77754.38
Total (II)		106,660.20	54.38	0.00	106,714.58
Total (I+II)		393,618.58	2,398.88	4,556.04	400,573.50

(Source: Kerala Forest Research Institute, Kerala Forest Department)

Forest area present along the project is tabulated in **Table 5.19**.

Table 5.19. Forest Area Present along the Project Road

Sl. No.	Name of the Forests	Location	Position LHS/RHS	Chainage in km		Length in m
				From	To	
1	Dense Mixed Jungle	Mukkadavu	LHS	02+950	03+050	0.100
2	Kadakkamon Reserved Forest (Forest Timber Depot)	Kadakkamon	RHS	07+100	07+900	0.800
3	Social Forestry	Konni	RHS	27+600	27+700	0.100
4	Ponthenpuzha Reserved Forest	Ponthenpuzha	Both side	61+650	63+500	1.850
Total Length in m						2.850

Man is the single most important factor responsible for destruction of forests by way of encroachment, illicit felling, illicit brewing of liquor, setting of fire, poaching etc. Occasional forest fires may occur due to natural causes, but in most of the cases, they are intentional. Surface fire is most common in these areas. Fire makes the tree more susceptible to further damage by insects and fungi. Fire cause greater damage to regeneration and small trees. Fire reduces the humus content and ground cover of the soil, consequently exposing the soil to the desiccating effect of sun and wind, and accelerates soil erosion. It kills the soil micro flora and

fauna, which are responsible for decomposition of organic matter impairing the pedogenic process. Hence, to avoid forest fire during road construction and operation phase, Forest fire safety management measures are provided in **Annexure 3.56**. Grazing is common in forests close to the boundary nearer to habitations. The teak plantations of all ages are affected by defoliator (*Hyblaea pleura*), and teak skeletoniser (*Eutectona machaeralis*).

Ponthanpuzha Reserved Forest: There is 2500 acre forest called Ponthanpuzha Kutti vanam in the vicinity of the project road, in Kottayam forest division of Kerala Forest Department. This forest spreads over the districts of Kottayam and Pathanamthitta. The forest harbors deer, wild boar, fox, pythons, other small creatures and a variety of avifauna. There are nearly twenty small streams in the forest. The existing project road is already passing through this forest area for about 1.850 km. However, development of existing road is restricted to existing road width and no fresh forest land diversion in this region. **Figure 5.23** shows the photographs of the Ponthanpuzha Reserved Forest.

Social forestry and forest wood trees. Unlike other roads, the trees along the sides of Punalur-Thodupuzha project road include very large tropical forest wood trees also. The common tree species along the roadside include rubber tree, teak, mangoes, tamarind, jackfruit tree and occasional banyan trees. There are some patches of social forestry along the roadsides. Main functions of Social Forestry divisions of Kerala Forest Department are production and distribution of quality seedlings for various govt. programmes like Harithakeralam, Entemaram, Vazhiyoral, Nammudemaram Padhathies etc., raising indigenous species and seedlings for planting along the side of roads, Conservation of Bio-diversity, planting of seedlings at public places, maintenance of Compensatory Afforestation areas, conduction of nature awareness classes, film shows, farmers training, conduction of departmental functions, etc. The project road is abutting Kadakkamon Reserved Forest (Forest Timber Depot) and Social forestry at km 7+400 and km 27+650 respectively. No forest land diversion is envisaged at these locations. **Figure 5.22** shows the photograph of the Kadakkamon Reserved Forest (Forest Timber Depot) present towards RHS of the project road. Flora and Fauna present in the forest area of the project region is presented as **Annexure 5.1**. Commercially Important NWFPs Collected from the Forests is given in **Annexure 5.2**.

5.6.2. RUBBER PLANTATIONS

These are vast areas of agricultural mono-crop plantations. Although with regard to canopy coverage it is similar to natural forests, but has very low forest/ecologic value. The main land use in the PIA is rubber plantations.

5.6.3. OTHER PLANTATIONS

Other plantations include coconut, tapioca, banana and mixed crop (coconut, banana, tapioca etc.) plantations. These are not dense as rubber plantations unless mixed cropping is followed. There are some areas of coconut plantations in the PIA. In the mixed crop areas the plants and trees grow very thickly showing dense lush green vegetation.

5.6.4. WILD LIFE SANCTUARIES

The **Figure 5.25** shows wildlife divisions and the wild life sanctuaries in the region. PIA as defined by MOEF has no wildlife sanctuaries. The reserved forests in the immediately adjacent to the project road are the outer areas of the Periyar wildlife sanctuary. These forests in the PIA are not part of the wild life sanctuary.



Figure 5.22. Kadakkamon Reserved Forest at Ch.7.400km



Figure 5.23. Ponthanpuzha Reserved Forest at km 62+000

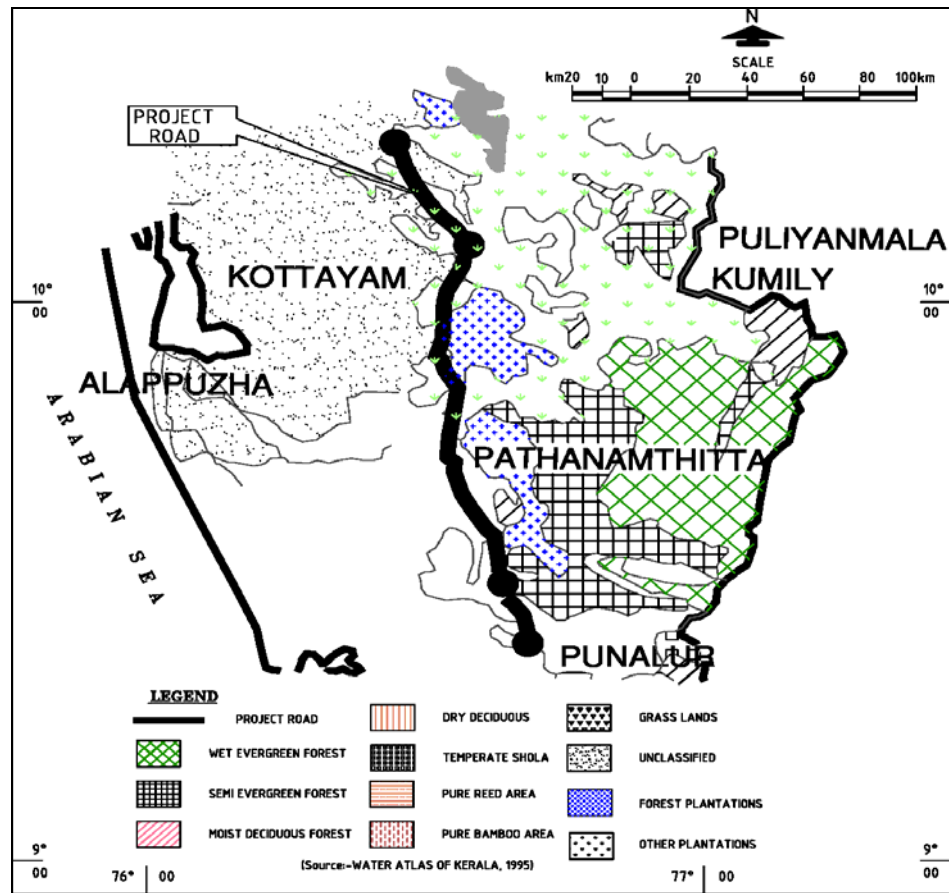


Figure 5.24. Project Road in Relation to Vegetation of the Region

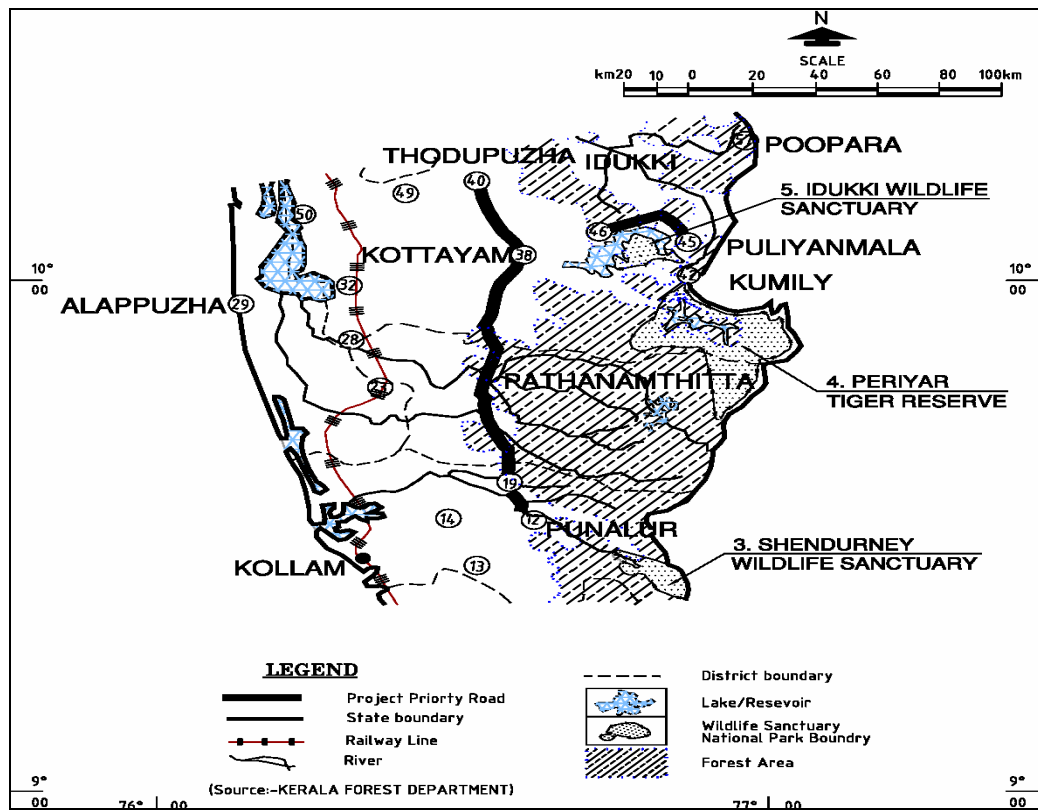


Figure 5.25. Project Road in Relation to Sanctuaries and National Parks the Region

5.6.5. FLORA, FAUNA AND ECO SYSTEMS

A typical vegetation scenario is as follows.

Flora. The evergreen forests in these regions are with lofty trees and the canopy is closed. Some of the common dominant trees are *Vateria indica* (Vellapine), *Dipterocarpus indicus* (Kalpine), *Cullani excelsa* (Karayani), *Plaquium ellipticum* (Palai) etc. Semi-evergreen forest holds a mix of evergreen and deciduous trees. *Artocarpus hirsuta* (Aini), *Salmalia malabarica* (Elavu), *Hopea parviflora* (Thampakam), *Tetrameles nudiflora* (Vellacheeni) etc., dominate in this type. Moist deciduous forests occur interspersed with grasslands around the lake and along the slopes of the north. *Terminalia* species (Maruthy) dominate, Teak, Rose wood, *Pterocarpus* (Venga) etc, also exist. Grasslands occur around the lake on the islets. There is scattered growth of fire hardy species like *Anogeissus latifolia* (Mazhukanjiram), *Careya arborea* (Pezhe), *Embluca Officinalis* (Nelli) etc.

The main species of grass are elephant grass (*Cynopogon* species), *Saccharum* etc that are commonly grazed by elephant, gaur and sambar.

About 1340 trees are proposed to be felled along the project. Out of 1340 trees, 1052 trees are proposed to be felled between Punalur to Ponkunnam project road and about 288 trees are proposed to be felled in Ponkunna to Thodupuzha road. Chainage wise list of trees to be felled for the project road is given in **Table 5.20. Annexure 3.50** provides the methodology for avenue plantation along the project road.

Fauna. The forests/sanctuaries in the PIA district naturally supports a variety of species of mammals, birds, reptiles, amphibians and fishes. Tiger, Panther and Wild dog, Elephant, Gaur, Sambar, Barking Deer, Wild Boar, Sloth Bear, Bilgiri Tahr, Nilgiri Langur, Lion Tailed Macaque, Otter, Malabar Giant squirrel, civets etc. are generally sighted in deep jungles of the interior forests. There are several kinds of poisonous and non-poisonous snakes including the King Cobra. Tortoise may often be seen basking on rocks and tree-trunks by the lake. The Masheer, the most famous game fish of India, exists in large numbers. List of Fauna present along the project road is presented as **Annexure 5.3**.

The common aquatic birds are the India darter, little cormorant, kingfisher, and the black-necked stork.

5.6.6. PROJECT TIGER

The Periyar tiger reserve is one of the very important tiger reserves in India. The distance to the project tiger boundary from the project road could be more than 20-30km. Minimum distance of 20km to the outer boundary of tiger reserve is from Ranni.

5.6.7. PROJECT ELEPHANT

Similar to Project tiger, the area included in the project elephant is also 30km away from the project road. The 'project elephant' unlike 'Project Tiger' spreads over many sanctuaries in Kerala.

Table 5.20. Details of Likely Tree Removal along the Project Road

A. Punalur – Ponkunnam Road													
Chainage (km)		Categorisation of tress based on GBH											
		< 0.3 m			0.3 - 0.6 m			0.6 - 0.9 m			0.9 - 1.8 m		
		LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total
0+000	1+000	0	0	0	3	1	4	2	1	3	0	0	0
1+000	2+000	0	0	0	1	0	1	2	1	3	3	8	11
2+000	3+000	0	0	0	1	0	1	1	2	3	6	4	10
3+000	4+000	0	4	4	1	5	6	3	1	4	2	3	5
4+000	5+000	0	1	1	8	3	11	3	0	3	5	1	6
5+000	6+000	0	1	1	2	0	2	0	1	1	1	2	3
6+000	7+000	0	1	1	2	1	3	2	2	4	2	1	3
7+000	8+000	1	3	4	5	12	17	4	1	5	0	0	0
8+000	9+000	1	1	2	7	7	14	4	3	7	3	0	3
9+000	10+000	0	0	0	3	3	6	1	0	1	1	0	1
10+000	11+000	6	0	6	3	4	7	0	1	1	0	0	0
11+000	12+000	0	0	0	0	2	2	0	2	2	0	0	0
12+000	13+000	0	0	0	1	2	3	0	0	0	0	0	0
13+000	14+000	0	0	0	0	1	1	2	0	2	0	0	0
14+000	15+000	0	0	0	5	7	12	6	1	7	0	1	1
15+000	16+000	0	7	7	5	4	9	3	7	10	1	1	2
16+000	17+000	0	1	1	0	0	0	0	0	0	0	1	1
17+000	18+000	0	0	0	0	1	1	7	1	8	0	2	2
18+000	19+000	0	0	0	3	16	19	0	4	4	1	2	3
19+000	20+000	3	1	4	7	8	15	2	6	8	5	8	13
20+000	21+000	1	0	1	11	2	13	8	1	9	3	2	5
21+000	22+000	3	0	3	14	0	14	24	4	28	5	5	10

A. Punalur – Ponkunnam Road													
Chainage (km)		Categorisation of tress based on GBH											
		< 0.3 m			0.3 - 0.6 m			0.6 - 0.9 m			0.9 - 1.8 m		
		LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total
22+000	23+000	0	0	0	7	3	10	5	6	11	3	0	3
23+000	24+000	0	0	0	1	3	4	2	7	9	0	1	1
24+000	25+000	0	0	0	2	6	8	0	9	9	0	2	2
25+000	26+000	1	0	1	0	17	17	0	6	6	0	0	0
26+000	27+000	0	0	0	0	2	2	1	2	3	1	1	2
27+000	28+000	0	0	0	9	0	9	0	0	0	0	0	0
28+000	29+000	0	0	0	10	2	12	8	2	10	6	2	8
29+000	30+000	0	0	0	1	0	1	0	0	0	0	0	0
30+000	31+000	1	1	2	1	4	5	1	1	2	1	0	1
31+000	32+000	0	6	6	0	4	4	0	5	5	1	3	4
32+000	33+000	2	2	4	3	2	5	2	1	3	1	8	9
33+000	34+000	4	0	4	1	1	2	1	2	3	0	3	3
34+000	35+000	1	12	13	0	14	14	0	0	0	0	0	0
35+000	36+000	1	11	12	1	5	6	0	0	0	1	0	1
36+000	37+000	1	2	3	2	2	4	0	0	0	0	0	0
37+000	38+000	0	0	0	0	1	1	0	0	0	0	0	0
38+000	39+000	0	0	0	1	1	2	0	0	0	0	0	0
39+000	40+000	0	0	0	1	1	2	0	0	0	0	0	0
40+000	41+000	1	2	3	1	1	2	0	0	0	0	0	0
41+000	42+000	1	0	1	1	1	2	3	3	6	4	0	4
42+000	43+000	0	0	0	0	0	0	0	4	4	0	4	4
43+000	44+000	0	0	0	2	6	8	0	0	0	0	0	0
44+000	45+000	0	0	0	2	0	2	0	1	1	0	0	0
45+000	46+000	4	0	4	0	0	0	0	0	0	1	0	1

A. Punalur – Ponkunnam Road													
Chainage (km)		Categorisation of tress based on GBH											
		< 0.3 m			0.3 - 0.6 m			0.6 - 0.9 m			0.9 - 1.8 m		
		LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total
46+000	47+000	3	3	6	1	3	4	3	1	4	0	0	0
47+000	48+000	3	5	8	4	2	6	4	2	6	1	0	1
48+000	49+000	0	1	1	0	2	2	0	1	1	0	0	0
49+000	50+000	0	1	1	0	0	0	0	0	0	0	0	0
50+000	51+000	0	0	0	2	2	4	0	0	0	2	3	5
51+000	52+000	0	0	0	2	4	6	1	0	1	0	0	0
52+000	53+000	2	0	2	0	1	1	0	0	0	0	0	0
53+000	54+000	2	0	2	1	0	1	1	0	1	0	0	0
54+000	55+000	1	2	3	0	0	0	0	0	0	0	0	0
55+000	56+000	0	0	0	0	0	0	15	12	27	0	0	0
56+000	57+000	0	0	0	0	0	0	2	5	7	0	0	0
57+000	58+000	0	0	0	0	0	0	6	6	12	0	0	0
58+000	59+000	0	0	0	0	0	0	1	2	3	0	0	0
59+000	60+000	0	0	0	0	0	0	6	0	6	0	0	0
60+000	63+000	Punthenpuzha Reserved Forest											
63+000	64+000	0	0	0	0	0	0	6	2	8	0	0	0
64+000	65+000	0	0	0	0	0	0	3	6	9	0	0	0
65+000	66+000	0	0	0	0	0	0	8	13	21	0	0	0
66+000	67+000	0	0	0	0	0	0	1	3	4	0	0	0
67+000	68+000	0	0	0	0	0	0	1	3	4	0	0	0
68+000	69+000	0	0	0	0	0	0	6	5	11	0	0	0
69+000	70+000	0	0	0	0	0	0	8	2	10	0	0	0
70+000	71+000	0	0	0	0	0	0	11	11	22	0	0	0
71+000	72+000	0	0	0	0	0	0	14	4	18	0	0	0

A. Punalur – Ponkunnam Road													
Chainage (km)		Categorisation of tress based on GBH											
		< 0.3 m			0.3 - 0.6 m			0.6 - 0.9 m			0.9 - 1.8 m		
		LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total	LHS	RHS	Total
72+000	73+000	0	0	0	0	0	0	5	11	16	0	0	0
73+000	74+000	0	0	0	0	0	0	13	10	23	0	0	0
74+000	75+000	0	0	0	0	0	0	4	4	8	0	0	0
75+000	76+000	0	0	0	0	0	0	4	7	11	0	0	0
76+000	77+000	0	0	0	0	0	0	4	14	18	0	0	0
77+000	78+000	0	0	0	0	0	0	12	13	25	0	0	0
78+000	79+000	0	0	0	0	0	0	9	3	12	0	0	0
79+000	80+000	0	0	0	0	0	0	7	6	13	0	0	0
80+000	81+000	0	2	2	0	0	0	3	3	6	0	0	0
81+000	82+000	5	5	10	0	0	0	0	0	0	0	0	0
82+000	83+000	1	1	2	0	0	0	0	0	0	0	0	0
83+000	84+000	0	0	0	0	0	0	0	0	0	0	0	0
Sub Total		49	76	125	138	169	307	255	237	492	60	68	128
Grand Total													1052

Source: Topographic Survey, 2012

B. Ponkunnam – Thodupuzha Road							
Chainage (km)		Categorisation of tress based on GBH					
		< 0.3 m			0.3 - 0.6 m		
		LHS	RHS	Total	LHS	RHS	Total
84+000	85+000	5	1	6	0	0	0
85+000	86+000	9	9	18	0	0	0
86+000	87+000	9	9	18	0	0	0
87+000	88+000	7	1	8	0	0	0
88+000	89+000	3	2	5	0	0	0
89+000	90+000	1	2	3	0	0	0
90+000	91+000	0	1	1	0	0	0
91+000	92+000	0	0	0	0	2	2
92+000	93+000	0	0	0	1	2	3
93+000	94+000	0	0	0	0	4	4
94+000	95+000	0	0	0	3	2	5
95+000	96+000	0	0	0	7	2	9
96+000	97+000	0	0	0	0	4	4
97+000	98+000	0	0	0	0	2	2
98+000	99+000	0	0	0	2	1	3
99+000	100+000	0	0	0	2	1	3
100+000	101+000	0	0	0	14	3	17
101+000	102+000	0	0	0	3	0	3
102+000	103+000	0	0	0	4	9	13
103+000	104+000	0	0	0	10	1	11
104+000	105+000	0	0	0	2	1	3
105+000	106+000	0	0	0	0	0	0
106+000	107+000	0	0	0	7	2	9
107+000	108+000	0	0	0	2	2	4
108+000	109+000	0	0	0	2	2	4
109+000	110+000	0	0	0	2	3	5
110+000	111+000	0	0	0	3	2	5
111+000	112+000	0	0	0	0	0	0
112+000	113+000	0	0	0	4	4	8
113+000	114+000	0	0	0	3	1	4
114+000	115+000	0	0	0	7	4	11
115+000	116+000	0	0	0	5	2	7
116+000	117+000	0	0	0	6	1	7
117+000	118+000	0	0	0	5	5	10
118+000	119+000	0	0	0	5	3	8
119+000	120+000	0	0	0	0	3	3
120+000	121+000	0	0	0	4	5	9
121+000	122+000	0	0	0	3	1	4
122+000	123+000	0	0	0	3	0	3
123+000	124+000	0	0	0	0	4	4
124+000	125+000	0	0	0	1	0	1
125+000	126+000	0	0	0	0	1	1
126+000	127+000	0	0	0	7	9	16
127+000	128+000	0	0	0	6	3	9
128+000	129+000	0	0	0	1	10	11
129+000	130+000	0	0	0	0	8	8

B. Ponkunnam – Thodupuzha Road							
Chainage (km)		Categorisation of tress based on GBH					
		< 0.3 m			0.3 - 0.6 m		
		LHS	RHS	Total	LHS	RHS	Total
130+000	131+000	0	0	0	1	1	2
131+000	132+000	0	0	0	0	0	0
132+000	133+000	0	0	0	0	0	0
133+000	134+000	0	0	0	0	0	0
134+000	135+000	0	0	0	0	0	0
Total		34	25	53	125	110	235
Grand Total							288

5.7. HUMAN HEALTH AND SAFETY

5.7.1. HUMAN HEALTH

The four PIA districts viz., Kollam, Pathanamthitta, Kottayam and Idukki districts has made notable achievements in health standards reflected in the attainment of a low infant mortality rate, low maternal mortality rate, low birth rate, low death rate, and high life expectancy at birth. With regard to childcare the State has recently (June 2002) identified by the UNCEF as the most baby friendly State in the country. The State has concentrated much on the social aspects including health care, education especially woman education and adult education etc resulting high level of general health consciousness. This has been made possible through a wide network of health infrastructure and social factors such as women's high education levels, general health consciousness and awareness.

5.7.2. HIGHWAY SAFETY

This is one of the most important considerations for the Highway Authority and road designers. The issue has been right fully considered in Sectoral Environmental Assessment (SEA) report. This is addressed more elaborately due to its importance in the Kerala State Transport Project.

5.7.3. ROAD ACCIDENTS IN KERALA

The World Health Organization has revealed in its Global Status Report on Road Safety that more people die in road accidents in India than anywhere else in the world, including the more populous China. At least 13 people die every hour in road accidents in the country, the latest report of the National Crime Records Bureau reveals. However, road safety experts say the real numbers could be higher since many of these accident cases are not even reported.

The Kerala state is leading the country in terms of risk factors like high rate of road accidents and high injury rate due to road traffic crashes. Road accidents are considered to be the third major cause of death in the state. Heart ailments and cancer are the other diseases that take a heavy toll of human lives in the Kerala State. The state of Kerala has nearly 3% of the country's population but it has recorded about 10 % of the country's road traffic accidents. According to the causality figures recorded in major medical college hospitals in the state, nearly 70% of the head injuries are reportedly caused due to traffic crashes. Rapid increase in the number of motor vehicles especially during the last two decades has been the major reason for the increasing number of road accidents in our state. The vehicle population has increased by 10 times between 1980 and 2000 and by 3 times between 1990 and 2000. The accident rate of Kerala is the highest in the country with 15 accidents per 1000 vehicles, which is twice that of all Indian average. Even bigger states like Uttar Pradesh, Madhya Pradesh, Gujarat, Rajasthan and Andhra Pradesh have reported far less number of accidents compared to Kerala State (Economic Review 2010).

Records shows that rash and negligent driving on the part of the drivers is the main cause of road accidents. According to the records, almost 99.7% of the accidents were caused due to the fault of driver of motor vehicles. However, the rest of the accidents are reportedly caused due to other reasons like defective vehicle, bad weather, poor road surface, fault of pedestrians etc. Poor surface conditions, road cutting, lack of pedestrian crossing facilities, uncontrolled access streets and unmanned junctions, bad driving habits and lack of discipline by road users ,haphazard parking on road side, absence of proper bus bay and shelter, visual acuity of drivers , encroachments/dumping of materials on road and protruded lamp post, unscientific check barriers, speed breakers etc are the major reasons of road accidents.

With 23.9 fatalities per 10,000 vehicles in 1996 as compared to less than five in North America and Western Europe, India has a high accident rate¹. The number of road accidents in Kerala is 24.16 per 1,000 vehicles versus the national average of 12.02. The **Table 5.21** shows the accident rate in Kerala from 1995-96 to 2011. Details of road accidents in Kerala State between 01.01.2011 and 31.12.2011 are presented in **Table 5.22**. The fatalities due to accident have increased by 53% in 2011 compared to 1995-96. As in other parts of India, the mixture of buses, lorries, cars, motorized rickshaws, motorcycles, bicycles and pedestrians travelling at vastly different speeds contribute to extremely unsafe road conditions.

Table 5.21. Accident Rates, Kerala, 1995-2011

ACCIDENT RATES	1995-96	96-97	97-98	98-99	99-2000	2011
Reported Accidents	37123	34702	33820	33296	37,072	35216
Personal Injuries	53475	51168	47668	46397	49,399	41379
Fatalities	2707	2707	2,668	2668	2711	4145

(Sources: Director-General of Police for the traffic accidents, and Motor Vehicle Department for vehicle statistics)

Table 5.22. Details of Road Accidents in Kerala (01/01/2011 to 31/12/2011)

DISTRICT	CASES	DIED	SERIOUSLY INJURED	INJURED
Kollam(Rural)	1255	200	1019	379
Pathanamthitta	1425	161	1028	484
Kottayam	2458	226	2103	1070
Idukki	1031	69	706	759
Kerala	35216	4145	25110	16269

There is a conspicuous absence of footpaths along most busy roads; the physical separation of vehicles and pedestrians is an essential feature of modern road design wherever there is any likelihood of conflict. Road junctions have few safety refuges for pedestrians and there is a total disregard by all drivers in observing rules relating to pedestrian crossings under the noses of the police officers. The project will address the road safety issues in all KSTP II road designs.

5.7.4. ENVIRONMENTAL ASPECTS INFLUENCING HIGHWAY DESIGN

The project highway design has applied all natural physical conditions. The analysis of some Kerala specific parameters is used in design decision-making. The designers have a clear understanding of the physical conditions of Kerala. There has been considerable research carried out to achieve this in the form of site surveys, scoping workshops, analysis of KSTP I lessons and Client/WB participation. Consultants have considered all these factors in the final output.

¹ Isaac 1999

² Elangovan 1999

5.7.5. IMPORTANT ROAD SAFETY FACTORS IN KERALA

The following key factors make the pedestrian/vehicle movement along the road unsafe.

- Rolling terrain, and sharp bends
- Narrow corridor widths
- Lack of provision of road lining and signing
- High rate of localised pedestrian movement, and lack of dedicated footpaths
- Private property-compound walls and thick growth of trees etc.
- High density of population
- Lesser visibility to driver especially due to trees³ and poor enforcement of legislation against encroachers
- Unauthorised structures, posters and advertisement along road sides-encroachment
- Human factor-information and attitudes-lack of enforcement of basic rules of Road Traffic Act
- Storage of construction materials and rubbish on the road sides
- Lack of level differences between the black topped portion and “footpaths”
- Poor intersection layouts and absence of any priority systems
- Trees, utilities, electric and telephone posts etc
- Use of advertisement boards and unauthorised signs often encouraged by the authorities responsible for road safety
- Poor drainage

The **Table 5.23** shows some factors influencing road safety in the three physiographic regions. The ribbon development is a common phenomenon in Kerala. Pedestrian movement is not very high along the project road.

Table 5.23. Physiographic Factors Influencing Road Safety

Sl. No	Parameters	Lowland Or Coastal Belt	Midland
1	Terrain	Plane area	Rolling
2	Density of population	Very high	High
3	Sharp bends	High	Very high
4	Narrow corridor width	Common	Very common
5	Pedestrian movement	Very high	Very high
6	Reduced visibility for drivers	Less	Less
7	Compound walls	Common	Very common
8	Tree growth	Not very thick	Thick
9	Density of road network	High	Very high
10	Speed of vehicles	High	High
11	Accident rates	High	High
12	Occurrence of curves and gradients	Moderate	High
13	Monsoon rainfall	Moderate	High
14	Road junctions	Very high	Very high
15	Public Trees	Few	More

The various factors including the operational stage traffic together demand great attention in upgrading the road network with road safety as one of the primary objectives. This may be

³ In Munnar, the tea gardens provide excellent visibility over long distances due to the very low height of the plants.

achieved within the limits of the existing project and also by introducing a better appreciation by PWD Engineers for the periodic maintenance projects.

5.7.6. COMPREHENSIVE AND INTEGRATED ROAD SAFETY ACTION PLAN

The ongoing road safety programme has the following key elements:

- Appointment of two road safety specialists-Completed
- Road safety audit for the KSTP I and II designs-Completed
- Preparation of a highway code for Kerala based on the IRC document with necessary modernization and translation into the Vernacular-Completed
- To act as advisor to the State Policy Committee and assist in the implementation of the policies with the many interested parties.
- Preparation of a road safety plan with the input from concerned agencies and organizations
- To train PWD engineers in road safety auditing on existing sites. Prepare a budget for improvement of existing conditions for any revised alignments, signing and lining with special attention to road junctions and to
- Prepare and hold workshops for interested parties in the road safety arena especially for PWD road maintenance engineers and the police.
- An 'Road safety awareness programme' targeting mainly the road users especially the school children is being taken up as one of the latest measures.

5.8. CULTURAL RESOURCES IN THE PIA DISTRICTS

Details of the shrines, churches, temples and mosques in the immediate vicinity of the Right of Way and needing to be protected are shown in the link specific Part II EMP **Annexure 3.55**. These include Temples, Mosques, Churches, Cremation ground, Hundi and shrine (very small religious place). The detailed analysis is provided in the Cultural Property Rehabilitation Measures. The same table also provides the impacted cultural properties. This is further discussed in the impact chapter. The Project design philosophy and the nature of Kerala roads with respect to the cultural aspects are important deciding factors. There are 38 identified cultural properties along the project corridor. During Sabarimala pilgrim season religious activities in all temples and few mosques will be on a higher scale. The list of 38 cultural properties includes temples, mosques, churches, cremation ground, hundi and shrine (very small religious places). The detailed analysis is provided in the CPR measures appended with EMP **Annexure 3.55**. The same table also provides the impacted cultural properties. This aspect is further discussed in the impact chapter. The Project design philosophy and the nature of Kerala roads with respect to the cultural aspects are important deciding factors

Sabarimala Pilgrimage: The Sabarimala temple is situated at about 467m above mean sea level inside the recently declared Tiger reserve. During the Sabarimala Pilgrimage season 40-60 million pilgrims have been visiting the hill shrine with a twenty percent increase every year. The pilgrims arrive at Sabarimala through various routes from all southern States. The Link 84 project road is the most widely used road with a total length of 134 km (included in KSTP II) which links to Link 70 and Link 6 (KSTP I roads) and finally to the National highway at Angamali will be the most used route included in KSTP for the Pilgrims. During the whole season, the estimated daily traffic at Pamba is 15,000 to 17,000 vehicles. Refer corresponding section in impacts and mitigation chapters. A connectivity map of the Sabarimala shrine with respect to various road/railways is provided in **Figure 5.26. Figure 5.27 and 5.30** are cultural properties located

immediately adjacent to the available corridor. The **Figure 5.27** is a tree shrine by the side of the project road. The final design avoided most of the cultural buildings but some walls or yards may be affected (Refer to EMP) as reflected in the impact, mitigation and enhancement aspects discussed in the relevant sections

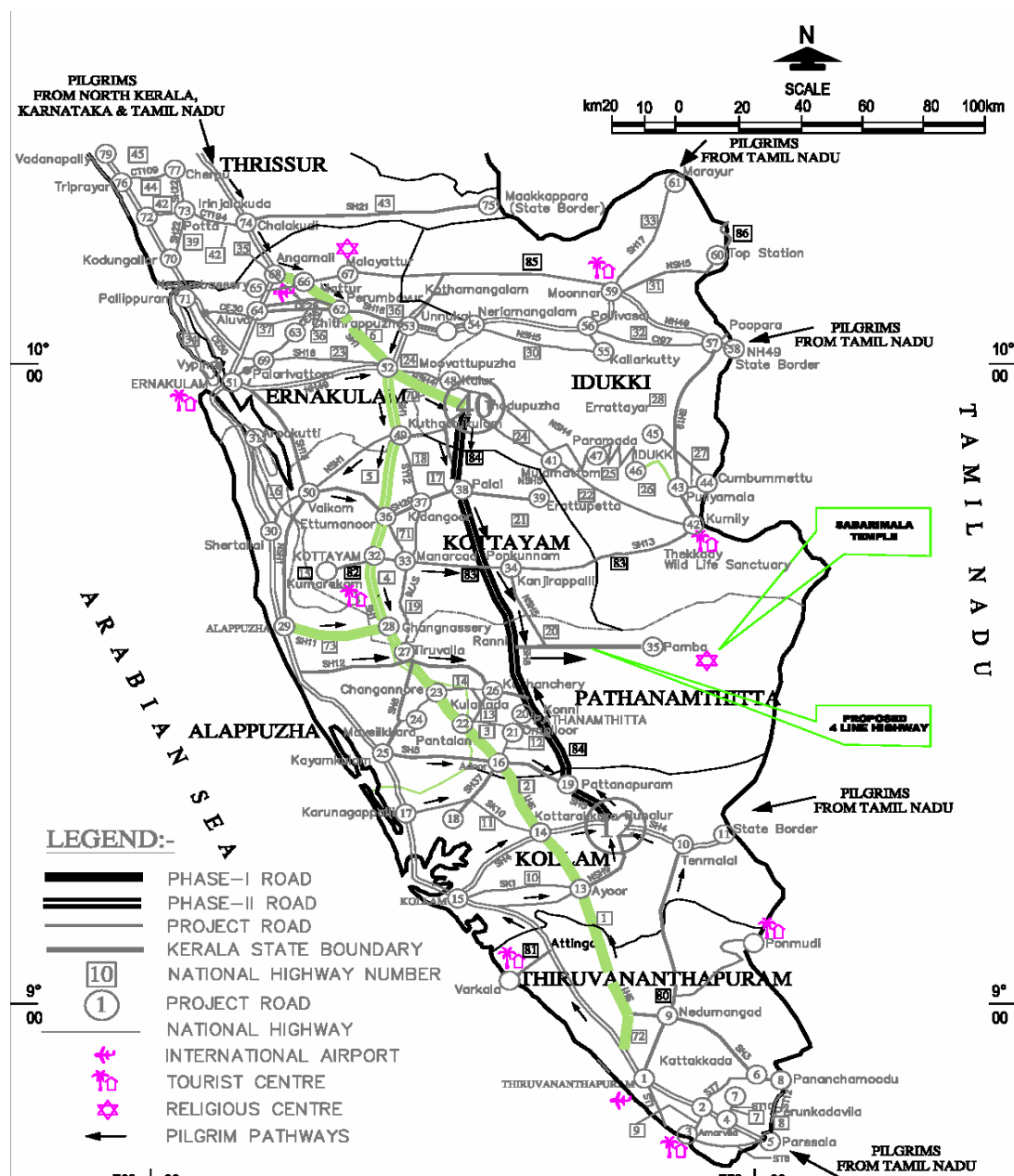


Figure 5.26. Connectivity to Sabarimala

	
Figure 5.27. Tree Shrine along the Project Corridor (Ch.0.80))	Figure 5.28. Old British Bridge at Punalur (Ch 0.100)
	
Figure 5.29. A View of the Street Vendors Doing Brisk Business along the Sides of the Project Road (Chainage 20.000)	Figure 5.30. Traffic Congestion during the Festival (Chainage 20.000)

The hanging Bridge at Punalur: The hanging Bridge of Punalur, Kerala, the only vehicular hanging bridge of Kerala and the second one in India built by the British. This old hanging bridge is now under the authority of archaeology department, and is under maintenance. The construction and engineering of this hanging bridge marvel dates back to 1877, by a British engineer named Albert Henry. The bridge is situated across river Kallada and joins the Kollam - Chengotta state highway which is now NH 208 and is very close to the project road start chainage.

The Punalur suspension bridge is the only suspended-deck type in south India. Built in 1877 by Albert Henry across the Kallada River, this huge bridge was suspended by three spans and was used for vehicular movement. Now the bridge is only of historical interest. The main concept behind the construction of this bridge was that areas on the other side of the river Kallada was dense forests. The need of a bridge was necessary, but the problem was through a concrete bridge, wild animals can easily pass to the populated area so to prevent that a bridge which shakes when some one enters was built and finally it succeeded.

The bridge is connected to four wells. The iron rods of the bridge are connected to the clips, situated in the wells. Each well is of about 100 feet deep and no one since know the engineering behind the construction of this bridge

Now the authorities are trying to keep the bridge as a monument with archaeological importance. A small garden and resting place is going to be built around the bridge and in mean time it could be a resting and refreshing spot for the public and tourists around. The present state of the hanging bridge is just the steel skeleton, seems got just painted. The bridge pillars are getting cleaned as part of beautification, a small grass lawn and some flowering plants around, cast iron gates are guarding the entrances and some night lamps are fixed around.

5.8.1. AGRICULTURE IN THE PIA

The major agricultural activities in the region include Rubber plantations, coconut plantations and banana. Although Kottayam district is famous for rubber-based industries, the PIA of project road has very few industries. In the PIA area at Pala and Chenapady few rubber-based industries are located.

5.8.2. INDUSTRIES IN THE PIA

The PIA districts are industrially backward despite being rich in natural resources and other infra-structural facilities. Most of the industries in the PIA districts are agro based industries and rubber based industries. Some forest based and textile based industries are also these. Most of the industries in the PIA districts belong to private sector. The Travancore Sugars & Chemicals Ltd. Koshy's Electronics Ltd, Sri. Srinivas Wheat Industries Pvt. Ltd and Padinjarekkara latex industries are the major among them.

5.8.3. TOURISM IN THE PIA

The **Figure 5.31** shows the project road in relation to the tourist centres of South Kerala.

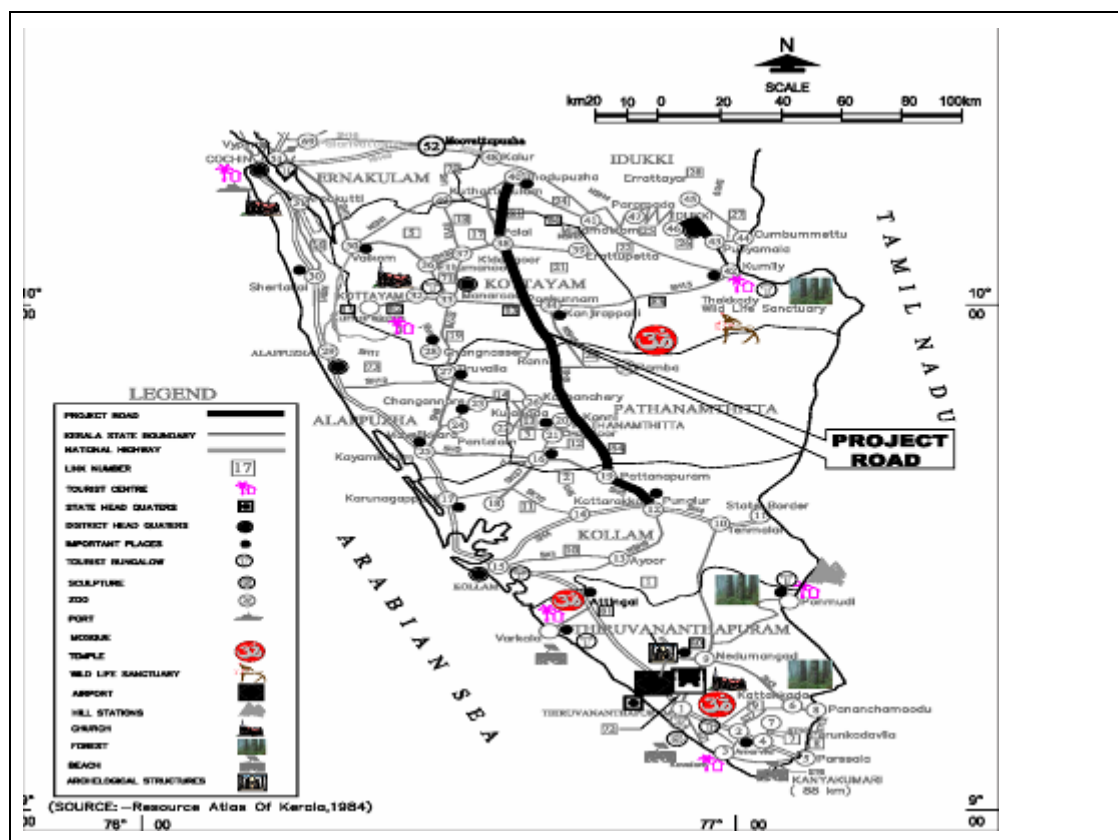


Figure 5.31. Project Road in Relation to Tourist Centres of the Region

Thekkady is the most important eco tourism area in Kerala with the two national projects on tiger (Project Tiger) and elephant (Project elephant). It is very easy to spot herds of Wild elephants in this sanctuary while taking boating in the Thekkady Lake.

Peerumedu-Kuttikanam-Panchalimedu- These are few hill stations in the region.

Thenmala. The newly built Thenmala eco-tourism project is similar to that of Thekkady in many respects. This is about 30 km from Punalur.

Sabarimala (Ayyappa temple) Sabarimala is one of the most famous pilgrim centres in India. It is 72 km. away from Pathanamthitta and is situated between two hills – Karimala and Neelimala which is 191 km. from Thiruvananthapuram and 210 km. from Kochi. Sabarimala is the holiest and the most famous centre of Hindu pilgrimage. The presiding deity is Lord Ayyappa (known as Sastha in puranas). Ayyappa is believed to be son of Lord Vishnu and Lord Siva and there by a symbol of unity between Vaishnavites and Saivates. The original temple was consecrated by Lord Parasurama. Every year crores of devotees from all over India visit the shrine of Lord Ayyappa for his blessings. The pilgrimage season starts in November (Vrischikam 1st) and ends in mid January (Makaravilakku). The traditional route is from Erumeli which is about 40 km. The other routes are from Vandiperiyar, Uppupara and Chalakkyam via. Plappally. These routes are well known for its scenic beauty and mythological importance. The temple is situated 5 km. away from Pamba in the hill, consecrated by the holy life of Sabari who was met by Lord Sree Rama during his way to Lanka. According to tradition, a pilgrim, desirous to worship Lord Ayyappa, has to undertake 41 days penance consisting of strict celibacy, morning and evening ablutions, growing of beard and daily prayers. The Sastha temple at Sabarimala attracts people in lakhs for the Mandalapooja and Makaravilakku festivals in December and January every year. On the particular day of Makaravilakku, lakhs devotees throng around the temple for a glimpse of Makarajyothi. The temple is closed for during the rest of the year except for the first five days of every Malayalam month and during Vishu. This temple is situated 467 metres above sea level amidst forest in the rugged terrains of the Western Ghats. A distinctive feature of the pilgrimage is the absence of any feeling of caste and class and presence of gesture of unity. Various facilities are provided for the pilgrims by the Government of Kerala, Devaswom Board and other voluntary organisations during the festival period. The nearest railway station is at Thiruvalla (102 km.)

Sreevallabha temple at Thiruvalla. Sreevallabha temple at Thiruvalla is one of the important pilgrim centre of Vaishnavites all over India. The town had been named after the magnificent temple of Thiruvallabhan (Sree Vallabha or Vishnu) which is said to have been founded as early as 84 BC. A natural big pool within the temple is considered to be a rare phenomenon. Besides the image of Vishnu there are 5 images all made of metals called Pancha loha (gold, silver, tin, lead and copper). A granite pillar carved out of single piece with an image of Garuda on its top stands in front of the temple. The pillar, which serves as a flag staff, is 50 feet high and 2 feet in diameter. There are wonderful corridors, all made of large granite slabs. There is an ancient underground cellar in this temple. The flagstaff is also a wonderful structure in this temple. The temple exhibits in a marked degree, the use of gabbler, one of the peculiar features of Kerala temple architecture. Kathakali, the folk art of Kerala, is performed almost on all days in this temple as offerings by devotees.

Bhagavathi temple of Malayalappuzha. The Bhagavathi temple, with artistic wall paintings and stone work has been an attraction to many foreigners. It is believed to help people to realise their dreams. People bring offerings in different forms during the festival.

Pandalam It is located at a distance of 16 km. from the project road. Pandalam is perhaps second only to Sabarimala in sanctity and significance. Lord Ayyappa, the presiding deity of

Sabarimala, had his human sojourn as the son of the Raja of Pandalam. It is believed that the Raja constructed a temple close to his palace on the banks of the river Achancovil, modeled on the Sabarimala shrine, which is the present Valiya Koickal temple. Pilgrims usually offer worship here before proceeding to Sabarimala. Three days prior to Makaravilakku, the sacred ornaments for Lord Ayyappa are taken in a procession from Pandalam to Sabarimala. Pandalam has one Arts and Science College. It has one cinema hall and one stadium. The nearest town having fire-fighting facility is Adoor, located at a distance of 12 km. The nearest railway station is Chengannur at a distance of 13 km.

Parumala: Parumala at a distance of 10 Km. from Thiruvalla is a kara of Kadapra village. It is in Parumala that Mar Gregorious Metropolitan, the declared saint of Malankara Orthodox Church, takes his eternal rest. The “Ormaperunnal” (Remembrance day) celebrated on the first and second of every November is very famous. A large number of devotees flock to this place for worship. The Travancore Devaswom Board has set a college named Pampa College. Mar Gregorious Hospital at Parumala is also noteworthy.

Omalloor Manjinikkara church is situated in Omalloor village with an area of 14.54 sq.km.. It is only 5 km. west of the district headquarters. Mar Ignatius Elias III, the holy Patriarch of Antioch, while on his visit to India, died at this place in 1932. His mortal remains are kept in this church. Later this place got developed into place of pilgrimage. Even today pilgrims, Indians as well as foreigners visit this place frequently. In February every year, devotees, especially Jacobite Syrian Christians flock here in their thousands.

Niranam: Niranam, once known as Kizhakkumbhagam, is located about 7 km. from Thiruvalla. It is having an area of 11.01 sq.km. Niranam is famous from very ancient times. One of the seven churches, believed to have been founded by St. Thomas, one of the twelve Apostles of Jesus Christ, is located here. It is only a few yards away from this place that the great Malayalam poets known as Kannassa Panickers lived and wrote their main poetic works. A site has been separately identified to put up a memorial for them. The nearest railway station is Thiruvalla.

Kodumon Chilanthiyambalam: Chilanthiyambalam is situated in Kodumon Panchayat about 15 km. from Pathanamthitta town. The chief attraction of this place is spider temple. It is believed that this temple was built during the reign of the last king of Sakthibhadra Kingdom. The Mahalakshmi of this temple is worshipped by all people irrespective of caste and creed. It is also believed that spider poison is cured by praying at this temple. The water of the Chilanthi kinar (well) in the premises of this temple is believed to cure skin disease.

Siva Temple at Nilackal The old Siva temple on the Pamba-Pathanamthitta road is an important place of worship. It is five kilometres away from Plappally. The estate of the Farming Corporation and the Ecumenical Centre of all denominations of Christians is also situated here.

Cherukole: It is the smallest village of Ranni taluk with an area of 15.61s sq.km. and located at a distance of 18 km. from the project road. It is renowned for an important religious convention of the Hindus, which is held in February every year on the river bed of Pamba, flowing through the district.

Kallooppara This revenue village is located at a distance of 10 km. from Thiruvalla. St.Mary’s church at Kallooppara stands in close proximity to the Bhagavathi temple which is an admirable example of communal harmony. There are two granite slabs inside the church with some inscriptions in Pali language. The nearest railway station is Thiruvalla. There is an Engineering College in the village.

Manjinikara Church . Mar Ignatitus Elias III, the holy patriarch of Anthioch, while on his visit to India died at this place in 1932. His mortal remains are kept in this church. Later, this place developed into a place of pilgrimage. Even today, pilgrims – Indians as well as foreigners – visit this place frequently. The annual festival (Orma perunnal) is held in February every year when devotees flock in thousands.

Maramon Situated near Kozhenchery, Maramon is the venue of a mammoth religious convention of Christians from all over the world. It is attended by people from all communities. It is held at Maramon, every year on the vast sandy beds of the river Pamba. The convention takes place in February in an atmosphere of devotion and lasts for a period of seven days. Addressed by speakers of international repute and attended by devotees innumerable, this is perhaps the largest Christian convention in Asia. The centenary celebration of the convention was held in February 1995.

Peruthenaruvi. Peruthenaruvi, the famous waterfall, is situated 36 km. away from Pathanamthitta. The waterfalls in the Pamba river at Perumthenaruvi attract thousands of people from inside and outside the district. The water flows down a rocky bed into a ravine sixty to one hundred feet deep. This is a beautiful natural waterfall and an ideal place of tourist attraction. It is only 10 km. from Erumeli and accessible by trekking or by jeep.

Charalkunnu It is a small beautiful and picturesque hill station located at Thottapuzhassery village with an area of 14.46 sq.km and at a distance of 18 km. from the district headquarters and 5 km. from Kozhenchery. This hill station developed in to a major centre of Social, Cultural and religious activities of Marthoma Church in Kerala offers a panoramic view of the nearby valleys including that of the river Pamba. This beautiful centre in central Travancore is gaining a lot of tourist attention because of its location and scenic aspects. There is comfortable camp house, with room and dormitories.

Kakki Reservoir. Kakki reservoir, set in sylvan background is a tourist delight. The splendid artificial lake offers exhilarating boating experience. The surrounding forest abounds with tigers, elephants, deer and monkeys.

Thodupuzha: The Head quarters of Thodupuzha taluk is situated at the end chainage of the project road. This is a place of historical importance. Karikode near Thodupuzha was the headquarters of Vadakkumkur Raja, where there is the remains of a fort Devi temple and Ninar Mosque constructed by Vadakkumkur Raja. The famous Annamalai temple dedicated to Lord Shiva constructed in Chola style architecture is also located at Karikode. The church at Muthalakodam near Thodupuzha is believed to have constructed before 13th century.

Thommankuthu: Thommankuthu is a chain of cascades 17 km from Thodupuzha, the project end chainage. This is a remote place with beautiful scenery of seven step water fall. This is developing to an important Tourist spot in the Idukki district.

Munnar: Situated 140 km from the project end chainage at an elevation of 1524 Mtrs. in above the mean sea level and on the confluence of three mountain streams Kannimalayar, Nallathanni and Kundala. It is a health resort especially in summer season. It is the centre of Tea Industry and also the Head quarters of the Kannan Devan Hill produce Company (now owned by Tata Tea Company). Munnar also has the highest peak in South India, Anamudi.

5.8.4. FISHERIES IN THE REGION

Fishing is not a prime source of livelihood in the PIA districts. However, important fishing centres are there in the project districts. The important fishing areas are Thangasseri near Kollam and Kumarakoam near Kottayam.

CHAPTER 6. PUBLIC PARTICIPATION & CONSULTATION

The WB's Environment Policy mandates the requirements for effective public consultation and information disclosure in the Environment Assessment (EA) process. Public consultation is an important element of the planning and implementation of projects and is embedded in the World Bank's safeguard policies on environment, involuntary resettlement, and indigenous peoples. Public consultation is necessary to ascertain the public's views and perceptions regarding the project. The EIA process also mandates the details of public consultations such as - the persons consulted, issues discussed, response to the concerns raised by public etc. The state being highly literate and densely populated, public participation exercise was very useful to incorporate suggestions, environmental mitigation and enhancement measures. The participation exercise was an integral part of the environmental and social assessment process starting early from the feasibility stage continued through Phase I design and entering to Phase II design and the process will continue through out the implementation phase. The State being unique in its environmental features with respect to climatic and geographical set up, the consultations held during phase I programme are in general applicable to the Phase II roads.

Sabarimala Pilgrimage considerations. No other holy place in India is visited by such large number of pilgrims within a short span of three months every year. The temple shrine situated about 45 km from the project road at about 500m a.m.s.l and surrounded by 18 hills, Sabarimala forms part of the Periyar tiger reserve, home for diverse flora and fauna. It is estimated five crore (?) devotees visit the temple a year with a twenty percent increase (?) every year. Realising these facts, Indian railways is in the process of constructing a railway line to connect Pamba named as 'Sabari railway line' and the preliminary works has already been started. The GOK is planning a four-lane highway corridor starting from this project road to Pamba (Foothill station to Sabarimala). The KSTP is planning to improve the Punalur-Thodupuzha project road. All these facts and figures indicate the level of service expected or that the project road should provide by the widening and improvement of the project road. The entire aspect forms a part of the public/State interest and can be considered as public consultation input. The pilgrims are floating population and they could not be spotted except during the season. Since the pilgrims are moving in random only rarely could they be able to explain the needs of pilgrim.

Every human activity in the PIA area should be controlled to preserve the ecology of the area. For example during pilgrimage season the vehicle parking in the forest area destroying many plants (mitigation-provide earmarked parking area in the least impacted location) and the pilgrims often use forest streams for meeting various water and human needs (mitigation-provide toilet and bathing facilities in a very controlled manner). Such an approach will make the project an environmental protection project or an eco-restoration project rather than a road

improvement project. In this case pilgrim consideration should focus each activity and a mitigation to counter the pilgrim activity.

Table 6.1. Sabarimala Considerations

Pilgrim Related Issues	Mitigation Measures to Address the Pilgrim Considerations
Road safety and accidents	Proposed ear marked parking area for vehicles including vehicles during pilgrim season. Details are provided in the last chapter on environmental enhancements. Bus bays are also considered in a number of places.
Water pollution (Solid and sewage waste)	Provide toilet and bathing facilities in the least impacted sections
Encroachment activities inside forest reserves	The above two controlled activities will largely resolve the issue. Further the rest areas with restaurant and other faculties will also assist control on destruction of natural reserves, streams, trees, shrubs etc.

The cost of environmental mitigation measures would be very high as these measures are the actual design requirements for the success of the project.

The public consultation and participation exercise was an integral part of the environmental and social assessment process through out the KSTP II project preparation. The State being unique in its environmental parameters with respect to climatic and geographical set up. The consultations held during KSTP I programme are in general applicable to the KSTP II roads

6.1. PROJECT SPECIFIC LOCAL CONSULTATIONS CONDUCTED FROM 1999 ONWARDS

The official level consultations started with the Kerala State Transport Project (KSTP) environmental investigations at the beginning of the project as early as in 1999. These consultations were considered for the environmental screening study carried out as a part of the Feasibility study reported in April 2000. The details of the key participants, venue, subjects discussed and other aspects are tabulated and presented in the **Annexure 6.1, 6.2 6.3, 6.4 and 6.5** prepared by Loius Berger. The details of scoping workshop are given in **Annexure 6.6**. Details of officials consulted during consultation are presented in **Annexure 6.7**.

These consultations are considered the then requirements of various Government agencies for clearing the project regarding environmental and forestry aspects at district, state and national level. After submission of the feasibility report, a number of consultations were carried out by the then consultants with the State Pollution Control Board, the Forest Department, Archaeological Department, Centre for Earth Science Studies, State Committee on Science Technology and Environment, Centre for Water Resources Development and Management etc. A series of project specific local consultations were also conducted by the previous consultants before the preparation of the EIA report. **Figure 6.1** shows earlier public consultation done with people at various places along the project road. The outcome of these consultations has been considered in the preparation of various submissions including the earlier Environmental Impact Assessment Report of Loius Berger.



Table 6.2. Summary of Issues and Mitigation/Compensations Aspects Discussed in Consultation with Local People

SL. NO	IMPACTS/ISSUES RAISED	MITIGATION MEASURES TAKEN / THE RESPONSE OF THE KSTP TEAM
1	Whether the design is final or not?	Team insisted for the problem /issues/impacts to be addressed. Till the time of construction there could be minor changes such as avoidance of a building due to a slight compromise in the width.
2	Is shifting of identified bus bay area possible?	Bus bay is decided based on the existing pattern of Bus stops as well as the availability of the land and convenience. Accordingly some shift was necessary from the original existing location.
3	Why not adopting central widening?	As far as possible, the straitening of the curves is included in the project as part of the up-gradation. Traffic and road safety considerations are part of the work. In all those areas where there is very less traffic this is avoided.
4	Is it possible to avoid demolition of the 'buildings' which are away from the widening corridor at Pala?	After site visit and detailed discussions the demolition of multi-storeyed buildings are avoided at Pala deviation.
5	Biological and physical	This aspect was never part of any discussion and no

	environmental issues raised	issues relating to this were raised during any of the recent consultations.
6	If the Access to house is destroyed will the project provide alternative access irrespective of the cost consideration	Project will provide reasonably good access to all buildings and properties irrespective of the cost considerations.
7	Is the project transparent and free from corruption?	This is a World Bank project with environmental and social considerations. All E.A/SA documents prepared for the project will be ultimately disclosed to the public.
8	The PAPs requested to avoid the major impacts to buildings and properties along Pala deviation	Avoided all those requested for Pala deviation
Source: Summarised from the report on various consultations held along the corridor, 2003		

6.2. REGIONAL SCOPING WORKSHOPS

As a part of the community participation, three regional scoping workshops were carried out to determine the extent and scope of the environmental documentation required. These exercises could open up all environmental and social issues that will have to be addressed in the project. These were valuable input and also consolidated the limited scope of widening and not to stick to any design standards specified by the road agencies. The **Table 6.4** provided the details of the environmental and social scoping workshops. The State being linear and the capital being located at the extreme south district, one meeting at Thiruvananthapuram would not suffice. Therefore there were three workshops instead of one at State level to maximise the participation at Thiruvananthapuram, Kochi and Kozhikode. All resource persons, NGOs and other stakeholders were formally invited to attend project level meetings. The total invitees for Thiruvananthapuram, Kochi and Kozhikode workshop were 200. The **Figure 6.2 & Figure 6.3** shows the scoping workshop session at Kochi.

Table 6.3. Environmental and Social Scoping Workshops

SL NO	SCOPING WORKSHOP	DATE	DISTRICTS COVERED	NUMBER OF PEOPLE PARTICIPATED	NUMBER OF PEOPLE INVITED
1	Thiruvananthapuram	Jan 8, 2000	Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta	57	80
2	Kochi	Jan 25, 2003	Ernakulam, Kottayam Thrissur, Palakkad and Idukki	47	60
3	Kozhikode	Feb 2, 2000	Malappuram, Kozhikode, Kannur, Kasaragod and Wayanad	51	60
Total				155	200

The minutes of all three scoping workshops are attached as **Annexure 6.6**. The objective of the workshops was to gather observations and concerns from the public, NGOs, and experts for the

scoping of the environmental and social aspects of the project. Apart from the organizers, the names of the various NGOs and officials who attended the workshop are included in the minutes attached as **Annexure 6.6**. The environmental and social teams have disclosed the early findings of the team and summaries of the project components were distributed to all participants. The environmental team had arranged photographic displays and there were displays from press.



Figure 6.2. Scoping workshop session at Kochi



Figure 6.3. Participants-scoping workshop session at Kochi

The Public Works Department (PWD) invited all recommendations to the success of the project from Government agencies, NGOs, and other stakeholders. The early identification of these suggestions, issues and recommendations would help for the project preparation. Several dozen participants attended the regional scoping sessions and stakeholder workshops. Inputs from these events influenced design decisions and subsequent assessment activities. The existing road scenario was explained to the people together with the requirements and inadequacy of the institutional set up. There is an urgent need for the improvement of the project roadways.

The information provided to the participants during the workshop include KSTP project summary for highways and waterways project. The initial findings on impacts and environmental issues during presentation were disclosed. There were photographic displays and displays from press. Project proponents invited NGO, Government agencies and other stakeholders to identify social and environmental concerns and issues that should be addressed in project preparation and provided information about the project enabling informed participation. Several dozen participants attended the regional scoping sessions and stakeholder workshops. Inputs from these events influenced design decisions and subsequent assessment activities.

The project authorities explained that at present highways are largely neglected and there is ample scope for improvement if it is properly planned. The minutes of all three scoping workshops are presented in **Annexure 6.6**. The objective of the workshops was to gather observations and concerns from the public, NGOs, and experts for the scoping of the environmental and social aspects of the project. Apart from the organizers, the names of the various NGOs and officials who attended the workshop are included in the minutes as appended in **Annexure 6.6**.

6.2.1. SCOPING WORKSHOP AT THIRUVANANTHAPURAM

MAIN ISSUES

Water logging on roads (flooding sections) recurs during the monsoons due to inappropriate design for the soil conditions and poor drainage. Strict laws and regulations should facilitate land acquisition. The importance of heritage tourism and the need for creating a cultural awareness in Kerala was emphasised.

MAIN CONCERNS

There is a land degradation problem in Kerala due to the varying terrain and the fact that approximately 40% of the landmass of the State is prone to landslides and slope instability. The apparent absence of coordination between the PWD and other line departments need to be corrected. The inadequate traffic signals, signboards and milestones and the frequent digging within the highways are very important concerns. The effective width of the road is reduced with inadequate provisions for the pedestrians using the road and also due to the existence of the utility poles.

It is also mentioned that the environmental and social impacts couldn't be solved by the PWD alone. There should be a realistic and pragmatic approach towards these problems.

RECOMMENDATIONS

The road alignments and widths in Kerala are unscientific, which may be improved with the use of satellite survey information. Considering the physical set up of Kerala, the design of north-south roads and the east-west roads should be different.

Consideration should be given to a proper water management system, minimizing disturbance to the paddy fields, and the biotic issues during the execution of the project. A committee should examine the environmental aspects and ensure that the guidelines are being followed. The biological aspects of the environment should be given more importance in this project. Various mitigation measures and safeguards should be ensured to protect the bio-diversity of the State. The importance of the NGO involvement in this project that the mitigation measures for various negative impacts can be formulated by conducting talks with stakeholders like NGOs, local people, etc. The coordination of various agencies should facilitate the rehabilitation programme, undertaking awareness classes for the pedestrians, and creating road management committees at the Panchayat level.

6.2.2. SCOPING WORKSHOP AT ERNAKULAM

Apart from the organizers, the various NGOs and officials who attended the workshop are listed in the minutes as appended in the **Annexure 6.6**.

MAIN ISSUES

The climate of Kerala is important. Statistically speaking Kerala receives 90% of its annual rainfall, in about 10 hrs. Tree cover of Kerala has decreased considerably. The following data of the decreasing trend of forest cover in the year 1900 - 70% forested area, 1950 - 50% forested area. 2000 - 25% forested area.

MAIN CONCERNS

A large percentage of accidents are taking place in the rural areas. Approximately 300 km of roads of the 2800 km pass through ecologically sensitive areas. The economic interest and environmental aspects are prime concerns in the selection of the roads.

RECOMMENDATIONS

The principles of island biology should be taken into account as Kerala can be compared to an Oceanic island. Ecologically sensitive roads if important will be subjected to detailed Environmental investigations to prepare an EIA in order to obtain formal MOEF clearance in case these are included for further investigations.

6.2.3. SCOPING WORKSHOP AT KOZHIKODE**MAIN ISSUES**

The Telecom and Kerala Water Authority works are affecting the road traffic. Space is required outside the road formation for separation of the utilities and drainage facility. All roads will become drains during the monsoon season and there are sewerage outlets to the road. Surface water is entering the roads. There is very little budget for road improvements in Kerala. The facility of roads is limited and there are no proper traffic regulations. Providing standard width is impractical. It is time to prevent the garbage being thrown into the drains.

MAIN CONCERNS

Overloading of vehicles is a serious concern as this causes accidents and damage to the road as well. Hence it was necessary to control these aspects. The past history of the road development should be evaluated. Ribbon development is everywhere.

There are about 103 Scheduled Castes (SC) and Scheduled Tribes (ST) in Kerala. Most of these weaker sections live along the roadsides. In the case of low-income groups, rehabilitation will be very difficult as the culture is linked with the land they hold. The encroachers should be classified and given compensation. In the case of SC and ST rehabilitation, it is always better to be spread and mixed with all other communities but they usually don't like the idea preferring a colony.

RECOMMENDATIONS

- Putting ducts is good, but suggested to have removable slabs along footpaths so that the telephone cables can be taken through the ducts provided below the slabs.
- There should be better facilities for road crossings. There should be economic assistance from the concerned departments and the present cables, which are already laid, cannot be removed. Suggested to have Parallel roads and bypass roads to get away from the present narrow roads.
- Capillary effect on the roads should be considered and also the topography and climate. Access roads are the main problem for PWD Roads. These should be included in the project.
- There is an urgent need for effective control of visual pollution. Road markings should be considered. In the case of bypasses it is possible to collect betterment revenue. It would be very useful to every one if the already approved alignments were considered.

- In the case of provision of water supply pipes along the roadsides, the department could pay the expenses. Widening will in fact shift the existing pipeline towards the center so provision for the relaying of pipes should be made.
- The cost of relaying of pipes should be included in the project budget. The environmental and social concerns of this pipe laying should be taken into account.
- Ecologically sensitive areas should be avoided.
- Rehabilitation of the people should be given more importance. The impact on low-income groups is high although the cost of land acquisition is very low.
- There should be some way out for the storm water drains. In all project related matters there should be 100 % transparency. If this is done there will not be any difficulty in convincing the people.
- Social and environmental impact should be considered seriously.
- The roads are very important for social advancement. People should be made aware about the various positive aspects of the project.

SCOPING BASED ON SCOPING WORKSHOPS

A change in the original Terms of Reference (TOR) was not required after the scoping sessions. All issues and the public concerns were considered in the EA process without any change in the original TOR with all issues and public concerns positively considered for the design as well as Environmental Assessment.

Phase II participation programme

As a part of the KSTP II participation programme, the project has planned a much better participation preferably on project affected panchayat basis. These are designed based on the experience from KSTP I programme to meet the various inadequacies that occurred during the KSTP I participation. From all consultations, necessity of much higher scale of participation was evident. During these the follow up meetings the KSTP team will explain the nature of the project, project impacts, project components including social and environmental components etc. The various queries regarding the compensation and other aspects of the project will be discussed / answered according to the project policy on Resettlement and Rehabilitation. A report will be prepared and formally submitted to the Bank in February 2004.

6.3. PUBLIC CONSULTATIONS CONDUCTED AS PART OF THE INDEPENDENT REVIEW OF EIA

Providing for people's participation in project design and development is a way to improve environmental governance by providing a mechanism to influence decisions about the use and management of natural resources. A series of FGDs were arranged jointly by KSTP officials and the consultants along the project road to update the earlier consultation process.

6.3.1. RATIONALE FOR FGDs

The focus Group Discussion adopted for this project involved one time discussion of various topics related to the project such as environmental issues, loss of access and safety; involving 6-12 individuals selected to meet specific criteria in order to broadly represent a particular segment

of society such as drivers, merchants, pedestrian passengers etc. This one-time face-to-face meetings were structured to be informal to encourage open discussion among participants in a relaxed atmosphere and were a good way to gauge the opinions of the public.

6.3.2. OBJECTIVES OF THE RECENT FGDs

The main objectives of the FGDs conducted recently were the following:

- To solicit the views of affected communities/individuals on environmental and social problems;
- To gather inputs from the affected communities/individuals in crucial decisions regarding mitigation of the identified environmental and social issues; and
- To minimize public resistance to changes by providing them a platform in the decision making process.

6.3.3. DATE AND VENUE OF FGDs

The FGDs were conducted in the following locations along the project road on 3rd and 4th of October, 2012. List of people consulted as part of recent focus group discussion (June- July 2012) is presented in **Annexure 6.8**.

6.3.4. ISSUES RAISED AND RESPONSE TO THE CONCERNS

Altogether the team met 160 persons representing various segments of society such as drivers, merchants, students and pedestrian passengers. The compliance to the general queries raised by them and the specific issues raised by the public along with the responses to their concerns are summarized in the following tables.

Table 6.4. General Queries from Public

SL NO	STAKEHOLDER CONCERNS/SUGGESTIONS	COMPLIANCE
1.	Why the width of the road is not uniform at all places?	Paved surface is uniform through out the road length
2.	Whether public will loose access to the roads during construction?	No. Where there is loss of access, alternate arrangements will provided as part of the project.
3.	Who will determine the time and routes for traffic diversion?	KSTP in consultation with police department will finalise this.
4.	Who is determining the value of land? What is the system of determining the fair value?	Based on the guidance value already fixed.
5.	How will you ensure the safety of passengers /pedestrians during construction?	This will be ensured by adopting proper Traffic Management Plan prepared by the Concessionaire.
6.	Whether there will be any speed restriction during and after construction of the road?	Yes. This is part of guidelines for Traffic Management Plan in the EMP These are also included in the construction site management procedures

SL No	STAKEHOLDER CONCERNS/SUGGESTIONS	COMPLIANCE
7.	Will the road cater to the demands for pedestrians and cyclists after construction?	Raised pedestrian crossing and footpaths are proposed for safety of pedestrians
8.	Will the road restrict accesses and how will I gain access to my property/shop?	Access road development are proposed wherever access is cut off
9.	What is the mechanism to ensure quality of construction?	The supervision consultant will ensure the quality of construction. The maintenance is also the responsibility of the Concessionaire for the five years after construction.

Table 6.5. Specific Concerns and Response

NO.	STAKEHOLDER CONCERNS/SUGGESTIONS	RESPONSE
1	Footpath, cycle path and parking area necessary in all junctions	Footpaths, hand rails and street lighting have been provided in the school locations, junctions and in built ups and parking areas provided. For accommodating slow moving vehicles 1.5 m paved shoulders are proposed on both sides of the main carriageway.
2	Drainage and water logging problems should be removed	The project design has provision for footpath with covered drains in built-ups, covered drains in semi urban locations and earthen drain in other areas.
3	Protection of paddy fields and wetlands	No paddy land is reclaimed for the road. Necessary retaining wall and pitching are proposed as protection measures for embankments and cut slopes
4	Road safety problems: road signages, speed reducing bumps, curve straightening and sight distance needed	Comprehensive road safety plan is part of the proposals. Raised pedestrian crossings are proposed at junctions and near schools.
5	Provide bus bay at the stops and build waiting sheds with adequate size and facility. Provide lay bays for long distance vehicles such as trucks.	Bus bays with approach tapering and passenger shelters have been planned as per acquired land availability. Truck lay bye are not proposed as there is scarcity of land and a truck lay bye require 0.2 ha land per location.
6	Preserve existing trees along the roads.	While finalising alignment, this criteria has already been adopted Trees only within 1m of formation width on either side will be cut. There existing trees will be preserved. Three times the number of trees cut are proposed to be planted.
7	Plant trees at least 5 m away from main carriage way to avoid accidents and	This has been incorporated in designs according to provisions of IRC SP 21...

NO.	STAKEHOLDER CONCERNS/SUGGESTIONS	RESPONSE
	address safety issues	
8	Provide signal light at every junction.	A system of prioritized traffic movement is envisaged with proper channelization including signs, islands, delineation, dedicated raised pedestrian crossing, hand rails and retro-reflected markings at all major junction.
9	Provide permanent arrangements for laying of cables, pipelines, etc. by the side of the road to prevent periodic cutting of the roadsides.	Cross utility ducts have been proposed for accommodating utilities. At built ups, space is reserved below footpath for accommodating utilities.
10	Avoid height difference between shoulder and paved surface at both sides of the road.	Edge drop will be avoided by implementing appropriate routine maintenance plan.
11	Use reflectors to show the demarcation line.	Raised pavement markers are proposed and included in the BoQ.
12	Provide comfort stations and rest places in major junctions	Development of Ox-bow land is part of this proposal. There are three number of ox-bow land developments. Type A is with proper lighting, sitting arrangements and eating arrangements besides parking facility and toilets. There will be adequate tree and shrub planting. Type B is same category with less facility arrangements where as the type C is the open type with fewer facilities. Type A and B will be developed as a separate project by KSTP in consultation with other state departments.
13	Provide speed breakers at all junctions	Speed calming measures are provided at all major junctions and intersecting roads
14	Handrails provided for footpath should not block access to shops	This is already taken care in the proposal and more specific arrangement will be done during project implementation stage.
15	Provide slope stabilisation measures for landslide prone area	Environmental friendly protection measures such as Rubble Masonry Breast Wall with shotcrete treatment and Stone Pitching have been included in the DPR.
16	Complete all necessary land acquisition for project, vacate the stay orders from High court	As per the information from KSTP officials, LA is almost completed. Remaining part will be completed before the commencement of the project.
17	Discrimination is seen in the land acquisition done for the project	No such discrimination is reported. All the LA activities will be completed prior to the commencement of the project.
18	The frequent accidents at Mannarkulanji junction , especially during Sabarimala	The current improvement work will consider these issues of the area on an

NO.	STAKEHOLDER CONCERNS/SUGGESTIONS	RESPONSE
	Season	urgent basis.
19	Address the issue of intrusion in to the forest areas	In the current proposal, development is limited to the existing ROW and hence no diversion of forest land is required for the forest. To address the entry in to forest land, provisions line barriers will be considered along the forest land.

6.3.5. CONCLUSION

Environmental concerns raised by the community during the FGD have been incorporated to the extent possible in the project preparation and in that sense the FGD was successful. However, the public consultation process of KSTP should continue till the completion of the project.

6.3.6. PUBLIC DISCLOSURE OF KSTP II DOCUMENTS

The project will disclose all Phase II environmental and social documents at the World Banks Project Information Centre at Washington and also at the PIC of Banks New Delhi office. Simultaneously all documents will be made public in Kerala at the District Information Centres with suitable press note for the public attention. After the World Bank approval, EIA/EMP documents relating to the project road will be disclosed at the relevant offices in Kerala PWD, KSTP and World Bank.

	
FGD done at Start chainage, Punalur	Discussion done with PWD officials at Alimukku
	
FGD done at Ittiyappara	FGD done at Koodal





6.3.7. KSTP II FINAL DESIGN OUTPUT

The final design output has integrated many existing facilities of the people for example bus stops, parking areas for auto rickshaws, cars, jeeps and mini tempos etc. These are already located along the project road and have been presented in EMP report. These are the rights of the people and hence it is not necessary to consult them for every location instead the project has to integrate the facilities in to the design. This is a direct contribution from the environmental investigations including consultations. The consultation carried out in the very early stages of the project has established the need for these kinds of facilities. The principle followed is that if the project takes the existing facility of people then the project will have to compensate or replace it. It is also recommended that the alternate arrangements should be at least qualitatively equivalent if not superior to the existing ones. Although additional land acquisition for parking areas is the work of the local bodies, the project has taken all these for implementation. There are two reasons behind this. First reason is that if this is left for local bodies like municipally, this will never be implemented or delayed for years together due to lack of local resources as well as due to other priorities. This can defeat the objective of the project. Secondly, these are important factors that will improve the road safety standards and reduce accidents.

CHAPTER 7. ASSESSMENT OF POTENTIAL IMPACTS

This chapter discusses the impacts due to the project activities upon different components of the local, and or regional environment. Specifically the environmental components are the same that are discussed in the **Chapter 5** baseline environment and broadly include Physical, Biological and Social environment. Potential impacts could occur during construction phase as well as during the operational phase. The fact that the project road is already operational makes the operational impacts during post constructional stage insignificant in many cases.

The construction of the project road during the three-pilgrimage season coinciding with the five-year construction contract would be a herculean task for the Kerala State Public Works Department. The construction Concessionaire, the Independent Engineer and local Government must take extensive precaution for the construction activities during the nine-month period spread over three successive years. There must be special arrangements for the diversion of traffic. Well laid out pre plans must be freely and easily available to the pilgrims and the vehicle drivers carrying the Pilgrims.

The project road in other seasons will pave the way for increased eco-tourism activities as the road that connects to the Kottayam-Kumily (KK road) road. In this way the project road is the linking road to Thekkady, Munnar tourist locations and also to the new Thenmala eco-tourism project. Thenmala is accessible from Punalur from where the project road starts.

Therefore the design stage and impacts during construction are most important. The various impacts due to the improvement and construction of the project road are presented. Wherever necessary the impacts during construction and operational stages are discussed separately.

The impacts due to project activities upon different components of the local, and or regional environment are provided in this section in the same sequence as that of the Baseline Chapter 5. Potential impacts could occur during construction phase as well as during the operational phase. The fact that the project road is already operational makes the 'operational stage impacts' insignificant in many cases.

Major Positive Impacts

- Diversion of traffic from other roads
- Reduced noise and air pollution.
- Reduced risk of accidents.
- Improved accessibility and connectivity.
- Reduced vehicle operating and maintenance cost.
- Savings in fuel consumption.
- Improved facilities to road users.
- Improved quality of life.
- Improved aesthetics.

- Generation of local employment.

Induced Impacts

- Ribbon developments and consequent impact to coastal ecosystems
- Improved commercial and tourism activities

Minor Impacts

All other impacts such as erosion, tree removal, impact to cultural properties etc are of smaller magnitude and have been considered for mitigation and avoidance.

7.1. METEOROLOGIC AND CLIMATIC IMPACTS

As indicated earlier there are only 1340 trees to be cut and removed for widening and improvement of the project road. The impact due to the tree removal would be an increased exposure to sunlight. Other than this, there would not be any change in the macro climatic conditions in the area due to the project improvement activities during construction phase. The impacts such as potential drainage problems, flooding, air quality impacts, etc. are discussed under the appropriate headings.

Operational Phase. During operational phase induced impacts like ribbon developments will be accelerated due to the improved nature of the road. These impacts otherwise could occur in the same magnitude but for a slightly longer period. None of these impacts are expected to introduce any significant impacts to natural environment.

7.2. IMPACTS TO REGIONAL PHYSICAL SETTINGS

7.2.1. IMPACTS TO PHYSIOGRAPHY

Physiography Impacts. The physiographic impacts due to a road improvement project are minimum except along the realignments. Thirty seven oxbow lands are there along the project road. In addition to this, there will be slight improvement of small curves due to safety reasons. This will also open up new area of disturbance leading to a change in the existing embankment heights. Proposed chainages where embankment heights will be raised are shown in Part II, EMP Annexure 3.41. A summary of these sections are provided in Table 7.1. Potential erosion impacts are discussed under section 7.2.5. The potential impacts of borrow pits, including their potential topographic impacts, are discussed under section 7.2.4.

Table 7.1. Proposed Chainages where Embankment Height will be Raised

ROAD NAME	NO. OF LOCATIONS	TOTAL LENGTH (m)
Punalur - Ponkunnam	16	13130
Ponkunnam - Thodupuzha	9	6350

During construction period. During the period of construction, chances of erosion are very high to the altered embankments. The heavy precipitation during monsoon will aggravate the rate of erosion unless suitable mitigations measures are taken. Erosion along the sloping Section I will be higher than the Section 2. All surface water bodies except isolated freshwater bodies like ponds across which the road passes are all included in sensitive areas and need special mitigation measures. The preserved topsoil heap and storage also will be subjected to erosion, if proper measures are not taken. The management measures are given in Part II EMP report.

During operational stage. During the operational period, immediately after the construction works, there will be plenty of scope for erosion due to the left over during the construction period. Once all activities proposed in the project including landscaping, tree planting and shrub planting are complete, the entire corridor will be stabilised and further erosion will be negligibly small. The cut section between Nellappara and Karimkunnam near Thodupuzha is important. Considerable cutting will be required along the section.

Potential Geomorphological Impacts The geomorphologic impacts include the filling of deep valleys, construction of new realignments and bypasses and raising of embankments. The proposed sections where embankment heights will be raised are shown in Part II, EMP **Annexure 3.41**. High Raise in embankment height is recommended from chainage 46.900 to 48.700, 73.300 to 74.900 and 120.600 to 122.550.

Potential Drainage Impacts. The proposed improvements to the existing cross drainage structures will have significant positive impacts as it is expected to remediate the current flooding problem in the project road mentioned in section 5.3.5 to a great extent. Cross drainage provisions will be upgraded where ever necessary to accommodate the 25-year floods in the case of culverts. In addition to the existing culverts new ones are also proposed to take care of the increased runoff, or correct existing inadequacies in drainage. The construction of culverts will be for the full formation width.

During construction period. The material storage places, newly constructed embankments and work areas etc may be subjected to erosion during the monsoon period. The nearby surface water bodies could be contaminated depending on the type of material stored. The topsoil heap and storage also will be subjected to erosion, if proper measures are not taken. The management measures are given in EMP report.

During operational stage. Immediately after construction, there will be erosion due to the small and minor erosional features left behind during construction stage. After the stabilisation i.e. complete construction including landscaping, tree planting, erection of gabions, retaining walls etc the effective erosion will be negligible. The water quality in roadside ponds will be improved after one or two monsoon seasons. As the construction period will cover a minimum of three monsoon seasons the erosional impacts if any immediately after the construction will be in a phased manner thus nullifying the adverse impacts on the surface water bodies.

7.2.2. GEOLOGICAL IMPACTS

Since most of the project road is located within in the highland belt (> 76m), the geological aspects of the corridor need to be assessed, as there could be an increase in the traffic especially heavy vehicles. Nevertheless the alluvial areas throughout the available corridor may undergo slight compaction due to the construction of embankments and also due to the increased traffic along the road corridor.

Sand Mining issue. The requirement of sand for concrete and macadam based pavements especially for the structural works is a matter of concern as the 'sand mining' is already an issue in Kerala. GOK has controlled the exploitation of these resources in almost all areas, limiting the harmful effects on the environment. The analysis done by consultants revealed that adequate quantities of quarry sand/dust would be available for the use of KSTP from approved sand mines. It is also a one-time requirement during the construction period of two years. The use of manufactured sand is also recommended.

7.2.3. SEISMIC IMPACTS

The project construction activities are anticipated to have no impact on the area's seismic conditions. The area's seismic characteristics have been considered for design of all structures. The recent tremors of Kerala were all minor. Minor tremors will not be resulted from the road improvements nor such tremors will create any significant impact on the constructed road. In the case of bridges along the project road, due consideration was paid while designing based on IRC -6, 2010.

In the case of Ponkunnam -Thodupuzha road, the seismic tremors during the monsoon season could trigger large-scale landslides and land slips along the highland region like Nellappara. It is also possible that the fissures and fractures developed during the past earthquakes could take large quantities of water during the monsoon season, which could accelerate the landslide process in the mountainous region. The ghats along this section are known for frequent landslides especially during monsoon season. Proposed widening may cause destabilization of hill slope at ghat locations. Hence, minimum RoW has been proposed at ghat sections to avoid further disturbance to the hill slopes. Slope protection works are also proposed in these sections. No impact is envisaged during operation phase of the project and hence no mitigation proposed. However, periodic surveillance shall be conducted to check slope stability of the land slide prone areas.

7.2.4. IMPACT ON TOP SOIL QUALITY

With regard to topsoil quality characteristics during construction, the topsoil loss is most important. In all areas of heavy construction work, along embankment slopes and new area to be added (by acquisition of land) to the road, construction camps, labour camps, Plant sites for WMM and hot mix plants etc are equally important. The normal practice is not to store any topsoil prior to the opening of any new area for any construction related work.

The impact on soil quality will be along the project road corridor, immediately adjacent areas, 37 realignments; and the sites of borrow pits, quarry areas and cut sections. With regard to topsoil quality characteristics during construction, the topsoil contamination and mixing with the solid and sewage waste along the active sites is a major impact. In majority of locations the soil could be forest loam and this necessitates a much higher scale of measures that should be taken to avoid degradation of soil quality. The workshops for automobiles and other machineries and equipments is an integral part of the Concessionaires activity if not managed properly will be the biggest hazard. The possible pollution materials could be mostly POL and bituminous wastes.

The locations where topsoil quality degradation could occur are

- In all areas of heavy construction work
- Along embankment slopes
- And new area to be added (by acquisition of land) to the road,
- Construction camps, labour camps, Plant sites for WMM and Hot mix plants,
- Temporary diversion areas opened for structural (bridges & culverts) works etc

In many locations, along the corridors a raising of the embankment height is required. The impact on soil quality will be confined to the available corridor along the project road, immediately adjacent areas and the sites of borrow pits and cut sections. All borrow pits are to be identified towards the landward side of the project road in the interior areas in the midland. In most of the cases, the distance from the centre line to the borrow pit locations is expected to be 10-20 km. The network of roads available throughout the area will facilitate the material

transport. Due to very high density of road network it is not possible to clearly identify the haul routes. There will be some adverse impacts due to the creation and operation of borrow pits. But, to minimise the same, Generic EMAP Table in Part II EMP reports –provides detailed guidelines for Guidelines for Top Soil Conservation and Reuse (Refer **Annexure 3.7** of EMP Report).

7.2.5. EROSIONAL IMPACTS

The impact on soil due to the project will be in terms of topsoil erosion. Strengthening and widening of the existing roads will not cause significant soil erosion. Soil erosion may occur at bridge locations, along the steep and un-compacted embankment slopes, earth stockpile locations and wherever vegetation cleared areas. Soil erosion will have cumulative effect such as destabilisation of embankments, turbidity and siltation of water bodies, drainage problems, etc. Establishment of construction camp and movement of construction vehicle and machineries on agriculture land will result in compaction of top soil. Also utilisation of productive top soil present in barrow area and quarry area for road construction can lead to loss of top soil. Further, soil pollution would take place to a negligible extent due to spillage of construction material, oil, fuel, grease and asphalt around the construction yards. Disposal of construction waste and domestic waste in unscientific way may result in loss of productive land.

The rivers and streams in the PIA districts are undergoing vigorous erosion from the upstream. The eroded soil quality materials are being taken in to the sea due to the heavy monsoon in-flows. Beyond the project road towards the seaward side a depositional environment prevails. As a result streams carrying sediment loads are deposited. The project design considerations and construction activities will not accelerate the rate of erosion. The proposed improvement of the project will be along the available corridor and to the immediately adjacent area already acquired for the project.

Unless precautionary measures are taken especially during the monsoon season all construction/disturbed areas along the project road will be susceptible to erosion leading to the loss of fertile topsoil. Design has taken in to account all areas, which require stabilisation. There could be permanent loss of agriculture/productive soils especially paddy field areas due to widening and borrow areas. The effect will be minimum due to the fact that no bypasses are considered along the project road. A total of thirty seven realignments are considered for various reasons. These are provided in **Table 5** of **Annexure 3.50** of EMP Report. There could be potential loss of topsoil along these stretches. Top soil conservation has been incorporated as a major mitigation measure and detailed guidelines for the same are incorporated in the in the EMAP Table given in Part II EMP Report. The improvements in the project corridor will not lead to any additional significant erosion. Retaining walls or toe walls will be constructed in the side slopes of raised berms.

Road drainage will be upgraded to accommodate 25-year floods. All drainage ways will be of suitable size and alignment to minimise any potential erosion.

During operational phase, better access can lead to conversion of agricultural land to commercial and residential purpose close to project road, especially in rural areas. This may result in loss of productive land and agriculture produce. Establishing project facilities like construction camps, labour camps near low lying areas and near bridge approaches, during monsoon, can lead to the erosion of the embankment formation. Borrow areas if not rehabilitated properly will cause soil erosion. Detailed guidelines for the same are incorporated in the in the Part II EMP Report.

7.2.6. QUARRY AND CRUSHING OPERATIONS

There is an increased importance to quarries and crushing operations due to difficulty to obtain good quality sand for construction. Due to the prevailing sand mining issue, manufactured sand, quarry sand and quarry dusts are widely used for road construction purpose. There are no quarries immediately adjacent to the project road; nevertheless a number of commercial rock quarries are available towards the interior areas of the project road 10-30 km away from project road. It is difficult to establish the haul roads due to large number of options available. The quarries of commercial suppliers are largely established quarries working for many years. In case the Concessionaire has to open new quarries there will be a series of possible impacts such as tree cutting, spoiling of landscape, topsoil loss and safety of the workers etc. These are described in the corresponding mitigation section and also in the detailed guidelines for siting, development, management and redevelopment of camps/sites incorporated in Part II Environmental Management Plan. Details of quarry and borrow Areas near project road is given in **Annexure 3.47** of EMP Report.

7.3. WATER RESOURCES IN THE REGION

7.3.1. IMPACT ON SURFACE WATER RESOURCES

IMPACTS DURING CONSTRUCTION

The project road is crossing rivers, canals and streams on their way and are abutting lakes, ponds and tanks, wells, bore wells, etc. Disposal of construction debris near the vicinity of water bodies may cause stagnation/ diversion of natural drainage. Water supply units present adjacent to project road within the proposed RoW will be impacted. The Sabarimala pilgrims are using all these rivers for bathing and other activities. Drawing of water for construction camps for domestic use from local water sources may disturb water supply use for the local inhabitants. Construction activity at bridge and culvert locations may cause water pollution. The construction of existing culverts, widening of the existing culverts and the demolition of unwanted culverts etc will definitely pollute the water unless special care is taken to mitigate and minimize these impacts. The positive impacts on the other hand will improve the drainage condition of the project road allowing a safe all weather roads useful to all road users.

There will be impacts to the existing surface water bodies due to the various construction activities including reconstruction of CD structures and the construction of new bridges. The demolishing of any bridges will require careful planning for the debris disposal prior to the physical demolition of the structures. During construction, there could be impact to the surface water bodies due to the various construction activities including topsoil, temporary or permanent storage of waste material (paint, lime, cement, oil etc) and other related construction activities. Ancillary construction site such as quarries, borrow areas would also affect water bodies.

More over the project has considered 37 realignments along this project road. Typical drawing of type C realignment improvement is presented in drawing no. PPT 1D 60-014 to 047. This will also disturb the drainage pattern unless appropriate mitigation measures are provided

Source of construction water. The water requirement for construction work will be met from the rivers, streams etc. Mitigation measures are described in the corresponding mitigation section. There will not be any scarcity of water for the construction water requirement. The water requirement will be of the order of 12,000 to 1717 KLPD for road construction and dust suppression, 12 KLPD for domestic use in labour camps and the requirement varies depending on the rainfall pattern. During monsoon season the requirement will be minimum for dust suppression, compaction etc. **Table 7.2** shows the possible impacts on water bodies due to the project.

Table 7.2. Potential Impacts to Water Bodies

WATER BODIES AFFECTED POTENTIAL IMPACTS/COMMENTS	
PUNALUR – PUNKUNNAM	
Kallada River	Water intake points, sand mining& likely sink for waste materials. Pollution from construction material.
Achankovil River	Water intake points, sand mining& likely sink for waste materials. Pollution from construction material.
Pamba River	Maximum impact due to Sabarimala pilgrimage , Water intake points, sand mining& likely sink for waste materials ,Chances of direct pollution from construction material sources
Manimala River	Chances of direct pollution from construction material sources
PONKUNNAM - THODUPUZZHA	
Meenachil River	Water intake points, sand mining& likely sink for waste materials. Pollution from construction material.

**IMPACTS DURING OPERATIONAL STAGE**

The operational stage impacts will be minimum due to the overall measures adopted by the project to contain the direct, indirect and long-term impacts. The project also used the avoidance (eg. IRC Standard width) as a strategy to limit the impacts to an acceptable level. Moreover, the project has planned environmental enhancement measures, which will also allow reversing any possible long-term impacts. There will not be any significant increased runoff as there could be

little additional surface area as a result of the implementation of the project. The project road have adequate right of way, at most of the sections the required land is minimum. During operational stage, the berms will be improved, embankment slopes stabilised or protected by rip-rap or other materials including planting to prevent soil erosion.

Water quality in roadside surface water bodies' such as ponds adjacent to the ROW may show slight improvements after road upgradation due to reduced erosion from improved roadside berms and embankment slopes stabilized or protected by riprap or other material including planting to prevent soil erosion. Lack of proper drainage arrangement may result in soil erosion, subsequently leading to turbidity and siltation of nearby natural water bodies. Spillage of edible oil, crude oil, lubricants and other hazardous chemical due to road accidents close to natural drainage will cause alterations in water quality. Unscientific disposal of debris and construction materials in low lying areas shall lead to flooding during rainy season. Water shall be utilised for maintenance of trees planted along project road.

7.3.2. IMPACT ON DRAINAGE PATTERN

Impact to drainage pattern during construction and operational stages are separately provided. Since the drainage impacts are very crucial due to the heavy intensity rainfall, necessary care need to be taken to avoid extensive damage caused by erosion. The impact in the urban, semi urban areas and the cut sections will be likely to be much higher. The cross drainage provisions will have to be upgraded where ever necessary to accommodate the floods in case of culverts. In addition to cross drainage structures, in critical areas, the longitudinal drainage needs to be addressed. It is also necessary to find locations for additional CD structures and also to remove unwanted CD structures. In this project road, five major bridges are there among them two are proposed for additional/ reconstruction, 15 minor bridges are there and 8 among them are proposed for additional/ reconstruction and one is proposed for widening. Among the 472 existing culverts, 87 are proposed for cleaning and widening and reconstruction is proposed for 347 nos. No bridges are planned to demolish.

IMPACT DURING CONSTRUCTION

There will be impacts to the existing drainage pattern due to the various construction activities including reconstruction of new cross drainage structures. During construction, there could be impact to the drainage pattern due to the various construction activities including topsoil preservation, temporary or permanent storage of waste material and other related construction activities. The construction or improvement of the cross drainage structures of the project road could also temporarily disturb the existing drainage patterns. More over the project has considered many realignments. This will also disturb the drainage pattern unless appropriate mitigation measures are provided. No bypasses are considered in this project that will generate higher impacts during construction.

As a part of the KSTP road widening and improvement, the existing cross drainage structures will be replaced /repaired /widened as per the design requirement. The locations of all CD structures are provided in the environmental data sheets. The development, improvement or reconstruction of cross drainage structures should consider the possibility of stream water being polluted because of the various construction materials (cement, petroleum, oil, lubricants, paint, lime etc). Mitigation measures are described in the corresponding mitigation sections. The EMP has contractual provisions to avoid these kinds of impacts.

IMPACT DURING OPERATION

Immediately after construction a possible issue could be the non linking of side drainage/CD and natural stream courses. This has been addressed in the design stage. During Operational

stage, there will not be any adverse impact on the existing drainage pattern. Many realignments are included in the project that will add new provisions for drainage. The increased drainage will improve and preserve the quality of the constructed road for longer period. There will not be any threat to the CD structures due to the sand mining in this area. The increased drainage facilities will provide greater safety and stability to the project road. During operational stage, the berms will be improved, embankment slopes stabilised or protected by rip-rap or other materials including planting to prevent soil erosion

7.3.3. IMPACT ON GROUNDWATER RESOURCES IN THE PIA

Impacts during construction and operational period have been separately provided.

IMPACTS DURING CONSTRUCTION

There are a number of open hand dug wells and water taps of Public Water Supplies (PWS) along the project roadsides and also in the area that will be ultimately acquired for widening. Most of the PWS and open wells will be impacted. Extraction of ground water for construction activities and domestic use of labour camps will result in depletion of local ground water table. Sources of ground water such as open wells, hand pumps and deep tube wells will be affected due to widening of project road at specific locations. Selection of construction camps adjacent to open well will lead to contamination of ground water due to unscientific usage of water near open wells. The likely impacted water sources are provided in the **Table 7.3**. The locations of all drinking water bodies identified are provided in the environmental data sheets

Table 7.3. Likely Impacted Drinking Water Sources

CHAINAGE	WATER SOURCE	LEFT/RIGHT	CHAINAGE	WATER SOURCE	LEFT/RIGHT
37.830	Public water tap	Right	82.190	Public water tap	Left
38.140	Public water tap	Right	82.850	Public water tap	Left
38.360	Public water tap	Right	84.120	Public water tap	Right
38.740	Public water tap	Right	84.930	Public open well	Right
40.390	Public water tap	Left	84.960	Public water tap	Left
40.650	Public water tap	Left	85.940	Public water tap	Right
42.080	Public water tap	Left	86.980	Public water tap	Right
42.500	Public water tap	Right	89.020	Public open well	Left
42.900	Public water tap	Right	89.060	Public water tap	Left
44.080	Public water tap	Left	96.440	Public water tap	Right
44.720	Public water tap	Left	96.790	Public water tap	Right
45.180	Public water tap	Right	99.270	Bore well	Left
45.570	Bore well	Left	99.270	Bore well	Left
48.320	Public water tap	Right	100.81	Public open well	Right
48.750	Public water tap	Right	103.61	Public water tap	Right
50.880	Public water tap	Left	104.390	Public water tap	Right
51.120	Public water tap	Right	107.410	Public water tap	Left
52.740	Public water tap	Left	112.140	Bore well	Left
54.810	Public water tap	Right	112.610	Public water tap	Left
57.890	Public water tap	Right	113.920	Bore well	Right
59.230	Bore well	Left	114.620	Bore well	Right
59.800	Bore well	Right	117.990	Bore well	Right
60.060	Bore well	Left	122.790	Public water tap	Left
60.650	Public water tap	Right	123.350	Public water tap	Left
61.240	Bore well	Left	123.930	Public water tap	Left
66.540	Bore well	Right	124.080	Public water tap	Left
68.640	Bore well	Left	124.200	Public water tap	Left
70.270	Bore well	Left	124.970	Public water tap	Left

CHAINAGE	WATER SOURCE	LEFT/RIGHT	CHAINAGE	WATER SOURCE	LEFT/RIGHT
75.330	Bore well	Left	125.100	Bore well	Left
76.280	Public water tap	Right	125.540	Public water tap	Right
76.400	Public water tap	Right	125.740	Public water tap	Right
76.880	Bore well	Right	126.010	Public water tap	Right
77.24	Public water tap	Left	126.150	Public water tap	Right
77.28	Public water tap	Left	126.660	Public water tap	Left
77.390	Public water tap	Left	126.950	Public water tap	Right
78.040	Bore well	Right	127.070	Public water tap	Left
78.580	Public water tap	Right	128.060	Public water tap	Right
78.740	Public water tap	Right	128.810	Public water tap	Left
78.830	Public water tap	Left	129.500	Public water tap	Left
80.260	Bore well	Right	129.810	Public water tap	Left
80.820	Public water tap	Right	130.730	Public water tap	Left
81.290	Public water tap	Right	131.270	Public water tap	Left
81.760	Public water tap	Right	131.720	Public water tap	Left
81.970	Public water tap	Left	131.960	Public water tap	Right
82.110	Public water tap	Left	132.140	Public water tap	Right

During operation stage, the proposed construction of embankments at rolling terrain will reduce the permeability of the unpaved shoulder and further decrease the ground water recharging rate to greater extent due to surface runoff. Paved surface of the roads will reduce the percolation of runoff water and decrease the ground water recharge.

7.3.4. IMPACT ON WATER QUALITY IN THE PIA

There could be impacts during construction and operational stage of the project.

IMPACT DURING CONSTRUCTION

There are various water bodies such as rivers, streams and canals crossing/abutting the project road. Some impacts are anticipated on the water quality of these water bodies during the construction phase. Discharge of untreated waste water generated from construction camps and labour camps to nearby water bodies will lead to deterioration of water quality. Runoff from hill slopes, embankments and earthen shoulder may increase the chances of soil erosion, which result in turbidity and siltation of water bodies. Cleaning of construction mechinaries, equipments and vehicles shall deteriorate the water quality.

As a usual practice everywhere, the debris and other concrete waste material of the existing structures will be dumped to the watercourses during dismantling of existing structures. Mitigation measures are discussed in the relevant sections and included in the Environmental Management Plan.

The construction activities near bridges and CD structures will bring in pollution in the form of cement, petroleum, oil lubricants and other materials and chemicals (e.g. lime) to the near by water bodies. Other than this, no significant adverse impacts to surface water or water quality are anticipated.

IMPACT DURING OPERATION

During operational stage, no impacts on water quality or availability of water are anticipated. If construction activities open new pathways or approach roads to the water bodies that may lead to cleaning of vehicles using river water bringing pollution. This allows the vehicles to enter directly to the water body or very close to the water body leading to severe pollution at that particular location. So far no such likely locations have been identified along the project corridors. In general the water quality is expected to be slightly improved due to an improved

road, constructed to environment and engineering standards. Impact during operational phase is comparatively minimum than construction phase. The common impact during operation stage is spillage of petroleum and other hazardous materials due to road accidents, which may deteriorate the water quality to considerable extent.

7.3.5. FLOODS DURING MONSOON SEASON

Although the project road is more or less completely located in the high land the project road is not free from flooding..

IMPACTS DURING CONSTRUCTION

The project construction activities will not add to any flooding effect. On the other hand it will reduce the flooding effect due to a rise in embankment height, due to the increased and efficient cross drainage structures (CDs) and longitudinal drainage structures.

There are some flood prone areas which will be flooded using heavy monsoon. The **Figure 7.2** shows an area, which was improved to avoid flash flooding. Flooding will destroy the road fabric and loss of resources inviting frequent maintenance. The raising of formation levels in this section is primarily for improving the vertical geometry and also for drainage provisions.



Figure 7.2. Flood prone Area near Ponthanpuzha

IMPACTS DURING OPERATION

The impact of flooding during operational stage will be minimum, as the design had considered these aspects. This aspect has been further examined in the corresponding mitigation sections 9.3.5. Along the new alignments new CD structures have been planned wherever it is required.

7.4. AIR QUALITY IMPACTS

This is one of the most important negative impacts due to the road construction activities. Air quality issues are addressed in two phases: the constructional and operational phases. Potential impacts and mitigation actions related to them (if any) are identified as follows.

IMPACTS DURING CONSTRUCTION PHASE

Vehicular emissions are one of the major sources of air quality impacts of highway projects. As the project envisages improvement of road conditions for smooth traffic flow, the project will have beneficial impact on air quality of the region during its operation. But, impacts on air quality during the construction phase of the project will be considerable as the amount of work involved in improvement of the road is significant. However, any possible impacts will be transitory. Anyhow, provision of adequate air pollution control equipment, like dust filters and measures like dust suppression by water sprinkling and planting of green belt may further help to significantly reduce the impact.

Emission of CO₂ and NO_x due to combustion of diesel from vehicles, hot mix plant, batch mix plant, diesel generator sets etc. will be a principal cause of air pollution during the construction phase. The main impacts include dust generation, fumes from the hot mix plants, crushers, vehicles and from the transportation of all types of construction material. The effect will be considerably less during the wet monsoon period for about six months. Hot-mix plants will require careful siting particularly with regard to sensitive receptor areas. (e.g. forest areas, schools and hospitals). The siting will consider the social aspects because of the density of population and ribbon development. (Refer EMAP provided in EMP). The proposed consultation activities during construction period will help to improve these issues. Asphalt and hot mix plants are required to be located at least 250m away from the nearest sensitive receptor. The extent of potential impacts during the construction period will vary according to the types of emission controls used, requirements to cover trucks transporting fill material, the types of pollution control devices used and the supervision exercised over the project. Fugitive dust generation due to operations such as excavation of construction materials in borrow and quarry areas, loading, transportation and unloading of construction materials, cutting and drilling of rock masses and dust due to other construction activities. Fugitive dust released during above activity may cause immediate effect on construction workers, inhabitant around the alignments especially those residing in downward wind direction. This could be controlled through adequate water sprinkling on daily basis during dry seasons. Most of the generated pollutants due to these construction activities are limited to construction phase and confined to impact zone.

The **Table 7.4** shows the pollution areas that will have to be monitored during construction. Details of monitoring, frequency and responsibility is given in EMAP provided in EMP.

Table 7.4. Proposed Areas for Pollution Monitoring

POLLUTION SOURCE AREAS THAT WILL HAVE TO BE MONITORED	LIKELY SOURCE OF POLLUTION	REMARKS
Construction areas	Dust, and vehicle emissions	
Completed sections	Dust, and vehicle emissions, POL	If not closed properly
Incomplete sections	Dust, and vehicle emissions	Due to the incomplete construction operations
Diversion for structural works	Dust, noise and vehicle Pollution	Structural diversions will be minimum due to the difficulty to select alternative routes.
Asphalt and hot mix plants	Bituminous fumes, dust, heat and vehicle emissions	Usually located close to the construction corridor.
WMM Plant	Dust and vehicle emissions	
Quarry sites	Dust emissions from explosives, and vehicles	Sites often far away from the construction area
Borrow areas	Primarily dust with vehicle emissions.	Sites often far away from the construction area
Workshops	Mainly POL fumes & dust	Occasionally Concessionaire resort to a number of workshops.

IMPACTS DURING OPERATIONAL PHASE

The air quality impacts will be reduced considerably as improved road conditions and resultant smooth traffic flow would be a marked improvement in the traffic emissions even though there could be a definite increase in the traffic. The various road improvement measures in fact ease flow of traffic with a constant cruising period. In addition to this, there will be a better parking space, better safety measures and a better road surface. The base line conditions will be

established and this will help to verify the air quality improvement. With improved vehicle performance on a better, and wider, road surface, the air pollution should be reduced. Paving and provision of adequate side drainage in villages will significantly reduce human exposure to air pollution, including both vehicular emissions and roadside dust.

The vehicular emissions have damaging effects on both human health and ecology. There is a wide range of adverse health/environmental effects of the pollutants released from vehicles. The effects may be direct as well as indirect covering right from reduced visibility to cancers and death in some cases of acute exposure of pollutants specially carbon monoxide. These pollutants are believed to directly affect the respiratory and cardiovascular systems. In particular, high levels of sulphur dioxide and Suspended Particulate Matter are associated with increased mortality, morbidity and impaired pulmonary function.

After improvement of the existing road, the traffic is expected to move smoothly at higher designed speed which will assure lower emissions of gaseous pollutants. The rate of emissions of various types of vehicles is presented in **Table 7.5**. However, the extent of these impacts, at any given time will depend upon the rate of vehicular emission within a given stretch of the road; and the prevailing meteorological conditions. The impacts will have strong temporal dependence as both of these factors vary with time. The temporal dependence would have diurnal, seasonal as well as long-term components.

Table 7.5. Rate of Emissions of Various Types of Vehicles

EMISSIONS	EMISSION FACTORS IN GM/KM/VEHICLE					
1. For Diesel Vehicles						
	Speed (km/hr)					
	30	40	50	60	70	80
CO	12.53	9.40	7.52	6.27	5.37	4.70
NO _x	22.28	16.71	13.37	11.14	9.55	8.36
2. For Petrol Vehicles						
	Vehicles					
	Car	2 Wheeler	3 Wheeler			
CO	2.72	2.0	4.0			
NO _x	0.58	0.5	0.5			

Source: Indian Institute of Petroleum

The trends in air quality situation as shown in Box 7.1 are highly positive. There are significant changes anticipated in current emission characteristics due to fuel combustion (sulphur content of diesel, fuel, lead, etc.); levels of engine maintenance, average vehicle age, improved vehicles etc. Such changes as might occur would be likely to have a beneficial impact. Grade changes within the project corridor are eased and would reduce adverse impacts due to vehicular emissions.

Box 7.1. Kerala Specific Air Quality and Trends in Roads and Vehicles in India

The effect of lush ever green vegetation with its inherent biodiversity is a very important positive factor for clean air as experienced in Kerala. The presence of lush green vegetation as observed in Kerala is actually the mitigation measures proposed for air quality degradation by environmentalists in the form of green belt, avenue planting etc in all developmental projects. In Kerala, the presence of lush evergreen vegetation towards the landward side if considered on a regional basis will reduce/nullify any adverse impacts to a large extent.

The high precipitation and the 600 km long coastal belt in Kerala are another two positive factors in controlling the air quality. The rainfall in Kerala is three times (120 - 130 rainy days) that of the national average. This will reduce adverse impacts to a large extent especially in the case of Suspended Particulate

Matter (SPM) and Respirable Particulate Matter-PM10 (RPM) levels. On the other side, the recent trend of high quality fuels (like Pb free) is also a promising trend to keep good air quality in the future.

The improved vehicle performance due to improved vehicles will further reduce the over all air quality impacts. The improved cars with less pollution labelled as Euro I, Euro II and India 2001 etc is now in the market. In the year 2005 Bharat stage-III emission norms have been implemented in 11 megacities for all the new vehicles except 2 & 3 wheelers while Bharat stage-II norms have been implemented all over the country. For issues related to the implementation of emission regulations the MoRT&H is advised by a separate committee the Standing Committee on Implementation of Emission Legislation. The MoRT&H has formed this committee to discuss future emission norms, related test procedures and the implementation strategy.

For containing vehicular pollution, the Government has taken important initiatives in recent years. The Union Government and the Provincial Governments in India have been emphasizing the need for planning and developing strategies to implement mitigation measures to maintain the urban air quality and make the cities cleaner and greener for achieving better air quality and good health for its citizens. Over the past decade or so, the government has brought in statutes aimed at regulating and monitoring industrial and vehicular pollution across the country.

7.5. IMPACT ON NOISE QUALITY

The project specific impact mitigation plan in the EMP will address the link-specific noise mitigation. The ambient noise levels are generally high and the widening of the roads are not a very significant level so as to reduce the noise impacts. Potential noise impacts can be identified in two phases: the construction and operational phases are as follows.

IMPACT DURING CONSTRUCTION

During the construction phase of the road, the major sources of noise pollution are vehicles transporting the construction material to the construction yard and the noise generating activities at the yard itself. Mixing, casting and material movement are primary noise generating activities in the yard and will be uniformly distributed over the entire construction period. Construction activities are expected to produce noise levels in the range of 80 - 95 dB (A).

Moreover, the construction equipment will have high noise levels, which can affect the personnel operating the machines. Use of proper Personal Protective Equipment (PPE) such as ear muffs will mitigate any adverse impact of the noise generated by such equipment.

The noise levels in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which in-turn are being enforced by Government of India through model rules framed under the Factories Act. The acceptable limit for each shift being of 8-hour duration; the equivalent noise level exposure during the shift is 90 dB (A). Hence, noise generated due to various activities in the construction camps may affect workers, if equivalent 8-hour exposure is more than the safety limit. ACGIH (American Conference of Government Industrial Hygienists) proposed an 8 hour Leq limit of 85 dB (A). Exposure to impulses or impact noise should not exceed 140 dB (A) (Peak acoustic pressure). Exposure to 10,000 impulses of 120 dB (A) is permissible per day.

The noise likely to be generated during excavation, loading and transportation of material will be in the range of 90 to 105 dB (A) and this will occur only when all the equipment operate together and simultaneously. This is however, is a remote possibility. The workers in general are likely to be exposed to an equivalent noise level of 80 to 90 dB (A) in an 8-hour shift, for which all statutory precautions should be taken into consideration.

Due to various construction activities, there will be temporary noise impact in the immediate vicinity of the project corridor. The construction activities will include the excavation for

foundations and grading of the site and the construction of structures for the facilities. The loading and unloading of construction materials, crushing plants, asphalt production plants, movement of heavy vehicles, transportation etc produce higher noise levels during the constructional stage.

Constructional noise impacts are a temporary phenomenon. General conclusions can be based on the types of construction work anticipated, the likely equipment required and their associated range of noise levels. The construction activities will include scarifying the existing road, shaping the site and constructing the structures and facilities. **Table 7.6** is the typical noise levels associated with highway construction, and **Table 7.7** is the typical noise levels of principal construction equipment, provide representative construction noise levels associated with some activities.

Table 7.6. Typical Noise Levels Associated with Highway Construction

ACTIVITY	NOISE LEVELS, dB(A)
Grading & Clearing	84
Excavation	89
Foundations	88
Erection	79
Finishing	84

Notes: Measured as L_{eq} assuming 70 dBA Ambient Noise Level.

The presence of sensitive noise receptors including schools, hospitals etc. are a concern during construction stage. The construction noise is generally intermittent and depends on the type of operation, location and function of the equipment and the equipment usage cycle, it attenuates quickly with distance.

Potential construction related noise levels of 85-90 dBA at 50 feet (15 metres) from the source would be reduced to less than 62 dBA 2,000 feet (610 metres) from the source. Excavation noise levels, for example, assuming bulldozer, loader and dump truck activity only, would yield a L_{eq} of approximately 85 dBA at 50 feet. These noise levels would decrease by about three or four dBA with every doubling of distance and would be reduced to approximately 67 dBA at 800 feet (244 metres).

Table 7.7. Typical Noise Levels of Principal Construction Equipment

(Noise Level in dB(A) at 50 Feet)

Clearing		Structure Construction	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
Excavation & Earth Moving		Concrete vibrator	76
Bulldozer	80	Air compressor	74-87
Backhoe	72-93	Pneumatic tools	81-98
Front end loader	72-84	Bulldozer	80
Dump truck	83-94	Cement and dump trucks	83-94
Jack hammer	81-98	Front end loader	72-84
Scraper	80-93	Dump truck	83-94
Grading and compacting		Paver	86-88
Grader	80-93	Landscaping and Clean-Up	
Roller	73-75	Bulldozer	80
Paving		Backhoe	72-93
Paver	86-88	Truck	83-94
Truck	83-94	Front end loader	72-84
Tamper	74-77	Dump truck	83-94
		Paver	86-88
		Dump truck	83-94

Source: U.S. Environmental Protection Agency, *Noise From Construction Equipment and Operations, Building Equipment and Home Appliances*, NJID, and 300.1, December 31, 1971.

OPERATIONAL IMPACTS ON NOISE QUALITY

As the road and traffic already exists, there won't be any significant increase in noise impacts, on the contrary the improvement of the road and the mitigation measures will reduce the noise impacts. However, uninterrupted movement of heavy and light vehicles at high speeds may cause increase in ambient noise levels on the project road. It may have negative environmental impacts on the sensitive religious receptors such as temples and mosques close to the project road. Noise barriers have been recommended for all the sensitive receptors at identified locations. The improvement of the project road with all roadside amenities like parking areas, bus bays etc, will enable traffic without the usual 'stop and go'. With the increased speed without the usual 'stop and go' the noise level will be lesser than the present day.

7.6. IMPACTS TO FLORA AND FAUNA**7.6.1. SOCIAL FORESTRY**

The various project road improvements will require the removal of approximately 1340 trees of which 50 percent are medium-sized trees. Unfortunately for safety reasons some trees along the ROW which are dangerous to traffic at some locations will have to be removed. During construction stage, all efforts shall be taken to avoid any impact on social forestry by the construction workers. The labour camp shall be provided with LPG in order to avoid cutting of trees for fuel purpose.

7.6.2. IMPACT TO COCONUT PLANTATIONS

In the high land Coconut plantations are not many nevertheless due to the profitability factor etc some farmers cultivated coconut plantations in the lower reaches of the Western Ghats. Impact to coconut plantations is negligibly small.

7.6.3. IMPACT TO RUBBER PLANTATIONS

This is the most important land use of the PIA after the forest reserves. In terms of area wise coverage this occupies maximum area. Although these are agricultural plantations, this has a forest canopy effect creating productive biomass⁴. This means that although the area is productive with regard to primary producers other elements of the forest ecology does not exist.

7.6.4. IMPACT TO TREES ALONG THE ROAD ROW

As already stated a number of public trees (Details provided in **Annexure 3.50** of Part I EMP) located along the roadsides will have to be cut and removed. There are number of hard wood tropical trees in this corridor whose loss cannot be compensated so easily as it is fully grown having tens of years old.

7.6.5. IMPACT TO PRIVATE TREES

The impacted private trees (438 trees) also include number of hard wood trees the actual loss can be ascertained from the RAP prepared for Phase II KSTP project.

7.6.6. IMPACT TO FORESTS

No forestland will be required for the proposed improvements near the forest reserves. However, during construction period it is likely that the Concessionaires team especially the labourers working on daily wages will encroach the forest areas for food, fire wood and even for poaching. Unless suitable mitigation measures are formulated this will be one of the important negative impacts. The mitigation measures for this are discussed in the relevant section. During construction stage, all efforts shall be taken to avoid any impact on social forestry by the construction workers. The labour camp shall be provided with LPG in order to avoid cutting of trees for fuel purpose.

7.6.7. IMPACT TO WILD LIFE SANCTUARIES

Although there are wildlife sanctuaries in the project-affected districts, there are no sanctuaries in the Project Influenced Area. The Periyar wild Life sanctuary is about 30 km away from the project corridor.

7.6.8. IMPACT TO NATIONAL PARK

Although the Periyar National Park is within the project affected districts, it is not within the PIA and is far away from the project road. Periyar National Park is notable as an elephant reserve and tiger reserve.

7.6.9. IMPACT TO PROJECT TIGER

The project will not impact the project tiger activities, as the area is more than 30 km away from the project corridor during construction phases. It is most unlikely that this will have some consequences on the project tiger as the road and traffic already exists. And impacts due to tourist activities will be minor.

7.7. IMPACT TO PROJECT ELEPHANT

The project will not impact the project elephant activities, as the area is more than 20-30 km away from the project corridor. It is most unlikely that this will have some consequences on the

⁴ The total quantity or weight of organisms in a given area

project elephant as the road already exists and impacts due to tourist activities will be of minor nature

7.7.1. HUMAN HEALTH AND SAFETY

The project road crosses a railway over bridge at km 01+000 (**Figure 7.3**) at Punalur. The road also crosses an aquaduct at km 47+560 at Uthimoodu (**Figure 7.4**.) Operational safety needs to be ensured through proper signage.



Figure 7.3. Project road crosses ROB at km 01+000 at Punalur



Figure 7.4. Project road Crosses an aquaduct at km 47+560 at Uthimoodu

Review of KSTP I revealed that the construction camps are rarely well managed by the Concessionaires. The labour camps are very important with regard to environmental management as the impact due to the construction workers camp could be of higher magnitude. The type of adverse impacts could be any one or more of the following.

- Unauthorized tree felling to get fuel-wood even when alternative fuel is made available
- Poaching of edible animals and birds of the locality in spite of prohibition
- Poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent
- Indigenous people getting invaded by imported construction labour-force, due to lack of discipline
- Transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities
- Creating hazardous traffic flow at construction site due to lack of concern about the local needs and provision for pedestrians

7.8. ROAD SAFETY, TRAFFIC MANAGEMENT AND ACCIDENT MANAGEMENT

Road safety being very important in Kerala with third highest accident prone State in India, a number of activities have been taken up in the project to benefit not only the KSTP but the entire State. The road safety concerns along the project road during construction and operational phases are separately provided.

7.8.1. DURING CONSTRUCTION

The work sites along the project road are usually dangerous with large scale excavated land, debris, heavy machineries, cut trees (waiting for transportation). The Concessionaires usually does not bother the 'off' work time' such as the nighttime and holidays. Many accidents at work

sites are reported during night often happen due to the absence of well-defined signages. Mitigation measures are described in the relevant sections. There will be traffic management problems unless proper diversion or alternate routes are provided. Often the Concessionaires open both sides of the road creating very dangerous situations.

Box 7.2. Summary of the KSTP Road Safety Audit Report

This Road Safety Audit was carried out at the request of the Government of Kerala and with the support of the World Bank and the Design Consultants. There is no Road Safety Audit Manual for India or Kerala but Road Safety Audit is described in the Manual for Safety. In Road Design, published by the Ministry of Surface Transport. The Road Safety Audit Report was specifically aimed at improving the sixteen sections of highway in the Phase I and Phase II of the Kerala State Transport Project. The road safety audit has brought out clearly the dangerous road safety culture of Kerala. The recommendations include change in the design drawings especially at Junctions. The audit once again brought out the dangerous situation of pedestrians in Kerala. This was also brought out by environmental, social and engineering studies. There are also recommendations to improve lining and signing provision for pedestrians, parking areas, need for traffic calming, crash barriers, speed barriers, improvement of oxbow lands etc. besides the inbuilt provision of bus bays, footpaths etc in the design drawings. A road safety action plan was also prepared as a part of the road safety audit.

7.8.2. DURING OPERATIONAL STAGE

During operational stage, there won't be any such dangerous road safety situations, as the project will provide necessary signages, information boards etc in all recommended and needed locations. More over the widened road will have many facilities such as parking areas that will positively contribute to road safety.

On a long term basis the project may require more parking areas and road safety measures as the daily addition of vehicles on the vehicle population on the road shows a rapidly increasing trend.

7.9. IMPACT TO CULTURAL PROPERTIES

There are a number of impacted cultural properties as provided in the **Annexure 3.55** of Part II EMP. Except in some cases only compound walls or hundi will be affected. No archaeological structures are affected due to the planned improvement of the corridor. The project has prepared a cultural property rehabilitation plan to avoid or minimise any adverse impacts due to the KSTP project. The mitigation plans are also provided in the respective sections. The project will reduce the traffic congestion with the widening and improvement measures during the Sabarimala Pilgrim season.

7.9.1. IMPACT DURING CONSTRUCTION

The project road improvement according to the planned design will necessitate the demolition of part of some compound walls of the temples. Similarly few temples, mosques and shrines will be impacted. Most of these impacts are very minor scale. The environmental team discussed the various aspects, with the temple representatives regarding the proposed demolition of the wall. The mitigation measures are discussed in the relevant chapter. Many temples, mosques and shrines will be impacted. The mitigation measures are discussed in the relevant Chapter. Suitable mitigation measures are discussed in the mitigation Chapter.

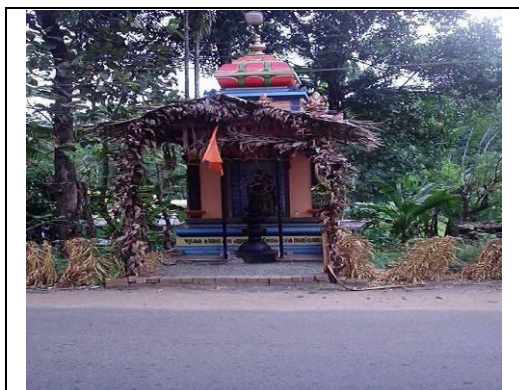


Figure 7.5. Shrine at km 53+500

The **Figure 7.5** shows a cultural property at km 26+100 of link no. 69 that will be impacted. If central widening is followed, both the main temple and the shrine will be impacted. The shrine is located on a solid raised platform with few trees as shown in the Plate. The platform is made of laterite bricks. Both the main temple and the adjacent shrine will not be impacted with appropriate mitigation measures as described in the mitigation and avoidance section 9.8.1

7.9.2. IMPACT DURING OPERATION

The Sabarimala region and other pilgrim regions will positively benefit from the road improvement due to the availability of a better access road and also due to the environmental enhancement proposals included in the project. Since there are some forest areas in the project road, the project has included adequate attention as provided in the relevant Chapter on mitigation.

The environmental enhancement proposals (Chapter 10) like better organised parking areas, bus bays and other information boards to tourists etc, will increase the tourism prospects of the region including the cultural properties and associated festivals. The overall road safety precautionary measures inherent in the project design will also positively benefit the region.

7.10. SOCIO-ECONOMIC IMPACTS

7.10.1. IMPACTS ON PRESENT STATUS OF LIVELIHOOD

POSITIVE IMPACTS

The accessibility and connectivity increases as it is the major connectivity between the various towns in the project corridor. Thus the time of travel between these places shall reduce significantly. With advent of the two-lane highway, the vehicle operating and maintenance cost is expected to go down substantially. These benefits can be attributable to smooth and even roads and low congestion. Savings in fuel consumption can be attributed to low congestion and relatively less travel time due to proposed improvements. The proposed road alignment shall also include general amenities like bus bays, pedestrian passes, road sign boards, street lights, medical aid etc and thus overall facilities to the road users shall improve. The proposed project is expected to improve the quality of life of the people residing in the project zone in terms of their economic, social and health status. Land value in the nearby areas of the proposed alignment will increase substantially. The overall aesthetics of the area shall improve with proposed landscaping and avenue plantation in the project stretch. Improvement of local tourism is envisaged due to better road infrastructure. Effective and enhanced connectivity can be expected through the project road from and between various parts of Kerala. During the construction stage of the project, both skilled and unskilled labours will be employed from the local villages to enhance the livelihood and economic standard of the people.

NEGATIVE IMPACTS

Improvement of proposed project road requires acquisition of productive agriculture land, demolition of commercial and residential building, felling of trees required for up-gradation of

road and shifting of public facilitating utilities such as electric poles, electric transformers, telephone lines, water supply lines, open and under ground sewage lines etc. Some of the community resources such as religious structures, hospitals, educational institutes, market places, panchayath meeting places and cattle grazing places will be affected.

7.10.2. IMPACTS ON LAND USE CHARACTERISTICS

The impact to land use will be two types during Pre-construction & construction and during operational stages

IMPACT DURING PRE AND CONSTRUCTION STAGES

During pre-construction stage, the existing land use characteristics of the acquired land will be changed to transportation land including parking areas, bus bays, rest areas etc. Up-gradation of project road requires acquisition agricultural land, commercial/ residential land and forest land, wherever the existing RoW is not accommodating design scheme. This is part of the project objectives. The roadside trees and bushes will also be cleared for the construction of the road. Other than this, there will not be any land use impact during construction stage. The impact on land use characteristics also include impact to ancillary sites such as borrow areas, quarry areas, labour camps, Concessionaires camps etc. In all newly opened Quarries, borrow area, labour camps etc. there will be land use changes on a temporary basis. Loss of productive agricultural land may result from the establishment of construction camps, batch mix plant and hot mix plant, quarry and barrow area. This results in minor change in agricultural yield due to project activities. Temporary change in land use at bridges and culvert locations shall be encountered to facilitate the existing traffic by alternate routes. Land selected for barrow and quarry area will change the land use pattern permanently.

Table 7.8. Distribution of Project Affected Population

ROAD	TOTAL PROJECT AFFECTED PERSONS (PAP)	PROJECT AFFECTED FAMILIES (PAF)	PROJECT DISPLACED FAMILIES (PDF)	TOTAL LAND REQUIRED (Ha)
Punalur - Ponkunnam	15405	2231	96	17.7046
Ponkunnam - Thodupuzha	19155	2990	129	35.7331
Source: RAP, KSTP				

LAND USE IMPACTS DURING OPERATIONAL STAGE

An induced impact is the ribbon developments through out the project road. Encroachment of RoW will invite parking and road safety issues. During operational stage, there will be induced impacts on the land use, immediately bordering the available corridor. The rate of ribbon developments along the sides of the project corridor is expected to be slow but continuous. An increased traffic could lead to a higher value for the land and there will be induced ribbon developments along the project corridors. These developments will be mostly close to the urban and semi urban pockets and also at the tourist locations. Better access can lead to conversion of agricultural land to commercial and residential purposes close to project road, especially in rural and urban areas. This leads to decrease in agriculture production and loss of productive lands. Aesthetics of the PIA regions shall change permanently.

7.10.3. IMPACT ON AGRICULTURE IN THE AREA

IMPACTS DURING CONSTRUCTION

Some of agricultural land will be acquired and converted to transportation land in the project corridor. Except the impact to ancillary construction sites such as borrow area, quarry areas etc, no adverse impacts are expected to the agricultural activities in the PIA region of the project corridor. The positive impacts include better communication and transport facilities due to the project.

Induced impacts include conversion of paddy fields by people adjacent to the road for residential and commercial purposes.

IMPACTS DURING OPERATIONAL STAGE

The envisaged land use changes will adversely impact the area of agricultural use. The agricultural areas immediately adjacent to the project road may be converted to business establishments as well as new dwelling units. Other than this, there will not be any adverse impacts on the agricultural activities in the area.

7.10.4. IMPACT ON INDUSTRIAL SECTOR

Industries in the project districts are mostly agro based small and medium category and rubber based industries. Kerala Agro –Fruit products, Punalur, Travancore Plywood industries, Punalur, and various crumb rubber factories located in Kottayam district need special mention here. The industrial sectors will positively benefit due to the improved roads in the region. Other than this, there will not be any impact on the industrial sector.

Easy connectivity to the waterways is very important for industrial development. Once the waterways of Kerala is fully developed these connectivity will provide economic boosts due to a growth in tourism and industrial sector. The west coast canal will provide cheapest or economic mode of cargo transport.

7.10.5. IMPACT ON PILGRIMAGE/TOURISM ACTIVITIES

Apart from Sabarimala pilgrim, the project road also caters the need of pilgrims to Maramon convention pilgrims and tourists. The impacts are provided separately for constructional and operational phases. Induced impact on tourism is a possibility but cannot be visualised at this stage.

IMPACTS DURING CONSTRUCTION

During construction, there will be slight difficulties for the road users. Although during construction period a significant decrease in the number of tourists is not anticipated, there will be definite difficulties to move along the project corridor. The mitigation measures are proposed and provided in the respective sections.

IMPACTS DURING OPERATIONAL STAGE

After construction of the road, the project will provide lot of enhancement to the various facilities provided to the pilgrims. The enhancement will be parking facilities, bathing facilities and eating and resting facilities at a number of places suitable for the purpose. These are discussed in the chapter on environmental enhancements. In order to implement these facilities all necessary budgetary provisions are provided.

Operational stage impacts are generally positive and will improve the prospects of tourism in the region. Overall development in the sector will improve the local economic situation thus helping the locals to obtain better employment opportunities.

7.11. SOLID WASTE COLLECTION AND DISPOSAL AT CONSTRUCTION CAMP

IMPACTS DURING CONSTRUCTION

Various construction activities such as demolition of structures, cutting of earth and rock mass for widening in some sections of project road, scarification of existing pavement will result in generation of huge quantity of construction waste. Further, substantial amount of domestic waste will also generate from workers camps. Improper disposal of these wastes may obstruct water flow resulting in reduction in water carrying capacity of the water body. Unscientific disposal of domestic waste may cause filthy smell resulting in health problems in workers and local residents. Improper collection waste from construction site may lead to traffic congestion and inconvenience for commuters. Enough management provisions are included in EMP to address these issues.

IMPACTS DURING OPERATIONAL STAGE

No impact is envisaged during operation phase of the project and hence no mitigation proposed.

7.12. IMPACT ON OTHER DEVELOPMENT PROJECTS IN THE AREA

The new upcoming developments projects in the project districts such as Aranmula international airport, Sabari rail etc will be positively benefitted through the present project.

CHAPTER 8. ANALYSIS OF ALTERNATIVES

8.1. INTEGRATION OF ENVIRONMENTAL CONSIDERATIONS IN THE ALTERNATIVES

8.1.1. SOCIAL AND ECONOMIC ALTERNATIVES VERSUS ECO-SENSITIVITY

The analyses of alternatives were an integral part of the early screening and selection process for the segregation of the high priority project corridor in the Kerala State Transport Project. Most of the ecologically sensitive corridors were dropped from the list of high priority corridors on account of the impact to forest reserves and coastal ecosystems. On the other hand some of the corridor developments are weighed against the social and economic benefits. The project road is one among such selected corridors which required widening and improvement in spite of the ecological sensitivity due to the project location.

8.1.2. DETERMINATION OF THE OPTIMUM WIDENING

This project has undergone a close scrutiny based on the environmental and social considerations. The determination of the road width for which the project road should be developed, was a crucial decision in the early stages of the project. In all physiographic locations viz, coastal low land, midland or high land, the impacts due to widening expected to be very high. The various sensitivity factors for the two units are as follows.

- Mid land-very high social sensitivity
- Highland-eco-sensitive

Location of the project road is midland and some sections in highlands. Due to the very nature of hilly highland areas there are a number of cut sections and realignment sections, these sections will balance each other with regard to cut materials and fill materials. The cut soil material are included in the estimation of soil together with material from borrow areas.

The social and environmental considerations were an integral part of the design and environmental assessment process. In the case of link no 68, there are two sections, which can be treated different in this Chapter for a detailed analysis.

The retaining walls will be provided in all required locations as given in the Environmental Management Plans. The cut soil material are included in the estimation of soil together with material from borrow areas. The analysis of alternatives has been prepared in accordance with the requirements of the World Bank and GOI guidelines.

8.2. “WITH” AND “WITHOUT” SCENARIOS

In the case of the project road under consideration, consideration of the ‘No Action’ and ‘Action alternatives’ have been examined as provided in the following subsections.

8.2.1. NO ACTION ALTERNATIVE

The no action alternative will allow an increase in accidents and a deteriorating road safety conditions. This will be acute during the pilgrimage season. The entire area is relatively underdeveloped compared to the others areas of the State. The no action alternative will not help the tourism especially the eco-tourism initiatives of the GOK. The ‘no action alternative’ will not provide much needed additional facilities such as parking areas, bus bays and rest areas and pilgrimage areas as envisaged in the project.

The steady increase in number of new and better vehicles will increase the number of vehicle year after year and will lead to traffic congestion and hence economic loss. The economic development of the region will not take place. Accidents and road safety will remain as an issue to be resolved. The entire road is an alternative safer route compared to the National Highways and the Main Central road (M.C Road) running parallel to the project road for tourists. The other aspects that will not be improved include no improvements beyond limited routine maintenance and rehabilitation of roads without any taking of land or buildings, removal of trees or other disturbance to the environment. There would be no improvements to drainage systems beyond their restoration to existing levels of service, no removal of impediments to pedestrians or construction of facilities for pedestrians and other slow moving traffic. This would leave the highway in its current appalling state.

The unsafe conditions and the environmental consequences (air and noise pollution and degraded environmental conditions) will continue and worsen. The no improvement condition in the long term would be a serious impediment to the development of the economy and thus to the improvement of conditions for all sections of the population. The two bypasses included in the project, which will be implemented by KSTP separately, will ease the traffic movement and safety of passengers and pedestrians. Thodupuzha bypass is also intended for the free movement of the pilgrimage traffic during October - December – January period. The bypasses will allow the urban area to develop in a more organised manner than the expected.

Forest ecosystems. ‘No action alternative’ will not change the status of the forest eco-systems. In the long run the sensitive ecosystems will continue to deteriorate in the same pace leading to large-scale destruction of forests in the region.

8.2.2. ACTION ALTERNATIVE

Population and traffic growth will continue to occur and exacerbate in an already critical situation. The "with" scenario, has been determined to be economically viable and would meet the local communities aspirations to a large degree. It would, thereby, contribute to the development goals of the project regions and thus to the entire Kerala State, improve road safety conditions, enhance economic efficiency and growth potential of the area, and improve the well-being and livelihood of those within the potentially affected area of the project road. Potential negative environmental impacts associated with the "with" scenario can be reduced through good engineering practice and, where warranted, appropriate mitigation and enhancement actions as specified herein.

A comparative statement of No Action Alternative and Action Alternative is shown in **Table 8.1**.

Table 8.1. A Comparative Statement of No Action Alternative and Action Alternative

NO ACTION ALTERNATIVE	ACTION ALTERNATIVE
Narrow corridor remains	Corridor will be widened and improved
Travel distance saving does not arise	Travel distance savings
The forest ecosystems will continue to degrade	There will be protection for forests and forest plantation as per the environment enhancement Plan
No awareness will be built in the local Groups and NGOs	There will be a number of awareness meetings to the local people & NGOs

NO ACTION ALTERNATIVE	ACTION ALTERNATIVE
Road safety and accidents will continue to be the same	There will be substantial improvements with regard to road safety and accidents
Tourism prospects remains dull	Tourism prospects will improve, which cannot be visualised at this stage.
There will not be any environmental enhancement to the region for tourism and recreation	There will be a number of measures for improving the environmental conditions that will help for tourism and recreation.

The analysis clearly shows that the ‘no action’ alternative is not a prudent course of action. This alternative “do nothing” is not acceptable and has already been rejected by the State Government as demonstrated by the implementation of the Kerala State Transport Project phase - II.

The Chapter 2 Project descriptions and the road safety aspects outlined in the baseline section emphasise that the **‘No Action Alternative’** is not a sensible avenue under the present circumstances.

The overall improvement of the project road will improve the status of the project road and possibly lead to a re-notification as National Highways.

Forest ecosystems. The action alternative will improve the status of the forest eco-systems with controlling intrusion of travellers in to the forest and the planting of additional avenue trees. The trees planted as a part of the project mitigation and enhancement measure will be added to the State reserve. . This will benefit students, teachers and researchers besides the tourist’s and bird watchers and Ornithologists.

8.3. DESIGN DECISION CONSTRAINTS FOR VARIOUS ALTERNATIVES

Since the project road selected under the project are of almost similar character throughout Kerala, it was necessary to take a viable decision on the extent of developments due to the Social implications including the high cost of land. The team of *Engineers, Economists, Sociologists* and *Environmentalists* of PMT and PWD found that widening to the IRC standard (30m) or any other standard would affect large-scale population. Therefore the issue was discussed at all levels for an implementable option affecting least number of people and properties and should have minimum environmental impacts. These meetings were held at government, department and consultant’s level and also with public participation at various stages involving experts from related fields individually and sometimes collectively. These deliberations were also held in the field on the project road for easier understanding among the specialists involved for quicker decisions.

The following decision constraints were considered in particular.

- The legal right of way (ROW) could not be established.
- Severe limitations were found with respect to the available corridors width and the existing geometry.
- A rigid adherence to a particular design standard would necessitate substantial realignments, in a large number of locations, which are linked to substantial land acquisition, environmental impacts and social hardships to the population.

- The decision to widen on any one side was difficult except in the case of curve improvements. One side widening was generally selected on the grounds of least cost and inconvenience to the frontages.
- The present rate of accidents, road indiscipline, vehicle speeds, present road condition and road safety, particularly pedestrian safety was matters of serious concern and influenced every decision that was taken.

The widening of the pavement with the provision of footpaths in built-up areas as necessary would result in a seven-metre width pavement and 2.5 metre wide footpaths / shoulders. This standard could only be accommodated within a 12 metre physical Right-of-Way, with some narrowing if necessary, to avoid the costly acquisition of roadside property.

Table 8.2. Widening Alternatives Considered for the Project Road

PARAMETER	30M COI	15M COI	12M COI	10M COI
Number of affected PAPs	17584	6029	1824	1229
Number of structures affected	4171	3112	733	492
Magnitude of land take (ha)	233.04	35.01	21.19	7.38

Source: Louis Berger Report 2004

The costs of land and accommodation works are very high and the designs need to avoid even small areas of land acquisition wherever possible.

8.4. ENGINEERING ALTERNATIVES CONSIDERED

The engineering alternatives considered were reasonable and potentially viable alternatives with regard to the project road. In the case of eliminated or discarded alternatives the reason for their elimination and in those cases of detailed investigation alternatives have been documented.

The design and decision-making process was undertaken so that environmental, resettlement and rehabilitation issues prompted the early identification of appropriate actions. Such actions included, for example, shift in alignments/realignments based on an awareness of the locations of cultural resources and biological resources such as areas of roadside trees and the early identification of short realignments to reduce local impacts. Such adjustments were weighed against benefits derived from reductions in congestion in built-up areas and improvement of road safety and were incorporated in the design process to ensure that the maximum practical avoidance of sensitive areas (e.g. shrines, hospitals, forest areas) and adverse impacts to the Project Affected Persons (PAPs), etc. The alternatives found to warrant documented consideration in the process are as follows.

8.4.1. ALIGNMENT AND WIDENING ALTERNATIVES

Some areas of the project road have some sharp curves which affect the visibility of drivers. Except along the built-up areas, the width of the road is also comparatively higher perhaps due to its earlier status as National Highways.

Relatively minor shifts of the ROW to one side or the other (or both) in the same area and incorporating the existing ROW are significant in the context of the Kerala State Transport Project and such shifts have avoided adverse impacts in many instances.

Four types of widening alternatives have been devised by the earlier consultants. Three out of four of the alternatives have been employed in various segments along the ROW for Phase I and Phase II roads. The fourth alternative has been dropped in order to reduce the effective land take for road improvement. The four sets of alternative cross sections provide a "menu" from

which the cross-section most appropriate to a particular circumstance can be and has been employed (e.g. for rural areas, for urban areas etc). The widening/ improvement of bridges proposed in the previous reports have been generally followed for preparing DPR in 2012 except in the case of bridges with poor structural condition. In such cases appropriate decisions to satisfy the requirement have been taken.

However, the original proposals were examined with a judicious methodology evolved by the consultant in proposing retention, reconstruction and strengthening etc. of the structures with due contingency to the economic aspect. Condition of the structure, IRC design standard requirement, as well as geometric feature played key roles in such a decision.

The widening and strengthening of the pavement will take place along its existing alignment with only minor changes in the position of the centre line horizontally and vertically. The newly improved road may not therefore conform strictly to the ideal design standard, but will represent a major improvement upon the service provided by the existing route. In urban areas improvements of the roadway slightly to either side of the centreline of the ROW, is dictated by circumstance and minimises environmental and social impacts.

8.4.2. BYPASS ALTERNATIVES

Though two bypass are going to be implemented in the project road, one at Pala and the other at Thodupuzha, as they are under separate package of PWD, no bypass alternatives were considered under the current project. Apart from these two towns, none of the semi urban areas along the project route require a bypass to decongest the existing traffic scenarios.

8.4.3. REALIGNMENT ALTERNATIVES CONSIDERED IN THE PROJECT

A total of 37 realignment alternatives were considered under the project to avoid sharp curves and to improve road safety. The length of these realignments varies from 50m to 250m. All realignments considered was finally included in the design drawings after thorough field verifications. A 'no action' alternative for these short lengths is unsafe for pedestrians as well as the daily commuters.

Table 8.3. Impacts Related to Realignments

IMPACT ALONG EXISTING ALIGNMENT	IMPACT ALONG NEW ALIGNMENT
Loss of Business and living	Loss of cultivation
Degraded environment	Loss of Paddy Field/Agricultural land/Productive land
Further maintenance uncertain especially in rural areas	In voluntary settlement

8.4.4. ENGINEERING ALTERNATIVES CONSIDERED IN INITIAL DESIGNS 2004

To avoid major social impacts, the options are shifting the centre line to right side, left side or concentric widening (i.e. both sides). Opting to widen to either the right or left of the roadway facilitates the preservation of various environmental and social resources on the side avoided. The qualitative aspects of various resources to be avoided in each section were considered as a part of the analysis. Alternatives were analysed for all possible sections of the road based on the information and analysis supplied by the initial screening and feasibility analysis followed by field checks with the least adverse environmental and social consequences. Nevertheless some impact to boundary wall of cultural properties and buildings are inevitable with most appropriate mitigation measures.

➤ NO ACTION ALTERNATIVE

The 'no action alternative' will allow the chaos of traffic jams that would occur in the towns of the project road. This will not relieve the pilgrim season traffic along the project road.

All activities undertaken by the PWD will remain as a public waste of resources. The PAPs along the alignments will continue to suffer due to the unfortunate "**Uncertainty**" imposed on their land and property by the local PWD. People have been unable to get compensation for years together. The continued difficulty in selling their land and property resources to relieve the economic pressure that may arise from time to time such as arranging marriage of son/daughters, and for other important purposes like higher education and even for proper living.

➤ ACTION ALTERNATIVE

Action alternative on the other hand will relieve all uncertainties described above. This includes the provision of better compensation package for the sacrificed land and property. In addition the weaker PAPs like widow headed households will get special alternative training provision for addressing the grievances with grievances redressal cell (GRC) etc will also relieve a lot of mental pain associated with the court cases.

ALTERNATIVE 1

Improve to a 7.0 m wide pavement with sealed shoulders. The adverse impact on the realigned / bypassed community resulting from Alternative 1 can be addressed by appropriate mitigation measures.

ALTERNATIVE 2

Alternative 2 is to improve to a 7.0 m main carriageway with two 1.5m wide auxiliary lanes and sealed shoulders.

The potential impacts on the physical and social features of the environment are judged to be higher in Alternative 2 combined with the fact that Alternative 2 indicates a higher EIRR and NPV and is thus rated more economically viable, as well as the preferred alternative from a capacity and safety perspective, has led to the selection of Alternative 2 for the higher trafficked roads.

The provision of kerbs and footpaths is attractive to pedestrians also the creation of bus lay-bys and parking areas wherever land areas permit, especially in village locations but cognisant of the detrimental effect of parking on visibility especially near pedestrian crossings and road junctions.

The absence of a design standard will not generally inhibit speeds below 50 km/hr as is demonstrated by the present road alignment. It must be remembered that with smooth machine-placed surfaces and even slightly improved alignments, drivers will tend to drive faster; this makes driver education and the imposition of speed limits even more important.

ALTERNATIVE 3

The early economic and traffic projections indicate that two-lane roads will reach traffic capacity within 10 to 15 years on some of the project routes pointing to the need to consider dual two lane carriageways. This is the reason for considering the alternative three. This is to improve to a dual two-lane carriageway. Footpaths will be provided wherever necessary for the separation of pedestrians from vehicles. It is also necessary to try to separate the large number of two wheeled and slower moving vehicles from the faster larger vehicles on the roads as traffic volumes increase. Drivers will need education in the use of the road but the effective removal of slow moving vehicles increases the efficiency of the main traffic lanes. In effect it reduces the number of vehicles using them in such a way that within the project life no road would require dual two-lane carriageways.

The very positive advantages of this option must still be offset against the need to widen most of the existing road corridors, which generally offer ROW of only 10 or 12 metres width, and many sections as little as nine metres width. Option three will need considerable areas of land acquisition with greater negative social and environmental impacts. It also adds considerable to the costs to the Highway Authority for the land, accommodation works and any resettlement, all “negative costs” in terms of building and maintaining roads. Where land purchase is required on the scale anticipated it must be substantiated by road lines designed to accept engineering standards and the adherence to these standards will incur the need for even greater land requirements dictated by the use of minimum curvature radii and minimum vertical and horizontal sight distances. The use of option three was subsequently discounted.

The very positive advantages of this option must still be offset against the need to widen most of the existing road corridors, which generally offer ROW of only 10 or 12 metres width, and many sections as little as nine metres width.

Where land purchase is required on the scale anticipated it must be substantiated by road lines designed to accept engineering standards and the adherence to these standards will incur the need for even greater land requirements dictated by the use of minimum curvature radii and minimum vertical and horizontal sight distances. The use of Option Three was subsequently dropped from further consideration.

8.4.5. PILGRIMAGE SEASON ALTERNATIVE

The project road will positively benefit the Sabarimala/Maramon/Bharananganam pilgrimages by way of improved road surface, parking areas, bus bays and also environmental enhancement measures such as the provisions for bathing and resting. The control of pilgrimage season pollution to water and environment is an important consideration. A no action alternative will stop these benefits immediately.

8.4.6. RESERVE FOREST ALTERNATIVES

The project will positively benefit the reserve forests/sensitive area. These forest reserves are important, as it is located in the outer areas of the important tiger and elephant reserves. Protection works will positively contribute to the ecosystem. The elaborate arrangements during construction to implement and monitor, mitigate etc will also create sufficient awareness. The sign boards will installed after construction.

8.4.7. JUNCTION ALTERNATIVES

The road safety studies have pointed out the safety requirement at important road junctions. Based on the nature of traffic from the safety point of view, eight traffic junctions were to improve to acceptable standards. Majority of the junctions were left out from this improvement. The junction improvement will increase the number of project-affected persons and will require demolishing of expensive commercial structures. In spite of this, the junction alternative is an important requirement of the project. Total 25 major junctions and 211 minor junctions exist along the project road.

A no junction improvement alternative could be dangerous as pointed out by the road safety audit and also by the design compromises made in the project.

Table 8.4. List of Major Junctions in the Project Road

Sl No	Chainage (km)	Classification	Remarks	Proposed Improvements
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		LHS	RHS		
1	0+000	+		LHS Towards Kollam RHS towards Thenmala	At grade
2	12+835	T		Towards Kottarakara	At grade
3	13+400	T		Towards Adoor	At grade
4	16+410	+		LHS Towards Adoor, RHS Towards Padom	At grade
5	25+600	T		Towards Pandalam	At grade
6	29+215	+		LHS Towards Adoor,RHS Towards Tannithode	At grade
7	36+380	+		LHS Towards Patunaman Thillu ,RHS Towards Malayapuzha	At grade
8	38+600	T		Towards Pathnamthitta	
9	42+500		T	Towards Pumba, Sabarimala	
10	42+950	T		Towards Kolencheri	
11	49+900	T		Towards Thiruvalla	
12	51+870	T		Towards Mallapallyi tiruvalla	At grade
13	56+200	T		Towards Ranni Bypass	
14	60+400		T	Towards Erumeli	
15	67+950	T		Towards Changacherry	At grade
16	73+300		T	Towards Kangirapally	
17	84+000	+		LHS Towards Kottayam , RHS Towards Ponkunnam	At grade
18	96+450		T	Towards Bharananganam	
19	104+880	T		Towards Ettumanor	At grade
20	105+170	T		Towards Ramapuram	At grade
21	105+770		T	Towards Poonjar	At grade
22	106+160	T		Towards Fire Station Pala	At grade
23	130+280	T		Towards Kuthatukulam	At grade
24	132+530	T		Towards Thodupuzha Bypass Junction	At grade
25	132+760		T	Towards Idukki	At grade

8.4.8. ENVIRONMENTAL ENHANCEMENT AND ROAD SAFETY ALTERNATIVES

The following environmental enhancement alternatives were considered in addition to the impact mitigation measures. These measures are required for landscaping, and to improve road safety measures. The project has taken into consideration the various road safety implications in the design. Having fully convinced the importance of road safety, the World Bank requested the State Government to carry out a road safety audit for the final Phase II designs. A road safety specialist carried out the Road Safety Audit during June 2001. This audit has considered the various road safety alternatives and measures carried out to arrive at the final design. The recommendations of Kerala Road Safety Act 2007 have also been considered. The iRAP manual (International Road Assessment Programme) manual 2011 and iRAP Safer Roads investment Plans were also considered for the designs. Moreover, recently the road safety expert of World Bank made some suggestions in July 2012. Most of the road safety measures suggested by them have been incorporated in the final designs especially those of important road junctions.

Bus stops/Bus bays. The bus lay-bys were integrated with the design when the environmental and social investigations underlined the need for the same. This is to improve road safety and to reduce accidents.

Parking areas. The provision for parking areas within the limited width of widening is also recommended from the environmental investigations. This is to improve road safety and to reduce accidents. Due to the sufficient availability of land at many sections there are several opportunities for environmental enhancement. Majority of the trees could be saved. All bigger trees such as Banyan trees at urban sections could be saved and the appearance of tree can be further improved by providing platforms. This allows an opportunity and space for people to arrange discussion and meetings. In tourist areas, besides parking areas, the space will allow for shrub and tree planting which will improve the value of the project corridor.

Cultural property rehabilitation plan. In addition to compensation and rehabilitation of the affected/impacted cultural properties there will be enhancement for other cultural properties close to the ROW.

Rest areas. The redundant portion of the realigned sections can be suitably developed for tree planting, restaurant and resting facilities in future.

8.5. ECONOMIC ALTERNATIVES

Following alternatives are considered by the consultants for the economic analysis.

Without Project Situation: The first is a ‘without project’ (do minimum) where the existing intermediate lane project road is considered as such in its present condition and without improvement. In this case the future traffic volume is assumed to continue to flow along the existing road only. In the HDM model analysis, this ‘do minimum’ alternative will form the first / base strategy against which all other strategies will be compared.

With Project Situation: This corresponds to the reconstruction of the existing road sections of the project road to two lane carriageway (7m) with hard & soft shoulders and appropriate other improvement works like alignment correction, pavement reconstruction, widening / reconstruction of CD structures.

The later comprises of the strategy of the ‘with project’ situation in the HDM model. In order to arrive at the net benefits associated with this strategy, these are compared to the ‘do minimum’ / ‘without project’ alternative separately. By comparing the above alternatives, the net agency costs and net user costs and finally net project benefits associated with the project during its analysis period are calculated for the proposed improvement options separately, in order to arrive at their economic internal rate of return (EIRR) and economic net present value (ENPV). More details on economic alternatives and cost analysis are provided in chapter 8 of Detailed Project Report.

CHAPTER 9. IMPACT MITIGATION AND AVOIDANCE

The impact mitigation measures and avoidance strategy are based on the project improvement proposals and its impacts during construction and operational periods as defined in the previous Chapters. This is one of the few transport projects where the project *avoided any standard widths* that need to adopt for State highway standards (a minimum of 30m ROW) for widening. This is only to avoid large-scale environmental and social impacts. Adoption of any standard width will result in large-scale R&R issues. These were compared to the project benefits, costs, and the actual requirement and after hard consultation process, it was evident that widening to any standard designs were not necessary. At the same time the improvement could result in large-scale accidents and unsafe road safety conditions. This is only because through an improved smooth road surface the drivers will tempt to drive faster and with improved vehicles the tendency will be even higher.

Apart from impact mitigation, many impacts have been avoided with suitable changes in the design or by small design compromises without jeopardizing the road safety concern. Mitigation measures have been planned for all identified impacts. Where the effects of the mitigation measures are not adequate or total, the project strategy was to reduce the effect of impacts to an acceptable level. In order to further improve the situation a number of environmental enhancement measures are devised as provided in the **Chapter 10**.

The mitigation measures are devised and aimed to the extent possible to reduce and mitigate the effect of environmental impacts due to the construction and operation of the project. The environmental mitigation costs for different mitigation measures are provided in Part II Environmental Management Plan. The *Bill No 11 of BOQ* closely links to the Environmental Management Plans of the project road. The bill no 2 and 3 also include actions that will allow other detailed environmental mitigation works such as topsoil conservation and site clearance. The three bills include all the environmental management and mitigation costs of the project corridor for actual implementation.

9.1. METEOROLOGY AND CLIMATE

Under the heading natural environment; temperature, rainfall and humidity are included. The effect of clearing of vegetation, cutting of a few trees etc will not itself contribute to generate any impact of noticeable nature and does not warrant any special mitigation measures.

There are very few trees along the project corridor, which will be cut and removed due to safety reasons. There will be removal of trees from the private properties also. Although the private trees will be compensated, the project will plant trees as a compensation package at the rate of three per tree removed. However unlike other KSTP project corridors the replanting of trees will be carried out along the project corridor. Therefore other than the envisaged replanting of trees, no other mitigation measures are required.

9.2. PHYSICAL SETTING OF THE REGION

9.2.1. PHYSIOGRAPHY

The physiographic changes are due to the change in embankment height, new alignments such as realignments and due to the substantial geometric corrections either to the left or right side of the alignment. The Part II EMP furnishes these chainages along the entire project road where there would be a comparatively significant rise in the embankment height.

The overall construction activities will bring in a number of additional changes along the corridor. The changes are mainly due to the additional construction material that will be used as a part of the widening and improvement of the project road. The actions that will be taken to ensure embankment stabilisation are construction of retaining walls, toe walls, selection and use of less erodable material, placing of gabions and riprap and sound compaction, particularly around bridges and culverts. Retaining wall or toe walls will be required in all watercourses with planting of trees and rip-rap (stone pitching). The effort of the Concessionaire for stabilisation will get quick results if carried out in the monsoon season. Re-vegetation, sodding and seeding will allow the stabilisation of embankment. All this needs to be carried out immediately after the construction to avoid erosion of the constructed embankment. Contract documents for the project road has specified that final forming and re-vegetation must be completed as soon as possible following fill placement to enable a rapid regeneration of stabilising ground cover.

Monitoring and construction supervision according to the terms of the contract will be undertaken by the Independent Engineer (IE) to ensure that regeneration efforts are successful.

The berms and batter slopes of road embankments are required to be seeded with a fast growing crop and native seed mix immediately after fill placement to prevent scour and to encourage stabilisation. Grass sods will be used wherever feasible. Berms, embankment slopes and road cuts are required to be stabilised by re-vegetation with unpalatable (grazing resistant) plant species, placement of fibre mats, rip-rap, rock gabions, or other appropriate technologies. Most areas to be cleared of vegetation are roadside berms to be covered by pavement and will not need re-vegetation or to be stabilised. Installation of drainage structures and raising of road formation levels may create exposed slopes that will be stabilised before the onset of the monsoon.

Discharge zones from drainage structures will be furnished with riprap to reduce erosion when required. Where necessary, grass sods will be imported and laid to provide ready made turfing. Down drains/chutes will be lined with rip-rap/masonry or concrete to prevent erosion. Side slopes will be adjusted to 1:1.5 or flatter to reduce erosion potential or, if steeper, stabilised, covered with riprap or other material to prevent soil erosion. These requirements are clearly specified in the construction contracts. Construction in erosion and flood prone areas will be limited to the dry season.

Mitigation for disposal of waste material generated /Scarified Black top. The total scarified bituminous material to be removed from the existing road surface is estimated to be about 61,063.8 cubic metres considering 124.620 km of Punalur –Ponkunnam - Thodupuzha project road for about 7.0 m pavement for a thickness of 0.07m (124.620 m x 7.0m x 0.07 m).

Although the total material to be disposed seems to be high, the actual material to be disposed per kilometre would be of the order of 1,500 cubic metre only, after considering some in-situ construction requirement. The fill material requirement for new alignments of 8.250 km (4.250+1.000+3.000) considered for realignments and two bypasses would be very high. The in-situ requirement considering a mere 3m filling would be of the order of 3,71,250 Cubic metres (8250 x 15 x 3) after the excavation of 0.5 metre of topsoil. The high requirement is mainly due to the deep valleys along the project road. Parking areas and access roads also require considerable filling at some locations. More over the Concessionaire will use some material for the in situ requirement related to the embankment stabilisation and access roads.

9.2.2. GEOLOGICAL CHARACTERISTICS

Sand requirement is a one-time requirement during the construction period for three years. The project, as a mitigation measure towards sand mining issue, will resort to quarry sand and dust

from quarries. The project Environmental Management Plan will make provisions for increased use of quarry dust and sand to avoid the mining effect on river sand.

Since the project road has taken all necessary testing for a suitable design the expected impacts due to the geological factors are nil.

9.2.3. SEISMIC CHARACTERISTICS OF THE REGION

As described earlier in **Chapter 5**, the Project Corridor is within the Seismic Zones III as defined by the Indian Standard (IS) 1893 (Part I): 2002 Seismic Zoning Classification. The basic horizontal seismic coefficient (α_h) for Zone III is 0.04. Seismic factor has been considered for designing of all culverts and bridges. Other than this no other mitigation measures are necessary.

9.2.4. IMPACT ON SOIL QUALITY

During the construction period, the EMP stipulates the preservation of topsoil from the construction areas as per the guidelines given in **Annexure 3.7**. This guideline gives detailed measures about preserving fertile topsoil as so to avoid erosion during rainfall and flooding (along coastal area) during monsoon. If required the soil heap will be protected by rock boulders or ridges with gaps filled by soil. The heaped area will be sufficiently drained to avoid any flooding events. The MoRTH specifications including those mentioned in EMP has specified the need to store and utilise the topsoil.

During the monsoon season, all construction/disturbed areas along the project road that will be susceptible to erosion will be maintained properly to avoid large-scale erosion of soil from the work area. Areas requiring soil stabilisation have been identified during all surveys and have been taken into account in the construction design. There could be permanent loss of agriculture/productive soils especially paddy field areas due to widening\ borrow areas.

All borrow pits are identified in the interior areas in the midland. In most of the cases, the distance to the borrow pit locations is expected to be 10-30 km. The network of roads available throughout the area will facilitate the material transport. It is not possible to clearly identify the haul routes because of the various options and constraints available. The specific locations of borrow pits identified are provided in the baseline section. There will be significant adverse impacts due to the creation of borrow pits. The contractual clauses in the EMP will address these issues.

9.2.5. EROSION

The envisaged project design considerations and construction activities will not accelerate the rate of erosion. The improvement of the project will be along the available corridor and to the immediately adjacent area to be acquired for the project. The design was in accordance with the standards of the Indian Roads Congress (IRC) pursuant to surveys carried out as per “IRC:56-2011 Recommended Practices for Treatment of Embankments and road side slopes for erosion control” The improvements along the project corridor will not itself lead to any additional significant erosion. Raised berms will, wherever necessary, be stabilised by retaining walls, rip-rapping, fibre mats, sodding, and/or replanting. Road drainage will be upgraded to accommodate the 25-year floods. All drainage ways will be of suitable size and aligned to minimise any potential erosion.

If proper measures are not taken, the nearby surface water bodies will be contaminated depending on the type of material stored. The Concessionaire will have to take the necessary precautions to avoid erosion. All material storing places will be covered using tarpaulin. The topsoil heap and storage also will be subjected to erosion, if proper measures are not taken. The

measures required at the topsoil preserved sites include lining of the soil heap boundary with bricks or rocks of boulder size. The EMP will ensure that the topsoil will be stored to avoid erosion during the monsoon months.

As in other parts of Kerala, the project road region receive heavy monsoon showers. The project has considered and provided adequate arrangement for both longitudinal and cross drainage structures. As the region receives long spell of rainfall, the project has considered and provided adequate arrangement for both longitudinal and cross drainage structures. This will allow much better drainage facilities and thus avoid scouring and erosion of the embankment and the road itself. The drainage facilities at urban, semi urban and village areas are considered to fit into the local conditions. The cross-sections at cut sections that are employed in the project have provision for increased longitudinal drainage. The drainage facilities at cut sections would be according to the design cross-section for cut sections.

The project has avoided chances of erosion to the extent possible all areas. Wherever possible suitable measures are suggested for forest preservation and ecological enhancement. This includes fencing (will help the vegetation to grow strongly thereby reducing erosion) retaining wall, toe wall construction. These measures are practical and consistent with other social and environmental concerns (e.g. tree preservation, buildings), wherever possible the widening of the project road has been planned to take place away from the water bodies. The cooperation with local people and authorities are an integral part of the project planning. The public consultation conducted as part of the project will continue throughout the project implementation and operation phases.

Concessionaire's construction establishments: There should be sediment trap in all ancillary areas like construction camps, labour camps, plant areas, borrow areas etc. The area should be well drained and the water should be collected in a pit trapping the sediment load in the run off. The eroded sediment thus collected can be brought back for use. The leakage and erosion from the material storage places could lead to the contamination of surface water bodies.

Table 9.1 provides the details of mitigation measures proposed to control erosion.

Table 9.1. Mitigation Measures to Control Erosion

EROSION ACTIVITY	MITIGATION MEASURES	REMARKS/REFERENCE To EMP
Top soil heap	Boundary lining using rock boulders and coconut leaves, split coconut and tarpaulin sheets	Especially during monsoon Refer EMAP during construction period.
Drainage along the sides of the road	Longitudinal drainage provision through out the project corridor with or without lining.	Depending on the location, requirement varies.
Drainage across the road	Cross drainage provision in the form of culverts and bridges through out the project corridor with or without lining. New CD structures are also planned where ever necessary including the realignment sections	This will allow much better drainage facilities and thus avoiding scouring and erosion of the embankment and the road itself
Material storage places	Rock boulders and coconut leave mat /Bamboo etc can be employed as a cost effective local methods instead of the use of tarpaulin sheets.	Hand made coconut leaf mat is locally available material and the promoting of this will provide and

		encourage employment.
Cut sections	The cross-sections at cut sections that are employed in the project have provision for increased longitudinal drainage	Stabilisation of the cut sections against erosional activity is very important.

9.2.6. LAND SLIDES AND SOIL EROSION IN THE AREA

DURING CONSTRUCTION

Concessionaires, IE and PWD local divisions involved in the construction supervision should take extra attention not to trigger any landslides within the project corridor or immediately adjacent areas of the corridor. Wherever necessary, the raised areas will be stabilised by providing environmental friendly structures now employed worldwide. These methods include retaining walls, rip-rapping, fibre mats, sodding, and/or replanting as per the MoRTH specifications. The twenty-five year floods have been considered for the improved road drainages. All drainage ways will be of suitable size and alignment to minimise any potential erosion. Proper drainage is one factor to minimise the occurrence of landslide. During construction period, it is necessary to take all necessary measures to avoid erosion. The leakage and erosion from the material storage places could lead to the contamination of surface water bodies.

The cost effective measures such as the lining of the soil heap boundary with bricks or rocks of boulder size or locally available *coconut leave mat* shall be employed to avoid erosion to the topsoil heaps. The EMP will ensure that the topsoil will be stored to avoid erosion during the monsoon months.

Retaining walls, fibre mats, rip rapping, sodding and or replanting will be constructed in the side slopes of raised berms. Road drainage could up - graded to accommodate the 25-year floods. All drainage ways will be of suitable size and alignment to minimise any potential erosion.

DURING OPERATIONAL STAGE

The project has adopted standard design considerations that will not result in higher rates of erosion compared to the traditional road construction followed in the State. The proposed construction activities will be along the available corridor and to the immediately adjacent corridor. The improvements along the project corridor will not itself lead to any additional significant erosion except along new alignments.(Bypasses/realignment).

9.2.7. CONSTRUCTION MATERIALS

All borrow pits are identified in the interior areas in the midland and high land. In most of the cases, the distance to the borrow pit locations is expected to be 10-30 km. The network of roads available throughout the area will facilitate the material transport. It is not possible to clearly identify the haul routes because of the various options and constraints available. The specific locations of borrow pits identified are provided in the baseline section. There will be significant adverse impacts due to the creation of borrow pits. The contractual clauses in the Concessionaires Borrow area management Plan will address all issues satisfactorily.

The BOQ has provisions for the Concessionaire to prepare quarry area management plan. The necessary guide lines for the preparation of the Quarry and borrow area management plan is provided in the EMP. These plans need to obtain the PWD and Independent Engineer (IE) approval prior to the implementation. The environmental mitigation costs have been estimated and included in the BOQ bill no11. The specific task that will have to be addressed have been identified and included.

Existing sources as provided in the Baseline Chapter, in active operation are likely to be used. Concessionaires may; however, select other supply options provided that they are cost competitive, provide material meeting established quality standards in an environmentally sound manner. The specific locations of quarries likely to be used in the construction of the project are provided in Section 5.2.3. The impacts due to the operation of borrow areas and quarry areas have been considered in the EMP.

9.2.8. QUARRY AND CRUSHING OPERATIONS

The impacts due to the operation of borrow areas and quarry areas have been considered in the EMP. The Concessionaire will have to prepare and implement a Concessionaires quarry management plan clearly describing all activities relating to quarries and quarry materials. The opening and closing of the quarry need to be clearly mentioned. The quarry management plan should have approvals from all concerned agencies. The environmental mitigation costs have been estimated and included in the BOQ bill no11. In order to encourage and ensure the implementation, the cost for the preparation of the plan itself is included. The specific task that will have to be addressed have been identified and included. Existing sources in active operation are likely to be used. Concessionaires may; however, select other supply options provided that they are cost competitive, provide material meeting established quality standards in an environmentally sound manner.

9.3. WATER RESOURCES IN THE REGION

There will not be any significant adverse impacts to surface water bodies. The project road cross a number of rivers, streams and canals whose details provided in the respective sections. The mitigation measures will include actions to avoid the obstruction of stream courses due to material storage or dumping. The EMP clearly identifies all mitigation measures requiring attention. The contract clauses are included for all categories.

9.3.1. SURFACE HYDROLOGY

The water withdrawal points for the construction should be developed and operated in a manner that will not disturb the surface hydrology. The intake points should be developed, operated and closed in an environmental friendly manner. The Concessionaire will be required to prepare a water management plan regarding the use of water resources, intake points, operation of the vehicles, and closing of disturbed areas. The plan should have the approval of the Independent Engineer(IE) and the PMT.

There are a number of dos and don'ts for the Concessionaire as provided below:

- Concessionaire's vehicles shall not be allowed to wash in rivers or streams. This is to avoid potential pollution from oil residues.
- Concessionaires shall not use water from the community drinking water sources such as;
 - Public water supply schemes
 - Community spring water sources
 - Community hand pumps
 - Community bore wells / shallow tube wells
 - Location of the streams from which the Community takes drinking water
- Concessionaire shall obtain all legal approvals and clearances from the concerned departments.

- Concessionaire shall consult the local communities where the water source has been identified.

Temporary arrangement to enter the water body/ stream or river:

The increased runoff due to widening of the roadway will be negligibly small. Water quality in roadside ponds adjacent to the ROW may show slight improvement after road upgrading due to reduced erosion from improved roadside berms and embankment slopes stabilised or protected by riprap or other material including planting to prevent soil erosion. Water requirement for this will be met from the surface water sources like canals, streams, ponds, lakes, chiras etc. The requirement will be considerably reduced during monsoon. Conversely, during summer season, i.e., during March-April-May the requirement will be much higher. During this period, the small water bodies will be generally dry; however, there will not be any major difficulty in obtaining water for construction.

9.3.2. DRAINAGE PATTERN IN PIA

There are a few new bridges along the link under consideration. Many realignments have been considered necessary in this project. The only work that will be affecting the drainage pattern is the improvement/reconstruction of the culverts and the longitudinal drains. The fact that the road already exist and the avoidance of bypasses have been made the overall impacts to a minimum level. The impacts mitigation due to the ancillary construction sites such as the operation of borrow areas, quarry areas, Concessionaires and other labour camps have been considered in the EMP. The Concessionaires are to prepare a borrow area and quarry area management plan and obtain approval from the Engineer (IE). Environmental mitigation costs have been estimated and included in the BOQ bill no11.

Concessionaires establishments: appropriate drainage should be planned in all areas for the storm water flow.

Cross Drainage. Cross drainage structures will be replaced in accordance with the standards of the Indian Roads Congress (IRC) pursuant to surveys carried out as per IRC SP35-1990 and IRC:34-2011 - Recommendations for Road Construction in Areas Affected by Water Logging, Flooding and/or Salts Infestation (First Revision). Adequate numbers of new CD works are provided in the design drawings wherever the new alignments are proposed. Complete details of the Cross Drainage facilities are provided in the Chapter 5, section 5.3.2. The designs for culvert widening are adjusted to one and two-side widening. There will be reconstruction where ever the existing structure is in a poor condition. The planned construction is for the full formation width. IRC:34-2011 - Recommendations for Road Construction in Areas Affected by Water Logging, Flooding and/or Salts Infestation (First Revision) was also considered for designing.

9.3.3. GROUNDWATER IN THE PIA

There will not be any groundwater requirement for construction, as the construction water will be completely met from the rivers and streams. All affected wells / hand pumps and PWS within the proposed construction zones have been identified as shown in EMP- Environmental Data Sheet. There will be no net loss of water access points. In the event that wells must be relocated, temporary alternative water sources (e.g. new wells, trucked potable water) will be provided to ensure that local residents have ready daily access to potable water. Large scale exploitation of groundwater being a sensitive issue, all approvals must be obtained.

Wells and Hand Pumps. New wells and hand pumps will be provided as specified by the Resettlement Action Plan (RAP). Along the project corridor many wells and hand pumps will have to be removed because of improvement in the available corridor width. The loss of existing

private hand pumps is included in the RAP and they will be replaced as a rehabilitation measure. All public wells and additional wells, if required, as a result of the rehabilitation measures are also included and in the EMP the cost has been considered. Water sources should be properly developed for meeting drinking water standards and other requirements.

Concessionaires establishments and practice: In all major workshop areas where the oil spillage will be very high, oil - water separator pit should be constructed. This can make sure that the oil spillages are not infiltrated in to groundwater and get in to the open hand dig wells (community drinking water source).

9.3.4. WATER QUALITY

The water quality impacts will be controlled, mitigated or minimised by the enforcement of all applicable laws and regulations. This is built in to the Environmental Management Plan. The upgrading of the project road link will reduce erosion from the roadway and result in minor improvements in water quality (i.e. reduced silt loads). Care has been taken in the design to provide side drainage.

Wherever practical and consistent with other environmental concerns widening of the project road has been planned to avoid water bodies. Where this was not possible (CD work along the banks of water bodies for Cross drainage) slope protection is required to be installed until embankment surfaces are stabilised. Co-ordination with local agencies is recommended to ensure that any future developments along the existing ROW in the vicinity of water bodies and other sensitive areas are well controlled. Contract provisions have been incorporated in the bid documents to ensure that construction camps and other potential sources of secondary impacts are properly sited and provided with drainage and wastewater treatment facilities. The provisions for waste disposal at service centres and construction labour camps are the contractual obligations of the Concessionaire.

As the source of construction water could be the water bodies streams and rivers, efforts shall be maintained to avoid any impacts to the ecosystems as mentioned above.

The KSPCB under its 'consent to establish' for Phase I roads directed that effluent treatment facilities namely septic tanks and soak pits and adequate sanitation facilities shall be provided for the construction force. The domestic effluent during construction phase shall be treated to achieve the effluent standards as stipulated below:

- pH 6-8.5,
- Bio chemical Oxygen Demand (3 days at 27°C)-30 mg/l, max
- Suspended solids 100 mg/l. max
- Oil & Grease 10mg/l, max

9.3.5. FLOODS DURING MONSOON SEASON

Throughout the corridor there will be an increase of 20-30 cm height due to the additional material that will be used during the construction work. In all other flood prone stretches suitable mitigation measures have been framed and provided in the EMP. Storm drainage provisions will be upgraded to accommodate 25-year floods. The adequate cross drainage structures and longitudinal drainage structures will also help to effectively drain the area very quickly. Areas where swampy area exists a number of mitigation measures are proposed. Junction improvements, footpath and curve improvements are also planned to have an overall positive impact. The project has planned many bridges and culverts. This is a major improvement along the project corridor, as it will allow even the multi axial trucks along the corridor. During

operational stage, maintenance of the drainage structures deserve highest important due to the nature of precipitation in the area.

9.4. AIR QUALITY

Air quality issues are addressed in two phases: the construction and operational phases.

9.4.1. DURING CONSTRUCTION STAGE

The KSTP construction phase will be difficult because of the ribbon development throughout the road network. Asphalt and hot-mix plants are required to be located at least 500 metres away from the nearest sensitive receptor (e.g. school, hospital). As a Kerala specific relaxation, this distance is relaxed to 250m by the KSPCB due to the practical difficulty in maintaining the distance. Operators are required to install emission controls. Road surfaces, excavation and construction sites will be sprayed to keep them moist for dust control. Trucks carrying earth, sand or stone will be covered with tarpaulin sheets to avoid spilling.

Potential significant adverse impacts upon adjacent residents or site employees during construction will be mitigated by either discontinuing until favourable conditions are restored, or, if warranted, sites will be watered to prevent dust generation, particularly at crushing plants. Machinery and equipments are required to be fitted with pollution control devices, which will be checked at regular intervals to ensure that they are in working order. The best available pollution control technologies are required.

Avoidance itself will be a suitable mitigation or minimisation measure to sensitive areas. As a special mitigation measure for impacts on water bodies, no construction machinery and plants will be established near rivers and water bodies. All approval from concerned agencies must be obtained prior to the construction related activities near water bodies.

Concessionaires establishments: For the concrete batching plants, crusher plants and hot mix plants the Concessionaire must obtain all necessary approvals from the State Pollution Control Board. The crusher plants should be suitably covered with hoods to minimise the dust pollution. The approach roads should be well maintained so that it is free from dust formation.

9.4.2. DURING OPERATIONAL STAGE

The net air quality impact during the operational phase of the project road is expected to be beneficial. Improvements in road surface condition and traffic capacity will alleviate local congestion and improve traffic flow, thereby reducing engine idling and the contribution it makes to local air quality degradation. With improved vehicle performance on a better road surface, the air pollution should actually be reduced. Provision for designated parking areas for auto rickshaws, cars, jeeps etc will improve the road safety conditions and traffic management situations decongesting the traffic corridor thereby positively contributing to air quality improvements. Paving and provision of adequate side drainage in villages will significantly reduce human exposure to air pollution, including both vehicular emissions and roadside dust.

9.5. NOISE QUALITY

Noise issues are considered in two phases: the construction and operational phases as follows. Confining construction activities of the project road links to social working hours and employing noise controlled construction equipment of international standards will mitigate noise impacts during the construction phase for the local population. Measures will include:

Source Controls, i.e. requirements that all exhaust systems be maintained in good working order; properly designed engine enclosures and silencers will be employed; and regular equipment maintenance will be undertaken.

Site Controls, i.e. requirements that stationary equipment will be placed as far away from sensitive receptors as possible (i.e. aggregate crushers, etc.); disposal sites and haul routes will be selected to minimise objectionable noise impacts; and shielding mechanisms will be employed where possible.

Time and Activity Constraints, i.e. operations will be scheduled to coincide with periods when people are least likely to be affected; work hours and work days will be limited to less noise sensitive times as far as possible.

Community Awareness, i.e. public notification of construction operations will incorporate noise considerations and methods to handle complaints should be included.

9.5.1. OPERATIONAL NOISE IMPACT MITIGATION

It is anticipated that there will be ‘measurable’ decrease in noise levels as the measured values indicate high noise levels in the region. Estimated noise levels due to road use following construction warrant consideration of mitigation actions in regard to those sensitive receivers for which noise levels may exceed the ambient noise standards specified by the Noise Pollution (prevention and control) Rules 2000 of the Ministry of Environment and Forests, Government of India. Mitigation at these locations may include the posting of signs prohibiting the use of horns and, to the extent possible, landscape planting to serve as noise barriers. The effect of noise can be reduced considerably by the combined effect of sound insulating walls and green barriers. The typical designs for noise barriers are enclosed in the EMP document. The principle of the designed barrier is also explained in the design sections. Proposed project mitigation actions include the following:

Sound Insulating Walls for Silence Zones. This is basically a stone or brick wall to act as a sound barrier. This may be necessary in the case of hospitals and medical centres, schools and other educational institutions. A number of schools and a few hospitals have been identified adjacent to the road corridor. The level of improvement is marginal and not to any recommended standards of IRC (30m) or any other standards due to various factors unique to Kerala. Therefore in order to address the issue of noise levels along silence zones, the noise barriers have been recommended for all silence zones. Although the wall is meant for noise reduction, it will also serve as a safety barrier with only one or two authorised outlets for people and vehicles to move in or out. This will also serve as the barrier for preventing dust during summer and muddy water during the monsoon acting as a physical barrier to the highway. This is necessary and evident when viewing the current behaviour of the drivers; the speed of the vehicles is often considerably higher than the design speed (or speed for the level of service) of the road. The PMT would be responsible for the implementation of this work. In order to project the environmental significance of the wall, the wall will be painted green.

Green Barriers for Silence Zones. These are simply a thick layer of green plantation of Asoka trees acting as noise attenuating objects. These trees may be planted just “inside” and adjacent to the sound insulating wall. The PMT will be responsible for the implementation of this work. Details of the implementation are provided in the Part II - EMP.

Raising Walls for Silence Zones. This includes the cost of increasing the height of already existing walls around hospitals / schools if necessary. In addition to schools (educational

institutions), hospitals are also identified adjacent to the road corridor. The PMT will be responsible for the implementation of this work.

Noise mitigation techniques will be employed as may be warranted at each of the sensitive receptor sites. Definitive noise levels will be empirically determined at each site and selection of the mitigation technique will be made on a site-specific basis in consultation with property owners. The mitigation costs have been estimated as a part of the environmental costs of the project in Part II - EMP.

9.6. FLORA AND FAUNA

The project has devised an impact minimisation strategy for flora and fauna. Ideal conditions prevail in the forest areas in the project road in the form of comparatively better-preserved trees.

The impact mitigation actions include long term planning for the project road. As part of the Environmental enhancement strategy, Environmental awareness boards will be placed at all critical locations

All the above discussed impact minimisation, mitigation and enhancement measures have been reviewed after the receipt of a study report from the Centre for Water Resources Development and Management ⁵(CWRDM) in March 2003.

Roadside trees. The loss of trees will be mitigated by planting at least three trees per tree removed from the roadsides. Similarly in addition to compensation at appropriate market rate, the trees removed from the private land also will be replaced at the same rate. The loss of trees and vegetation at ancillary sites like borrow areas, quarry areas, labour camps, WMM plant, hot mix plant etc. will also be mitigated according to the measures adopted in the Environmental Management Plan.

Private trees. The trees/plants/shrubs lost on construction site under in take points if any will be considered for replanting as per EMP. Throughout the project road, there are trees in private ownership. Those trees, which are required to be removed for the purpose of this project, will be subjected to compensation and likely replanting at the rate of three trees planted against every tree removed (refer EMP).

The project's "tree planting strategy" encourages the people immediately adjacent to the road to plant high canopy trees. (Part II – EMP, **Annexure – 3.50**, Landscaping, Tree Planting & Environmental Enhancement Plan). Necessary training will be imparted to the Concessionaires and the Supervision Consultants immediately after mobilisation.

Rubber Plantations. Considerable area of rubber plantations (RAP,2003)will be taken over by the project road improvement. Although the mono - cropic plantations have very high forest like canopy value in terms of tapping the solar energy and converting to biomass. The removal of the plantations for road purpose does not requires any mitigation measures. The project has a tree-planting programme and the lost trees will be planted. On the other hand the rubber farmers will get good road for transportation of their product

Coconut Plantations. There are very few coconut plantations along the project corridor. Unlike the rubber plantations the mixed crop in the coconut plantations will have a high canopy value similar to the forest reserves. The removal of private trees however will be replanted by Tree planting programme envisaged under the project.

⁵ This is an autonomous research institute established by GoK under KSCSTE.

9.6.1. FORESTS

As stated earlier, the forest reserves adjacent to project road do act as a barrier and a training area for interior areas from being encroached by the people. No forest area will be diverted for the purpose of this project. Considering this aspect, the project will provide demarcation of the forest boundary with the Project road by providing barbed wire through out the common boundary with forest reserves. Further Concessionaires are to set-up camps and plants at least five km away from the forest boundary. Adequate training will be provided to Concessionaires. Sign boards and information boards will be provided near to the forest boundaries according to the EMP. Other than this no other mitigation measures are found necessary

9.6.2. WILD LIFE SANCTUARIES.

No Wildlife sanctuaries are with in the PIA area hence no mitigation measures are warranted. No portion of the project tiger/project elephant is within the PIA hence no special mitigation measures are found warranted.

9.7. HUMAN HEALTH AND SAFETY

Human health and safety is increasingly important during highway construction, improvement and operation due to various reasons. These are based on the fact that the 'highway corridors' act as corridor for spread of diseases. In this case as the road and traffic already exists, this will not be the case. This Resettlement Action Plan has taken care of this aspect. The Kerala Road Safety Authority Act 2007 is a positive step in Kerala towards ensuring human health and safety.

9.7.1. HUMAN HEALTH

All measures required to mitigate noise pollution in silence zones have been discussed under noise mitigation. Similarly, all measures required to mitigate air pollution in sensitive areas have been discussed under air quality mitigation. Other than these, no further mitigation actions are regarded as necessary for air and noise issues.

The EMP has given sufficient attention with regard to health and safety of their workers, maintain and cleanup campsite, and respect the rights of local landowners. If located outside the ROW, written agreements with local landowners for temporary use of the property will be required and sites must be restored to a level acceptable to the owner within a predetermined time period. The Concessionaire, prior to the establishment of the camps, will have to develop the workers camp restoration plan to the satisfaction of the Independent Engineer.

In order to protect the need of the migrant labourers if employed, they shall be provided with facilities for cooking, eating and sleeping. The Concessionaire needs to observe all labour laws and ensure minimum daily wages. The EMP has made provisions to monitor the labour requirements.

The Concessionaire must provide all Personnel Protective Equipments (PPE) to all personnel working for the project execution and exposed to various kinds of risks. Appropriate environment and safety measures should be in place. Clearances from various agencies for fuel storage should also be obtained. Relevant fire safety equipment should be installed.

9.7.2. HIGHWAY SAFETY DURING CONSTRUCTION

The Indian Roads Congress (IRC) has recently come out with guidelines⁶ on road safety in road construction zones. This will be the basis for the construction road safety and will be strictly implemented after incorporating in the contract documents.

9.7.3. HIGHWAY SAFETY DURING OPERATION

Highway safety was of paramount important to Kerala State Transport Project. Because of the special relevance to this project, all road safety aspects are dealt with separately in **Chapter 5** on Health and Safety aspects. A heavy thrust on the road safety aspects of the entire State itself is being paid by a State road sector safety programme covering all road networks.

9.7.4. LACK OF PARKING SPACE FOR AUTORIKSHAWS AND JEEPS

There should be space provided for parking off the road without interfering with the smooth flow of traffic. Along the project road, in almost all rural areas the populace is heavily dependant on rickshaws, jeep services and cars / taxis. The car users, especially taxis are very high. All urban and semi-urban centres require parking spaces for auto rickshaws and jeeps as shown in **Annexure 3.51**, Part II – EMP. This is also shown in the Environmental Data Sheet prepared for the project road.



Figure 9.1. A Typical Location at Pathanapuram where parking area required

9.7.5. PARKING OF VEHICLES ON BOTH SIDES OF THE ROAD

The parking of vehicles on both sides should not be encouraged at any location, especially in urban areas. One-side parking may allow free flow of traffic. This could be addressed in each town and should be enforced

9.7.6. LACK OF SUFFICIENT SPACE FOR BUS STOPS AND BUS LAYBYS

Bus stops should not obstruct the free flow of traffic. The location of bus stops should provide sufficient space to the commuters, especially the large number of school children, to safely wait. The pedestrians should be safe from both approaches. In this project there is an inbuilt (included in the design) provision for bus stops as provided in **Chapter 10**. There are numerous locations, which require bus stops that are discussed separately later in **Chapter 10** - Environmental Enhancements. The introduction of some courtesy on the roads as a result of driver education should enable buses to rejoin the traffic stream without any belligerence or danger. The project has included the provision for bus bays/bus lay buys. This will help to achieve a smooth traffic flow. Provision for bus bays however have been restricted by providing at a minimum intervals as the number of bus stops are numerous some times too close to each other

⁶ IRC: SP: 55:2001, Guide lines on safety in road construction zones and IRC:SP:44-1996 Highway Safety Code

9.7.7. UNPLANNED ILLEGAL DIGGING ON ROAD SIDES

The State PWD as the Highway Authority is responsible for the Right of Way (ROW) of all main roads in Kerala. Any detrimental activity by any other department on the road Right of Way should be seen as illegal unless carried out with the permission of the Highway Authority (HA).

Any digging for laying of pipes, cables etc should be subject to clearances and approvals from the PWD. Regular PWD co-ordinating meetings are an essential part of planning any road works with police participation. Proper planning and implementation can save a considerable amount of money, save a number of people from accidents, and reduce inconvenience to the public.

The project has provision for utility ducts through out the entire corridor and also ducts crossing the road for crossing of utilities at regular intervals.

9.7.8. PARTLY COVERED / UNEVENLY COVERED OPEN DRAINS

A formal system of drainage improvement needs to be developed to permanently cover the drains rendering them to be safe footpaths at least in all urban and semi-urban areas. The PWD needs to fund the operations and improve engineer's awareness. The project design has taken this into account.

9.7.9. INADEQUATE EMBANKMENT HEIGHT IN FLOODING AREAS

The PWD should have some signing programme to warn of flash flood sections. In all flood-prone sections the road should be raised properly and drained with adequately sized culverts to the extent that such flooding shall not affect the smooth flow of traffic during monsoon seasons. Any borrow pits opened for this purpose must be controlled with proper licensing / approvals / agreements etc.

9.7.10. ENCROACHMENT OF VARIOUS TYPES

The Highway Protection Bill is a positive step to control encroachment. Local engineers must become more familiar with the legal limits of the ROW and encroachments should be addressed severely and quickly. Narrow corridors with poor visibility and no provision for pedestrians cannot afford to accommodate encroachers.

9.7.11. PARKING OF VEHICLES ON BOTH SIDES OF THE ROAD

The parking of vehicles on both sides should not be allowed at any location, especially in urban areas. One-side parking may allow free flow of traffic. This could be addressed in each town and should be enforced.

9.7.12. TREES, VEGETATION, FORESTS AND WILD LIFE

For road safety purposes, it is necessary to remove some trees along the corridor to assist the free flow of traffic and improve safety and visibility. Road frontages must be requested to trim overhanging growth to prevent the obstruction of roads and footpaths. The fruits and coconut leaves of dense coconut trees grown on the sides throughout the corridor is also matter of concern due to the chance of falling on pedestrians, vehicles etc.

9.7.13. UTILITIES

Illegal digging must be stopped by the PWD. New works may make provisions for utilities to avoid unnecessary digging along the road corridors especially along narrow sections. Road openings should be controlled by the PWD which needs to recover the cost of reinstatement or installation of safety aids from the promoting authorities. The project has included a provision for longitudinal and cross utility ducts.

9.7.14. EFFECTS OF MONSOON ON ACCIDENTS

Engineering designs with suitable signing and pedestrian facilities can assist in avoiding many dangers. These are considered in the designs. This has been further reviewed in the light of recent road safety audit.

9.7.15. NUMEROUS ROAD INTERSECTIONS

The Rules of the road regulations are very clear on priority at junctions. The PWD must sign and line the appropriate priorities and they must then be enforced by police action with support from the courts. This aspect was considered in the design.

9.7.16. DANGEROUS OVERTAKING OF VEHICLES

The drivers of Government-owned vehicles including the State-run KSRTC BUS services are most easily targeted for driver education programmes in the short term. Driver education, proper law enforcement and strict penalties by the Courts must be used to curb dangerous driving practices.

9.7.17. TEMPORARY FISH AND VEGETABLE MARKETS AND AUTOMOBILE WORKSHOPS

This cannot be allowed to continue for safety reasons especially in all town areas of the Project road. The local authorities should provide additional space for fish and vegetable markets. There should be stringent conditions for setting up automobile workshops, e.g. license being issued only after fulfilling all requirements.

9.7.18. SPEED LIMITS IN URBAN AREAS

Speed limits through all heavily built-up areas and adjacent to schools and other institutions are essential. The use of lower limits, which are difficult to enforce, should be discouraged. Proper signing and enforcement is essential and requires more police training and more effective Court action. The use of properly - constructed speed bumps in restricted areas may be considered (to IRC Specifications).

9.7.19. DISPOSAL OF SOLID WASTE/MUNICIPAL WASTE IN MARKET AREAS

The State Government should encourage the local Municipal authorities to acquire additional separate land for solid waste disposal and adopt hygienic systems of collection and disposal. In the short term, liaison with the PWD to control the placing of skips on more appropriate sites would be most beneficial.

9.7.20. PEDESTRIAN SAFETY

The capital investment needed to carry out this project is aimed not only at improving the infrastructure to service State departments but also to bring major improvements in the efficiency of the existing roads and to improve the quality of life for road users. The anticipated improvements should result in improved efficiency and a reduction in traffic accidents with greater travel enjoyment to all road users. This will be dependent upon implementing the recommended safety measures. In addition, provisions for footpaths next to schools and hospitals have been made in the design.

9.8. CULTURAL RESOURCES IN THE REGION

The project has prepared a Cultural Property Rehabilitation measures (CPRP). During construction especially at the time of Sabarimala/Maramon pilgrim season and also the temple festivals along the project road, there will be temporary access problems for the Pilgrims/tourists

to the cultural properties. The rehabilitation plan clearly defines the type of structures needed to compensate any losses or the need to carry out some enhancement measure.

9.8.1. MITIGATION PLAN FOR SABARIMALA PILGRIMS/ FESTIVALS

At the time of construction of the road, Sabarimala festival season in every year require freezing of all major activities in the project stretch from Kumbazha to Mannarkulanji by the construction Concessionaire. Nevertheless the Concessionaire can continue any activity that will not directly affect the pilgrims to Sabarimala.

9.8.2. MARAMON CONVENTION

The Maramon Convention is a Christian convention held at Maramon, Pathanamthitta, Kerala, India annually during the month of February on the vast sand-bed of the Pampa river, nearly 15 kms away from the current project road. Maramon Convention is held for eight days during the first week of the Great Lent that usually falls in February. More than 200000 people assemble there during the convention. Since the Convention centre is located away from the main project road no specific mitigation actions are required during construction Phase. Nevertheless the Concessionaire needs to make sure that the construction activities are not against the interest of the visiting pilgrims.

9.8.3. BHARANANGANAM CHURCH FESTIVAL

The mortal remains of the St. Alphonsa are entombed at this church which is now famous pilgrim centre. Many people gather at this church every year during the annual festival feast of St. Alphonsa in July. Since the church is located few kilometres away from the main project road no specific mitigation actions are required during construction Phase. Nevertheless the Concessionaire needs to make sure that the construction activities are not against the interest of the visiting pilgrims.

9.9. SOCIO-ECONOMICS

In this section only those items that will help to determine impacts are discussed.

9.9.1. LAND USE IN THE PIA

With regard to ribbon developments PWD need to enforce the applicable laws with the assistance of the agencies concerned. The major land use impact would be the conversion of all acquired land to transportation land. A total of 53.4ha of land will be converted to transportation land in the project road. The total land requirement has been estimated to be 17.70 ha for Punalur – Ponkunnam road and 35.73 Ha for Ponkunnam – Thodupuzha road. In link no 84 the additional requirement of land is 0.62 ha only. The impact on land uses will be limited to the land use of the construction camp, labour camps and various plants such as the WMM plant and the hot mix plant. This is a temporary effect. The Concessionaire will have to prepare a management plan for all these items for an efficient and effective restoration (Refer EMP). The supervision consultants will ensure its proper implementation.

9.9.2. AGRICULTURE IN THE DISTRICT

No specific mitigation measures are warranted for impact to agriculture areas. Linkage to MC road, SHs and high ranges are major factors that will help agriculture.

9.9.3. INDUSTRIES IN THE PIA

Industries will positively benefit out of the increased transportation and linkages. On the other hand the pollution from increased and existing industries need to be contained by proper

implementation of the pollution control laws. Linkage to State Highways and highranges will help to a positive growth of the industry.

9.9.4. TOURISM IN THE PIA

9.9.4.1. DURING CONSTRUCTION

The Concessionaire need to develop a project specific traffic management plan with the approval of PMT to tide over the pilgrimage season traffic.

Passenger traffic including the tourist traffic should not be affected. There should be strict enforcement of IRC road safety measures as indicated in the regulations (Refer IRC: SP: 55:2001). More over the traffic will not be closed during construction period, as it will affect the schedule of the passengers as well as the tourist's visiting the area. During festival season freezing of main activities will be required.

The PMT/PWD need to develop a 'Sabarimala season traffic arrangements'. The plan should contain excellent route maps depicting the various construction activities of KSTP (Second year and Third year maintenance, Up-gradation of MC road and other roads during Phase I and Phase II). The user-friendly maps and guideline can be priced also. The priced version should be more elaborate and user friendly. The entire aspects should be available in PWD Web site (www.keralapwd.gov.in).

9.9.4.2. DURING OPERATION

Linkage to National Highways, Railways and pilgrim centres will help to a positive growth of the tourism. The area will positively benefit from these linkages.

CHAPTER 10. ENVIRONMENTAL ENHANCEMENTS

The project has taken adequate mitigation and avoidance measures for all environmental and social impacts. Nevertheless these measures are not adequate to reverse the environmental degradation and other long-term impacts. It is necessary to devise some measures for value addition as well as to counter these categories of impacts. Moreover the three month long Sabarimala pilgrimage during November to January every year need special measures. The total period could be 6-10 months in the three-year construction period with three months in every successive every year. As already described, the impact of the pilgrimage on the project road improvements during construction would be very high unless some regional strategies are devised. The impact during operational stage can be managed by the environmental enhancement measures discussed in this Chapter.

The institutional arrangements for the implementation of environmental and social mitigation and enhancement measures are described in the separately bound Environmental Management Plan (EMP).

As discussed in the previous chapters number of general mitigation and minimisation measures are considered wherever appropriate according to the degree of impacts. Nevertheless these measures are not adequate to reverse the environmental degradation and other long-term impacts. Further efforts are also made to include other measures, which will be a value addition to the project and increases the social accessibility of measures taken in the project. The various environmental enhancement measures taken include,

- » Provision for parking areas
- » Bus bays
- » Bus waiting shed with inbuilt Kiosk
- » Cultural property enhancement
- » Rest area development (Development and Improvement of Oxbow land)
- » Development of parks for community use
- » Development of platforms for aesthetically beautiful trees and structures
- » Improvement to drinking water sources
- » Bathing ghats along river banks close to the roads

Since the project road is passing through forest area, it need special care for providing any additional enhancement measures. The development without adequate ecological knowledge may further deteriorate the forest ecosystems. The KSTP has taken adequate environmental impact mitigation and enhancement measures, which will help to preserve the forest ecosystems. The project there for has taken the execution of the work as an opportunity to implement various environmental enhancement measures to achieve sustainable development. The specific activities are discussed in the Environmental Management Plans for each road and an overview is presented in this Chapter.

10.1. ENVIRONMENTAL ENHANCEMENT MEASURES

The project will improve all access roads including the access road to these areas. Provision of tourist signboards at the access roads is also included in the Bill of Quantities. The important Tourist locations include Thekkady, Idukki, Munnar, Thenmala, Vagamon, Peerumed and

Kuttikanam (Hill area). The Sabarimala pilgrimage season need special arrangements especially close to perennial water bodies. The pilgrims usually stop at water access points only.

10.2. RENOVATION OF HANGING BRIDGE AT PUNALUR

The hanging bridge at Punalur is listed in the State Archaeological Departments list of district wise Archaeological sites. This needs some renovation and preservation. The district panchayath Kollam and the State Archaeological Department are jointly planning the implementation these renovation works. The access roads will be improved and shrubs will be planted and sitting and rest places will be made at this location. Finally much bigger signboards will be placed on both sides of the bridge. The possibility of pedestrian use will also be explored. This renovation plan has not been considered as part of KSTP.

10.3. PUBLIC TRANSPORT AND CONVENIENCE

The expected traffic reversals from National highways require adequate parking spaces for all types of vehicles especially trucks. Other required facilities include rest areas, bus bays and bus shelters.

10.3.1. PARKING AREAS FOR TRUCKS

The project road provides adequate space for developing major parking slots at various places along the project road. No additional land requirement would be required.

10.3.2. BUS BAYS

Separate space for bus lay-bys and bus shelters are one of those safety measures out of many that are necessary to help reduce accidents and increase public convenience. The bus bays and bus shelters should be located outside the carriageway and should not affect the free flow of traffic. There should be pedestrian crossing facilities and proper signing of bus stops. Entry of other vehicles to the bus lay-bys must be prohibited. Taking all these aspects into consideration, bus lay-bys have been built into the designs. 118 New bus bays proposed (including both sides) in this road and the details of bus lay bays in the project road is shown in the environmental data sheet in EMP and in **Annexure 3.43** of EMP.

The project road has the highest number of bus waiting sheds per kilometre length. It is not practical to provide bus bays in all these locations. Therefore the team of specialists after visiting the project corridor recommended bus bays and bus waiting sheds with a better rational. However in all existing waiting shed locations new bus shelters are planned without a bus bay. This provision is strictly subjected to local conditions especially land requirement away from the traffic corridor.

10.3.3. BUS SHELTERS / BUS WAITING SHEDS

The bus stop should have bus shelters or bus waiting sheds in a region experiencing six monsoon months. This is necessary in a high rainfall, hot and humid country. The local municipal or Panchayath authorities normally provides these with agreement to the sitting by PWD Engineers.

Action required. A budgetary provision for bus shelters and signing is included in the construction cost. A uniform design (main portion-skeleton) for the construction of bus shelters for the KSTP project has been made (**Figure 10.1**). The local bodies can raise funds out of advertisement in a glass lit case as in many western countries. This will not spoil the bus-waiting shed as the advertisement are not pasted but clipped to the baseboard in an illuminated glass case. The entire advertisement is inbuilt fixed in the skeleton design. The design for bus shelters is provided in the DPR (Drawing No. PPT 1D-60-009).

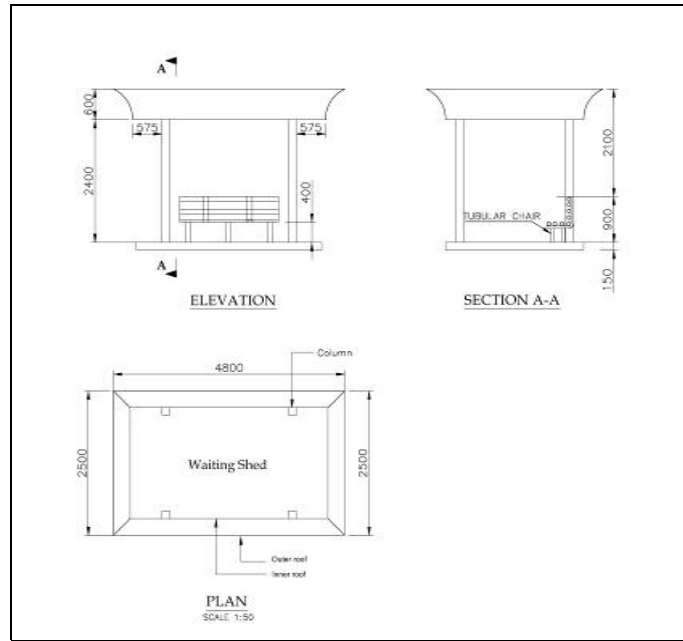


Figure 10.1. Bus Waiting Shed

10.4. PARKING SPACE OR BAYS

10.4.1. AUTO RICKSHAW STAND

In Kerala, it has become an integral part of both rural and urban life. Both the number of auto rickshaws and the commuters are increasing. The latest trend indicates that people from all walks of life are using them for many purposes from simple shopping to travel to hospitals, schools etc even on a monthly contract basis. The nursery school children are regularly being taken and returned to houses on a contract basis. This shows the importance of auto rickshaws in everyday life. Design for autorikshaw parking area is provided in **Figure 10.2**.

Action required. There should be separate designated parking cum passenger picking-up space for auto-rickshaws in urban, semi-urban and village market areas as identified in the detailed inventory of project road is included in environmental data sheet of the Part II EMP report and details presented in **Annexure 3.51**. The project has adequate PWD land for developing in to parking areas. Land of the order of two cents (80 sq.m) minimum will be required for a safe parking area. There should be separate traffic regulations to keep everything in order for auto-rickshaw / operators including photo identity card and identity number.

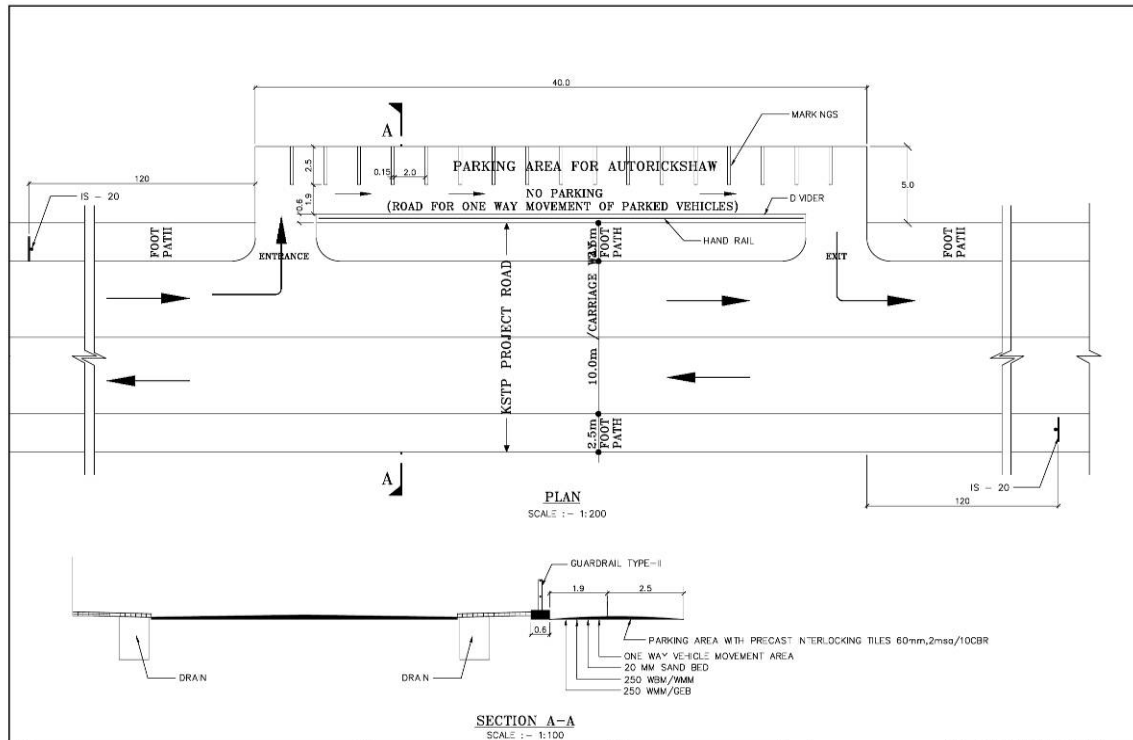


Figure 10.2. Design for Autorikshaw Parking Area

10.4.2. TAXI STAND FOR JEEPS AND CARS

There is sufficient land availability for the construction of various requirements. If the space is not a constraint, the jeep and taxi car parking areas should be constructed separately since the kind of users are different for these two vehicles. Normally, taxi cars carry tourists and official-level travellers whereas the jeeps are serving bulk travellers and mostly non-tourist passengers. The Resettlement Action Plan (RAP) has a provision to buy land for parking areas. The trucks should not be allowed to enter the towns during the peak traffic times. The local Municipal authorities need to provide alternative parking areas for truckers. **Figure 10.3** provides the design for taxi parking. There will be provision for separate parking space for these vehicles. The space required will be of the order of 50 cents (200 sq.m). This space should be secure and away from the existing available corridor. Raised footpaths will be required at these locations. The project will develop many of the existing parking areas especially that of Auto rickshaws.

10.4.3. ENHANCEMENT TO CULTURAL PROPERTIES

In addition to mitigation measures cultural properties located close to the project road will be improved by providing/constructing suitable enhancement measures.

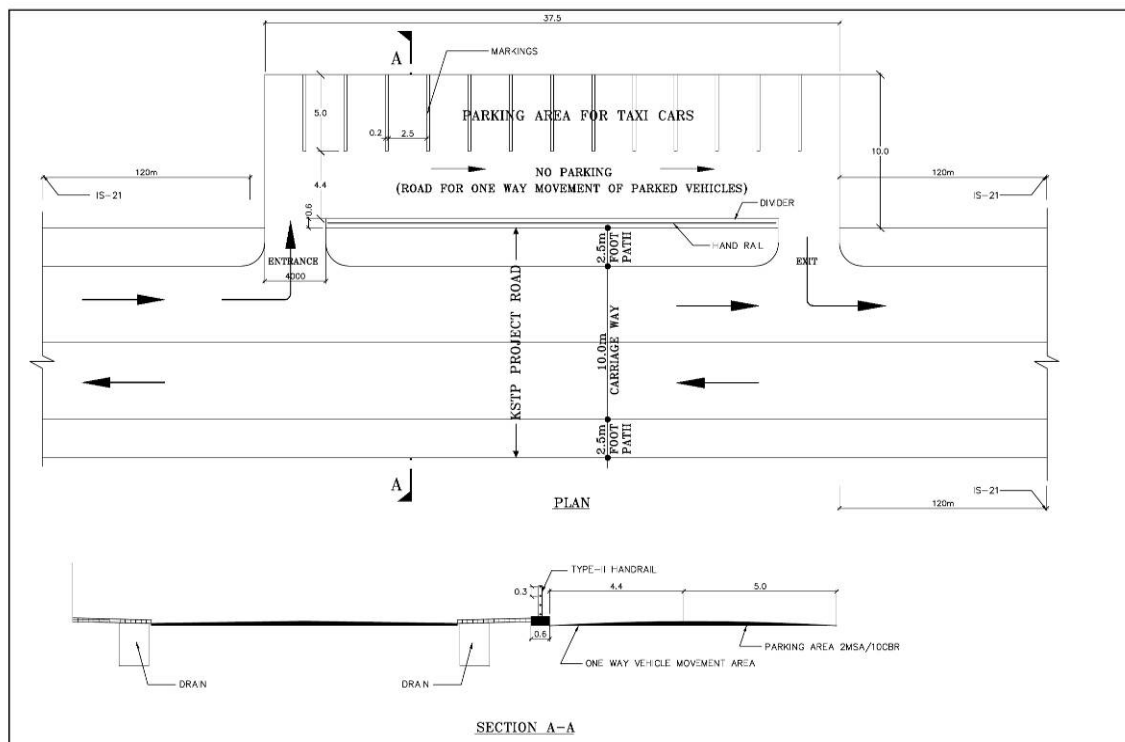


Figure 10.3. Proposed Parking Area Design for Taxi (Car / Jeep)

10.5. TREE PLANTING

10.5.1. ROADSIDE TREE PLANTING

The existing trees along the roadside should not be removed if they are not affecting the road safety of the location. There should not be any new trees planted too close to the roadsides, as it will affect the visibility of the vehicle drivers on the road. In urban and municipal areas the tree planting should be away from the existing available corridor. Detailed guidelines are provided in **Annexure 3.50** -landscaping, tree planting and environmental enhancement plan for kerala state transport project (kerala specific policy for road side tree planting) in EMP.

Action required. The tree planting on the private land outside the ROW should be encouraged by various incentives. This will be the responsibility of local Municipal Authorities and the Forest Department who could possibly make young trees available for specific sites. This could be carried out through an awareness programme involving NGOs. A tree planting strategy has been developed for the Project which is given in **Annexure 3.50** of the EMP.

10.6. TOURISM ENHANCEMENTS

10.6.1. DISPLAY OF TOURIST LEVEL INFORMATION

Kerala is a tourist area (popularly known as ‘Gods own Country’) and many travellers use the Kerala roads and enjoy the scenic beauty. The clear display of the name of tourist locations including name of rivers or back waters and the length and catchment areas would be a very positive step for encouraging tourism with investment from Tourism as well as PWD.

10.6.2. REST AREA

The rest area and oxbow land development proposal which was part of the original proposal as three types has been decided to be taken as a separate project by KSTP and now only type C development is the part of the current project. However, the basic details are given below.

10.6.2.1. TOURIST FACILITIES

Tourism promotion should include the provision of international standard (hygiene) restaurants, shopping centres and rest areas. There should be all weather restaurants with parking and shopping facilities. Kerala traditional art, culture, painting etc could be displayed here with a mini shopping centre.

There can be many arrangements, which shall be made to attract a wide variety of people with economic rates and hygienic conditions. This is considered in the development of rest areas. There are a number of ideal locations for such a venture in project road.

10.6.2.2. REST AREAS

The location for tourist facilities can also be developed for toilet facilities especially for woman tourists and travellers. The availability of such facilities needs no advertisement as it will become popular within a very short period of time. There should be small restaurant and sitting facilities with adequate hygiene and drinking water availability. This can also be attached to the improvement of Puramboke land/oxbow land.

Type A - Oxbow lands which are big enough to build restaurants, comfort stations, parking facilities, lighting and sitting arrangements. The specific nature of this will be decided by KSTP in consultation with other state departments and will be taken up as a separate activity.

Type B - This is more or less similar to Type A, but space availability is comparatively less than Type A.

Type C - At minor realignment locations, where the land to provide parking space for vehicles is scarce, only landscaping is provided to improve the aesthetics of the road and also with environmental considerations. This type of oxbow land is categorised as Type-C and the cost estimated for such type is around Rs. 2,00,000.

Annexures

Annexure 1.1 Roads Undertaken In Kerala State Transport Project - I

Sl. No.	Link No.	Road Name	Length km	Existing Average Carriageway (CW) Width (m)	Proposed CW Width (m) ¹ (Total improvement is up to 15 m)
1	1	Taikkod-Kottarakkara	46.02	7.10	10
2	2	Kottarakkara-Adoor	20.85	6.70	7
3	3	Adoor-Chengannur	23.58	7.10	7
4	6	Muvattupuzha-Angamaly	31.40	7.33	10
5	40	Thrissur-Kuttiapuram	33.08	6.76	10
6	50.1	Palakkad-Shornur	45.30	7.17	7
7	70	Muvattupuzha-Thodupuzha	17.83	5.51	7
8	72	Taikkod-NH47	12.60	4.20	10
9	73	Alappuzha-Changanaserry	24.14	7.00	7
Total			254.80		

¹ Refer proposed total improvement in Chapter 2

Annexure 2.1. Typical Design Cross Sections

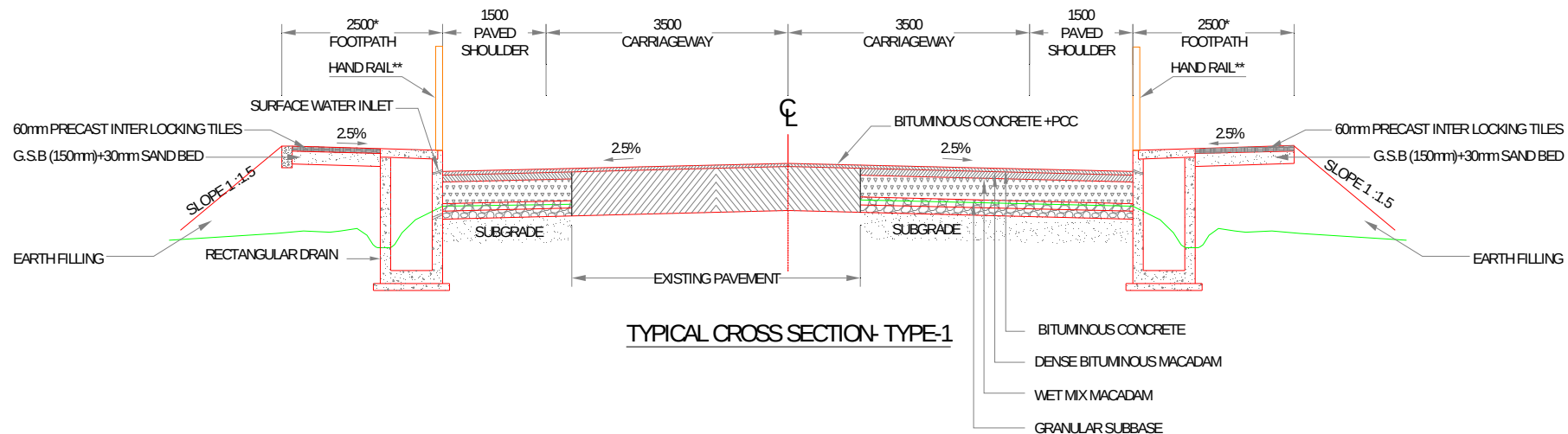


Figure 2.1: TYPICAL CROSS SECTION- TYPE-1



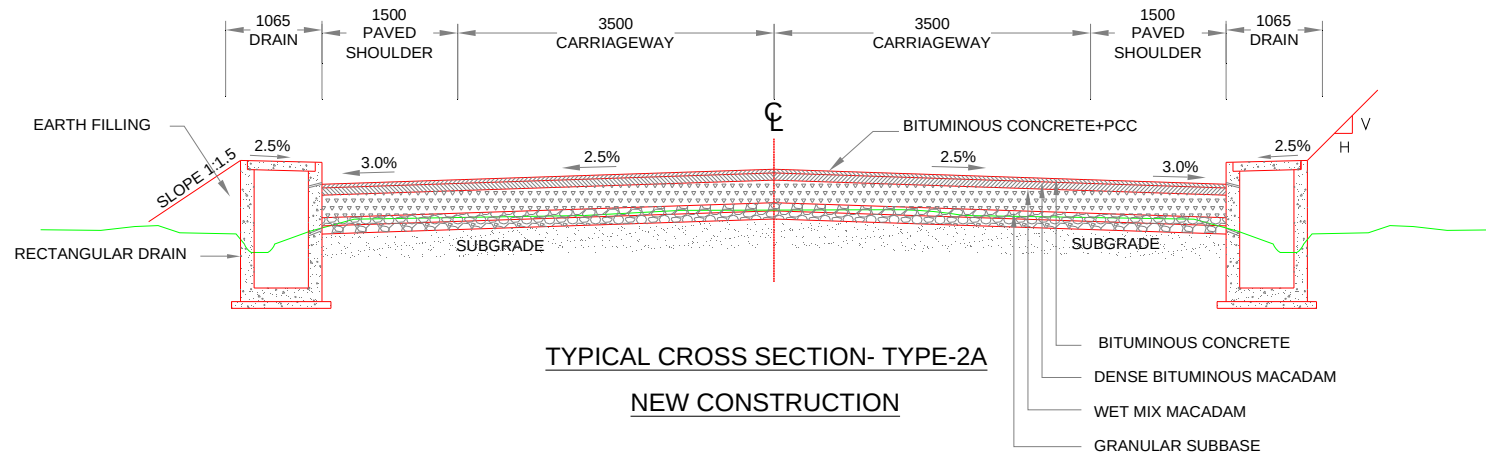


Figure 2.4: TYPICAL CROSS SECTION- TYPE-2A

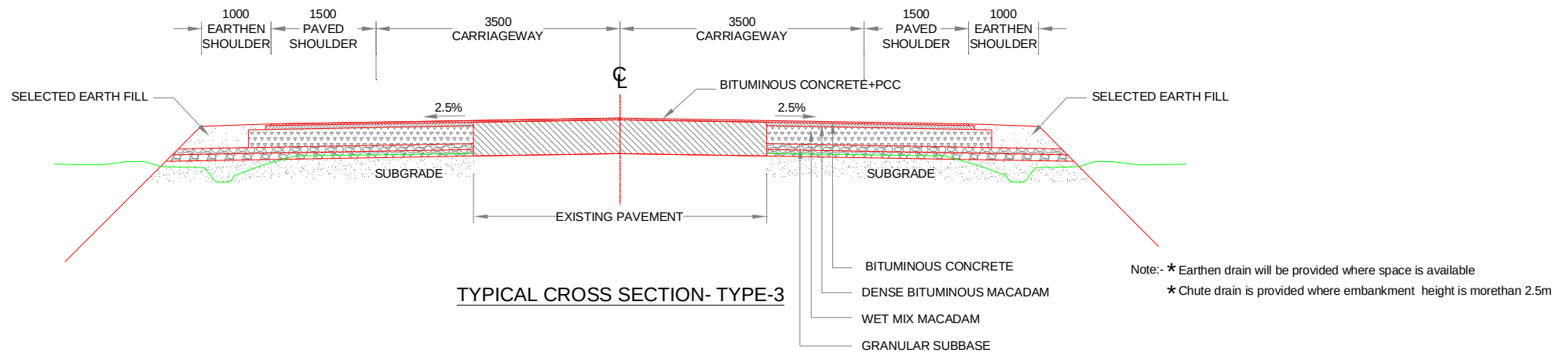


Figure 2.5: TYPICAL CROSS SECTION- TYPE-3

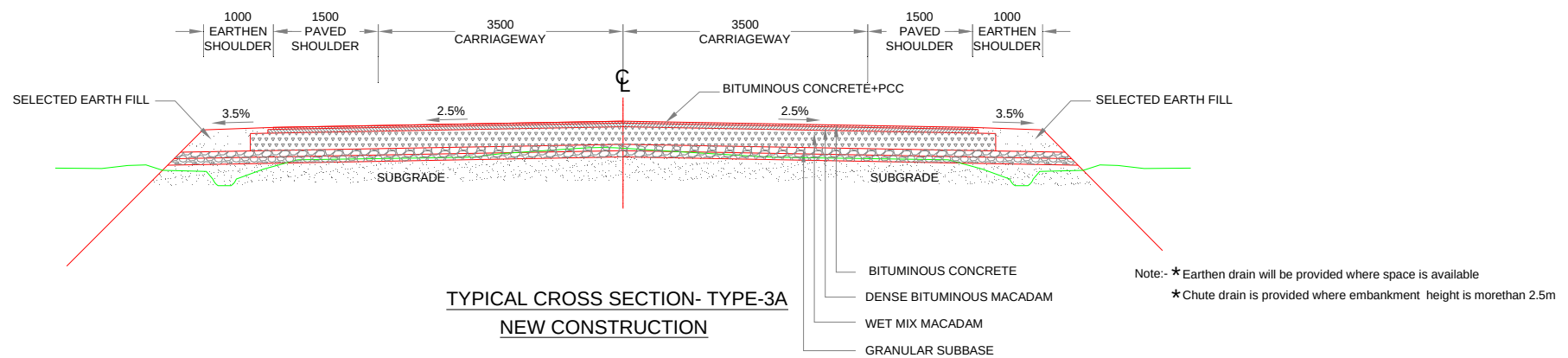


Figure 2.6: TYPICAL CROSS SECTION- TYPE-3A

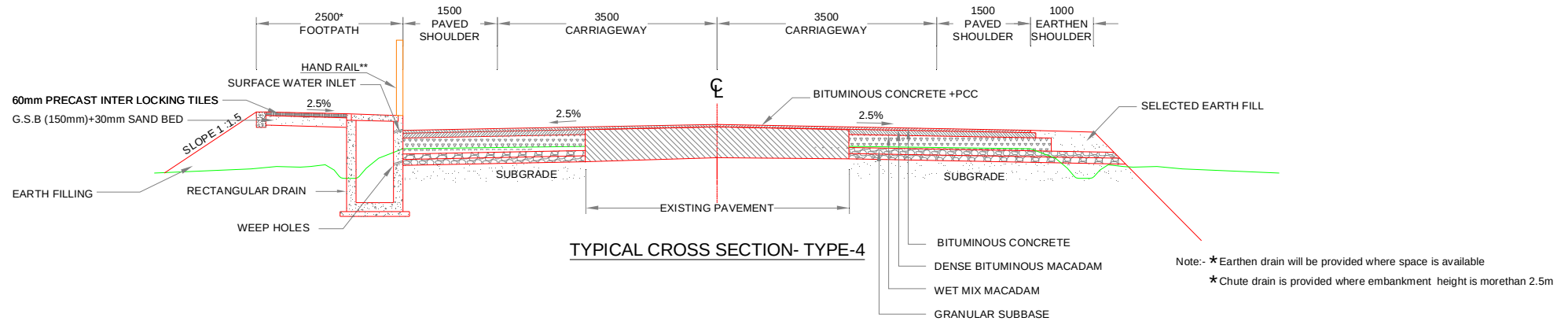


Figure 2.7: TYPICAL CROSS SECTION- TYPE-4

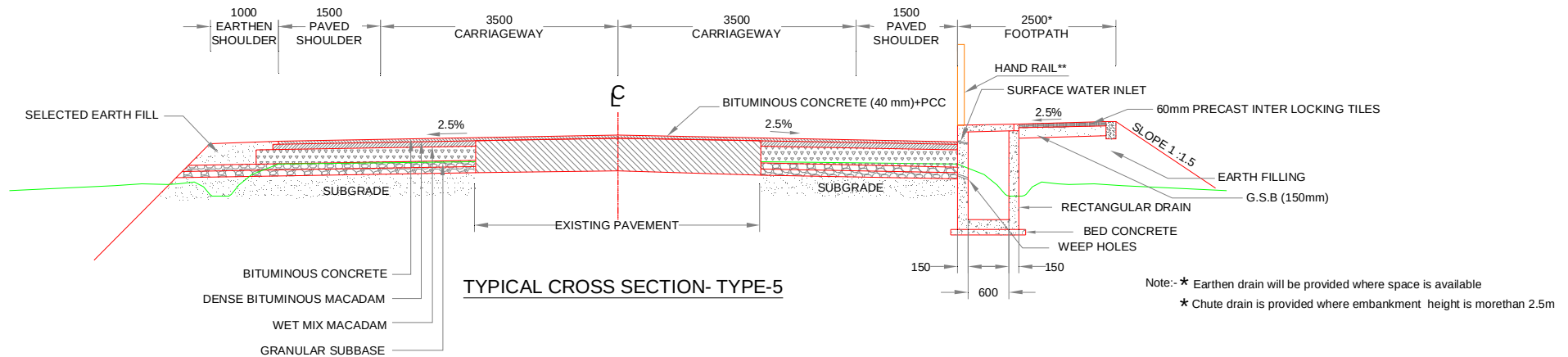


Figure 2.8: TYPICAL CROSS SECTION- TYPE-5

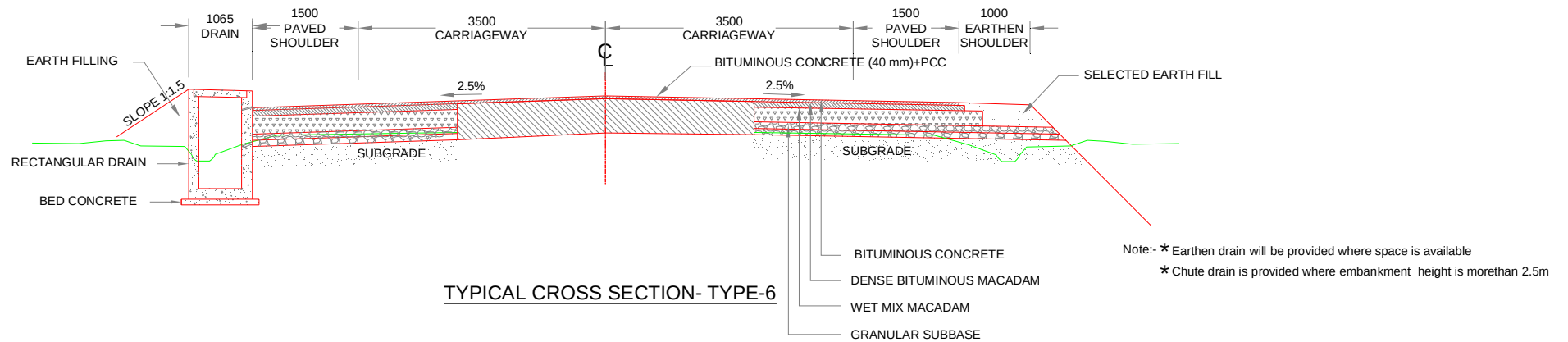


Figure 2.9: TYPICAL CROSS SECTION- TYPE-6

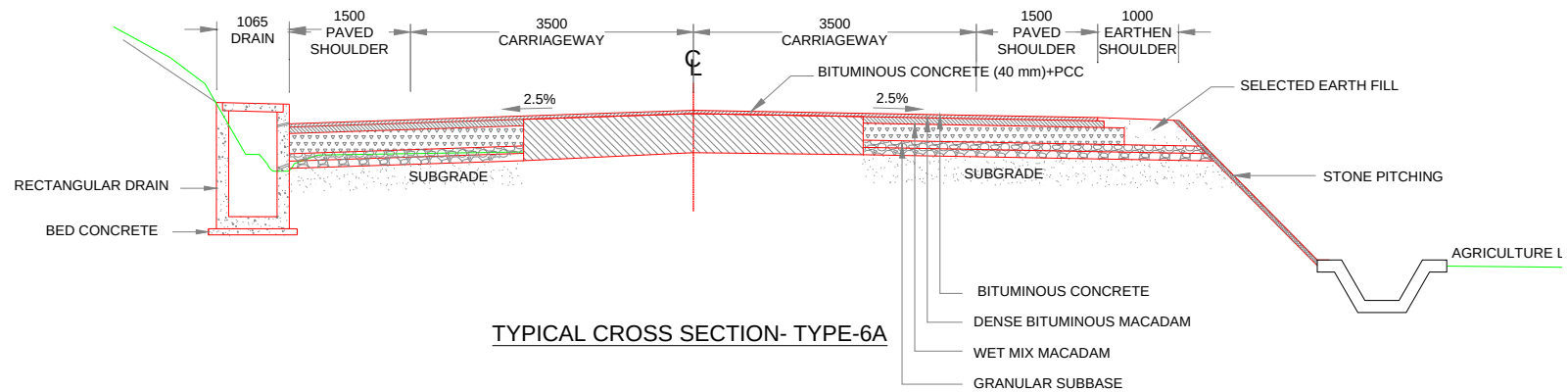


Figure 2.10: TYPICAL CROSS SECTION- TYPE-6A

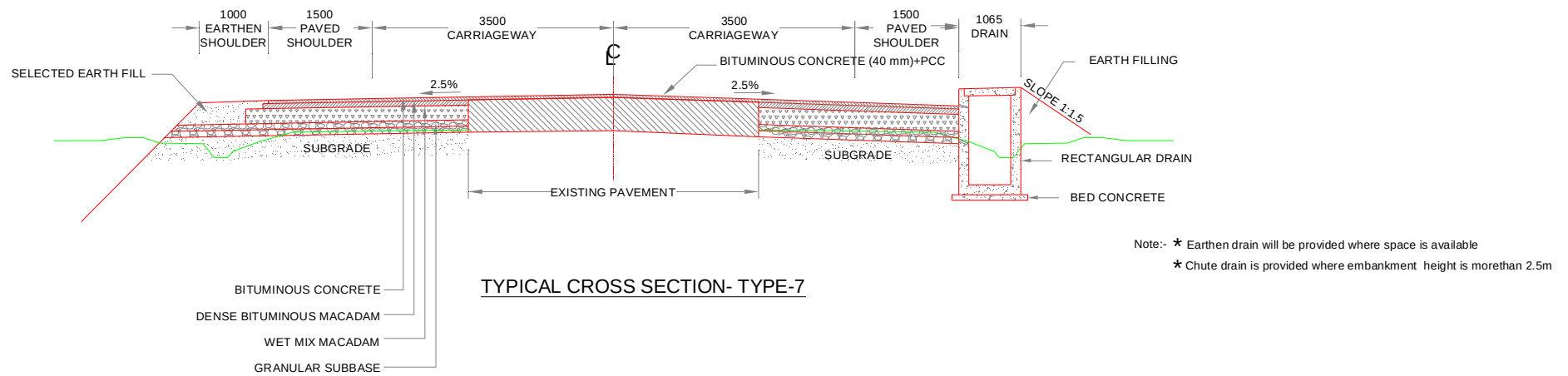


Figure 2.11: TYPICAL CROSS SECTION- TYPE-7

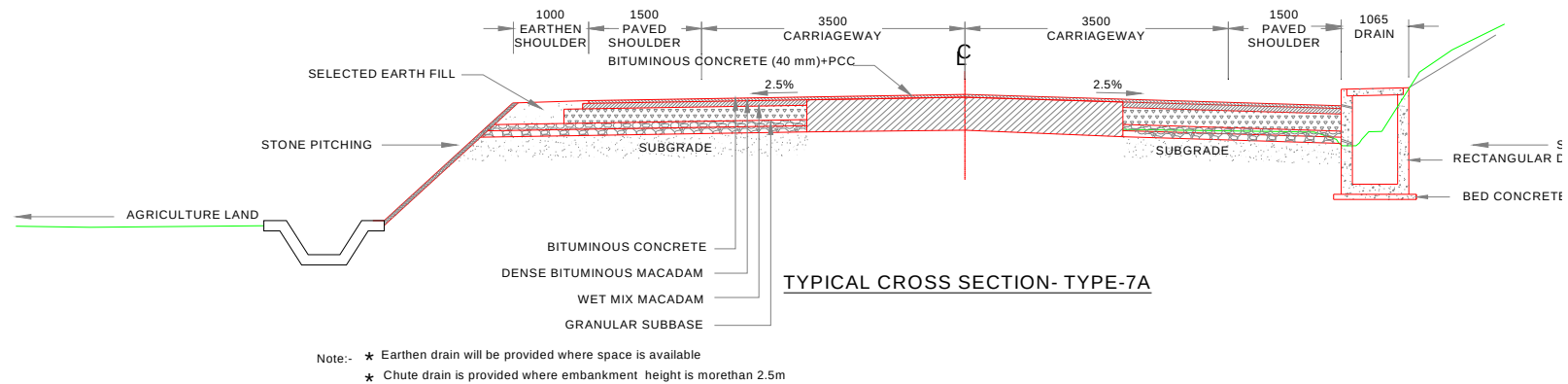


Figure 2.12: TYPICAL CROSS SECTION- TYPE-7

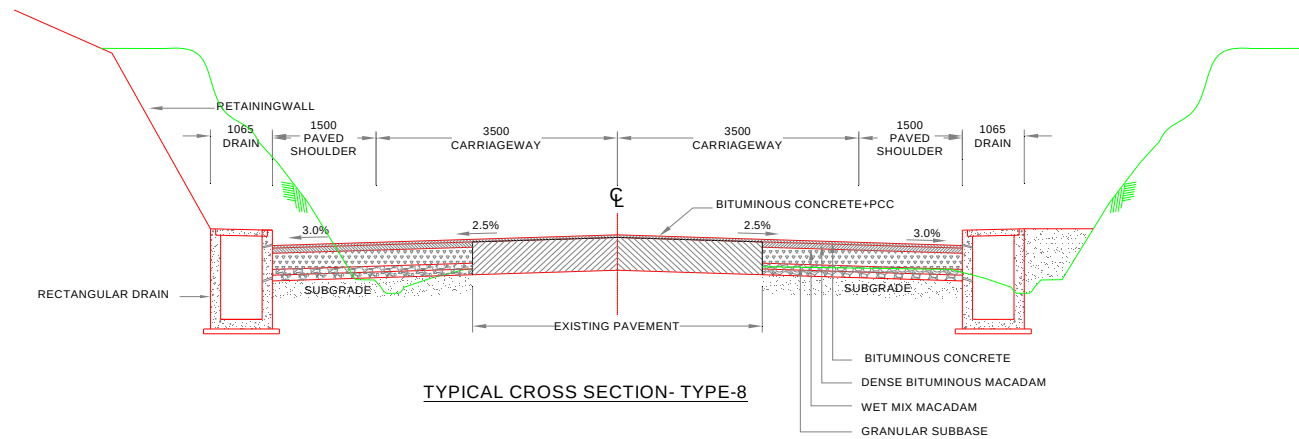


Figure 2.13: TYPICAL CROSS SECTION- TYPE-8

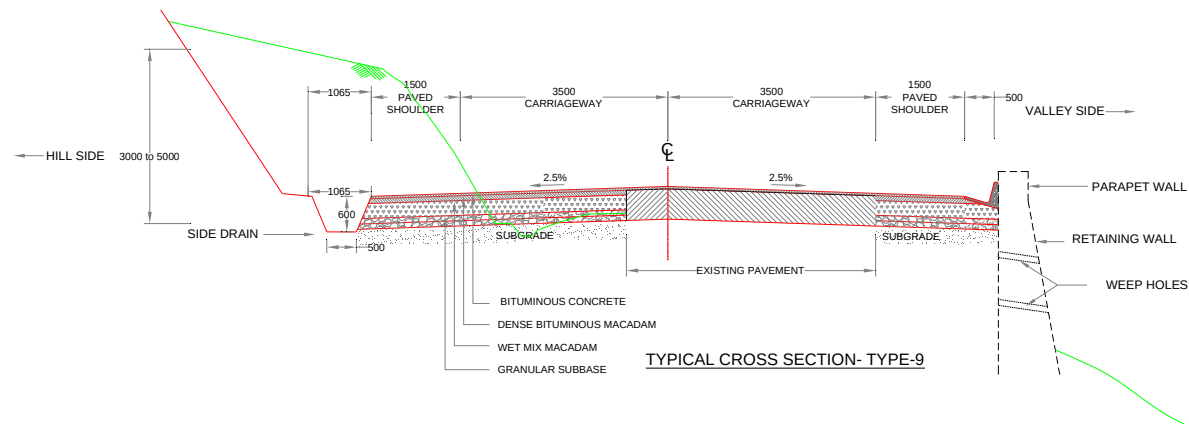


Figure 2.14: TYPICAL CROSS SECTION- TYPE-9

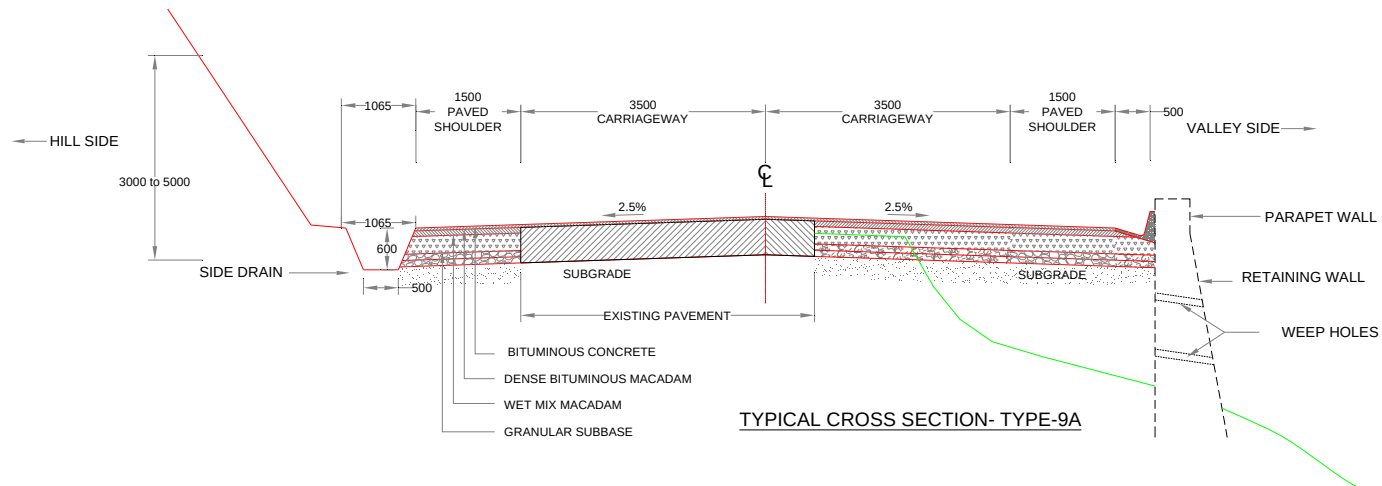


Figure 2.15: TYPICAL CROSS SECTION- TYPE-9A

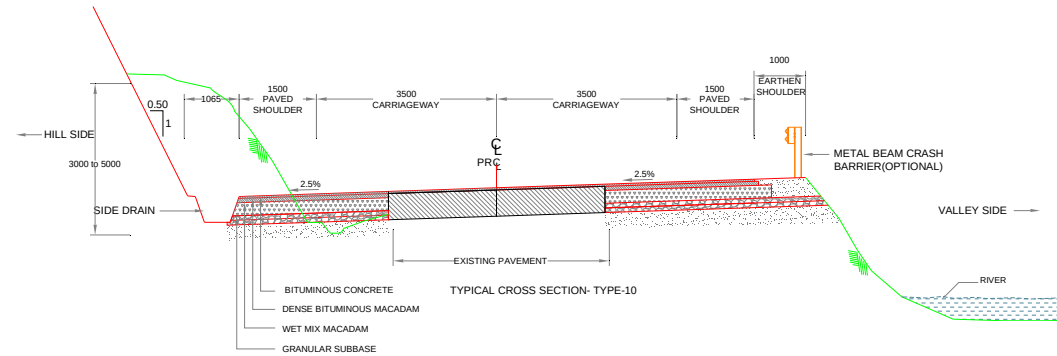


Figure 2.16: TYPICAL CROSS SECTION- TYPE-10

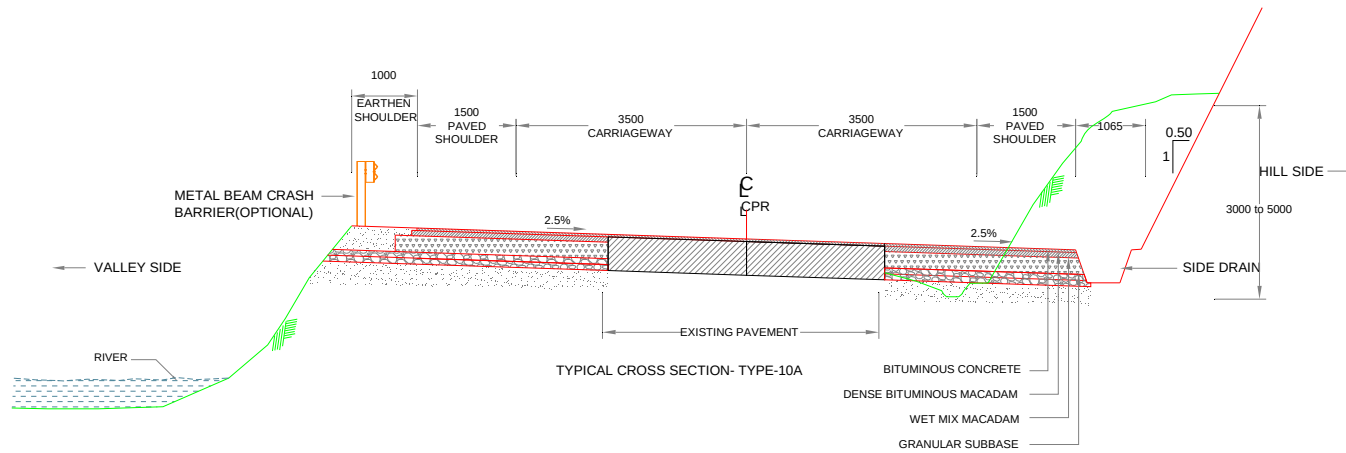


Figure 2.17: TYPICAL CROSS SECTION- TYPE-10A

Annexure 2.2. Design Cross Sections Applied Along The Corridor 84

Sl No	Chainage (km)		TCS type
	From	To	
1	0+000	0+400	Type 1
2	0+400	0+850	Type 9A
3	0+850	1+150	Type 1
4	1+150	1+800	Type 2
5	1+800	2+000	Type 3
6	2+000	2+280	Type 9A
7	2+280	2+380	Type 8
8	2+380	2+550	Type 10
9	2+550	2+980	Type 10A
10	2+980	3+150	Type 2A
11	3+150	3+700	Type 9A
12	3+700	3+800	Type 2
13	3+800	4+600	Type 7
14	4+600	4+800	Type 2
15	4+800	5+200	Type 1
16	5+200	5+500	Type 2
17	5+500	6+200	Type 7
18	6+200	7+900	Type 2
19	7+900	9+300	Type 7A
20	9+300	9+700	Type 2
21	9+700	10+100	Type 6
22	10+100	10+450	Type 7
23	10+450	10+600	Type 9A
24	10+600	11+100	Type 6
25	11+100	12+000	Type 2
26	12+000	13+600	Type 1
27	13+600	14+200	Type 2
28	14+200	14+900	Type 7
29	14+900	15+100	Type 2A
30	15+100	15+550	Type 2
31	15+550	16+300	Type 1
32	16+300	17+100	Type 2
33	17+100	18+200	Type 6
34	18+200	19+900	Type 2
35	19+900	21+100	Type 7
36	21+100	21+400	Type 2
37	21+400	22+000	Type 7
38	22+000	22+300	Type 2
39	22+300	23+300	Type 6A
40	23+300	23+900	Type 6
41	23+900	24+400	Type 2
42	24+400	24+950	Type 6
43	24+950	25+650	Type 2

Sl No	Chainage (km)		TCS type
	From	To	
117	68+050	69+000	Type 10
118	69+000	69+400	Type 9
119	69+400	69+500	Type 10
120	69+500	70+350	Type 6
121	70+350	70+700	Type 10
122	70+700	71+100	Type 6
123	71+100	71+850	Type 10
124	71+850	72+750	Type 6
125	72+750	72+940	Type 2
126	72+940	73+200	Type 2A
127	73+200	73+300	Type 6
128	73+300	74+900	Type 9
129	74+900	75+200	Type 6
130	75+200	75+500	Type 2
131	75+500	75+700	Type 6
132	75+700	76+000	Type 7
133	76+000	76+250	Type 6
134	76+250	77+000	Type 7
135	77+000	77+400	Type 6
136	77+400	77+900	Type 9
137	77+900	78+300	Type 7
138	78+300	78+400	Type 2A
139	78+400	78+600	Type 2
140	78+600	79+100	Type 7
141	79+100	80+000	Type 2
142	80+000	80+700	Type 7
143	80+700	82+000	Type 9A
144	82+000	82+100	Type 1
145	84+000	84+400	Type 1
146	84+400	84+650	Type 2
147	84+650	85+100	Type 1
148	85+100	85+600	Type 2
149	85+600	85+900	Type 6
150	85+900	86+200	Type 7
151	86+200	86+900	Type 2
152	86+900	87+500	Type 2
153	87+500	88+150	Type 7
154	88+150	88+800	Type 2
155	88+800	89+300	Type 7
156	89+300	89+990	Type 2
157	89+990	90+170	Type 2A
158	90+170	90+300	Type 9
159	90+300	90+470	Type 2A

Sl No	Chaianage (km)		TCS type
	From	To	
44	25+650	25+900	Type 6A
45	25+900	27+800	Type 2
46	27+800	28+150	Type 1
47	28+150	28+700	Type 2
48	28+700	29+900	Type 1
49	29+900	31+300	Type 2
50	31+300	31+600	Type 6
51	31+600	31+800	Type 2
52	31+800	32+400	Type 6
53	32+400	32+700	Type 7
54	32+700	33+500	Type 6
55	33+500	33+700	Type 7
56	33+700	33+900	Type 3
57	33+900	34+200	Type 2
58	34+200	34+700	Type 6
59	34+700	34+950	Type 2A
60	34+950	35+200	Type 2
61	35+200	35+700	Type 6
62	35+700	35+920	Type 3
63	35+920	36+300	Type 2
64	36+300	36+500	Type 1
65	36+500	36+800	Type 2
66	36+800	37+500	Type 6
67	37+500	40+530	Type 2
68	40+530	40+600	Type 2A
69	40+600	41+140	Type 9A
70	41+140	41+200	Type 2A
71	41+200	41+400	Type 9A
72	41+400	41+480	Type 2A
73	41+480	41+800	Type 2
74	41+800	43+100	Type 9
75	43+100	44+500	Type 9A
76	44+500	45+100	Type 6
77	45+100	45+400	Type 2
78	45+400	46+640	Type 7
79	46+640	46+900	Type 3A
80	46+900	47+720	Type 9
81	47+720	47+820	Type 3A
82	47+820	48+740	Type 7
83	48+740	48+880	Type 3A
84	48+880	48+950	Type 3
85	48+950	49+420	Type 2A
86	49+420	50+700	Type 2
87	50+700	51+400	Type 1
88	51+400	51+480	Type 0

Sl No	Chaianage (km)		TCS type
	From	To	
160	90+470	91+430	Type 9
161	91+430	91+610	Type 2A
162	91+610	91+760	Type 6
163	91+760	91+900	Type 2A
164	91+900	92+080	Type 6
165	92+080	92+220	Type 2A
166	92+220	93+400	Type 6
167	93+400	93+600	Type 2
168	93+600	94+000	Type 6
169	94+000	94+300	Type 2
170	94+300	94+530	Type 6
171	94+530	94+680	Type 2A
172	94+680	95+500	Type 6
173	95+500	96+000	Type 2
174	96+000	97+000	Type 1
175	97+000	97+600	Type 6
176	97+600	98+000	Type 2
177	98+000	98+500	Type 6
178	98+500	99+500	Type 2
179	99+500	100+300	Type 7
180	100+300	100+500	Type 2
181	100+500	100+900	Type 7
182	100+900	101+000	Type 9
183	101+000	101+500	Type 2
184	101+500	101+900	Type 10A
185	101+900	102+100	Type 2
186	102+100	103+700	Type 7
187	103+700	104+300	Type 2
188	104+300	104+700	Type 1
189	104+700	104+850	Type 0
190	104+850	106+200	Type 1
191	106+200	106+900	Type 2
192	106+900	107+200	Type 9
193	107+200	107+500	Type 2
194	107+500	107+800	Type 6
195	107+800	108+050	Type 9
196	108+050	108+380	Type 2A
197	108+380	109+100	Type 2
198	109+100	109+200	Type 2A
199	109+200	109+620	Type 7
200	109+620	109+770	Type 2A
201	109+770	110+000	Type 6
202	110+000	110+900	Type 2
203	110+900	112+800	Type 2
204	112+800	113+200	Type 1

Sl No	Chaiange (km)		TCS type
	From	To	
89	51+480	53+300	Type 1
90	53+300	53+900	Type 2
91	53+900	54+600	Type 10
92	54+600	56+080	Type 6
93	56+080	56+250	Type 2A
94	56+250	56+900	Type 9
95	56+900	57+400	Type 2
96	57+400	58+800	Type 7
97	58+800	59+200	Type 2
98	59+200	59+500	Type 7
99	59+500	59+700	Type 6
100	59+700	60+300	Type 9
101	60+300	60+700	Type 3A
102	60+700	62+400	Type 3
103	62+400	62+600	Type 3A
104	62+600	62+900	Type 2
105	62+900	63+300	Type 9
106	63+300	63+800	Type 2
107	63+800	64+570	Type 7
108	64+570	64+700	Type 2A
109	64+700	65+600	Type 9
110	65+600	66+000	Type 2
111	66+000	66+300	Type 6
112	66+300	66+950	Type 7
113	66+950	67+030	Type 2A
114	67+030	67+820	Type 2
115	67+820	67+900	Type 0
116	67+900	68+050	Type 2

Sl No	Chaiange (km)		TCS type
	From	To	
205	113+200	113+500	Type 2
206	113+500	116+500	Type 7
207	116+500	116+600	Type 2A
208	116+600	116+800	Type 2
209	116+800	117+000	Type 2A
210	117+000	117+300	Type 6
211	117+300	117+500	Type 7
212	117+500	117+900	Type 2
213	117+900	120+300	Type 6
214	120+300	120+430	Type 2A
215	120+430	122+550	Type 9A
216	122+550	123+400	Type 9
217	123+400	124+500	Type 2A
218	124+500	125+000	Type 2
219	125+000	125+450	Type 1
220	125+450	126+000	Type 6
221	126+000	126+450	Type 2
222	126+450	126+520	Type 2A
223	126+520	128+300	Type 6
224	128+300	128+600	Type 10
225	128+600	129+000	Type 9
226	129+000	129+600	Type 2
227	129+600	130+250	Type 9A
228	130+250	130+400	Type 1
229	130+400	130+850	Type 2
230	130+850	131+000	Type 2A
231	131+000	132+950	Type 2
Total Length			131.050 km

Annexure 2.3. Codes of Practice of Indian Road Congress (IRC) in terms of Environment

Sl. No.	IRC Code	Description
1	IRC:34-2011	Recommendations for Road Construction in Areas Affected by Water Logging, Flooding and/or Salts Infestation (First Revision)
2	IRC:56-2011	Recommended Practices for Treatment of Embankment and Roadside Slopes for Erosion Control (First Revision)
3	IRC:90-2010	Guidelines of Selection, Operation and Maintenance of Bituminous Hot Mix Plant (First Revision)
4	IRC:103-1988	Guidelines for Pedestrian Facilities
5	IRC:104-1988	Guidelines for Environmental Impact Assessment of Highway Projects
6	IRC:SP:21-2009	Guidelines on Landscaping and Tree Plantation
7	IRC: SP: 42 – 1994	Guidelines on Road Drainage
8	IRC: SP: 44 – 1996	Highway Safety Code
9	IRC: SP: 48 – 1998	Hill Road Manual
10	IRC: SP: 88 - 2010	Road Safety Audit Manual

Annexure 3.1. Institutional Aspects of Environmental Management

1. GOI -INSTITUTIONAL SETTING FOR ENVIRONMENTAL ANALYSIS

1.1.1 MINISTRY OF ENVIRONMENT AND FOREST (MOEF)

The Ministry of Environment and Forests (MOEF) is the organisation responsible for environmental matters in India. exhibit 3.1 indicates the organisational structure of India's Environmental Management System. The current framework has evolved largely since the creation of the MOEF in 1985. Many States already had State Pollution Control Boards (SPCBs) located in the Departments of Public Health to perform functions as outlined in India's Water and Air Acts.

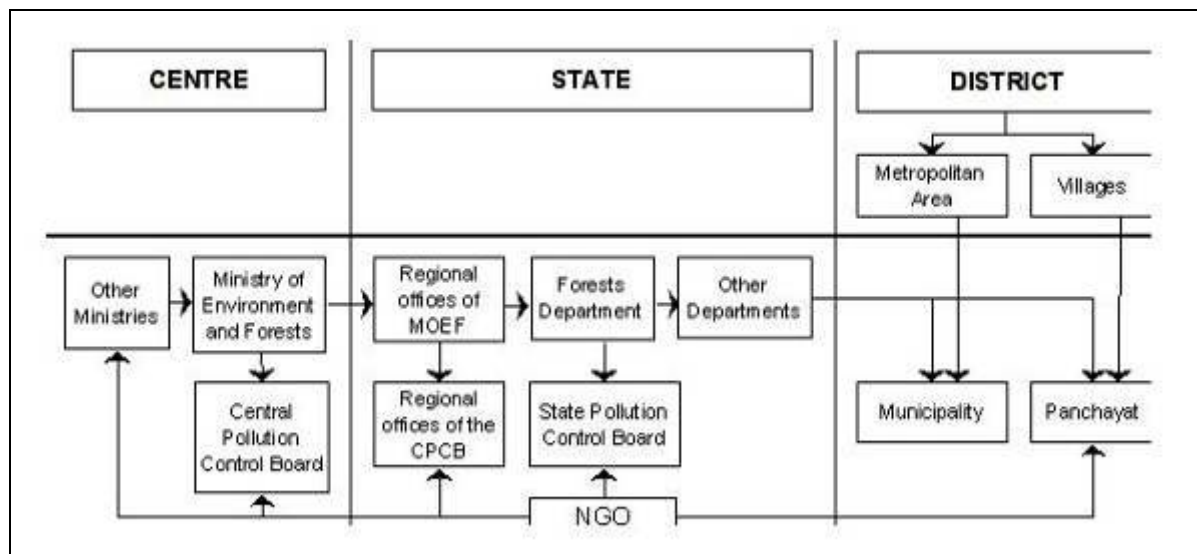


FIGURE 1 : GOI ENVIRONMENTAL MANAGEMENT ORGANISATION

Source: Adapted from World Bank Report T-6910-IN, December 3, 1996

The MOEF is the agency primarily responsible for the review and approval of EIAs pursuant to GOI legislation. As a part of its EIA review procedures, MOEF requires the submission of an application, the EIA and accompanying Resettlement Action Plan (RAP) for review by an Environmental Appraisal Committee. Before approval can be granted, a No Objection Certificate (NOC) from the State Pollution Control Board (PCB) and State Forest Department (both discussed below) must also be obtained. A summary of applicable GOI policies and regulations are provided in chapter 3.

1.1.2 CENTRAL POLLUTION CONTROL BOARD (CPCB)

The CPCB is a statutory authority attached to the MOEF and located in New Delhi. It was constituted in 1974 (and thus predates MOEF). Its major functions are to:

- Advise the Central Government with regard to water and air pollution matters;
- Plan and implement water and air pollution programmes;
- Co-ordinate activities of the State Pollution Control Boards;
- Organise popular air and water campaigns;
- Increase Public awareness;
- Compile air and water data and provide guidelines;
- Set air and water standards.

1.1.3 MOEF REGIONAL OFFICE

Kerala is located in the Southern Region (Bangalore MOEF office), which includes Kerala, Tamil Nadir and Karnataka. The Southern Region office is responsible for:

- Evaluation of proposals for diversion of forestlands;
- Assist in the preparation of the National Forestry Action Plan (NFAP);
- Assist Paryavaran Vahinis²;
- Provide technical and scientific consultations on biological diversity;
- Monitoring of conditions following environmental clearance;
- Pursuing pollution control measures by industries and local bodies;
- Collecting and furnishing information in relation to Environmental Impact Assessment of projects, pollution control measures, methodology and status, legal and enforcement measures, environmental protection in special conservation areas such as wetlands, mangroves and biological reserves; and
- Co-ordination functions.

1.1.4 MUNICIPALITIES AND PANCHAYATH

Municipalities and panchayats are expected to play an increasing role in Environmental Management at the District level and States may delegate functions. Under certain amendments municipalities may be involved in:

- Urban and town planning;
- Water supplies;
- Solid waste management and sanitation;
- Urban forestry;
- Protection of the environment; and
- Promotion of the ecological aspects of urban development.

1.1.5 OTHER ENTITIES WITH ENVIRONMENTAL RESPONSIBILITIES

Other entities and their environmental tasks include the following.

Ministry of Agriculture

- Prevention and control of desertification
- Conservation and regeneration of watersheds
- Protection of irrigation command areas
- Conservation and regeneration of forest
- Prevention and control of pollution
- Ministry of Water Resources – Prevention and control of floods
- Conservation and regeneration of wetlands
- Conservation and regeneration of coral reefs
- Protection of irrigation command areas

- Monitoring water quality

Ministry of Rural Development

- Conservation and management of land and soil
- Prevention and control of drought
- Conservation and regeneration of forest
- Prevention and control of pollution

Ministry of Power

- Prevention and control of pollution
- Recycling of resources
- Conservation and management of energy

Ministry of Petroleum

- Protection of mining and oil extraction areas
- Recycling of resources
- Prevention and control of pollution
- Conservation and management of energy

Department of Ocean development

- Conservation of coral reefs and coastal regions
- Conservation and relegation of island resources
- Prevention and control of pollution

2. WORLD BANK PROCEDURAL AND REGULATORY REQUIREMENTS.**2.1.1 ENVIRONMENTAL IMPACTS-REQUIREMENTS**

Environmental requirements of the World Bank are specified in detail in its Operational Policy (OP) 4.01 and other related OPs. In instances in which the procedural and regulatory requirements differ, the more stringent applies. The procedural and regulatory aspects of those requirements and those of the Ministry of Environment and Forests (MOEF), Ministry of Surface Transport (MOST) and the State Public Works Department (PWD) can be summarized as follows: The World Bank environmental requirements are based on a three-part classification system

Category A - requires a full Environmental Assessment (EA)

Category B - projects require a lesser level of environmental investigation.

Category C - projects require no environmental analysis

The Bank classifies the KSTP as Category A, largely it is understood, based on the large number of project-affected people and the biodiversity of Kerala. In other words, the Bank classification is based on the anticipated cumulative social and environmental impacts due to the construction and operation of the Project.

Further if sensitive areas are within the potentially affected environment of a project or sub-project (as in the case of Punalur – Ponkunnam - Thodupuzha project road under discussion), if significant socio-economic impacts are anticipated or if otherwise warranted, Category A environmental documentation is required at the project-level. Clearance for the overall Programme is obtained, provided that:

- The SEA is found to conform to the cited guidelines. (Box 3.1)
- The SEA is accompanied or followed by detailed design and project-level environmental documentation when necessary and provides assurance that the environmental issues

will be properly addressed in the subsequent phases of the Programme. And

- All other feasibility, design, mitigation plans and financial responsibility requirements are acceptable.

The World Bank determined that the KSTP required an SEA to “develop simple, standard and practical recommendations to be included in the design and construction of the project” including:

- Proper use of existing borrow areas and quarries;
- Landscaping of borrow areas and spoil tips;
- Development of proper storage areas specifically for diesel fuel and bitumen;
- Rehabilitation of the ROWs through replanting;
- Minimizing soil erosion;
- Protection, enhancement and proper management of sensitive habitats;
- Establishment of an Environmental Management Unit within the PWD.

BOX 3.1 Importance of Sectoral approach

In recognition of the needs of large, multi-year lending programmes likely to involve a number of projects or sub-projects such as the KSTP, the Bank’s procedures also provide for the preparation of a Sectoral Environmental Assessment (SEA) as that term is defined by its OP 4.01- 07 dated October 1991. A SEA is designed to accommodate a number of circumstances, particularly *“the Bank’s increasing use of programmatic, sector-oriented and time-slice investment programs (which) have served to build up a demand for a Sectoral EA approach”*.³

Within this approach, the sections of road upgrading projects not involving significant additional ROW acquisition or affecting sensitive areas or large numbers of PAPs are generally considered Category B projects, provided that the potential environmental concerns are addressed within the SEA and that the mitigation actions incorporated in the SEA (if applicable) are implemented. The SEA can hasten environmental clearance of projects or sub-projects in that, they do not warrant such intensive investigation. It can therefore simplify and expedite the implementation process and reduce potential risks and uncertainties.

The required SEA for the Project has been formally submitted to the PIU together with all other Project documents. In addition to the documentation and commitments in the SEA, World Bank approval is also contingent upon the completion of detailed designs for 25 percent of the total Project, the securing of all necessary environmental approvals for these actions from MOEF and other GOI agencies and the completion of project-level EAs where warranted. There are six road links in the Phase II construction activities.

2.1.2 SOCIAL IMPACTS-REQUIREMENTS

The World Bank has set out certain mandatory social impact mitigation requirements for loan projects. The Operational Policy 4.30⁴ describes the Bank’s policy and procedures for projects that involve involuntary resettlement. *This policy aims to improve, or at a minimum, sustain the same standard of living of the people who will be displaced because of a development project.* The policy also requires that projects minimize the need for involuntary resettlement. Where displacement is unavoidable, resettlement plans should pay particular attention to the vulnerable groups. In addition, the World Bank has special guidelines for addressing impacts upon the indigenous communities due to

³ The World Bank Environmental Assessment Source book

⁴ Involuntary Resettlement, The World Bank Operational Policy 4.30, June 1990

infrastructure projects. This document specifically requires the project authorities to include consultation with and informed participation of the tribal population. However, the reconnaissance survey has indicated that there are no tribal habitations along the corridor.

3. GOI AND GOK POLICIES, LEGAL AND ADMINISTRATIVE FRAME WORK

3.1.1 ENVIRONMENTAL REGULATIONS

Indian National Framework: The major elements of the Indian legal framework for environmental management are:

The Constitution - provides for the protection and improvement of the environment and states that it shall be the duty of every citizen of India to protect and improve the national environment, including forest, lakes, rivers, and wildlife and to have compassion for living creatures. Primary responsibility for administration and implementation of the GOI policy with respect to conservation, ecologically sustainable development and pollution control rests with the MOEF and the regulations established pursuant to the National Conservation Strategy, National Forest Policy, the Policy for Abatement of Pollution (1992), and the Indian Environmental Protection Act 1986 (29 of 1986) revised in 1997.

The following key legislations pertain: -

Water (Prevention and Control of Pollution) Act of 1974 and Cess Act of 1977. This act has resulted in the establishment of the central and State level pollution control boards whose responsibilities include managing water quality and effluent standards as well as monitoring water quality, prosecuting offenders and issuing licences for construction and operation of certain facilities in the industrial sector.

Air (Prevention and Control of Pollution) Act of 1981. The SPCB is empowered to set air quality standards and monitor and prosecute offenders under this act.

Environment (Protection) Act of 1986 - enacted in the wake of the Bhopal gas tragedy, the Act is an umbrella legislation that provides a framework for Central and State Authorities established under previous laws. It provides a single focus for the protection of the environment and sought to “plug” several loopholes.

Forest (Conservation) Act 1980 as amended. Under this law the PWD must obtain administrative approval from the Forest Department to clear over 20 hectares of designated forestland and in 1986 when the MOEF enacted the Environmental Protection Act, the entire linear stretches of road side plantations along the State highways were declared as protected forests (refer Box 3.2 for more details). According to this although the land is under the control of State Government, due to its protected Status, approval of Central, Regional or State Government for using the land for widening and rehabilitation must be granted.

At the State level, Government was empowered to declare reserves and protected forest and was also given the authority to acquire land for extension and preservation of forests. In December 1996, a Supreme Court judgement further defined the types of forests to be protected. Depending on the size of the tract to be cleared, clearances are required from the following levels of Government.

- If the forest exceeds 20 hectares then prior permission of Central Government is required.
- If the forest is between 5 to 20 hectares the regional Office of Chief conservator is empowered;

- If the forest is below or equal to five hectares the State Government may give permission; and,
- If the construction area is more than 40 % forest, permission to undertake any work is required from the Central Government, irrespective of the size of the area.

Box 3.2 Applicability of Forest conservation act to Roadside strip Plantations

The 18 February 1998 MOEF circular on linear plantations on roadsides, Canal and railway lines modified the applicability of provisions of Forest (Conservation) Act, 1980 to linear plantations. The new modification recognises that the spirit behind the Forest (Conservation) Act was conservation of natural forests and not strip plantations. In the case of the “notified to be protected” roadside plantations, the clearance may be given by the concerned regional office of the MOEF, irrespective of the area of plantation lost. While issuing the approval, in place of normal provisions for compensatory afforestation, the regional offices will stipulate a condition that for every tree removed at least two trees should be planted. If the concerned Regional office does not issue the decision within thirty days of the receipt of fully completed application, the project proponent may proceed with widening/expansion under intimation to the State Forest Department, and the MOEF.

In the case of Kerala, the entire State cover green vegetation and this makes the strip and linear plantations less significant for a development project like the KSTP.

Wildlife (Protection) Act of 1972. This Act has allowed the Government to establish a number of National Parks and Sanctuaries over the past 25 years. This Act prohibits an activity within National Park and Sanctuary areas.

The EA identifies National Park and Sanctuary areas within the project study area. The EA confirms that permission from the Chief Wildlife Warden will be sought for:

Undertaking activity in a National Park or Sanctuary area.; and labourers and contractors entering a National Park or Sanctuary area. Document identifies the extent of habitat destruction, including number of trees removed. The EA document describes mitigation measures to minimise habitat destruction.

Policy Statement on Abatement of Pollution of 1992. Affirmed the Government's intention to integrate environmental and economic aspects in development planning with an emphasis on the preventive aspects of pollution and the "polluter pays" principle.

The Public Liability Insurance Act of 1991. Under the heading of land use, the following are also noted to be of potential relevance to the Project:

- The Urban Land (Ceiling and Regulation) Act of 1976.
- The Model Regional and Town Planning and Development Law of 1985.
- Provisions in State Acts on Town and Country Planning.
- The Industries (Development and Regulation) Act and Amendment of 1951 and 1987.
- The Mines & Minerals (Regulation & Development) Act and Amendments of 1957 and 1984.
- The Coal Mines (Conservation and Development) Amendment Act of 1985

4. ROAD DEVELOPMENT POLICY

The draft Road Development Policy for Kerala (1999) prepared by the Government of Kerala, (GoK) underlines capacity expansion of its primary road network as the key priority and an integral element of the State's economic development strategy. The policy's overall objective is to

promote *"a sustainable road network providing connection to all cities, towns and villages, and allowing safe and efficient travel between them."*

The Government seeks to address the following key road sector issues:

(a) Addressing network deficiencies and improving road sector financing:

The draft road policy outlines Government's strategic approach to improve the network capacity. GoK aims to rehabilitate existing high- and medium-density corridors in a phased and timely manner and upgrade the network to comply with modern highway design standards. Greater emphasis will be placed on road maintenance. PWD will be encouraged to contract out maintenance and operations to private contractors on a pilot basis and use more modern technology for road pavement and treatments. The Government aims to provide adequate funds to meet the growth demand, simultaneously exploring avenues of private sector participation in the transport sector. Since budget allocations alone are not expected to meet the road sector's growing requirements, the State intends to supplement its road sector resource allocation by instituting a wider base of road user charges. The Government recently legislated the establishment of a State Road Fund that will seek to generate user charges through road tolls and dedicated fuel levies. The Roads and Bridges Development Corporation of Kerala (RBDCK), recently established by the GoK, will seek to raise funds through loans, shares and grants from financial institutions in order to construct and maintain identified roads and bridges. RBDCK recently awarded contracts to build railway over-bridges in the state and several NH bypasses will be built as BOT schemes in the near future.

(b) Enhancing institutional capacities:

The Government has committed itself to improve the performance of the road sector. In particular, steps are being taken to modernise and improve the PWD's performance, covering all its activities so that it keeps pace with new developments and requirements. With this in view, a consultant was engaged to undertake an Institutional Development Strategy (IDS) study to help establish a strategy for developing the PWD's technical, managerial and financial capabilities to effectively manage the State road transport network and to be responsive to road users' demands. Based on the study's recommendations, an Institutional Strengthening Action Plan (ISAP) listing the institutional development activities that are to be implemented during the next five years and beyond was developed and debated. The Government has formally endorsed the ISAP. Based on the ISAP, the PWD is developing a programme for:

- Human resource development strategy
- Improving pwd's financial management capacities
- Capacity building for planning and policy functions
- A management information system
- Strengthening environmental and social impact monitoring
- Improving procurement procedures
- Strengthening road safety engineering capacities

The state PWD has started implementation of some of the above. These measures are expected to reform PWD into a modern agency that will serve as a knowledge provider, while sourcing private sector capacities. ISAP implementation activities will be supported by IDS technical assistance consultants and three PWD staff working groups to seek institution-wide feedback on the ISAP. The institutional development consultants, who will serve as external experts to assist PWD in refining and implementing the ISAP, will work closely with the staff working groups that oversee,

- Organisational restructuring and institutional strengthening
- Management and quality systems
- Information technology and management information systems

(c) Reducing accident rates and mitigating environmental and social impacts:

Kerala's high accident rates have prompted the Government to address road safety problems by introducing road safety audits for new road projects and analysing accident blackspot locations. PWD has developed, as part of project preparation, a draft comprehensive and integrated State Road Safety Action Plan, which includes recommendations for the following road safety sub-sectors:

- Coordination and management of road safety,
- Accident data systems,
- Safety publicity campaign,
- Safety engineering,
- Safety education for children,
- Traffic legislation and enforcement,
- Driver training and testing,
- Vehicle safety standards,
- Emergency aid to road accident victims, and
- Safety research.

The plan also recommends establishing a PWD Road Safety Unit. As for environmental and social impact issues, the GoK's approach is to identify potential impacts early in the planning process and programme accordingly so as to avoid or mitigate adverse effects of road development. The policy is to prepare and implement Environmental Management Plans (EMP) whenever required, and to develop codes for environmental practice related to State road construction and maintenance.

Annexure 3.2. National Ambient Air Quality Standards by CPCB

“[SCHEDULE VII]

[See rule 3(3B)]

NATIONAL AMBIENT AIR QUALITY STANDARDS

S.No	Pollutants	Time-weighted average	Concentration in ambient air		Method of measurement
			Industrial Residential, Rural & other Areas	Ecologically Sensitive Area (Notified by Central Government)	
1	Sulphur Dioxide (SO ₂) µg/m ³	Annual* 24 hours**	50 80	20 80	-Improved West and Geake -Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂) µg/m ³	Annual* 24 hours**	40 80	30 80	-Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM ₁₀ µg/m ³	Annual* 24 hours**	60 100	60 100	-Gravimetric -TOEM -Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or PM _{2.5} µg/m ³	Annual* 24 hours**	40 60	40 60	-Gravimetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO) mg/m ³	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) Spectroscopy

* 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 08 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.

Note: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

Annexure 3.3. National Ambient Air Quality Standards for Noise by CPCB

Sl. No.	Area	Leq dB (A)	
		Day Time*	Night Time**
1	Industrial Area	75	70
2	Commercial Area	65	55
3	Residential Area	55	45
4	Silent Zone***	50	40

Notes :

* Day Time -- 0600 hour to 2100 hour (15 hours)

** Night time --2100 hour to 0600 hour (09 hours)

*** Areas upto 100 metres around certain premises like hospitals, educational institutions and courts may be declared as silence zones by the competent authority ;

Annexure 3.4. National Standards for Drinking Water (IS:10500)

Sl. No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
Essential characteristics			
1	Colour, (Hazen units, Max)	5	25
2	Odour	Unobjectionable	Unobjectionable
3	Taste	Agreeable	Agreeable
4	Turbidity (NTU, Max)	5	10
5	pH Value	6.5 to 8.5	No Relaxation
6	Total Hardness (as CaCO ₃) mg/lit., Max	300	600
7	Iron (as Fe) mg/lit, Max	0.3	1
8	Chlorides (as Cl) mg/lit, Max.	250	1000
9	Residual free chlorine, mg/lit, Min	0.2	--
Desirable Characteristics			
10	Dissolved solids mg/lit, Max	500	2000
11	Calcium (as Ca) mg/lit, Max	75	200
12	Copper (as Cu) mg/lit, Max	0.05	1.5
13	Manganese (as Mn)mg/lit, Max	0.1	0.3
14	Sulfate (as SO ₄) mg/lit, Max	200	400
15	Nitrate (as NO ₃) mg/lit, Max	45	100
16	Fluoride (as F) mg/lit, Max	1.9	1.5
17	Phenolic Compounds (as C ₆ H ₅ OH) mg/lit, Max.	0.001	0.002
18	Mercury (as Hg)mg/lit, Max	0.001	No relaxation
19	Cadmium (as Cd)mg/lit, Max	0.01	No relaxation
20	Selenium (as Se)mg/lit, Max	0.01	No relaxation
21	Arsenic (as As) mg/lit, Max	0.05	No relaxation
22	Cyanide (as CN) mg/lit, Max	0.05	No relaxation
23	Lead (as Pb) mg/lit, Max	0.05	No relaxation
24	Zinc (as Zn) mg/lit, Max	5	15
25	Anionic detergents (as MBAS) mg/lit, Max	0.2	1
26	Chromium (as Cr ⁶⁺) mg/lit, Max	0.05	No relaxation
27	Polynuclear aromatic hydro carbons (as PAH) g/lit, Max	--	--
28	Mineral Oil mg/lit, Max	0.01	0.03
29	Pesticides mg/l, Max	Absent	0.001
30	Radioactive Materials		
	i. Alpha emitters Bq/l, Max	--	0.1
	ii. Beta emitters pci/l, Max	--	1
31	Alkalinity mg/lit, Max	200	600
32	Aluminium (as Al) mg/l, Max	0.03	0.2
33	Boron mg/lit, Max	1	5
Bacteriological Parameters			
a) For water entering a distribution system Coliform count in any sample of 100 ml should be zero(0).			
b) For water in a distribution system (i) E Coli count in 100 ml of any sample must be zero (0). (ii) Coliform organisms should not be more than 10 per 100 ml in any sample. (iii) Coliform organisms should not be present in 100 ml of any two consecutive samples or more than 5% of the samples collected for the year.			

Annexure 3.5. National Standards for Inland Surface Waters Subject to Pollution (IS:2296)

Class C – Drinking water with conventional treatment followed by disinfection.

Sl No.	Parameter and Unit	Class C
1	Taste	--
2	Odour	--
3	Colour (True) (Hazen unit), Max	300
4	pH (Min and Max)	6.5 - 8.5
5	Conductivity (25°C) μ S/cm, Max	--
6	DO (mg/L), Min	4
7	BOD (3 Days 27°C) (mg/L), Max	3
8	Total Coliforms (MPN/100 mL), Max	5000
9	TDS (mg/L), Max	1500
10	Oil and Grease (mg/L), Max	0.1
11	Mineral oil (mg/L), Max	--
12	Total Hardness as CaCO ₃ (mg/L), Max	--
13	Chlorides as Cl (mg/L), Max	600
14	Sulfates as SO ₄ (mg/L), Max	400
15	Nitrates as NO ₃ (mg/L), Max	50
16	Free CO ₂ (mg/L), Max	--
17	Free NH ₃ as N (mg/L), Max	--
18	Fluorides as F (mg/L), Max	1.5
19	Calcium as Ca (mg/L), Max	--
20	Magnesium as Mg (mg/L), Max	--
21	Copper as Cu (mg/L), Max	1.5
22	Iron as Fe (mg/L), Max	50
23	Manganese as Mn (mg/L), Max	--
24	Zinc as Zn (mg/L), Max	15
25	Boron as B (mg/L), Max	--
26	Barium as Ba (mg/L), Max	--
27	Silver as Ag (mg/L), Max	--
28	Arsenic as As (mg/L), Max	0.2
29	Mercury as Hg (mg/L), Max	--
30	Lead as Pb (mg/L), Max	0.1
31	Cadmium as Cd (mg/L), Max	0.01
32	Chromium as Cr ⁶⁺ (mg/L), Max	0.05
33	Selenium as Se (mg/L), Max	0.05
34	Cyanide as CN (mg/L), Max	0.05
35	Phenols as C ₂ H ₅ OH (mg/L), Max	0.005
36	Anionic detergents as MBAS (mg/L), Max	1
37	PAH (mg/L), Max	--
38	Pesticides (μ g/L), Max	--
39	Insecticides (μ g/L), Max	0
40	Alpha emitters (μ C/mL), Max	10 ⁻⁹

Sl No.	Parameter and Unit	Class C
41	Beta emitters ($\mu\text{C}/\text{mL}$), Max	10^{-8}
42	Percent Sodium (%),Max	--
43	Sodium Absorption Ratio, Max	--

Annexure 3.6. National Standards for Discharge of Effluents

S. No.	Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
.	2		3	.	.
.	.	(a)	(b)	(c)	(d)
1	Colour and odour	All efforts should be made to remove colour and unpleasant odour as far as practicable		All efforts should be made to remove colour and unpleasant odour as far as practicable	All efforts should be made to remove colour and unpleasant odour as far as practicable
2	Suspended solids mg/l, max.	100	600	200	(a) For process waste water (b) For cooling water effluent 10 per cent above total suspended matter of influent.
3	Particle size of suspended solids	shall pass 850 micron IS Sieve	-	-	(a) Floatable solids, solids max. 3 mm (b) Settleable solids, max 856 microns
4	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5	Temperature	shall not exceed 5°C above the receiving water temperature			shall not exceed 5°C above the receiving water temperature
6	Oil and grease, mg/l max,	10	20	10	20
7	Total residual chlorine, mg/l max	1.0	-	-	1.0
8	Ammonical nitrogen (as N), mg/l, max.	50	50	-	50
9	Total kjeldahl nitrogen (as N); mg/l, max. mg/l, max.	100	-	-	100
10	Free ammonia (as NH ₃), mg/l, max.	5.0	-	-	5.0
11	Biochemical oxygen demand (3 days at 27°C), mg/l, max.	30	350	100	100
12	Chemical oxygen demand, mg/l, max.	250	-	-	250
13	Arsenic (as As).	0.2	0.2	0.2	0.2
14	Mercury (As Hg), mg/l, max.	0.01	0.01	-	0.01

S. No.	Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
.	2		3	.	.
.	.	(a)	(b)	(c)	(d)
15	Lead (as Pb) mg/l, max	0.1	1.0	-	2.0
16	Cadmium (as Cd) mg/l, max	2.0	1.0	-	2.0
17	Hexavalent chromium (as Cr + 6),mg/l, max.	0.1	2.0	-	1.0
18	Total chromium (as Cr) mg/l, max.	2.0	2.0	-	2.0
19	Copper (as Cu)mg/l, max.	3.0	3.0	-	3.0
20	Zinc (as Zn) mg/l, max.	5.0	15	-	15
21	Selenium (as Se)	0.05	0.05	-	0.05
22	Nickel (as Ni) mg/l, max.	3.0	3.0	-	5.0
23	Cyanide (as CN) mg/l, max.	0.2	2.0	0.2	0.2
24	Fluoride (as F) mg/l, max.	2.0	15	-	15
25	Dissolved phosphates (as P),mg/l, max.	5.0	-	-	-
26	Sulphide (as S) mg/l, max.	2.0	-	-	5.0
27	Phenolic compounds (as C ₆ H ₅ OH)mg/l, max.	1.0	5.0	-	5.0
28	Radioactive materials: (a) Alpha emitters micro curie mg/l, max. (b) Beta emitters micro curie mg/l	10-7 10-6	10-7 10-6	10-8 10-7	10-7 10-6
29	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30	Manganese	2 mg/l	2 mg/l	-	2 mg/l
31	Iron (as Fe)	3mg/l	3mg/l	-	3mg/l
32	Vanadium (as V)	0.2mg/l	0.2mg/l	-	0.2mg/l
33	Nitrate Nitrogen	10 mg/l	-	-	20 mg/l

* These standards shall be applicable for industries, operations or processes other than those industries, operations or process for which standards have been specified in Schedule of the Environment Protection Rules, 1989.

Annexure 5.1. Flora & Fauna in the Forest Area**A. FLORA**

<i>Abutilon persicum</i>	<i>Aporosa lindleyana</i>	<i>Canthium dicoccum</i>
<i>Acacia intsia</i>	<i>Ardisia pauciflora</i>	<i>Carex baccans</i>
<i>Acalypha malabarica</i>	<i>Argyreia elliptica</i>	<i>Careya arborea</i>
<i>Acalypha paniculata</i>	<i>Argyreia hirsuta</i>	<i>Carissa carandas</i>
<i>Achyranthes aspera</i>	<i>Aristolochia tagala</i>	<i>Casearia esculenta</i>
<i>Acrotrema arnottiana</i>	<i>Asparagus racemosus</i>	<i>Cassia hirsuta</i>
<i>Actephila excelsa</i>	<i>Asystasia dalzelliana</i>	<i>Cassia mimosoides</i>
<i>Actinodaphne tadulingamii</i>	<i>Atylosia lineata</i>	<i>Cayratia japonica</i>
<i>Adenia hondala</i>	<i>Baccaurea courtallensis</i>	<i>Cayratia pedata</i>
<i>Adenostemma lavenia</i>	<i>Barleria involucrata</i>	<i>Centrosema pubescens</i>
<i>Aeginetia pedunculata</i>	<i>Barringtonia acutangula</i>	<i>Ceropegia candelabrum</i>
<i>Aeschynanthus perrottetii</i>	<i>Bauhinia phoenicea</i>	<i>Chassalia ophioxylodes</i>
<i>Ageratum conyzoides</i>	<i>Begonia malabarica</i>	<i>Chloranthus brachystachya</i>
<i>Agrostistachys borneensis</i>	<i>Belosynapsis vivipara</i>	<i>Chrysopogon fulvus</i>
<i>Alstonia scholaris</i>	<i>Bentinckia condepanna</i>	<i>Cissus quadrangularis</i>
<i>Amaranthus viridis</i>	<i>Bidens biternata</i>	<i>Citrus medica</i>
<i>Amomum cannicarpum</i>	<i>Biophytum sensitivum</i>	<i>Clerodendrum viscosum</i>
<i>Anaphalis lawii</i>	<i>Bischofia javanica</i>	<i>Clidemia hirta</i>
<i>Anaphalis subdecurrens</i>	<i>Blumea lanceolaria</i>	<i>Coleus malabaricus</i>
<i>Anaphalis travancorica</i>	<i>Blumea membranacea</i>	<i>Combretum ovalifolium</i>
<i>Anaphyllum wightii</i>	<i>Blumea virens</i>	<i>Commelina clavata</i>
<i>Andrographis paniculata</i>	<i>Boehmeria glomerulifera</i>	<i>Commelina obliqua</i>
<i>Andrographis wightiana</i>	<i>Bolbitis sp.(Hybrid)</i>	<i>Commelina suffruticosa</i>
<i>Aneilema montanum</i>	<i>Breynia retusa</i>	<i>Connarus macrocarpus</i>
<i>Aneilema ovalifolium</i>	<i>Breynia vitis-idaea</i>	<i>Conyza bonariensis</i>
<i>Aneilema scaberrimum</i>	<i>Bridelia scandens</i>	<i>Costus speciosus</i>
<i>Angiopteris evecta</i>	<i>Caesalpinia bonduc</i>	<i>Crotalaria ferruginea</i>
<i>Antidesma menasu</i>	<i>Caesalpinia mimosoides</i>	<i>Crotalaria heyneana</i>
<i>Aphanamixis polystachya</i>	<i>Calamus hookerianus</i>	<i>Crotalaria pallida</i>

<i>Crotalaria walkeri</i>	<i>Calanthe masuca</i>	<i>Galinsoga parviflora</i>
<i>Croton caudatus</i>	<i>Crotalaria umbellata</i>	<i>Garuga pinnata</i>
<i>Croton malabaricus</i>	<i>Diploclesia glaucescens</i>	<i>Gleichenia linearis</i>
<i>Croton reticulatus</i>	<i>Diplocyclos palmatus</i>	<i>Glochidion ellipticum</i>
<i>Cryptolepis buchananii</i>	<i>Dipterocarpus bourdillonii</i>	<i>Glycine javanica</i>
<i>Cucumis sativus</i>	<i>Dracaena terniflora</i>	<i>Glycosmis mauritiana</i>
<i>Cyanotis aristata</i>	<i>Drymaria cordata</i>	<i>Gomphandra tetrandra</i>
<i>Cyanotis pilosa</i>	<i>Dumasia villosa</i>	<i>Gordonia obtusa</i>
<i>Cycas circinalis</i>	<i>Ehretia canarensis</i>	<i>Gouania microcarpa</i>
<i>Cyclea peltata</i>	<i>Elaeocarpus munroii</i>	<i>Grewia disperma</i>
<i>Cynanchum callialatum</i>	<i>Elaeocarpus serratus</i>	<i>Grewia orbiculata</i>
<i>Cyperus diffusus</i>	<i>Elaeocarpus tuberculatus</i>	<i>Grewia umbellifera</i>
<i>Cyperus distans</i>	<i>Elatostema lineolatum</i>	<i>Gynura aurantiaca</i>
<i>Cyperus iria</i>	<i>Eleusine indica</i>	<i>Gynura nitida</i>
<i>Cyrtococcum oxyphyllum</i>	<i>Embelia ribes</i>	<i>Habenaria crinifera</i>
<i>Debregeasia longifolia</i>	<i>Emilia sonchifolia</i>	<i>Hedyotis membranacea</i>
<i>Dendrobium herbaceum</i>	<i>Eragrostis unioloides</i>	<i>Helicteres isora</i>
<i>Dendrobium ovatum</i>	<i>Eranthemum capense</i>	<i>Hibiscus angulosus</i>
<i>Desmodium heterocarpon</i>	<i>Eriocaulon truncatum</i>	<i>Hibiscus furcatus</i>
<i>Desmodium laxiflorum</i>	<i>Ervatamia caudata</i>	<i>Hibiscus lunariifolius</i>
<i>Desmodium laxum</i>	<i>Ervatamia divaricata</i>	<i>Holigarna arnottiana</i>
<i>Desmodium motorium</i>	<i>Ervatamia heyneana</i>	<i>Holigarna nigra</i>
<i>Desmodium triflorum</i>	<i>Erythrina stricta</i>	<i>Hoya wightii</i>
<i>Desmodium triquetrum</i>	<i>Erythralium populifolium</i>	<i>Humboldtia vahliana</i>
<i>Dianella ensifolia</i>	<i>Euonymus indicus</i>	<i>Hydnocarpus laurifolia</i>
<i>Dichapetalum gelonioides</i>	<i>Eurya japonica</i>	<i>Hydrocotyle javanica</i>
<i>Dicraea stylosa</i>	<i>Fagraea ceilanica</i>	<i>Hydrocotyle javanica</i>
<i>Dillenia pentagyna</i>	<i>Ficus hispida</i>	<i>Hypolytrum nemorum</i>
<i>Dillenia suffruticosa</i>	<i>Firmiana colorata</i>	<i>Hyptis suaveolens</i>
<i>Dioscorea oppositifolia</i>	<i>Flemingia macrophylla</i>	<i>Ichnocarpus frutescens</i>
<i>Diospyros bourdillonii</i>	<i>Flemingia strobilifera</i>	<i>Impatiens acaulis</i>

<i>Impatiens viscosa</i>	<i>Floscopa scandens</i>	<i>Ophiorrhiza brunonis</i>
<i>Ipomoea hederifolia</i>	<i>Impatiens chinensis</i>	<i>Oreocnide integrifolia</i>
<i>Ixora brachiata</i>	<i>Lygodium flexuosum</i>	<i>Orthosiphon thymiflorus</i>
<i>Ixora lanceolaria</i>	<i>Macaranga peltata</i>	<i>Osbeckia aspera</i>
<i>Jasminum azoricum</i>	<i>Madhuca neriifolia</i>	<i>Osbeckia truncata</i>
<i>Jasminum rottlerianum</i>	<i>Maesa indica</i>	<i>Osbeckia virgata</i>
<i>Justicia neesii</i>	<i>Mallotus philippensis</i>	<i>Oxalis corniculata</i>
<i>Justicia procumbens</i>	<i>Mallotus tetracoccus</i>	<i>Panicum gardneri</i>
<i>Knema attenuata</i>	<i>Malvastrum coromandelianum</i>	<i>Panicum psilopodium</i>
<i>Kyllinga breviflora</i>	<i>Medinilla beddomei</i>	<i>Passiflora foetida</i>
<i>Kyllinga bulbosa</i>	<i>Meliosma pinnata</i>	<i>Pavetta indica</i>
<i>Lagenandra toxicaria</i>	<i>Memecylon heyneanum</i>	<i>Pavetta zeylanica</i>
<i>Laggera pterodonta</i>	<i>Merremia umbellata</i>	<i>Pennisetum polystachyon</i>
<i>Lasianthus acuminatus</i>	<i>Merremia vitifolia</i>	<i>Peperomia pellucida</i>
<i>Lasianthus ciliatus</i>	<i>Micrococca mercurialis</i>	<i>Peperomia portulacoides</i>
<i>Lasianthus peduncularis</i>	<i>Microtropis stocksii</i>	<i>Persicaria chinensis</i>
<i>Leea indica</i>	<i>Mimosa pudica</i>	<i>Pholidota pallida</i>
<i>Lepianthes umbellata</i>	<i>Molineria trichocarpa</i>	<i>Photinia notoniana</i>
<i>Leucas biflora</i>	<i>Mucuna monosperma</i>	<i>Phyllanthus maderaspatensis</i>
<i>Leucas vestita</i>	<i>Mucuna pruriens</i>	<i>Phyllanthus rheedii</i>
<i>Ligustrum gamblei</i>	<i>Murdannia pauciflora</i>	<i>Phyllanthus urinaria</i>
<i>Ligustrum walkeri</i>	<i>Mussaenda glabrata</i>	<i>Physalis peruviana</i>
<i>Linociera ramiflora</i>	<i>Mussaenda laxa</i>	<i>Pilea melastomoides</i>
<i>Litsea bourdillonii</i>	<i>Myxopyrum smilacifolium</i>	<i>Pilea microphylla</i>
<i>Litsea coriacea</i>	<i>Neanotis indica</i>	<i>Piper mullesua</i>
<i>Litsea glabrata</i>	<i>Neanotis quadrilocularis</i>	<i>Piper nigrum</i>
<i>Litsea oleoides</i>	<i>Nelsonia canescens</i>	<i>Pithecellobium monadelphum</i>
<i>Lobelia nicotianifolia</i>	<i>Oberonia brunoniana</i>	<i>Pogostemon benghalensis</i>
<i>Ludwigia prostrata</i>	<i>Oberonia denticulata</i>	<i>Pogostemon paniculatus</i>
<i>Lycopodium clavatum</i>	<i>Oberonia santapau</i>	<i>Pogostemon purpureus</i>
<i>Podocarpus wallichianus</i>	<i>Ochlandra scriptoria</i>	

<i>Polyalthia fragrans</i>	<i>Schizostachyum beddomei</i>	<i>Themeda triandra</i>
<i>Pothos scandens</i>	<i>Sirhookera latifolia</i>	<i>Thottea siliquosa</i>
<i>Pouzolzia wightii</i>	<i>Smilax zeylanica</i>	<i>Thunbergia fragrans</i>
<i>Psychotria concreta</i>	<i>Smithia gracilis</i>	<i>Tiliacora acuminata</i>
<i>Psychotria nigra</i>	<i>Solanum denticulatum</i>	<i>Torenia bicolor</i>
<i>Psychotria nudiflora</i>	<i>Solanum giganteum</i>	<i>Tournefortia heyneana</i>
<i>Psychotria octosulcata</i>	<i>Solanum nigrum</i>	<i>Trema orientalis</i>
<i>Psychotria truncata</i>	<i>Solanum stramonifolium</i>	<i>Trichilia connaroides</i>
<i>Pteridium aquilinum</i>	<i>Solanum torvum</i>	<i>Trichosanthes nervifolia</i>
<i>Pteris quadriaurita</i>	<i>Sonchus wightianus</i>	<i>Triumfetta pilosa</i>
<i>Pterospermum obtusifolium</i>	<i>Sonerila brunonis</i>	<i>Triumfetta rhomboidea</i>
<i>Pueraria phaseoloides</i>	<i>Sonerila rheedii</i>	<i>Turpinia malabarica</i>
<i>Pycnus unioloides</i>	<i>Sonerila zeylanica</i>	<i>Turpinia nepalensis</i>
<i>Reinwardtiadendron anamalaiense</i>	<i>Spermacoce pusilla</i>	<i>Urena lobata</i>
<i>Remusatia vivipara</i>	<i>Spilanthes calva</i>	<i>Utricularia striatula</i>
<i>Rhynchoglossum notonianum</i>	<i>Stachytarpheta indica</i>	<i>Vateria indica</i>
<i>Ricinus communis</i>	<i>Stephania japonica</i>	<i>Vepris bilocularis</i>
<i>Rotala indica</i>	<i>Stephania wightii</i>	<i>Vernonia arborea</i>
<i>Rubus wightii</i>	<i>Sterculia guttata</i>	<i>Vernonia divergens</i>
<i>Sarcostigma kleinii</i>	<i>Stereospermum personatum</i>	<i>Vigna radiata</i> var. <i>sublobata</i>
<i>Schumannianthus virgatus</i>	<i>Strobilanthes asper</i>	<i>Vitex altissima</i>
<i>Scoparia dulcis</i>	<i>Strobilanthes heyneanus</i>	<i>Vitis rheedii</i>
<i>Scurrula parasitica</i>	<i>Strobilanthes rubicundus</i>	<i>Wendlandia thyrsoides</i>
<i>Securinega virosa</i>	<i>Strychnos cinnamomifolia</i>	<i>Xanthophyllum arnottianum</i>
<i>Selaginella inaequalifolia</i>	<i>Symplocos cochinchinensis</i>	<i>Xylia xylocarpa</i>
<i>Senecio corymbosus</i>	<i>Syzygium arnottianum</i>	<i>Zanthoxylum ovalifolium</i>
<i>Setaria palmifolia</i>	<i>Syzygium laetum</i>	<i>Zehneria maysorensis</i>
<i>Setaria pumila</i>	<i>Syzygium mundagam</i>	<i>Zephyranthes carinata</i>
<i>Sida acuta</i>	<i>Tarennia asiatica</i>	<i>Themeda triandra</i>
<i>Sida rhombifolia</i>	<i>Taxillus tomentosus</i>	<i>Zizyphus rugosa</i>
<i>Sida rhomboidea</i>	<i>Tephrosia pulcherrima</i>	<i>Zizyphus glabrata</i>
	<i>Tetrastigma sulcatum</i>	

B. FAUNA**FISHES**

- | | |
|--------------------------------------|--|
| 1. <i>Parambassis thomassi</i> | 32. <i>Hypselobarbus curmuca</i> |
| 2. <i>Psuedoambassis ranga</i> | 33. <i>Hypselobarbus kurali</i> |
| 3. <i>Nandus nandus</i> | 34. <i>Labeo rohita</i> |
| 4. <i>Pristolepis marginata</i> | 35. <i>Garra mullya</i> |
| 5. <i>Etroplus maculatus</i> | 36. <i>Travancoria jonesi</i> |
| 6. <i>Etroplus suratensis</i> | 37. <i>Noemacheilus denisoni</i> |
| 7. <i>Oreochromis mossambica</i> | 38. <i>Noemacheilus guentheri</i> |
| 8. <i>Glossogobius giuris giuris</i> | 39. <i>Noemacheilus triangularis</i> |
| 9. <i>Awaous gutum</i> | 40. <i>Lepidocephalus thermalis</i> |
| 10. <i>Sicyopterus griseus</i> | 41. <i>Lepidocephalus limbatus</i> |
| 11. <i>Anabas testudineus</i> | 42. <i>Hyporhamphus limbatus</i> |
| 12. <i>Macropodus cupanus</i> | 43. <i>Xenentodon cancila</i> |
| 13. <i>Channa marulius</i> | 44. <i>Aplocheilus lineatus</i> |
| 14. <i>Channa orientalis</i> | 45. <i>Heteropnuestes fossilis</i> |
| 15. <i>Channa striatus</i> | 46. <i>Clarias dusuuumieri</i> |
| 16. <i>Mastacembelus armatus</i> | 47. <i>Danio malabaricus</i> |
| 17. <i>Tetraodon travancoricus</i> | 48. <i>Pristolepis malabarica</i> |
| 18. <i>Megalops cyprinoides</i> | 49. <i>Parambassis thomassi</i> |
| 19. <i>Anguilla bengalensis</i> | 50. <i>Haplocheilus lineatus</i> |
| 20. <i>Anguilla bicolor</i> | 51. <i>Mystus montanus</i> |
| 21. <i>Tor khudree</i> | 52. <i>Mystus oculatus</i> |
| 22. <i>Cyprinus carpio communis</i> | 53. <i>Dayella malabarica</i> |
| 23. <i>Puntius amphibius</i> | 54. <i>Amblyyaryngodon melettina</i> |
| 24. <i>Puntius chola</i> | 55. <i>Etroplus maculatus</i> |
| 25. <i>Puntius filamentosus</i> | 56. <i>Osteobrama bakeri</i> |
| 26. <i>Puntius melanampyx</i> | 57. <i>Hypoxorhamphus limbatus</i> |
| 27. <i>Puntius parrah</i> | 58. <i>Ompok bimaculatus</i> |
| 28. <i>Puntius sarana subnasutus</i> | 59. <i>Mastacembelus guentheri</i> |
| 29. <i>Puntius ticto ticto</i> | 60. <i>Rasbora daniconius daniconius</i> |
| 30. <i>Puntius vittatus</i> | 61. <i>Anguilla bengalensis</i> |
| 31. <i>Hypselobarbus kolus</i> | 62. <i>Parambassis dayi</i> |

AMPHIBIANS

- | | |
|-------------------------------------|------------------------------------|
| 1. <i>Lchthyophis beddomei</i> | 23. <i>Tomopterna breviceps</i> |
| 2. <i>Uraeotyphlus narayani</i> | 24. <i>Philautus femoralis</i> |
| 3. <i>Bufo melanostictus</i> | 25. <i>Philautus leucorhimus</i> |
| 4. <i>Bufo microtympanum</i> | 26. <i>Philautus pulcherrimus</i> |
| 5. <i>Bufo parietalis</i> | 27. <i>Philautus nasutus</i> |
| 6. <i>Microhyla ornata</i> | 28. <i>Polypedates maculatus</i> |
| 7. <i>Microhyla rubra</i> | 29. <i>Rhacophorus malabaricus</i> |
| 8. <i>Uperodon globulosus</i> | 30. <i>Rana hexdactyla</i> |
| 9. <i>Euphylyctis cyanophlyctis</i> | 31. <i>Rana cyanophlyctis</i> |
| 10. <i>Euphylyctis hexadactylus</i> | 32. <i>Rana tigerina</i> |
| 11. <i>Hoplobatrachus crassus</i> | 33. <i>Rana limnocharis</i> |
| 12. <i>Hoplobatrachus tigerinus</i> | 34. <i>Rana semipalmata</i> |

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|------------------------------|----------------------------|
| 13. Indirana beddomii | 35. Rana malabarica |
| 14. Indirana leithii | 36. Rana beddomii |
| 15. Limnonectes brevipalmata | 37. Rana aurentiaca |
| 16. Limnonectes keralensis | 38. Poly pedatus maculatus |
| 17. Limnonectes keralensis | 39. Tomopterna refescence |
| 18. Micrixalus fuscus | 40. Micrixalus nudis |
| 19. Nyctibatrachus major | 41. Bufo fergusonii |
| 20. Rana curtipes | 42. Bufo lourenti |
| 21. Rana temporalis | 43. Uraeotyphlus species |
| 22. Rana malabarica | |

REPTILES

- | | |
|--------------------------------|--------------------------------|
| 1. Melanochelys trijuga | 31. Uropeltis ceylanicus |
| 2. Indotestudo forstenii | 32. Rhinophis sanguineus |
| 3. Lissemys punctata punctata | 33. Python molurus |
| 4. Cnemaspis gracilis | 34. Eryx conicus |
| 5. Cnemaspis indica | 35. Lycodon tranancoricus |
| 6. Cnemaspis kandiana | 36. Lycodon aulicus |
| 7. Cyrtodactylus collegalensis | 37. Oligodon taeniolatus |
| 8. Hemidactylus brooki | 38. Oligodon travancoricus |
| 9. Hemidactylus frenatus | 39. Amphiesma stolata |
| 10. Hemidactylus leschenaulti | 40. Amphiesma beddomei |
| 11. Hemidactylus maculatus | 41. Amphiesma monticola |
| 12. Calotes calotes | 42. Xenochrophis piscator |
| 13. Calotes ellioti | 43. Elaphe helena |
| 14. Calotes rouxi | 44. Ptyas mucosus |
| 15. Calotes versicolor | 45. Dendrelaphis tristis |
| 16. Draco dussumieri | 46. Ahaetulla nasuta |
| 17. Psammophilus blanfordianus | 47. Boiga trigonata |
| 18. Chamaeleo zeylanicus | 48. Bungarus caeruleus |
| 19. Mabuya macularius | 49. Naja naja |
| 20. Mabuya carinata | 50. Ophiophagus hannah |
| 21. Scincella laterimaculatum | 51. Vipera russellii |
| 22. Riopa punctata | 52. Echis carinatus |
| 23. Ristella beddomii | 53. Hypnale hypnale |
| 24. Ristella guentheri | 54. Trimeresurus malabaricus |
| 25. Ophisops leschenaulti | 55. Bungarus faciatus |
| 26. Varanus bengalensis | 56. Ptyas mucosus |
| 27. Ramphotyphlops braminus | 57. Typhlina bramina |
| 28. Typhlops acutus | 58. Geochelone travancorica |
| 29. Teretrurus sanguineus | 59. Lissemys punctata punctata |
| 30. Uropeltis ocellatus | |

BIRDS

- | | |
|---|--|
| 1 Little cormorant
(Phalacrocorax niger) | 101 Greyfronted green pigeon
(Trenon pampadora affinis) |
| 2 Darter (Anhinga rufa) | 102 Imperial green pigeon |

		(<i>Ducula aenea</i>)	
3	Grey heron (<i>Ardea cinerea</i>)	103	Nilgiri wood pigeon (<i>Columba elphinstonii</i>)
4	Pond heron (<i>Ardeola grayii</i>)	104	Large Indian parakeet (<i>Pisttacula eupatria</i>)
5	Cattle egret (<i>Bubulcus ibis</i>)	105	Blossom headed parakeet (<i>Pisttacula cyanocephala</i>)
6	Little egret (<i>Egretta garsetta</i>)	106	The cuckoo (<i>Cuculus canorus</i>)
7	Night heron (<i>Nycticorax nycticorax</i>)	107	Indian banded bay cuckoo (<i>Cacomantis sonneratii</i>)
8	Chestnut bittern (<i>Ixobrychus cinnamomeus</i>)	108	Indian plaintive cuckoo (<i>Cacomantis passerinus</i>)
9	Pariah kite (<i>Milvus migrans</i>)	109	Drongo cuckoo (<i>Surniculus lugubris</i>)
10	Brahminy kite (<i>Haliastur indus</i>)	110	Lesser coucal (<i>Centropus toulou</i>)
11	Indian shikra (<i>Accipiter badius</i>)	111	Grass owl (<i>Tyto capensis</i>)
12	Osprey (<i>Pandion haliaetus</i>)	112	Bay owl (<i>Phodilus badius. ripleyi</i>)
13	Jungle bush quali (<i>Perdicula asiatica</i>)	113	Great horned owl (<i>Bubo bubo bengalensis</i>)
14	Red spurfowl (<i>Galloperdix spadicea</i>)	114	Forest eagle owl (<i>Bubo bubo nipalensis</i>)
15	Grey jungle fowl (<i>Gallus sonneratii</i>)	115	Brown fish owl (<i>Bubo bubo zeylonensis</i>)
16	Redwattled lapwing (<i>Vanellus indicus</i>)	116	Short eared owl (<i>Asio flammeus</i>)
17	Blue rock pigeon (<i>Columba livia</i>)	117	Ceylon Frogmouth (<i>Batrachostomus monlinger</i>)
18	Indian spotted dove (<i>Streptopelia chinensis</i>)	118	Great eared nightjar (<i>Eurostopodus macrotis bourdilloni</i>)
19	Indian emerald dove (<i>Chalcophaps indica</i>)	119	Bluewinged parakeet (<i>Psittacula columboides</i>)
20	Roseringed parakeet (<i>Psittacula krameri</i>)	120	Indian jungle nightjar (<i>Caprimulgus indicus</i>)
21	Indian lorikeet (<i>Loriculus vernalis</i>)	121	Indian cuckoo (<i>Cuculus micropterus</i>)
22	Common hawk cuckoo (<i>Cuculus varius</i>)	122	Longtailed nightjar (<i>Caprimulgus macrurus</i>)
23	Common Indian nightjar (<i>Caprimulgus asiaticus</i>)	123	Whiterumped spinetail swift (<i>Chaetura sylvatica</i>)
24	Indian koel (<i>Eudynamis scolopacea</i>)	124	Scops owl (<i>Otus scops</i>)
25	Coucal/Crow pheasant (<i>Centropus sinensis</i>)	125	Malabar barred jungle owlet (<i>Glaucidium radiatum subsp</i>)
26	Indian barn owl (<i>Tyto alba</i>)	126	Spotted owlet (<i>Athene brama</i>)
27	Grey headed bulbul (<i>Pyconotus pricoephalus</i>)	127	Yellow browed bulbul (<i>Hypsipetes indicus</i>)
28	Ruby throated bulbul (<i>Pyconotus melanicterus</i>)	128	Black head babbler (<i>Rhopocichla atriceps</i>)
29	Indian alpine swift (<i>Apus melba</i>)	129	Quaker babbler (<i>Alcippe poioicephala</i>)

30	Indian house swift (<i>Apus affinis</i>)	130	Brown flycatcher (<i>Muscicapa latirostris</i>)
31	Malabar trogon (<i>Harpactes fasciatus</i> subsp)	131	Brown breasted flycatcher (<i>Muscicapa muttui</i>)
32	Pied kingfisher (<i>Ceryle rudis</i>)	132	Indian roller (<i>Coracias benghalensis</i>)
33	Chestnutheaded bee-eater (<i>Merops Leschenaulti</i>)	133	White bellied blue flycatcher (<i>Muscicapa pallipes</i>)
34	Rufoustailed flycatcher (<i>Muscicapa ruficauda</i>)	134	Blue throated flycatcher (<i>Muscicapa rubeculoides</i>)
35	Redbreasted flycatcher (<i>Muscicapa parva</i>)	135	Tickell's blue flycatcher (<i>Muscicapa tickelliae</i>)
36	Malabar greyhornbill (<i>Tockus griseus</i>)	136	Verditer flycatcher (<i>Muscicapa thalassina</i>)
37	Small green barbet (<i>Megalaima viridis</i>)	137	Nilgiri flycatcher (<i>Muscicapa albicaudata</i>)
38	Crimsonthroated barbet (<i>Megalaima rubricapilla</i>)	138	White browed fantail flycatcher (<i>Rhipidura aureola</i>)
39	Indian pitta (<i>Pitta brachyura</i>)	139	Paradise flycatcher (<i>Trepsiphone paradisi</i>)
40	Malabar crested lark (<i>Galerida malabarica</i>)	140	Black naped flycatcher. (<i>Hypothymis azurea</i>)
41	Indian golden oriole (<i>Oriolus oriolus</i>)	141	Streaked fantail warbler (<i>Listicola juncidis salimalii</i>)
42	Blackheaded oriole (<i>Oriolus xanthornus</i>)	142	Franklin's wren Warbler (<i>Primia hodgsoni</i>)
	Black drongo (<i>Dicrurus adsimilis</i>)	143	Jungle wren warbler (<i>Primia ylvatica</i>)
43		144	Thickbilled warbler (<i>Acrocephalus aedon</i>)
44	Jungle myna (<i>Acridotheres fuscus</i>)	145	Indian great reed warbler (<i>Acrocephalus aedon</i>)
45	Hill myna (<i>Gracula religiosa</i>)	146	House crow (<i>Corvus splendens</i>)
46	Indian tree pie (<i>Dendrocitta vagabunda</i>)	147	Tytler's leaf warbler (<i>Phylloscopus tytleri</i>)
47	Southeastern tree pie (<i>Dendrocitta vagabunda</i> subsp)	148	Largebilled leaf warbler (<i>Phylloscopus magnirostris</i>)
48	Paddyfield warbler (<i>Acrocephalus agricola</i>)	149	Blue chat (<i>Erithacus svecicus</i>)
49	Jungle crow (<i>Corvus macrohynchos</i>)	150	Shama (<i>Copsychus saularis</i>)
50	Malabar woodshrike (<i>Tephrodornis gularis</i>)	151	Indian robin (<i>Saxicoloides caprata</i>)
51	Orange minivet (<i>Pericrocotus flammeus</i>)	152	Pied ground thrush (<i>Zoothera wardii</i>)
52	Goldfronted chloropsis (<i>Chloropsis auriformis</i>)	153	Orange headed ground thrush (<i>Zoothera citrina</i>)
53	Fairy bluebird (<i>Irena puella</i>)	154	Whiteheaded babbler
54	Redwhiskered bulbul (<i>Pycnonotus</i>		

jocosus)	(<i>Turdoides affinis</i>)
55 Whitethroated ground thrush(<i>Zootera citrina cyanotus</i>)	155 Grey headed yellow wagtail. (<i>Motacilla flava</i>)
56 Redvented bulbul (<i>Pycnonotus cafer</i>)	156 Magpie robin (<i>Copsychus saularis</i>)
57 Kerala rock pipit (<i>Anthus similis</i>)	157 Malbar whistling thrush (<i>Myiophonus borsfieldii</i>)
58 Tailorbird (<i>Orthotomus sutorius</i>)	158 Yellow backed wagtail (<i>Motacilla flava tutea</i>)
59 Blue headed yellow wagtail (<i>Motacilla flava beema</i>)	159 Grey wagtail (<i>Motacilla cinerea</i>)
60 Indian grey tit (<i>Parus major</i>)	160 Forest wagtail (<i>Motacilla indica</i>)
61 Velvetfronted nuthatch (<i>Sitta frontalis</i>)	161 Tickell's flowerpecker (<i>Dicaeum erythrorhynchos</i>)
62 Large pied wagtail (<i>Motacilla maderaspatensis</i>)	162 Purple rumped sunbird (<i>Nectarinia zeylonica</i>)
63 . Small sunbird (<i>Nectarinia minima</i>)	163 Indian shag (<i>Podiceps fuscicollis</i>)
64 Indian house sparrow (<i>Passer domesticus</i>)	164 Large cormorant (<i>Podiceps carbo</i>)
65 Little Gerbe (<i>Podiceps ruficollis</i>)	165 Purple Heron (<i>Ardea purpurea</i>)
66 Loten's sunbird (<i>Nectarinia lotenia</i>)	166 Large egret (<i>Ardea alba</i>)
67 Purple sunbird (<i>Nectarinia asiatica</i>)	167 Little spiderhunter (<i>Arachnothera longirostris</i>)
68 Yellow backed sunbird <i>Aethopyga siparaja</i>)	168 Yellowthroated sparrow (<i>Petronia xanthocollis</i>)
69 Little green heron (<i>Ardeola striatus</i>)	169 Open bill stork (<i>Anastomus oscitans</i>)
70 Smaller egret (<i>Egretta intermedia</i>)	170 Travancore baya (<i>Ploceus philippinus travancoreensis</i>)
71 Yellow bittern (<i>Ixobrychus sinensis</i>)	171 Red munia (<i>Estrilda amandava</i>)
White necked stork (<i>Ciconia episcopus</i>)	172 White throated Munia (<i>Lonchura malabarica</i>)
72 Pintail (<i>Anas acuta</i>)	173 Spotted munia (<i>Lonchura punctulata</i>)
74 Spot bill duck (<i>Anas poecilorhyncha</i>)	174 Black head munia (<i>Lonchura malacca</i>)
75 Garganey (<i>Anas querquedula</i>)	175 Common rose finch (<i>Carpodacus erythrinus</i>)
76 Black crested Baza (<i>Aviceda lephotes</i>)	176 Bush lark (<i>Mirafrassamica</i>)
77 Black winged kite (<i>Elanus caeruleus vociferus</i>)	177 Crag martin (<i>Hirundo rupestris</i>)
78 Sparrow hawk (<i>Accipiter nisus</i>)	178 Eastern swallow (<i>Hirundo rustica gutturalis</i>)
79 Crested hawk eagle (<i>Spizaetus cirrhatu</i> s)	179 Indian cliff swallow (<i>Hirundo fluvicola</i>)
80 Dusky cragmartin (<i>Hirundo concolor</i>)	180 House martin (<i>Delichon urbica</i>)
81 Booted hawk eagle	181 Brown shrike (<i>Lanius cristatus</i>)

	(<i>Hieraaetus pennatus</i>)		
82	Black eagle (<i>Ictinaetus malayensis perniger</i>)	182	Ashy drongo (<i>Dicrurus adsimilis</i>)
83	Grey shrike (<i>Lanius excubitor</i>)	183	Short toed eagle (<i>Circaetus gallicus gallicus</i>)
84	Greyheaded fishing eagle (<i>Ichthyophaga ichthyaetus</i>)	184	Common myna (<i>Acridotherestrictis</i>)
85	Racket – tailed drongo (<i>Dicrurus paradiseus</i>)	185	Common iora (<i>Aegithina tiphia</i>)
86	Greyheaded myna (<i>Sturnus malabaricus</i>)	186	Common kingfisher (<i>Alcedo atthis</i>)
87	Crested serpent eagle (<i>Spilornis cheela melanotis</i>)	187	Threetoed kingfisher (<i>Ceyx erithacus</i>)
88	Redheaded merlin (<i>Falco chicquera</i>)	188	White breasted kingfisher. (<i>Hakyon smyrensis</i>)
89	Kestrel (<i>Falco tinnunculus</i>)	189	Blue eared kingfisher (<i>Alcedo meninting</i>)
90	Indian kestrel (<i>Falco tinnunculus objurgatus</i>)	190	Bluebearded bee-eater (<i>Nyctyornis athertoni</i>)
91	Banded crane (<i>Rallina urizonoides</i>)	191	Broadbilled roller (<i>Eurystomus orientalis</i>)
92	White breasted waterhen (<i>Amaurornis phoenicurus</i>)	192	Malabar pied hornbill (<i>Anthraceroceros coronatus</i>)
93	Watercock (<i>Gallicrex cinerea</i>)	193	Rufous woodpecker (<i>Micropternus brachyurns jerdonii</i>)
94	Pheasant tailed jacana (<i>Hydrophasianus chirurgus</i>)	194	Speckled piculet (<i>Picumnus innominatus</i>)
95	Painted snipe. (<i>Rostratula bengalensis</i>)	195	Pigmy wood pecker (<i>Picoides nanus</i>)
96	Blackwinged stilt (<i>Himantopus himantopus</i>)	196	Green sandpiper (<i>Tringa ochropus</i>)
97	Little ringed plover (<i>Charadrius dubius</i>)	197	Black backed wood pecker (<i>Crysocolaptes festivus</i>)
98	Heart spotted woodpecker (<i>Hemicircus canente</i>)		
99	Common sandpiper (<i>Tringa hypoleucos</i>)		
100	Common tern (<i>Sterna hirundo</i>)		

MAMMALS

1	Grey musk shrew (<i>Suncus murinus</i>)	22	Leopard cat (<i>Prionailurus bengalensis</i>)
2	Day's shrew (<i>Suncus dayii</i>)	23	Indian flying fox (<i>Pteropus gigantius</i>)
3	Nilgiri tahr (<i>Hemitragus hylocrius</i>)	24	
4	Jungle cat (<i>Felis chaus schreber</i>)	25	Short nosed fruit bat (<i>Cynopterus sphinx</i>)
5	Common mongoose	26	Painted bat (<i>Kerivoula picta</i>)

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|----|---|----|---|
| | (<i>Herpestes edwardsii</i>) | | |
| 6 | Ruddy mongoose | 27 | Slender loris (Sub species), |
| | (<i>Herpestes smithii smithii</i>) | | (<i>Loris tardigradus malabaricus</i>) |
| 7 | Common otter (<i>Lutra lutra</i>) | 28 | Wild boar (<i>Sus scrofa</i>) |
| 8 | Bonnet macaque | 29 | Sambar deer (<i>Cervus unicolor</i>) |
| | (<i>Macaca radiata diluta</i>) | | |
| 9 | Indian porcupine (<i>Hystrix indica</i>) | 30 | Barking deer (<i>Muntiacus muntiac</i>) |
| 10 | Jungle striped squirrel (<i>Funambulus tristriatus</i>) | 31 | Mouse deer (<i>Tragulus meminna</i>) |
| 11 | Elephant (<i>Elephas maximus maximus</i>) | 32 | Indian pangolin |
| | | | (<i>Manis crassicaudata</i>) |
| 12 | The striped palm squirrel (<i>Funambulus palmarum</i>) | 33 | Blacknaped hare |
| | | | (<i>Lepus nigricollis nigricollis</i>) |
| 13 | Malabar giant squirrel | 34 | Leopard (<i>Panthera pardus</i>) |
| | (<i>Ratufa indica maxima</i>) | | |
| 14 | Common giant flying squirrel | 35 | Common palm civet |
| | (<i>Petaurista petaurista</i>) | | (<i>Paradoxurus hermaphroditus</i>) |
| 15 | Indian field mouse | 36 | Sloth bear (<i>Melursus ursinus</i>) |
| | (<i>Mus booduga</i>) | | |
| 16 | Indian mole rat | 37 | The threestriped palm squirrel |
| | (<i>Bandicota bengalensis</i>) | | (<i>Funambulus palmarum</i>) |
| 17 | Common house rat (<i>Rattus rattus</i>) | 38 | House mouse (<i>Mus musculus</i>) |
| 18 | Fulvous fruitbat | 39 | Small Indian civet |
| | (<i>Rousettus leschenaulti</i>) | | (<i>Viverricula indica</i>) |
| 19 | Common yellow bat | 40 | Toddy cat |
| | (<i>Scotophilus heathi</i>) | | (<i>Paradoxurus hermaphroditus</i>) |
| 20 | The Indian hore | 41 | Wild dog (<i>Cuon alpinus</i>) |
| | (<i>Lepus nigricollis nigricollis</i>) | | |
| 21 | The bandicoot rat | 42 | Jackal (<i>Canis aureus</i>) |
| | (<i>Bandicota indica</i>) | | |

Annexure 5.2. Commercially Important NWFPs Collected from the Forests

Sl. no.	Malayalam name	Scientific name
1	Adapathian	Holostemma adakodien
2	Athithippali	Raphidophora pertusa
3	Amalpori (red)	Chassalia ophioxyloides
4	Amalpori (white)	Chassalia ophioxyloides
5	Adalodakam	Adhathoda zeylanica
6	Edampiri/Valampiri	Helicteres isora
7	Eenthappana	Cycas circinalis
8	Urinchikai	Sapindus laurifolius
9	Eramkol (grade 1)	Oxytenanthera monostingma
10	Eramkol (grade 2)	Oxytenanthera monostingma
11	Elakkai	Elettaria cardamomum
12	Odamaram	Sarcostigma kleinii
13	Orila	Desmodium gangeticum
14	Kacholam	Kaempferia galanga
15	Kadukka	Terminalia chebula
16	Kadukkathode	Terminalia chebula
17	Kannadivella (low quality)	Vateria indica
18	Kannadivella (low quality)	Vateria indica
19	Kannadivella (high quality)	Vateria indica
20	Kakkumkai	Entada rheedei
21	Kayyonni (kunjunni)	Eclipta alba
22	Karinkurinji	Nilgirianthus ciliatus
23	Karinkurinji	Nilgirianthus ciliatus
24	Karinthen	
25	Kalpasam	Parmelia dilatata
26	Kasthoorimanjal	Curcuma aromatica
27	Kazhanji	Caesalpinia bonduc
28	Kattar vaazha	Aloe vera
29	Kaanjiram	Strychnos nux-vomica
30	Kaattinchi	Zingiber zerumbet
31	Kaatukurumulaku	Piper nigrum
32	Kaattuthippali	Piper longum
33	Kaattuthulasi	Ocimum gratissimum
34	Kaattupayar	Phaseolus trilobus
35	Kaattupavakka	Momordica charantia
36	Kaattupunnakka	Calophyllum inophyllum
37	Kaanthaarimulaku	Capsicum minimum
38	Kaattumanjal	Curcuma pseudomontana
39	Kaattumulaku	Piper species
40	Kiriyaatu	Andrographis paniculata
41	Keezhanelli	Phyllanthus airy-shawii
42	Kungillyam, Kungiliam	Boswellia serrata
43	Kudampuli (unakka)	Garcinia gummi-gutta

44	Kudampuli (pacha)	Garcinia gummi-gutta
45	Kunthirikkom (grade I)	Canarium strictum
46	Kunthirikkom (grade II)	Canarium strictum
47	Kunthirikkom (grade II)	Canarium strictum
48	Kumizhu	Gmelina arborea
49	Kurunthotti	Sida rhombifolia ssp. retusa
50	Kodithuva	Tragia involucrata
51	Koduveli	Plumbago indica
52	Kopuvella	Vateria indica
53	Kolarakku	
54	Kolinchi	Alpinia galanga
55	Garudakodi (eswaramooli)	Aristolochia indica
56	Changalamparanda (green)	Cissus quadrangularis
57	Chappanga	Caesalpinia sappan
58	Chittirapoovu	Euphorbia thymifolia
59	Chittaratha (dry)	Alpinia calcarata
60	Chittamruthu (green)	Tinospora cordifolia
61	Chittelam	Heracleum ringens
62	Cheevakkai/shekkakkai	Acacia concinna
63	Chemparathi	Hibiscus rosa-sinensis
64	Cheruthekku	Callicarpa tomentosa
65	Jeevakom	Malaxis rheedei
66	Jnaaval	Syzygium cumini
67	Thakara	Cassia tora
68	Thazhuthama	Boerhaavia diffusa
69	Thanni	Terminalia bellirica
70	Thanikka	Terminalia bellirica
71	Thanarakizhangu	Nelumbium speciosum
72	Honey	Honey
73	Honey wax crude	Honey wax crude
74	Honey wax processed	Honey wax processed
75	Thepprakkayu	Semecarpus anacardium
76	Thettamparal	Strychnos potatorum
77	Darbha	Desmostachya bipinnata
78	Naruneendi, Nannari	Hemidesmus indicus
79	Naankinkuru	Mesua ferrea
80	Naaykkuruna	Mucuna pruriens
81	Neela amari	Indigofera tinctoria
82	Neerualakkuru	Croton tiglium
83	Nellickka (dry)	Emblica officinalis
84	Nellickka (green)	Emblica officinalis
85	Nellickka (fruit wall)	Emblica officinalis
86	Panjikkaya	Ceiba pentandra
87	Padavalam	Trichosanthes cucumerina
88	Pattincha	Acacia caesia
89	Paachotti	Symplocos cochinchinensis

90	Paadakizhangu	Cyclea peltata
91	Paathiripoovu (Ist quality)	Stereospermum colais
92	Paathiripoovu (IInd quality)	Stereospermum colais
93	Paali	Palaquium ellipticum
94	Paalmuthukku	Ipomoea mauritiana
95	Peenari	Nothapodytes nimmoniana
96	Putharichunda	Solanum indicum
97	Punnapoovu	Dillenia pentagyna
98	Pulthylum	Cymbopogon flexuosus
99	Puli (with seed)	Tamarindus indica
100	Puli (without seed)	Tamarindus indica
101	Poovanathari	Schleichera deosa
102	Pollakkaya	Anamirta cocculus
103	Plassu (Poovum, Kaayum)	Butea monosperma
104	Manjakkooova	Curcuma angustifolia
105	Mattippal	Ailanthus triphysa
106	Maramanjil	Coscinium fenestratum
107	Marotti (seed)	Hydnocarpus pentandra
108	Marotti (oil)	Hydnocarpus pentandra
109	Muthanga	Cyperus rotundus
110	Mullilam	Zanthoxylum rhetsa
111	Moovila	Pseudarthria viscida
112	Ramacham	Vetiveria zizanioides
113	Vankurumthotti	Sida acuta
114	Vayampu	Acorus calamus
115	Vazhana	Cinnamomum verum
116	Veluthavanakku	Ricinus communis
117	Vellathumba	Leucas aspera
118	Sathavari	Asparagus racemosus
119	Sithari (Vithari)	Embelia ribes

Annexure 5.3. Fauna along the Project Road**Mammals of the Study Area**

Sl. No	Scientific Name	Local Name	Family
1	<i>Viverra megaspila</i> Blyth	Verugu	Viverridae
2	<i>Viverricula indica</i> Desmarest	Cheruverugu	-do-
3	<i>Herpestes edwardsi</i> (Geoffroy)	Keeri	Herpestidae
4	<i>Herpestes fuseus</i> Waterhouse	Chenkeeri	-do-
5	<i>Canis aureus</i> (Linnaeus)	Kurukkan	Canidae
6	<i>Vulpus bengalensis</i> (Shaw)	Kurunari	-do-
7	<i>Lutra lutra</i> (Linnaeus)	Neernaya	Mustelidae
8	<i>Ratufa indica</i> (Erxleben)	Malayannan	Sciuridae
9	<i>Funambulus palmarum</i> (Linnaeus)	Annan	-do-

Reptiles of the Study Area

1	<i>Calotes versicolor</i> (Daudin)	Onthu	Agamidae
2	<i>Mabuya carinata</i> (Schneider)	Arana	Scincidae
3	<i>Varanus bengalensis</i> (Daudin)	Udumbu	Varanidae
4	<i>Coluber mucosus</i> (Linnaeus)	Chaera	Colubridae
5	<i>Xenochrophis piscator</i> (Schneider)	Neerkoli	-do-

Amphibians of the Study Area

Amphibians:			
1	<i>Rana tigrina</i>	Thavala	Ranidae
2	<i>Rana hexadactyla</i>	Thavala	-do-

Birds of the Study Area

Sl. No	Scientific Name	Local Name	Family
1	<i>Dendrocygna javanica</i>	Choolan eranda	Dendrosygniidae
2	<i>Anas querquedula</i> L.	Vari eranda	Anatidae
3	<i>Nettapus coromandelianus</i> (Gmelin)	Pachha eranda	-do-
4	<i>Coracias benghalensis indica</i> Lantham	Panakaaka	Coraciidae
5	<i>Alcedo atthis</i> Kleinschmidt	Podiiponmann	Alcedinidae
6	<i>Ceryle rudis</i>	Pulli meenkotthi	-do-
7	<i>Halcyon smyrnensis fusca</i> (Boddaert)	Meenkotthichaan	Alcedinidae
8	<i>Pelargopsis capensis</i>	Kaakameenkothi	Dacclonidaea
9	<i>Merops orientalis</i> L.	Naatuvelitatta	Meropidae
10	<i>Merops philippinus</i> Lantham	Valiya velitatta	-do-
11	<i>Centropus sinensis parroti</i> Stresemann	Chempothu	Cuculidae

Sl. No	Scientific Name	Local Name	Family
12	<i>Eudynamys scolopacea</i> (L.)	Kuyil	-do-
13	<i>Cuculus micropterus</i> Gould	Kuyil	-do-
14	<i>Streptopelia chinensis</i> (Gmelin)	Arippravu	Columbidae
15	<i>Amaurornis phoenicurus</i> Pennat	Kulakozhi	Rallidae
16	<i>Gallinula chloropus indica</i> Blyth	Pattakozhi	-do-
17	<i>Porphyrio porphyrio</i> (L.)	Nelakozhi	-do-
18	<i>Calidris minuta</i>	-	-do-
19	<i>Gallinago gallinago</i>	Visharivalan	Scolopacidae
20	<i>Tringa glareola</i>	Pullikaadakokku	-do-
21	<i>Tringa hypoleucos</i>	Neerkkada	-do-
22	<i>Tringa nebularia</i>	Pachhakali	-do-
23	<i>Tringa ochropus</i>	Karimban kaadakokku	-do-
24	<i>Tringa tatanus</i>	Chorakali	-do-
25	<i>Metopidius indicus</i> (Latham)	Naadan thamarakozhi	Jacanidae
26	<i>Hydrophasianus chirurgus</i> (Scopoli)	Vaalan thamarakozhi	-do-
27	<i>Charadrius alexandrinus</i>	Cherumanlakozhi	-do-
28	<i>Charadrius mongolus</i>	-	-do-
29	<i>Charadrius dubius</i>	Aatumanlkozhi	-do-
30	<i>Vanellus indicus</i>	Chorakannithittiri	-do-
31	<i>Glareola lactea</i> Temminck	Valiyameevalkkada	Glareolidae
32	<i>Larus brunnicephalus</i> Jerdon	Kadalpaatha	Laridae
33	<i>Chlidonias hybrida indica</i> (Stephens)	Kari aala	-do-
34	<i>Sterna aurantia</i>	Puzha aala	-do-
35	<i>Circus aeruginosus</i> (L.)	Kari thappi	Accipitridae
36	<i>Haliaeetus leucogaster</i>	Vellavayaran kadal parunthu	-do-
37	<i>Haliastur indica</i> (Boddeart)	Krishna parunthu	-do-
38	<i>Milvus migrans govinda</i> (Skyes)	Chakkiparunthu	-do-
39	<i>Pandion haliaetus</i> (L.)	Thaliparunthu	-do-
40	<i>Podiceps ruficollis capensis</i> Salvadori	Mungamkozhi	Podicipedidae
41	<i>Phalacrocorax niger</i> (Vieillot)	Cheriya neerkaaka	Phalacrocoracidae
42	<i>Ardea cineria rectirostris</i> Gould	Chaaramundi	Ardeidae
43	<i>Ardea pupurea malinensis</i> Meyen	Chayamundi	-do-
44	<i>Ardeola grayii grayii</i> (Skyes)	Kulakokku	-do-
45	<i>Bubulcus ibis coromandus</i> (Boddeart)	Kaalimundi	-do-
47	<i>Butorides striatus</i>	Chinnakokku	-do-
48	<i>Casmerodius albus</i>	Perumundi	-do-
49	<i>Egretta gularis schistacea</i> (Hemprich & Ehrenberg)	Thirimundi	-do-
50	<i>Egretta garzetta</i> (L.)	Chinnamundi	-do-
51	<i>Ixobrychus cinnamomeus</i> (Gmelin)	Mazhakoccha	-do-

Sl. No	Scientific Name	Local Name	Family
52	<i>Ixobrychus flavicollis</i> (Latham)	Karikoccha	-do-
53	<i>Ixobrychus sinensis</i> (Gmelin)	Manjakochha	-do-
54	<i>Mesophoyx intermedia</i>	Cherumundi	-do-
55	<i>Nycticorax nycticorax</i> (L.)	Pathirakokku	-do-
56	<i>Ciconia episcopus</i> (Boddeart)	Karinkokku	Ciconiidae
57	<i>Hirundo daurica erythropygia</i> Sykes	Varayan kathrika	Hirundinidae
58	<i>Hirundo rustica guttularis</i> Sepoli	Vayalkothikathrika	-do-
59	<i>Nectarinia asiatica</i> (Latham)	Karuppan thenkili	Nectarididae
60	<i>Nectarinia zeylonica flaviventris</i> (Hermann)	Manjathenkili	-do-
61	<i>Lonchura punctulata</i>	Chootiyatta	Dasseridae
62	<i>Lonchura malacca</i>	Aatachemban	-do-
63	<i>Lonchura striata</i>	Aatakaruppan	-do-
64	<i>Acridotheres tristis</i> (L.)	Maadatha	Sturnidae
65	<i>Corvus macrorhynchos culminatus</i> Sykes	Balikaaka	Corvidae
66	<i>Corvus splendens protegatus</i> Madrasz	Kaaka	-do-
67	<i>Dendrocitta vagabunda</i> Whistler	Oolennjali	-do-
68	<i>Columba livia intermedia</i> Strickland	Ambalapraavu	Columbidae
69	<i>Pycnonotus cafer</i> (L.)	Nattubulbul	Pycnonotidae
70	<i>Turdoides afinis affinis</i> (Jerdon)	Kariyilakili	-do-
71	<i>Motacilla maderaspatensis</i> Gmelin	Vaalukulukipakshi	Motacilidae
72	<i>Oriolus oriolus</i> Sykes	Manjakili	Oriolidae

Fishes of the Study Area

Sl. No	Scientific Name	Local Name	Family
1	<i>Etioplos suratensis</i> (Bloch)	Irimeen	Cichlidae
2	<i>Etioplos maculatus</i> (Bloch)	Chootachi	-do-
3	<i>Tilapia mossambica</i> Peters	Tilopi	-do-
4	<i>Mugil cephalus</i> Linnaeus	Malan	Mugilidae
5	<i>Liza parsia</i> (Hamilton)	Thirutha	-do-
6	<i>Liza tade</i> (Forsskal.)	Kanambu	-do-
7	<i>Chanos chanos</i> (Forsskal.)	Poomeen	Chanidae
8	<i>Lates calcarifer</i> (Bloch.)	Narimeen	Centropomidae
9	<i>Megalops cyprinoids</i> (Broussonet)	Palankanni	Megalopidae
10	<i>Lutjanus argentimaculatus</i> (Forsskal.)	Chemballi	Lutjanidae
11	<i>Glossogobius giurus</i> (Hamilton)	Poolan	Gobiidae
12	<i>Stenogobius malabaricus</i>	Kurudan	-do-
13	<i>Eleotris fusca</i> (Bloch. & Schneider)	Noongal	Eleotridae
14	<i>Leiognathus</i> sp.	Mullan	Leiognathidae
15	<i>Scatophagus argus</i> (Linnaeus)	Kachchai	Scatophagidae
16	<i>Lepturcnthus savala</i>	Thalayan	Truiciuridae
17	<i>Cynoglossus</i> sp.	Maantha	Cynoglossidae
18	<i>Arius</i> sp.	Etta	Ariidae

Sl. No	Scientific Name	Local Name	Family
19	Mastacembelus sp.	Aaron	Mastacembilidae
20	Anchoviella sp.	Nechal	Engraulidae
21	Carangoides sp.	Prachi	Carangidae
22	Hyporhamphus limbatus Valenciennes	Koyala	Exocoetidae
23	Xenetodon cancila L (Hamilton)	Koyala	Belonidae
24	Secutor sp.	Mullan	Leiognathidae
25	Sillago sihama (Forsskal)	Kolan	Sillaginidae
26	Lactarias lactarias (Schneider)	Kadu	Lactarridae
27	Sphyreena sp.	-	Sphyraenoidae
28	Chirocentrus dorab	Mullavala	Chirocentridae
29	Pampus argenteus (Euphrasen)	Aakoli	Stromteidae
30	Pampus chinensis (Euphrasen)	Aakoli	Stromteidae
31	Channa marulius (Hamilton)	Varaal	Channidae
32	Daysciaena albida (Cuvier)	Kora	Sciaenidae
33	Thysariophrys indicus (Linnaeus)	Aeri	Platycephalidae
34	Rasbora daniconius (Hamilton)	Kananjon	Cyprinidae
35	Aplocheilus lineatus (Val.)	Maanathukanni	Cyprinodontidae
36	Synaptura sp.	Maantha	Soleidae

Crabs of the Study Area

Sl. No	Scientific Name	Local Name
1	Scylla serrata	Puzhanhandu
2	Charybdis cruciata	-
3	Portunus pelagicus	Kadalnhandu
4	Portunus sanguinolentus	Kadalnhandu
5	Maluta lunaris	-
6	Uca sp.	Ottakaalan nhandu
7	Eupagurus sp.	-

Prawns of the Study Area

Sl. No	Scientific Name	Local Name
1	Penaeus monodon	Kaara
2	Penaeus indicus	Naaran
3	Metapenaeus dobsoni	Poovalan
4	Metapenaeus affinis	Kalanthan
5	Metapenaeus merguensis	-
6	Metapenaeus monoceros	Choodan
7	Macrobrachium sp.	Kaalankonchu
8	Panulirus homarus	Cheetakonchu

Molluscs of the Study Area

Sl. No	Scientific Name	Local Name
1	Meretrix costa	Elambakka
2	Meretrix meretrix	Koorka

Sl. No	Scientific Name	Local Name
3	<i>Perna indica</i>	Kallumakkai
4	<i>Perna viridis</i>	Kallumakkai
5	<i>Crassostrea madrasensis</i>	Muru
6	<i>Crassostrea malabarica</i>	-
7	<i>Crassostrea cuculata</i>	-
8	<i>Pinctada fucata</i>	Muthuchippi
9	<i>Cordium</i> sp.	Muthuchippi
10	<i>Arca</i> sp.	Muthuchippi
11	<i>Cardite bicolor</i>	Muthuchippi
12	<i>Tridacha gigas</i>	Muthuchippi
13	<i>Bullia</i> sp.	-
14	<i>Telescopium</i> sp.	Purikka
15	<i>Fusinus</i> sp.	-
16	<i>Terebra</i> sp.	-
17	<i>Murex</i> sp.	-
18	<i>Villorita cyprinoids</i>	-
19	<i>Pila virens</i>	-
20	<i>Limnaea</i> sp.	-
21	<i>Indoplanorbis</i> sp.	-
21	<i>Bellamya</i> sp.	-
23	<i>Paphia malabarica</i>	-

Insects of the Study Area

Sl. No	Scientific Name	Local Name	Order
1	<i>Scolopendra</i>	Pazhuthara	Chilopoda
2	<i>Spirostreptus</i>	Cheratta	Diplopoda
3	<i>Gerres</i>	-	Hemiptera
4	<i>Corixa</i>	-	-do-
5	<i>Gryllotalpa</i>	-	Orthoptera
6	<i>Mantis religiosa</i>	-	Dictyoptera
7	<i>Gomphus</i>	-	Odonata
8	<i>Libellula</i>	-	-do-
9	<i>Anthia sexguttata</i>	-	Coleoptera
10	<i>Myrmeleon</i>	Kuzhiaana	Neuroptera

Butterflies of the Study Area

Sl. No	Scientific Name	Local Name	Family
1	<i>Idea malabarica</i>	Malabar tree nymph	Danaidae
2	<i>Danaus chrysippus</i>	Plain tiger	-do-
3	<i>Danaus genutia</i>	-	-do-
4	<i>Trumala limniace</i>	Blue tiger	-do-
5	<i>Parantica algea</i>	Glassy blue tiger	-do-
6	<i>Euploea core</i>	Common core	-do-
7	<i>Mycalesis perseus</i>	Common bush brown	Satyrinae
8	<i>Mycalesis patnia</i>	Glad eye bush brown	-do-

9	<i>Lethe rokira</i>	Common tree brown	-do-
10	<i>Ypthima ceylonica</i>	Ceylon four ring	-do-
11	<i>Orsotriaena medus</i>	Nigger	-do-
12	<i>Ypthima huebneri</i>	Common four ring	-do-
13	<i>Melanitis leda</i>	Common evening brown	-do-
14	<i>Melanitis phedima</i>	Dark evening brown	-do-
15	<i>Elymnias hypermnestra</i>	Common palmfly	-do-
16	<i>Ariadne merione</i>	Common castor	Nymphalidae
17	<i>Junonia iphita</i>	Chocolate pancy	-do-
18	<i>Junonia lemonias</i>	Lemon pancy	-do-
19	<i>Junonia atlites</i>	Grey pancy	-do-
20	<i>Hasora badra</i>	Common awl	Hesperiidae
21	<i>Celaenorrhinus leucocera</i>	Common spotted flat	-do-
22	<i>Matapa aria</i>	Common red eye	-do-
23	<i>Celaenorrhinus ambareesa</i>	Malabar spotted flat	-do-
24	<i>Triodes minos</i>	Southern birdwing	Papilionidae
25	<i>Pachliopta hector</i>	Crimson rose	-do-

Annexure 6.1. Minutes of Meeting at Thodupuzha for Link 84 for KSTP Phase II Upgradation

Venue: PWD Rest House, Thodupuzha

Date, Time: June 11, 2003, 11.30 a.m.

Public Participation:

The meeting was arranged by PMT and the invitation by the NGO appointed for phase I. Complete list of participants in the meeting is provided as attachment - 1

Participants from KSTP PMT/PCC:

Mr. Sreekandan Nair, Environmental Engineer (EE), Project Management Team (PMT)

Mr. Sundara Rajan C.V., Environmental Specialist, PCC

Mr. BGP Reddy, Design Engineer, PCC

Mr Emmanuel, Sociologist, PMT

Participants from local KSTP division

Mr Srinivasa Iyer, AE, Thodupuzha

Apart from the organisers, 40-invited project affected persons participated in the meeting (Refer attached participants list- attachment-1). The photographs taken during the sessions are attached as attachment-2.

Since the alignment has been decided some two years ago and the land acquisition notification under section 4 (1) has been issued, the alignment changes were not possible for the proposed road. Moreover a major bridge across the river has been constructed according to the decided alignment. All those aspects together allow less flexibility for KSTP to consider other alternatives. The 'mahsar' has been prepared for all PAPs.

Mr Sreekantan Nair project Environmental Engineer opened the meeting and introduced the project team.

Mr Emmanuel, sociologist from PMT has provided a brief idea about the land acquisition and compensation package. Mr Emmanuel also described the role of NGOs and the time required to complete the land acquisition process. Further the PCC Environmentalist described the project characteristics and the environmental and social aspects of the project preparation and implementation.

A few participating members especially Mr Sacaria (a small local tea shop owner) was disgusted with the earlier PWD land acquisition process. Land has been taken in some cases and the crops have been destroyed without any compensation for about two years. Mr Sacaria also alleged that there were many irregularities during the finalisation of the design due to political intervention. The participants were quite appreciative of KSTP who informed then that KSTP cannot undo those irregularities at this juncture as the land acquisition process had advanced so much. The team had put a lot of effort to explain the alignment and the measures taken by the KSTP.

Later the session was opened for public discussion. Since the land acquisition issues are usually similar in nature, all the women participants were requested to present their case one by one followed by men.

As a first case, Smt⁵. Kathaiyanai Amma presented her case. This is the case of a widow having seven children running a small teashop; later the PCC environmentalist has interpreted the case of the PAP for the loss made, total compensation package and additional benefits of being a widow. Wherever required the PMT Environmental Engineer and sociologist interfered and explained other aspects.

Similarly 20 such cases were taken up and interpreted to the entire 40 members. During this case interpretation, the team has answered the anxieties of the participants regarding compensation, timing and benefits.

The PCC design engineer and the local divisional engineer explained the possibility of minimising impacts by certain minimum design changes such as construction of a retaining wall and shifting the alignment by 1-2 metre etc.

At the end Chainage, the parties on both sides, wanted to save their properties from being affected. Therefore this part was not considered.

Construction of retaining wall has been included to limit the land acquisition. Retaining wall will be provided to save paddy field. Other than this there were no environmental concerns raised during the meeting.

The meeting was closed at 1.30 p.m.

⁵ Smt is the abbreviation of Sreemathi a local term used to respect ladies.

11/6/03

①

LIST OF PARTICIPANTS

Sl No	Name of participants	Address/designation	Signature
1	N.N. രാമകൃഷ്ണ നാഥ്	മുളയിൽ	N.N.R.
2	മുളയിൽ	മുളയിൽ	
3	M.S. ശബരൻ നാഥ്	മുളയിൽ	
4	P.M.V. Roshni	Mannar	
5	മുളയിൽ	മുളയിൽ	
6	P.M. മഹേഷ്	മുളയിൽ	
7	മുളയിൽ	മുളയിൽ	
8	മുളയിൽ	മുളയിൽ	
9	P.S. Soman	മുളയിൽ	
10	മുളയിൽ	മുളയിൽ	
11	മുളയിൽ	മുളയിൽ	
12	മുളയിൽ	മുളയിൽ	
13	P. Chundhan Nair	padinjumel house	Chundhan
14	K.M. Sridharan	Kandathu House	Sridharan
15	G. Gopalakrishnan	Moduram, Manakud	
16	Mathew V. G	Vanniyakunni	Mathew
17	Joshi Mathew	Paradiyil	Joshi
18	മുളയിൽ	മുളയിൽ	
19	G. Sajidharan	Madavanna	Sajidharan
20	M.S. Soman	മുളയിൽ	
21	T.H. Soman	മുളയിൽ	T.H.S.

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Sl No	Name of participants	Address/designation	Signature
22	Ramanichandran	Manakkadan	Ramani
23	Shoola Jacob	Manakkadan	Shoola
24	Bhanadhi Anna	Samswatha Murali	(6)
25	മാനക്കടൻ	മാനക്കടൻ	
26	Shaji	Manakkadan	Shaji
27	മനുജൻ	മാനക്കടൻ	
28	മാനക്കടൻ	മാനക്കടൻ	
29	മാനക്കടൻ	മാനക്കടൻ	Revi
30	മാനക്കടൻ	മാനക്കടൻ	PT
31	മാനക്കടൻ	മാനക്കടൻ	
32	I. C. Pawlase	Idiyankandattil Mankad P.O.	I.C.
33	മാനക്കടൻ	മാനക്കടൻ	
34	M. Umikrishnan	Mullesthal house Maduvana	
35	V.K. Kumar	Valoor, perumpalloor P.O. Muvattupuzha	V.K.
36	T.D. Cherian	Theruvankudam, P.O. Muvattupuzha	T.D.
37	Saj Jacob	Theruvankudam, P.O. Muvattupuzha	
38	A.V. Vinayakumar	Madakalathil house, Maduvana, Manakkadan	
39	Rajappan-G.	Maduvana, Manakkadan da-P.O. Thodupuzha	Raj
40	Nisha Issac	Asst. Engineer, SEUF	Nisha

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Annexure 6.2. Minutes of Meeting held at Pala along Link 84 for KSTP Phase II Upgradation

Venue: Pala Revenue Divisional Officer (RDO) conference hall

Date, Time: July 02, 2003, 04.00p.m.

Public Participation:

Complete list of participants in the meeting is provided as attachment-a1. The meeting and the invitation were carried out by the PMT through the KSTP divisional office at Ponkunnam. The photographs taken during the meeting is provided in attachment-a2.

Participants from KSTP PMT/PCC:

Mr. Thomas, Superintending Engineer (SE), Project Management Team (PMT)

Mr. Sreekantan Nair, Environmental Engineer (EE), PMT

Mr. Sundara Rajan C.V., Environmental Specialist, PCC

Mr. Emmanuel Sociologist, PMT

Mr BGP Reddy, Design Engineer, PCC

Participants form KSTP Ponkunnam division

Mr George Kutty, EE, Ponkunnam Division

Ms. Shylamol.V.K. AE, KSTP, Ponkunnam

Mr John Kenneth.D AE, KSTP, Ponkunnam

Mr. Johny George, AE, KIST, Ponkunnam

Mr George Kutty EE KSTP – Ponkunnam division introduced the team and explained the various aspects of the project preparation as well as the land acquisition procedures.

Mr Emmanuel provided a brief introduction to social issues and the kind of compensation.

Since the team found that the people are mainly interested to know the impact due to the Pala deviation alignment, the team explained the details of the affected structures and properties and persons.

Further, the team explained the various queries with regard to the alignment, affected structures and compensation.

The Vypari Vyvasaya Samithy president requested the KSTP team for avoiding the multi-storied building (Plate no-14-21). According to the present design, these structures will have to be demolished.

The gathered people generally appreciated the KSTP team for providing the strip plan for their reference.

Most of the questions were relating to avoidance of structures from being affected.

Most of the affected persons will study the consequences and informed that they will represent their case. The team stated that progressive & useful suggestions will be sorted out and implemented with regard to reduced impacts, reduced demolition of valuable properties.

Meeting closed at 5 pm.

ATTACHMENT
LIST OF PARTICIPANTS ATTENDED THE MEETING

Public Meeting at RDO's Conference Hall, Palai
conducted by PMT, KSTP, TVM. on 02-07-2003

No.	Name of Participant	Address	Signature
1	20.06.03	congrat	Enathakal
2	A. M. Mathew	Ancheril	Mathew
3	T. J. Joseph	Thuruppil	Joseph
4	James Mathew	Cherupuzha - P.V. Centre	James
5	N. V. John	Christie Villa, Palai	John
6	Sebastian George	Mattathil Palai	Sebastian
7	Siby Jose	Choiru Shree mast	Siby
8	JOSEPH JUSTIN	VATAKUNNEL ENTERPRISES	Justin
9	P. R. Gopalakrishnan	Shree Manas	Gopal
10	R. G. Prasanna	Pathanam	Prasanna
11	Joseph Mathew, Puzha	ABAILASH BAKERIES Palai	Joseph
12	Georgelinty Mathew	Mamakkallu	Georgelinty
13	T. T. Mathew	Thakadipal Agavein	T. T. Mathew
14	P. V. Jose	Electroplating works	P. V. Jose
15	M. C. H. Bingham	Man. B. 11, D. L.	M. C. H. Bingham
16	K. V. Subramanya	Palai	K. V. Subramanya
17	CYRIL SOSEMOON NUNAKAL	Palai	CYRIL SOSEMOON NUNAKAL
18	Josekutty Cherupuzha Palai	Palai	Josekutty
19	C. J. Joseph	Chirappuzha	C. J. Joseph
20	Thomas Mathew (Comy)	KOTTARAM	Thomas Mathew
21	K. P. Rajan	Kochupuzha Palai	K. P. Rajan
22	Sojan Mathew	Valiyachal Palai	Sojan
23	Tommy Thomas	Linta Medicals	Tommy
24	Pius George	Thakadipal Anthinadu po.	Pius George
25	Francis Joseph	Thasappel	Francis Joseph
26	Francis Joseph	Mattathil	Francis Joseph
27	Tommy Mathew	Palakkal	Tommy Mathew

Annexure 6.3. Minutes of Meeting held at Kumbazha for KSTP Phase II Upgradation of Link 84

Venue: Simeon Stylites Orthodox Cathedral, Kumbazha

Date, Time: July 02, 2003, 0930 a.m.

Public Participation:

Complete list of participants in the meeting is provided as attachment 1. The meeting and the invitation were carried out by the PMT through the KSTP divisional office at Ponkunnam. Although individual invitations were limited to about 50 PAPs, 110 persons turned up for the meeting (Attachment-A1). The reason for such large crowd at the meeting was due to wide publicity given by the Kumbazha action committee in the local newspapers for three successive days prior to the meeting. The photographs taken during the meeting is provided as attachment 2.

Participants from KSTP PMT/PCC:

Mr. Thomas, Superintending Engineer (SE), Project Management Team (PMT)

Mr. Sreekantan Nair, Environmental Engineer (EE), PMT

Mr BGP Reddy, Design Engineer, PCC

Mr. Emmanuel Sociologist, PMT

Mr. Sundara Rajan C.V., Environmental Specialist, PCC

Participants from KSTP Ponkunnam division:

Mr George Kutty, EE, Ponkunnam Division

Mr Johny George, AE, Ponkunnam division

Mr Prakash S, AE, Ponkunnam division

Mr T.K. Thomas SE welcomed the audience, introduced the KSTP team and explained the various aspects of the project preparation as well as the procedures relating to land acquisition.

The PCC Environmentalist Mr Sundara Rajan seeing the mood of the people then stood up and talked on the environmental and sociological considerations and the various levels of public consultations held during the last four years. When the environmentalist stated that there was a meeting with Konni Public Committee the emotionally charged Project Affected Persons (PAPs) shouted that they are not in a mood to listen to the KSTP team, rather they want to air their grievances and the authorities should immediately take action to resolve their problems. More than 50 Project Affected Persons (PAPs) assembled at that time were emotionally charged and started showing their impatience. The PCC environmentalist has therefore discontinued the talk and invited the PAPs to present their issues and problems one by one.

The first PAP to speak was Mr N Sukumara Pillai, president of the Konny Public Committee. Mr. Pillai, informed the entire audience that the former Director of KSTP had promised that the project will follow Central Widening (CW) i.e., 7.5m towards either sides from the centre. Mr Pillai insisted that he wanted to specifically face and address the entire audience rather than the KSTP team. President has alleged that the actual widening now envisaged is against the principle laid out by the World Bank. Land acquisition towards one side under the pretext of curve straightening were clear instances of nepotism and corruption. The nutshell of the readout message was that the present alignment is unacceptable to the local people. There were even

allegations that the KSTP is trying to help the Malaysian Contractors by introducing heavy filling and cutting along the new corridors (Realignments). Mr Sukumaran further stated that the SE is now trying to soften the resistance under pressure from Bank. After the turn of first PAP, seventeen other Project Affected Persons (PAPs) explained their grievances followed by submission of memorandums. Some even equated the new alignment and the related land acquisition as broad day robbery. As the invitations were extended to all PAPs on either side of the road, there were arguments and counter arguments with regard to the selected alignments. Although a change in the alignment could trigger an impact, most of these people are not Project Affected Persons (PAPs).

Further the emotionally charged PAPs rushed to the dais creating noisy scenes and melee. The entire meeting was later noisy and there were 60 number of memorandums/representations. Many representations received are copies of the representations forwarded earlier to the Minister and the PWD. The various representations were compiled briefly and enclosed as Attachment-b3.

Mr KA Emmanuel Sociologist, PMT- KSTP made several attempts to explain the compensation, Resettlement & Rehabilitation package. But the people were no mood to listen to them. The PAPs mentioned that only central widening is acceptable to them. The Konni Panchayat vice president Mr. Shamraj explained the need for good road and stated that many apprehensions of the people are based on “misunderstanding”. President however stated that there are some genuine problems. If people are not cooperative, even these genuine cases will be left out. Although initially people were very attentive, soon they started shouting as they disagreed with him and in the noisy scenario people clustered in groups and started verbal duels.

Report on meeting with Konni Public Committee (KPC)

The ‘Konni Public Committee’ was unhappy over the invitation of large number of other people, as they believed that they are instrumental in organising such a meeting with the KSTP team.

Taking this into account a separate sitting was arranged immediately after the noisy general meeting for the Konny Public Committee (KPC) with regard to a decision on the follow up of their memorandums to the World Bank. The various aspects of land acquisition and compensations were explained to the committee. Although certain important aspects of Resettlement and Rehabilitation (R & R) were explained briefly to the committee, they were in no mood to take it as real. They termed the RAP and R&R policy as gimmicks.

KPC members emphatically stated that they believed that the entire process of KSTP with regard to Link 84 was not transparent. Hence none of them was willing to listen to the compensation package unless and until the present alignment which they alleged as irregularities, were amicably resolved with central widening as a general principle.

They emphasized time and again that they do not want to part with their property whatever may be the compensation or rehabilitation package offered to them.

The KPC was very firm on the following:

Widen the road uniformly and equally on both sides to make it 15 meters broad. As all curves are not straightened in the new alignment, leave the curves as they are. The discrimination and injustice of acquiring land from one side of the road alone should be stopped.

All available Government land (Puramboke land) should be utilized fully for the upgradation of road and acquisition of private land should be effected only where govt. land is insufficient.

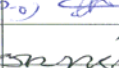
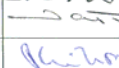
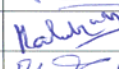
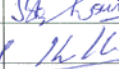
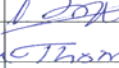
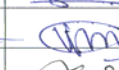
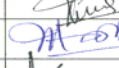
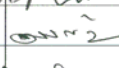
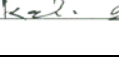
In the eventuality of a deviation from the existing road the government land should be transferred to the persons whose property is being acquired.

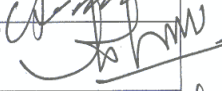
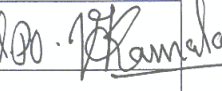
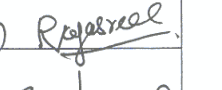
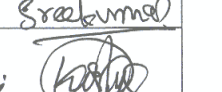
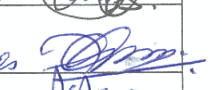
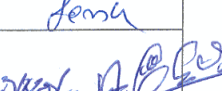
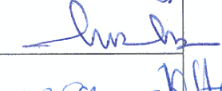
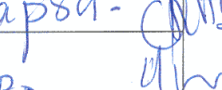
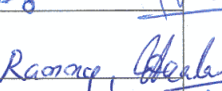
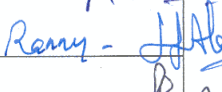
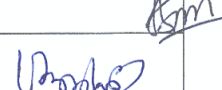
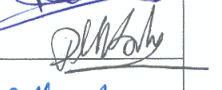
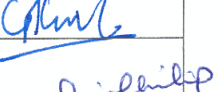
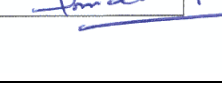
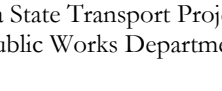
Observing the privilege given to the Konni committee, the people of Ranny wanted to have a separate sitting to discuss their grievances. The various aspects of land acquisition and compensations were explained to the people of Konni.

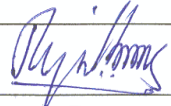
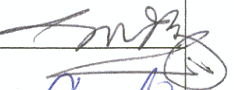
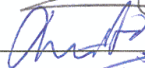
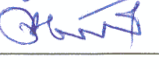
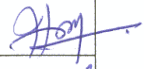
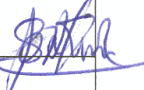
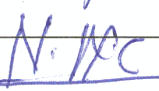
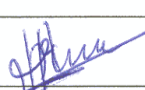
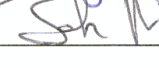
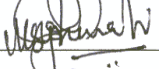
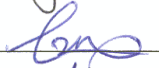
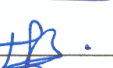
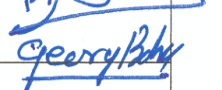
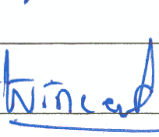
The public meeting started exactly as scheduled at 9.30am and continued till 12.30 noon followed by site visits that were made to some typical locations along the project road.

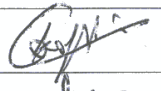
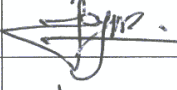
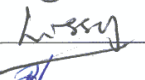
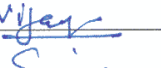
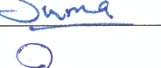
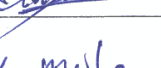
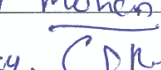
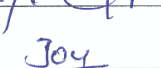
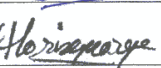
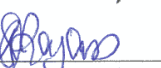
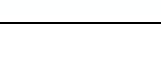
ATTACHMENT 1
LIST OF PARTICIPANTS ATTENDED THE MEETING

Public consultation conducted on 21/10/03
at Kumbazha, Palharamthitta for Link-84.

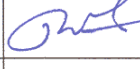
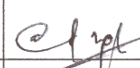
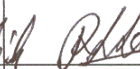
Sl No	Name of participants	Address/designation	Signature
1.	P.T. George	Pampakotta House Uthimoodu P.O. Palharamthitta	
2	Philip Mathew	Thengamkudi, Uthimoodu P.O.	
3	N. Sukunathan	Soor AD Dargah	
4	C.V. Krishnan	Charuvu P.O. Palharamthitta	
5	Philipose Philip	Koottikavath House Uthimoodu P.O.	
7	Kannukaran Nair	Vazhachalayi, Konni.	
8	Balakrishnan Nair	Rathu V. Lab, 17 Tattapuzha	
9	K.C. Mathew	Kallavattal Chellakudi	
10	Philip Cherian	Valliyaparambil, Kumbazha	
11	Kuriyappan Samuel	Valliyaparambil, Kumbazha	
12	Varghese Mathew	Asha Bhavan, Konni.	
13	T.G. Pappan	Sothakkal House, Kumbazha	
14	Thomaskutty T.	Thengidayil Kumbazha	
15	C.T. Chacko	Kinaraasilayi - Har	
16	Digi Daniel	Anchunuvadakkathi, Konni	
17	Dhamayazhi	Valliyaparambil, Konni	
18	P.T. Thomas	Perungudi House, Konni P.O.	
19	George Varghese	Thickunil House Konni Mangalam	
20	A.T. George	Edaralamuriyil Mangalam, Konni	
21	Mathew Easo	Amichal House Konni P.O. (Mammadi)	
22	K.P. Prabhakaran	Koottikavath, Varkazh	
23	V. John, Secretary	I.P. Church, Marimangalam	

Sl No	Name of participants	Address/designation	Signature
24	A.V. Mathew	Thiruvananthapuram, P.O. 2/10/00, 2/10/00	
25	John C. Varghese	2/10/00, 2/10/00, 2/10/00	
26	V. Kamalasekaran	Thiruvananthapuram, Muringakal P.O.	
27	R. Sreekumar	Thiruvananthapuram, Salimamandiram	
28	S. Rajasee	Muringakal P.O.	
29	R.S. Koshy	Kulamangal, Mangalamkudi	
30	V.M. Samuel, Trustee	St. George, Changanassery	
31	G. Krishnakumar	Thiruvananthapuram, Kadamalilalankun	
32	Jemu Mathew	Kadamalilalankun	
33	A.P. Easwar	Thiruvananthapuram, Palamoor	
34	P.N. BHASKARAN NAIR	JAI. BHASKARAN Kooni	
35	P.J. Thomas - Nibuvilla	Palamoor, Kumbazha	
36	T.G. Thimkadan	Kochuvilapil, Mylapora	
37	K.A. PHILIP	Karuvancheri, Molekum P.O.	
38	V.C. Abraham	Vagala Hills vicar, Mamuniam P.O.	
39	K.K. Abraham	Karumala, Mandiram, Rany	
40	K.K. Mathew	Kallukhakkunnam, Uthimadu	
41	P.S. Varghese	Thekkizhithi Kooni	
42	Abdul Wajeez (Syamal)	Psd f, Kooni Goma Panchayat	
43	P.S. Koshy	Pooramand Kooni	
44	G.I. George	Georakathinal, Kumbazha	
45	PRINCE PHILIP	Therakathukalayil, Eliyarakal, Kooni	

Sl No	Name of participants	Address/designation	Signature
46	E. T. Rajan	Puthuparampil Puthen Veedu Vakayar. Po. Kooni	
47	C. K. Mathew	Chirakadavil, Mannarakulangi Mylepora Town P.T.A.	
48	V. D. Georgekutty	Valliyaparampil Kuzhuvallur	
49	A. O. O. Omik	Edum. Puzha	
50	P. A. Mohammed	M.S. Mangal. Mannoor	
51	RAJU DANIEL	AIRIYIEL HOUSE, KUMBASAGHA	
52	Kamalasan	Palamkunnathil Tottam, Pannai	
53	N. N. Chandran - Galkin.	Santhibhavan Kalamangal	
54	Prabakaran. ER	Chakkankal - Ranni	
55	Nijayam x. A. G	Arumanoor / Kumbazha	
56	John Mathew	Koodathinal House Uthimoodu P.O. Ranni	
57	Amalambika	Vineyapuram Thangalpur	
58	Yohannan Sankarathil, Kumbazha		
59	A. L. BALAN	Uthimoodu, Ranni	
60	A. S. Harichandran Var	Arumanoor Puthenveedu Kumbazha	
61	Ledithambika T. S	Arumanoor Puthenveedu	
62	Salyman	Kizhakkemurugel	
63	BABU. T.	Kallichelkun House	
64	George Babu	Kumbazha. P.O. Ezhipurayil House Kumbazha	
65	Sajan. P. Varghese	Mepethoor House Mylepora Town. P.O.	

Sl No	Name of participants	Address/designation	Signature
66	M. J. GEORGE	MAHIVAS HOUSE MYLAPRA TOWN	
67	V. P. Joy	MAHIVAS VATHAYIL MYLAPRA TOWN P.O	
68	Lissy Babu.	Kallichal House Kumbazhappu P.O	
69	RAJU : N.V	~~Neelilvali~~	
70	Apalakrishnan Nair	lethesadanam Samiepadi	
71	Rajagoran V.V	"	
72	S. J. J. J. J.	S. J. J. J. J.	
73	S. V. J. J. J. J.	S. J. J. J. J.	
74	K. D. George	Madappallil, Kumbazhappu	
75	Rajan George	Madappallil, Kumbazhappu	
76	Charles Thomas	Kadavil, Madappallil,	
77	Binusa Saeed	palamurugil House.	
78	Vijayamma	Ushas.	
79	Suma Jolly	Kodathu house	
80	Madhu	Komala Bhawan	
81	Shameerudeen	Chelluadu	
82	Mohankumar	midhan Nival Ekalolam	
83	Ravendran Nair	Chemakalil Malloay. CPK	
84	Joy chinekalayil	Kondi, mangram.	
85	Morise George	Palamurugil home Madhassay	
86	P. Indira Rajan	Kalarickal	
87	Nareyana Pillai	Punnamoorthi, palimela	

Sl No	Name of participants	Address/designation	Signature
88	കുമാരൻ	Punnacotti/Veedu	
89	Omanayama P G	TISU Bhavanam Puthimukku.	Omanayama P G
90	കുമാരൻ	കുമാരൻ കെട്ടിടം	
91	കുമാരൻ	Nitya Chanthanya. Konni	Shela Jagadith
92	കുമാരൻ	വടവേലി	
93	കുമാരൻ	കുമാരൻ	
94	S. Valsala	Nangale Puthil Veedu	S. Valsala
95	T. P. Suresh	കുമാരൻ, കോട്ടയം	
96	T. P. Suresh		
96	George Thomas	Konuvu Cheril, Mylapra P.O	
97	A. N. Chandragadan	Santhi Bhavan, Kalanjoor. P.O	
98	T. J. JOHN	THADATHIL MYLAPRA	
99	P. K. Chandrasekhar	Principal R.V.H.S.S Ka	
100	P. T. Gresh, Principal	Principal S.C. English Medium School, Puthuvayal	
101	C. T. Chandra K	Kankavayal	
102	ANIL R. TITUS	KOCHUVEETTIL Kumbazha P.O	
103	M. P. Anil Kumar	Menampuzhatu House	
104	S. Jithin	Thengukavu P.O	
105	K. N. NINAD	KALANTJOUR P.O.	
106	B. C. NAIR	Kanuvu Cheril	
107	Ramkrisnan	Padi Ppuval	
108	Thomas M. Oommen	Manukyuni Vakayar. P.O, Konny.	

Sl No	Name of participants	Address/designation	Signature
104	P. T. George,	Pampakotta House UTHIMOOL P.O.	
105	Mohan Kumar.	Pulimulku.	
106	C-V-MAN	Cholamattu, Lamy	
107	Unnikrishnan	Kungallappalli	
108	Padmanabha Pillai	Rajali Bhavan, Mallaseeng, Koni	
109	P.K. Ravi	Rajali Bhavan II, Mallaseeng, Kundam	
110	P.K. Abraham	Vellasseril puthuvelli	

Annexure 6.4. Minutes of Meeting –1 held at Pramadam Panchayat Office for KSTP Phase II Upgradation for Link-84

Venue: Panchayat Office, Pramadam, Pathanamthitta Dist

Date: Time- July 18, 2003 , 10.30 a.m.

Participation: Panchayath Presidents and members as detailed in the attachment. The meeting and the invitation were carried out by the PMT, through the KSTP divisional office at Ponkunnam. (the list of participants and photographs attached as attachment c1 & c2). The invitation letter prepared in Malayalam by the KSTP, Ponkunnam is also enclosed for reference as attachment-C3.

Participants from KSTP PMT/PCC

Mr. Sreekantan Nair, Environmental Engineer (EE), PMT

Mr. Emmanuel, Sociologist, PMT

Mr. Sundara Rajan.C.V, Environmental Specialist, PCC

Dr.Latha Bhaskar, Social Development Expert, PCC

Mr.B.G.P.Reddy, Design Engineer, PCC

Participants from KSTP, Ponkunnam.

Mr. George Kutty, EE, Ponkunnam Division

Mr. Prakash, AE, Ponkunnam Div.

Mr. John Kenneth, AE, Ponkunnam Div.

The Panchayat President, Mr. M.V.Philip welcomed the team and opened up the discussions. The team members introduced themselves and explained that the purpose of the visit as to get the support of the Panchayat authorities to facilitate land acquisition for the Link 84-1.4(Punalur-Ponkunnam) through replacement and rehabilitation of the PAPs within Pramadam panchayat area and facilitate upgradation works as per the KSTP. A Public consultation held at Kumbazha on 2nd July 2003, inviting all affected persons, ended in chaos as the affected and unaffected staying on both sides of the road were at each other's throats over the issue of land acquisition and the team could not win over and convince of the compensation packages. So this meeting of the Local Self Government leaders was called for, to seek their support to move ahead.

Opening up the discussion the Executive Engineer of Ponkunnam Division, Mr. George Kutty explained the background of the project and the positive impacts expected through this project. In continuation to this Mr. Sreekantan Nair, Environmental Engineer, PMT, explained the status of implementation of the project and the specifications of upgradation works in Punalur-Ponkunnam road. This linkage needs the maximum upgradation works, as there are certain hairpin bends to be straightened for safe travel radius. The Panchayat members are well aware of the corridor of impact marked for the road upgradation works vis-à-vis the PAPs. They reiterated the need for road upgradation in the context of development and safety but expressed their concern over the PAPs. Clarifying to their doubts, Mr. Emmanuel, the Sociologist of the PMT, explained the compensation packages offered by the project for rehabilitation and resettlement of the PAPs. He explained that even the squatters and encroachers would be compensated to ensure that nobody would be adversely affected due to this project. The members clarified their doubts on the compensation packages and the specific queries raised are given below.

- What are the means for the valuation of the land and assets?
- What are the replacement procedures?
- What are the transition packages and when it will be settled?
- What is the composition of the District level committees and grievance Redressal committees and is there any representation for the locals in it?
- What are the scope and possibility for widening of bridges and provisions for bus bay and parking space in junctions?
- What are the roles of proposed NGOs?
- What is the expected completion period of the project?

The team clarified these doubts. Mr. Sundara Rajan, Environmental specialist of the PCC then made clear that even though the State has the power to acquire the land for common good vide the Land acquisition Act, the project is much concerned of the PAPs and provide adequate compensation for their losses. Due to this ample time is invested for social and environmental studies and preparation of Resettlement Action Plan as well as field level consultations, to ensure the well being of the project affected persons. The resettlement Action Plan (RAP) so prepared is a transparent document, which anybody can access and is even available in the websites of PWD. Due to all these efforts more time is invested for planning phase and once it is perfect implementation will be smooth. NGOs will be engaged to prepare micro plans pertaining to each PAP and support for the implementation of the same in the field. To explain all these consultations were arranged at Kumbazha on 2nd July 2003, but the participants were so annoyed that they were impatient to pay attention to the team. Everyone demanded to acquire the land opposite to his/her property, sparing them. As a result of this the team couldn't convince the PAPs on the compensation packages etc, for which the consultation was arranged there. Referring to this event the panchayat member Mr.K.E.Varghese remarked that those who are adversely affected have apprehension about the transparency of the project and the design of the road. The Team explained the multiple criteria considered for the design and the design Engineer Mr.B.G.P.Reddy explained the same with the support of the sitemap but the member complained that acquisition of land from one side of the road is not justifiable. He spotted a specific case in a bend where the car porch will be acquired and the access to the house will be difficult when the land is acquired for upgradation and requested realignment avoiding acquisition from that bent. The divisional team who know the spot ruled out the possibility, but agreed to revisit to ascertain the situation. It was ensured that maximum care will be taken to ensure justice and compensation to all PAPs and proposed to call the PAPs alone for a personal hearing at an early date. Though they have moved the court for their grievance redressal, the member ensured that the issue can be settled amicably as the project have ample scope for compensation, which the PAPs need to understand first. The President and Panchayat members assured their unreserved cooperation and reiterated the need for upgradation of the road, which will be vital in their area development. To facilitate this further it was decided to call for the meeting of all affected persons (and they alone) for an amicable settlement and discuss further, in the presence of the GP team. The members also suggested that a copy of the complaints filed might be shared with them, so that they can discuss with people to settle the issue.

**ATTACHMENT 1
LIST OF PARTICIPANTS**

Attendance at meeting held at Pramadampanchayat

Dt: 18/07/03

<u>Name</u>	<u>Designation/Address</u>	<u>Signature</u>
1) B. K. Reddy	Highway Engineer Louis Berger Fund	
2) Sreekanth Nair	Asst. Exec. Engineer	
3) T. K. George	Asst. Engineer, KSTP, Ponkunnam	
4) K. R. Varghese	V Ward	
5) R. Appukutty Nair	H/O POP	
6) J. A. Prasanna Kumar	A.E, K.S.T.P Ponkunnam	
7) Prakash S.	AE, KSTP Dn, Ponkunnam.	
8) K. A. Emmanuel	Sociologist PMT, KSTP	
9) Dr. Latha Bhaskar	Social Development Expert LBZ. PCC, KSTP	
10) M. K. Somanakrishnan	Secretary, Pramadom Grama Panchayat	
11) M. U. Philip	President, Pramadom Grama Panchayat	
12) ROBIN PETER	Vice President Pramadom Grama Panchayat	
13) Vijayarajan Ravindran	Uthara Panchayat Ward VII	
14) George Thomas	Member III ward	
15) Richi K. George	Member II ward	
16) C. V. Sundara Rajan	Enviro Mitti specialist	
17) John Kenneth D.	Assistant Engineer KSTP, Ponkunnam	
18) K. E. Varghese	Member No XI Pramadom Grama Panchayat	
19) N. Gopinathan Nair	Standing Committee Ward No XIII (Pramadom Grama Panchayat)	

Annexure 6.5. Minutes of Meeting –2 held at Konni Panchayat

Venue- Panchayat Office, Konni, Pathanamthitta Dist

Date&Time- July 18th 2003, 2.30 p.m.

Participation- Panchayath Vice-Presidents and members as detailed in the attachment. The meeting and the invitation were carried out by the PMT, through the KSTP divisional office at Ponkunnam. (The list of participants and photographs attached as attachment d1 & d2) The invitation letter prepared in Malayalam by the KSTP, Ponkunnam is also enclosed for reference as attachment.

Participants from KSTP PMT/PCC

Mr. Sreekantan Nair, Environmental Engineer (EE), PMT

Mr. Emmanuel, Sociologist, PMT

Mr. Sundara Rajan.C.V, Environmental Specialist, PCC

Dr.Latha Bhaskar, Social Development Expert, PCC

Mr.B.G.P.Reddy, Design Engineer, PCC

Participants from KSTP, Ponkunnam.

Mr. George Kutty, EE, Ponkunnam Division

Mr. Prakash, AE, Ponkunnam Div.

Mr. John Kenneth, AE, Ponkunnam Div.

The Grama panchayat President was away on tour and with his concurrence, the Vice-president Shri .K. Gopinatha Pillai, convened the meeting. The KSTP Team explained the purpose of the visit as to get the support of the Panchayat authorities to facilitate land acquisition for the Link 84-1.4 (Punalur-Ponkunnam) through replacement and rehabilitation of the PAPs within Konni panchayat area and facilitate upgradation works as per the KSTP. A Public consultation held at Kumbazha on 2nd July 2003, inviting all affected persons, ended in chaos as the affected and unaffected staying on both sides of the road were at each other's throats over the issue of land acquisition and the team could not win over and convince of the compensation packages. So this meeting of the Local Self Government leaders was called for, to seek their support to move ahead.

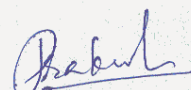
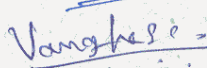
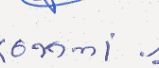
Welcoming the KSTP Team, Panchayat members expressed their apprehensions of the scheme and concern of the affected parties. Clarifying their doubts, the scheme was briefly explained to them and the Malayalam version of the resettlement and rehabilitation policy documents were circulated for detailed reading. They raised questions about the land acquisition and compensation packages. This was explained in detail to them. The main questions include-

- How is the design of construction finalised?
- If there is a complaint about the design where and whom to complaint?
- Who will finally decide the compensation and the criteria thereof?
- The composition of the Grievance Redressal committee and procedures?
- Compensation for those without any title deeds.

The team clarified all queries in detail and finally the members were convinced of the compensation packages for PAPs. Some of them opined that those who are resisting need to be

made aware of these benefits to get their support and assured that whenever there is an opportunity, the Panchayat members will try their level best to support the project. A meeting of the affected persons (alone) needs to be convened immediately to facilitate further actions in this connection. The panchayat committee assured their full support for these process, but do not want to get involve directly solving issues. As they are convinced they will try to convince the people in turn and requested KSTP to arrange for this. The meeting concluded at 4.30 p.m. with the vote of thanks by the vice president.

**ATTACHEMENT
LIST OF PARTICIPANTS**

Attendance / Meeting ^{held at} <u>Konni Panchayat</u> dt: 18.07.03		
<u>Name</u>	<u>Designation / Address</u>	<u>Signature</u>
1. B & P Reddy	Highway Engineer Louis Berger Group	
2. K.A. Emmanuel	Sociologist PMT KSTP	
3. Prakash S, AE, K.S.T.P. Dn, Ponkunnam		
4. K.A Prasannakumar A.E, K.S.T.P Ponkunnam		
5. Dr. Latha Bhaskar, Social Env. Expert, PCC		
6. T.K. Georgekutty, Exec. Engineer, K.S.T.P. Ponkunnam.		
7. K. Gopinatha Pillai - Vice President Coam Panchayat		
8. Sebu George, Chairman Konni.		
9. N. Prakashan Nair, Asst Ex. Engineer		
10. C.V. Sundara Rajan Sr. Specialist		
11. Thulasi Moorthy, wordman.		
12. Roji Baby, member Ward III Konni		
13. Varghese Abraham, Ward VII Konni		
14. Gope Nathar, m.s. (Kannur) ward		
15. A. Sathyanama, word. XIV, Konni		

കേരള പൊതുമരാമത്ത് വകുപ്പ്

കേരള സംസ്ഥാന ഗതാഗത പദ്ധതി ഡിവിഷൻ (KSTP)

പൊൻകുന്നം, കാഞ്ഞിരപ്പള്ളി - 686 507

ഫോൺ : 04828 - 206961

നം. PNW/25/03

തീയതി : 3-7-2003

പ്രേക്ഷകൻ

റ്റി. കെ. ജോർജ്ജുകുട്ടി

എക്സിക്യൂട്ടീവ് എഞ്ചിനീയർ

സീക്രട്ടറി

പ്രസിഡന്റ് / ചെയർമാൻ / സെക്രട്ടറി

..... ഗ്രാമപഞ്ചായത്ത് / മുനിസിപ്പാലിറ്റി

സർ,

വിഷയം : KSTP പുനലൂർ - തൊടുപുഴ റോഡ് വികസനം.

സൂചന : 1) കേരള ഹൈവേ സംരക്ഷണ നിയമം 1999, കേരള ഗസറ്റ് വാല്യം 45, നമ്പർ 114.

2) സ. ഉ. (സാ) നം. 1/ 2003/പൊ. മ. വ., തീയതി : 1-1-2003, തിരുവനന്തപുരം.

3) കേരള സംസ്ഥാന ഹൈവേയ്സ് പദ്ധതി, പുനർവ്യാസ പുനരധിവാസ നയരൂപരേഖ ആഗസ്റ്റ് 2000.

KSTP യുടെ ഭാഗമായി പുനലൂർ - തൊടുപുഴ റോഡ് വികസനത്തിന് ആവശ്യമായ സ്ഥലം ഏറ്റെടുക്കുന്നതിനു വേണ്ടി കോൺക്രീറ്റ് കുറ്റികൾ സ്ഥാപിച്ചുകൊണ്ടിരിക്കുകയാണ്. നിലവിലുള്ള റോഡിന്റെ വശങ്ങളിൽ സ്ഥാപിച്ചിരിക്കുന്ന കുറ്റികൾക്കിടയിലുള്ള ഭാഗമാണ് റോഡ് വികസനത്തിനാവശ്യമായിട്ടുള്ളത്. ഇങ്ങനെ കുറ്റികൾ സ്ഥാപിക്കുന്നതിനുള്ള അധികാരത്തെപ്പറ്റിയും സർക്കാർ ഏറ്റെടുക്കുന്ന സ്വത്തിനു ലഭിക്കുന്ന നഷ്ട പരിഹാരങ്ങളെപ്പറ്റിയും പല സ്ഥലങ്ങളിൽ നിന്നും അന്വേഷണങ്ങൾ ഈ ഓഫീസിൽ ലഭിച്ചിട്ടുണ്ട്. സൂചന (1)ഉം (2)ഉം അനുസരിച്ചാണ് പൊതുമരാമത്ത് വകുപ്പിുകാരികൾ ഈ കുറ്റികൾ സ്ഥാപിക്കുന്നത്. സാധാരണയായി പൊന്നും വിലയ്ക്ക് സർക്കാർ സ്ഥലമേറ്റെടുക്കുമ്പോൾ കൊടുക്കുന്ന നഷ്ടപരിഹാരത്തിനു പുറമെ ഈ പദ്ധതിയുടെ ഭാഗമായി സൂചന (3)ലെ നയരൂപരേഖയനുസരിച്ചുള്ള പുനർവ്യാസ-പുനരധിവാസ നടപടികളും കൈക്കൊള്ളുന്നതാണ്. ഇതു സംബന്ധിച്ചുള്ള വിവരങ്ങൾ പദ്ധതി ബാധിതരായ ഓരോരുത്തരെയും നേരിൽ കണ്ട് പറഞ്ഞു മനസ്സിലാക്കുന്നതിനായി "സർക്കാരിതര സേവന സംഘടന"ങ്ങളെ (NGO) നിയോഗിക്കുന്നതാണ്. കുറ്റികൾക്കിടയിലുള്ള സ്ഥലത്ത് റവന്യൂ സർവ്വേ ചെയ്യുമ്പോൾ തന്നെ സ്വകാര്യ സ്വത്തുടമകളെ കണ്ടുപിടിച്ച് നേരിട്ട് ബന്ധപ്പെടുന്നതാണ്. അതുവരെയുണ്ടാകുന്ന ചെറിയ കാലതാമസങ്ങൾ ക്ഷമിച്ചു കൊണ്ട് ഈ ഹൈവേ വികസന പ്രവർത്തനങ്ങൾ ജനസഹകരണത്തോടെ നടത്തുവാൻ താങ്കളുടെയും മറ്റു പൊതു പ്രവർത്തകരുടെയും വിലയേറിയ സഹായം അഭ്യർത്ഥിക്കുന്നു. പുനലൂർ-തൊടുപുഴ റോഡിനോടനുബന്ധിച്ചുള്ള താങ്കളുടെ പ്രവർത്തന മേഖലയിലെ പദ്ധതി ബാധിതരായ ജനങ്ങളെ ബോധവൽക്കരിക്കുന്നതിലേയ്ക്കായി സർക്കാർ അംഗീകരിച്ച പുനർവ്യാസ-പുനരധിവാസ നയരൂപരേഖയുടെ പകർപ്പുകൾ ഇതോടൊപ്പം അയക്കുന്നു. പുനലൂർ-തൊടുപുഴ സംസ്ഥാന ഹൈവേയുടെ വശങ്ങളിൽ ഇനി പുതിയ കെട്ടിട നിർമ്മാണ പ്രവർത്തനങ്ങൾക്ക് അംഗീകാരം നൽകുമ്പോൾ ഇപ്പോൾ സ്ഥാപിച്ചിരിക്കുന്ന കുറ്റികൾക്ക് വെളിയിൽ നിയമാനുസൃതമായ അകലം കരുതുവാനും ദയവായി ശ്രദ്ധിക്കണം.

താങ്കളുടെ വിശ്വസ്ത വിധേയൻ

എക്സിക്യൂട്ടീവ് എഞ്ചിനീയർ

Acc : നയരൂപരേഖ കോപ്പി

പകർപ്പുകൾ : സുപ്രണ്ടിംഗ് എഞ്ചിനീയർ, KSTP തിരുവനന്തപുരം,

ജില്ലാ കളക്ടർ / എക്സിക്യൂട്ടീവ് എഞ്ചിനീയർ കൊല്ലം, പത്തനംതിട്ട, കോട്ടയം, ഇടുക്കി.

തഹസിൽദാർ പുനലൂർ (പത്തനംപുരം), കോഴഞ്ചേരി (പത്തനംതിട്ട), റാന്നി,

കാഞ്ഞിരപ്പള്ളി, പാലാ, തൊടുപുഴ

Annexure 6.6. Minutes of Scoping Workshop for Kerala State Transport Project**SCOPING WORKSHOP - 1
THIRUVANANTHAPURAM, 18TH JANUARY, 2000****MINUTES**

An environmental and social scoping workshop was held on the 18th January in the PWD Rest House at Thycaud, Thiruvananthapuram. This was the first of the three that were proposed to help identify priority environmental and social issues, covering the districts of Thiruvananthapuram, Kollam, and Parthanamthitta. Mr. Karrappuni, Chief Engineer, Roads and Bridges Department of the PWD opened the workshop with a keynote address. Mr. David Wood, Team Leader of the PCC, made a welcome speech. Mr. Dushyantha Kumar, Director of the Project Implementation Unit, was Chairman.

Apart from the organizers, the various NGOs and officials who attended the workshop included:

K. Viswanath, Director, Mitraniketan.
M.P. Muralidharan, Geological Survey of India, Kerala Unit, Trivandrum.
K.M. Ravindran, Special Officer, Roads and Bridges Development Corporation.
Shiju Cherian, Kodumon Grama Vikasana Samithy, Pathanamthitta.
C. Christu Das, Director, The Dale View, Punalal P.O., Poovachal (via), Trivandrum.
Dr. S.P. Thampi, Director, Marine Archeology, Govt. of Kerala, Trivandrum.
K. Thomas Paulose, Vice President, Friends of the Trees, Trivandrum.
S. Chandra Mohan, Asst. Director, Kerala State Land Use Board, Trivandrum.
Sudheer Babu, S., Environmental Engineer, Kerala State Pollution Control Board.
Abdul Samad, Specialist (Soil Conservation), Kerala State Land Use Board.
C.K. Karunakaran, Secretary, Friends of Trees, Trivandrum.
Anil Kumar, P.V., Rajiv Gandhi Cultural Study Centre, Venganoor, Trivandrum.
Edwin George, The Salvation Army, Kawdiar, Trivandrum.
Mr. Sunder, Project Coordinator, Rajiv Gandhi Centre, Trivandrum.
Tommy Cyriac, Consultant, Finance Department, Govt. of Kerala.
Jacob Mohan George, Asst. Executive Engineer, Trivandrum.
Ms Sonia Kapoor, Environmental Specialist, The World Bank, New Delhi.

Mr. Karrappuni mentioned that the aim of the project is to rehabilitate and improve the existing roads with minimal acquisition of land and minimum dislocation of people and maximum benefit to the population at large. The objective of the workshop is to gather inputs and concerns from the public, NGOs, and experts for the scoping of the environmental and social aspects of the project.

After the welcome address, the various experts addressed the audience with their assigned topics for discussion. Mr. Andrew Blelloch, Environmental Specialist, talked on the environmental and social assessment process for the highways. Bill Cummings, Social Impact Specialist, talked on the environmental and social assessment process for the waterways. Mr. Sundara Rajan, Environment Impact Coordinator, talked on the environmental concerns in highways and waterways, and Dr. Biswanath Debnath, Social Impact Coordinator, discussed social concerns relating to highways.

The participants joined the discussion with their presentation. Mr. M.P. Muralidharan of the Geological Survey of India talked about the physical environment. He mentioned that the road alignments and widths in Kerala are unscientific, which may be made better with the use of

satellite survey information. Moreover, water logging on roads recurs during monsoons due to inappropriate design for the soil conditions. He suggested that the design of north-south roads and the east-west roads should be different.

Mr. Abdul Samad of the Kerala Land Use Board mentioned that there is a land degradation problem in Kerala due to the varying terrain and the fact that approximately 40% of the landmass of the State is prone to landslides and slope instability. He also mentioned that consideration should be given to a proper water management system, minimizing disturbance to the paddy fields, and the biotic issues during the execution of the project.

Mr. Sudheer Babu of the Kerala State Pollution Control Board mentioned that the PWD has to submit an application for conducting public hearing with the prescribed fees and 20 copies of the executive summary of the project for clearance by the KSPCB. The KSPCB will convene a panel for conducting the public hearing and subsequently make recommendations to the MoEF.

Mr. Christu Das, Director of Dale View, mentioned the apparent absence of coordination between the PWD and other line departments. He criticized the inadequate traffic signals, signboards and milestones and the frequent digging within the highways.

Mr. Ravindran, Special Officer, Roads and Bridges, described the difficulties involved in land acquisition for the roads. He mentioned that the effective width of the roads is reduced due to inadequate provisions for the pedestrians using the roads and also due to the existence of the utility poles.

Mr. Thomas Paulos, Vice President of Friends of the Tress and a retired town planner, also mentioned the difficulties involved in land acquisition for the roads. He mentioned that strict laws and regulations should facilitate land acquisition.

Mr. Karunakaran, Secretary of Friends of Trees mentioned that a committee should examine the environmental aspects and ensure that the guidelines are being followed. He maintained that the biological aspects of environment should be given more importance in this project. Various mitigation measures and safeguards should be ensured to protect the bio-diversity of the State.

Dr. Thampi of the Dept. of Archeology dealt at length with the importance of heritage tourism and the need for creating a cultural awareness in Kerala.

Ms Sonia Kapoor of the World Bank discussed the importance of the NGO involvement in this project and explained that the mitigation measures for various impacts can be formulated by conducting talks with stakeholders like NGOs, local people, etc. She also mentioned that the environmental and social impacts cannot be solved by the PWD alone. Hence, we should be realistic and pragmatic in dealing with these problems.

Mr. Anil Kumar of the Rajiv Gandhi Cultural Study Centre urged that coordination of various agencies should facilitate the rehabilitation programme, undertaking awareness classes for the pedestrians, and creating road management committees at the panchayat level. The workshop closed with thanks to the various attendees by the Chairman.

**KERALA STATE TRANSPORT PROJECT
SCOPING WORKSHOP - 2
ERNAKULAM, 25TH JANUARY, 2000**

MINUTES

An environmental and social scoping workshop was held on the 25th January in Hotel Renaissance, Ernakulam. This was the second of the three that were proposed to help identify priority environmental and social issues, covering the districts of Alappuzha, Ernakulam, Kottayam, Thrissur, Idukki, and Palakkad. The Project Implementation Unit (PIU), Irrigation Department and PCC decided to cover the entire Waterways issues at this scoping workshop. The Thiruvananthapuram workshop also discussed the waterways issue at a low profile. Er. E.K. Govindan, Superintending Engineer, Roads and Bridges Department of the PWD Central Circle, Aluva, opened the workshop with a keynote address. Mr. Andrew Belloch, Environmental Specialist in the PCC, made a welcome speech. Mr. Dushantha Kumar, Director of the Project Implementation Unit, was Chairman.

Apart from the organizers, the various NGOs and officials who attended the workshop included:

Mr. K. K. Abdul Gaffoor, KSINC, Kochi.

Dr. Shankar from the Kerala Forest Research Institute, Peechi, Thrissur.

Mr. Ravindran from the Kerala Shastra Sahitya Parishad, Thrissur.

Dr. Komala Vally Amma, SE, ID, Govt. of Kerala, Thiruvananthapuram.

Dr. V.N.Sivasankara Pillai, Cochin University for Science and Technology, Kochi.

Mr. Raji G. Nair, Assistant Executive Engineer, Irrigation Department, Kollam.

Mr. Joseph J. Karoor from the Friends of Periyar, Thekkady.

Er. Govindan mentioned that the traffic volume in Kerala is annually increasing at the rate of 10-11% and discussed the vital role of the road network in the state's development activities. He also mentioned that the aim of the project is to rehabilitate and improve the existing roads with minimal acquisition of land and minimum dislocation of people and maximum benefit to the population at large and the resettlement and rehabilitation objectives would be followed up with the panchayat level discussions.

After the keynote and welcome address, the various experts addressed the audience with their assigned topics for discussion. Mr. Andrew Belloch, Environmental Specialist, talked on the environmental and social assessment process for the highways. Mr. William Cummings, Social Impact Specialist, talked on the environmental and social assessment process for the waterways. Mr. Sundara Rajan, Environment Impact Coordinator, talked on the environmental concerns in highways and waterways, and Dr. Biswanath Debnath, Social Impact Coordinator, discussed social concerns relating to highways.

The participants joined the discussion with their presentation. Dr. Komala Vally Amma briefly described the Kerala waterways and made a comparison of the relative maintenance costs of the railways, the highways and the waterways and mentioned the cost per km in the waterways is Rs. 1000/- while it is Rs. 5000/- in the two other modes.

Mr. K. K. Abdul Gaffoor of KSINCO described at length certain waterways related facts of the cargo transport in Kerala. He mentioned that IWT carry both passengers and cargo. Industrial raw materials are being transported by IWT in Ernakulam area. Many parts of Inland Waterways have insufficient infrastructure facilities. Another problem faced by IWT sector in Kerala is insufficient loading and unloading facilities. Only 75% capacity of the boats and barges is being

used. Optimum size capacity of the barge is 500 MT but now only 150 MT vessels operate. The width and depth of Inland Water ways are not sufficient for this purpose. There is a future for Water Transport in Kerala for tourism as well as Cargo transport. The roads and railways have already reached a stratum point. Main problem associated is the hanging of power lines. There is a proposal for a joint venture high-speed catamaran service through the coastal area from Ernakulam to Thiruvananthapuram with private participation. Valiyathura in Thiruvananthapuram is easily accessible by the Harbor Engineering Department. Mr. Kumar suggested that their facts be put forwarded to the W.B officials when they reach Kochi.

Mr Raveendran of Kerala Shashtra Sahithya Parishath mentioned the bad condition of National water way -3. He is of the opinion that National Waterways are not developed properly. He further talked about two facts first is about the optimum use of present roads and the second one is the construction companies building new roads.

Mr. Regi G Nair – Asst. Engineer Irrigation Department, Kollam talked on the optimization of the containerization.

Dr. Shankar- Kerala Forest Research Institute, Peechi – Scientist in-charge, Agro forestry cum publicity. He compared Kerala to an Oceanic island. The principles of island biology should be taken into account. The climate of Kerala is also important. Statistically speaking Kerala receives 90% of its annual rainfall, in about 10 hrs. Tree cover of Kerala has decreased considerably. He clarified the following data of decreasing trend of forest coverage in the year 1900 –70% forested area, 1950 – 50% forested area. 2000 – 25% forested area. He presented a case study of Forest related EIA the Thenmala eco-tourism project for the participants. He explained the methodology followed to arrive at reasonable conclusions.. The EIA also focused on attitudes and approaches of people. Landslides usually occur in Erattupetta, Kulathupuzha region. Placing project components makes matrices. The eco tourism project is a registered charitable society. Mr. Mohanlal of the Indian Forest Service is the Secretary of the Thenmala ecotourism Society.

To a question from Mr Joseph J Karoor Friends of Periyar, Thekkady consultants stated that approximately 300 km length of roads out of 2800 km passes through ecologically sensitive areas. Consultants also explained the selection and screening process of roads. They indicated that economic interest and environmental aspects are prime concerns. Ecologically sensitive roads will not be deleted but will be subjected to detailed Environmental investigations to prepare an EIA in order to obtain MOEF for clearance in case these are included for further investigations. The consultants mentioned that a large percentage of accidents are taking place in rural areas.

A resident of Kuttanad area (Professor at CUSAT) where the three proposed waterways are planned explained the reasons for negligence of IWT. One of the main reasons is due to the faster mode of Road and Rail Transport. There are some private operators of boats. His impression is that through water ways only Cargo transport is possible and it is not profitable also. There are many country boats plying in Kuttanad area, which serves as a means of transport for the local people.

Dr. Komalavalli Amma mentioned that at present waterways are neglected and there is ample scope if it is properly developed.

Annexure 6.7. Details of Official Consultations

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
1	Mr Abdu Sammad Soil Conservation Specialist Kerala State Land Use Board Vikas Bhavan	Phone:442231 (O) 447830 (O) 475147 (R)	10 May 1999	Soil Conservation Data and Resource base available at Land Use Board.	No Published data .No books on Sale
2	Mr. Haridas P Nair Systems Manager, (On deputation from ISRO) Kerala State Remote sensing and Environment	360982 (R) Office: 440624, 447830 & 442231 kerrsec@400.nicgw.nic.in	10 May 1999	Remote sensing and GIS facilities available at this Office	No Published data .No books on Sale
3	Mr.M. Boominathan National Transportation Planning and Research Center (NATPAC) ,PRS Road,Thycaud, TVM 695 014	Phone:322624, 322581, 322681 Fax 91-0471-329414	6 May 1999	Various Activities of NATPAC especially R&R and Environmental aspects	No in-house Staff for R&R and Environmental Aspects.
4	Dr M Baba Director in Charge /Land use Commissioner Kerala State Land Use Board	442231(O) Fax:441167	Consulted	Consulted mainly about waterways With Mr. Malhotra of PCC. Some informal discussion about the CRZ Management Plan for Kerala was also discussed.	Received the Environmental Management plan after two days.
5	Mr. PKV Nair , Survey Of India (SOI) CGO Complex,Poomkulam (PO) TVM PIN 695522	Phone:481852(O)	16 April 1999	For Restricted and unrestricted SOI maps	PIU (PWD) submitted Application and later we received the SOI sheets
6	Mr. KK Thankappan State Editor,KERLA GAZATIERS	322618(O) 340823(R)	Consulted	With Mr William Cumming of PCC.	All useful gazetteers purchased.

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
7	Mr. VK Sinha, Chief Conservator of Forests (Wild Life) Forest Department	Phone:322217(O) 363958(R)	Consulted	No time for him to devote for this project and asked us to give it in writing.	Later we submitted our requirements never replied.
8	Mr. PK Surendranathan Asari, Principal Chief Conservator of Forests(Development &Project),	Phone:321610 321374(R) Fax	No formal consultation required till date.	Invited for Scoping Workshop through a formal letter.	Did not attend the scoping workshop.
9	Mr. K Sasidharan Nair, Principal Chief Conservator of Forests (General) Forest Department	Phone:321798 (O) 325584 (R)	Consulted	He indicated that unlike other States here forest conservation measures are active and successful ,land taking will have adhered Forest conservation rules (GOI & GOK)	He directed me to the Forest information office at social forestry division
10	Mr. Bhaskaran Census Department Deputy Director Operations CGO Complex,Poomkulam (PO),TVM,PIN 695522	Phone: 481860 Fax Email:	Consulted	For Restricted and unrestricted SOI maps	PIU (PWD) submitted Application and later we received the SOI sheets
11	Dr. Basak Executive Director, CWRDM,Kunnamangalam (MBR),Kozhikode, Pin 679573	Phone:0495355864 & 356242 Fax: Email:	Consulted formally and Informally	On sediment and water testing and Analysis and also on Scoping workshop	Consulted on advice from Prof. M. Jaya Kumar of State Committee on Science Technology And Environment.
12	Prof. M Jayakumar State Committee of Science & Technology & Environment Thycaud, Thiruvananthapuram		Consulted with environmental team of the project	Mainly CRZ and Waterways project. Need for Sediment testing water quality testing etc. Mr Kumar recommended CWRDM for sediment sampling and	CRZ related to Kuttanad area

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
				Analysis.	
13	Mr Vijaya Bhas Environmental Engineer, Kerala State Pollution Control Board (KSPCB), Pilamood	Phone: 318153 to 55 (3 nos) Fax No:	Consulted	Nothing specific has come out from the discussion	Purchased a book titled Environmental standards published by the SPCB
14	Survey Society Michel Gomas /Shanmugam/KM Soman, Additional Director, Director of land Survey and Records Opposite to Sri Mulam Club,	Phone: 325492	Consulted	Cadastral maps availability for the project Work. Resurvey work is in Progress.	Resurvey maps are also Available. Also received few district wise maps prepared by the department
15	Friends of Trees- Thiruvananthapuram Branch (FOT) Mr Thomas Poulose,B-8 Jawahar Nagar Thiruvananthapuram	Phone320954	Contacted	Project Environmentalist did a consultation with Mr Thomas Paulos as the contact person of the Organization	NGO
16	Er.Sathish Kumar, PWD City Road Section 3, Public Works Department, PMG	Phone: 364659 (R)	Consulted	No strip Plans are available for Kerala road network.	
17	Mr. R Radhakrishna, Ex, President, Kerala Shasthra Sahithy Parishath (KSSP),- Vanjiyoor Mathrubhoomi road TVM	525427(O) 752210(R)	Consulted on 30/04/1999	Land Acquisition, Road accidents and Road safety maintenance concern. They have promised their help.	NGO

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
18	Mr Bijoy Alex Director WWF Kerala State Office, Rupa,A-10 Tagore Nagar TC 15/989 Vazhuthakkad, TVM-695014,Kerala	Phone:0471-325183 323568 (R) 0471-436499 Fax: Email	Consulted on 17/09/1999	Dr Bijoy Alex, three personnel whom Should be included as resource persons.	KN Changappa, Sr Manager, Tata Tea limited, HRW & EPA. Mohan Alembur, DFO Munnar. Mr Jim Sacharia, Research range officer, Periyar.
19	Dr Roy George Education Officer World Wide Fund For Nature-India Thiruvananthapuram	325183	Consulted on 4/06/99	Forest wildlife aspects related to KSHP Their publications: The Natural resources of Kerala-WWF India, Kerala State Office. Land use control on Paddy fields Coastal zone Management Plan.	Dr Roy George education officer, recommended some other resource persons of the state for consultation. Prof Nandakumar Department of Geography, University College TVM, Prof. Kunjikrishnan.He also promised me some recommendations at a later stage.
20	Friends of Periyar Mr Joseph Karoor President Periyar wild Life Reserve Po Thekkady Idukki,Pin 685 536	Phone:04863- 22169(R)	Consulted 04/99	Their main concerns are The forest and wild Life Protection Landslides are also a concern. He also pointed out the complication due to the arrival of settlers in the high ranges.	NGO. He later attended scooping workshop.
21	Contacted: Mr Jalaludheen Indian Meteorological Department Meteo centre Thiruvananthapuram - -695033	Phone:322471(P) 322894(0)	Consulted on 14 May 1999	Number of stations in Kerala & Type of data available.	Data available for eight centers spread across Kerala. Data on Temp, Pressure, Rainfall, Humidity and wind data are available on cost basis.

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
22	Mr Nanda Kumar D Sr Lecturer Geography Dept University College	Phone:474490 After 8 PM 327413(R)	24/0699	His main concerns are that no good Road maps are available. He develops the map, which is now available, and this is the map given in the CES Resource Atlas. He is happy that people are actually working on the ground to collect basic data.	Very shortly he is leaving India for Higher education (PhD).
23	KG Mohanan Pillai, Director, Forest Information Bureau (FIB) PTP Nagar, Thiruvananthapuram.	360965(O)	17/09/99	Forest and wild life sanctuary maps. Forest and wildlife published data. Forestry publications and brochures.	Collection Procedures
24	Dr Shankar Scientist band Head EIA group Kerala Forest Research Institute (KFRI). Thrissor-680 653	0487-282064 E-Mail- libkfri@md2vsnlnet.in	26/1/00 during Scoping Workshop	He offered his help on any forestry studies. Presented a case study on Eco-tourism project in Kerala.	Indicated about anew sanctuary coming up.
25	Prof: E .Kunji Krishnan Department of Zoology University College Thiruvananthapuram	442853(R)	21/06/99	His main concern is whether the fund will be utilized properly. He wants a working accounting procedure within the PWD setup. Who can guaranty a honest setup where the funds are timely and properly utilized	He pointed out instances where the gross mis-utilisation of funds from world Bank and ADB had taken place.

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
26	Dr PKK Nair Director Environmental Resources Research Center PBNo1230, Peroorkada Thiruvananthapuram 695005 Kerala	0471-432159 0471-435115 0471-433159(R)	Consulted 23/06/99	Bio-diversity issues, Natural conservation measures, a complete EIA is necessary for any Road widening Project. Development of Parks along the Road. Medicinal Plants Etc Parking Places especially for the Sabarimala Pilgrim center.	Planting on both sides with trees or bushes especially in those places where there are paddy fields.
27	Mr Sivakumar Warblers and Waders NGO, Thiruvananthapuram.	431300	Consulted 1/3/2000	Endangered flora and Fauna	They are only working on endangered avifauna.
28	Dr. Khandoori, Chief Conservator of Forests (Special Afforestation) and Nodal Officer, Thiruvananthapuram	328347 (O) 357005 (R)	Consulted 13/10/2000	Rock blasting inside forest is banned. According to Kerala Preservation of Trees act (KPT act), permission from DFO is needed for cutting certain species of trees. According to Supreme court direction regarding avenue trees, no tree can be felled without a management plan. If forestland is acquired for any purpose, afforestation at a rate of 2500 plants per hectre is to be carried out.. Book on rates of afforestation is available.	The tree species of Sandalwood, Teak, Rosewood, Irul, Thempavu, Kambakam, Chembakam, Chidachi, Chandanavembu and Cheemi are included in KPT act.
29	Mr. K. Suresh Menon Divisional ManagerKerala Forest Development		24/10/2000	Felling of road side trees is to be carried out by forest department.	

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
	Corporation, Kottayam				
30	Dr. J.K. Sharma Director, Kerala Forest Research Institute, Peechi	0487-282064 E-Mail- libkfri@md2vsnlnet.in	21/10/2000	KFRI is providing only research data to forest department for preparation of Sanctuary management plan. List of flora and fauna for each district has been prepared under the peoples plan campaign. Not much research has been carried out on mangroves.	Some publication of KFRI were obtained.
31	Mr. James Zacharia, Mr. Sivadas, Mr. Kumaran Assistant Conservators of Forest Project Tiger Nattassery, Kottayam	0481 – 565940	24/10/2000	Elephant migration routes are intercepted by roads. Elephants will not be able to cross fills. For rock blasting along Idukki – Puliyanmala road. Permission from KSEB will be required since dam is situated very close to the road.	For information in elephant crossing points on the road, contact Dr. Easa of KFRI. They are interested in attending any workshops to be held in future.
32	Mr. N. Sasidharan Divisional Forest Officer, Collectorate, Kottayam		24/10/2000	For cutting trees on road side, apply to Assistant Conservator (Social Forestry) having jurisdiction over the area.	KPT act is applicable to private land only.

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
33	Mr. N. Sasidharan, Divisional Forest Officer, Collectorate, Kottayam		24/10/2000	Forest land along Idukki – Puliyanmala road. From Cheruthoni to Idukki, both sides of the road are handed over to Idukki Development Authority (IDA). Land is to be purchased from them. Encroachers will have to be rehabilitated. After Idukki, the land belongs to Cardamom hills RF. It has a dual status. It is revenue land, but the trees are owned by the Forest Department. For cutting trees on roadside, apply to Assistant Conservator (Social Forestry) having jurisdiction over the area.	KPT act is applicable to private land only.
34	Mr. P.K. Surendranathan Asari, Principal Chief Conservator of Forests, Thiruvananthapuram		15/12/2000	Rock blasting along Idukki – Puliyanmala road is not permitted since it is situated very close to the wild life sanctuary. However, concealed blasting can be done. No emission or noise is permitted. For Punalur – Thodupuzha road, forest clearance is not needed..	
35	Dr. D.S. Rao, Chief Conservator of Forests (Development)		15/12/2000	Forest department is not conducting any study on mangroves now. A project report on development of mangroves at Kumarakom was prepared 2-3	Agricultural University is conducting a study on mangroves. Another study is being carried out by Dr. Mohanan of CESS.

SL NO	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
				years ago.	
36	Mr. P. John Samuel, Additional Director, Department of Mining and Geology, Government of Kerala	0471 – 447429, 0471 – 556939 Fax: 0471 - 447429	3/1/2000	Controlled blasting near sanctuary areas to break hard and massive rocks	Suggested concealed blasting using a chemical called ECONAX or AQUANAX. Series of small drill holes, fill it with the chemical tightly, seal it and keep it for 24 hours. Rock will develop cracks.
37	Mr Rajendran Thampi – World bank Project Chief Conservator of Forests	328347 (O)	5/2/2001	The World bank Forestry project is being carried out by the various officials as part of their routine work. No Separate machinery for the Project.	The project activities include pulp wood plantation steak plantations, natural forest management, Sectoral management etc
38	Dr. Khanduori Chief Conservator of Forests (Special Aforestation) and Nodal Officer, Thiruvananthapuram	328347 (O)	5/2/2001	Road side tree planting, forest nurseries and official rates, Forestry Clearance and application procedures	
39	Mr Balakrishnan, Forest Range Officer	0498-205696(O) 0498 –204451®	9/6/2002	Mangrove Plantation Programme	
40	Mr. Krishnan, Deputy Superintendent, ASI, Bakel		12/02/2001	Excavation of residential areas and royal enclosures is in progress within Bakel Fort	
41	Local Member of Legislative Assembly (MLA)		9/5/2002	Foot over Bridge mainly for school children	This will cover both railway line and project road
42	Dr P.N Unni Scientist CWRDM, Kozhikode, Kerala	0495-200675	30/4/2002	Coastal Ecosystems in Kannur and Kasaragod districts	A copy of recently published Paper on Mangroves In Valapattanam river Basin provided

SL No	NAME & ADDRESS	FAX AND PHONE NUMBER	DATE OF CONSULTATION	SUBJECT DISCUSSED	REMARKS
43	Mr Mohan & Mr Verma Scientist , CESS Thiruvananthapuram	0471-442231&441167	22-/3/2002	Various literature references obtained from CESS Web site on mangroves and coastal Ecosystems	
44	Mr Varghese Nodal Officer Kerala Forest Department	0471-328347	9/7/2002	Phase II Forestry and CRZ Clearances. Requested for the proceedings of a workshop conducted by Forest Department at Kannur	Shared a Proceedings of the workshop on Mangroves
45	Dr Kamalkshan Kookat State Science Technology and Environment	0471-543701 to 705	11/7/2002	CRZ related Environmental clearance for the Three phase II roads	
46	Dr. Thomas (head of Dept) Dr. Kurian (Scientist) Dept of Marine Science, CESS	0471-442231&441167	12/7/2002	Preparation of Status Report for coastal zone Management Committee clearance	Requested to send formal letter to the Director, CESS

Annexure 6.8. List of People Consulted as Part of Recent Focus Group Discussion (June -July 2012)

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:	Punalur		
Venue:			
Date :	3/10/2012	Time	9:50 am

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	1. തിരുവല്ല Vegetable Merchant Punalur	944755658	
2.	2. തിരുവല്ല Vegetable Merchant Punalur	9947803741	
3.	3. തിരുവല്ല T.B. Jn. Punalur	956725333	
4.	4. തിരുവല്ല T.B. Jn. Punalur	9947403467	
5.	5. തിരുവല്ല T.B. Jn. Punalur	9961109893	
6.	6. തിരുവല്ല T.B. Jn. Punalur	9446592560	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	നാലിമുക്ക്		
Date :	3/10/12	Time	10:30

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	ബിനോ ചെമ്പലമുക്ക് താഴ്വര, നാലിമുക്ക്	2385110	
2	നാഥൻ താഴ്വര, നാലിമുക്ക്	9846887426	
3	Noushad. T. Kailash Indiram Vettuphitthalam (O)	9846894435	
4	റെജി വിതക്കടവിലുക്കൽ നാലിമുക്ക്	9947785508	
5	റെജി റാജ വിജയൻ നാലിമുക്ക്	9251197526	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	പുനലൂർ		
Date :		Time	

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	മി. ശ്രീ തൊലുപറമ്പിൽ പി. കെ. രാജൻ (PAP) പുനലൂർ	9447417672	
2.	മി. ശ്രീ മുളയൂർ പുനലൂർ	9845924477	
3.	മി. ശ്രീ മുളയൂർ പുനലൂർ	9562659752	
4.	പ്രൊഫ. ഡോ. വി. ശ്രീ പുനലൂർ ഗവണ്മെന്റ് കോളേജ് പുനലൂർ	9656376664	
5.	മി. ശ്രീ പുനലൂർ പുനലൂർ	9562659752	
6.			

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha	16:00
Link No.:		
Local place name:		
Venue:	തലശ്ശേരി	
Date :		Time 11:35 am

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	വിദ്യാധരൻ തൃക്കുളം തറവാട് ചക്കിട്ട ഭാഗം, തലശ്ശേരി	9847584961	
2.	ശശി തുവാർ ഗവൺമെന്റ് പാലാസ്സ്, തലശ്ശേരി	9947994554	
3.	ഡി. ജി. വിജയൻ സമുദായ ഭവനം തലശ്ശേരി	9567068445	
4.	എ. വി. രാജൻ കെ. എസ്. ഐ. വി. കെ. വി. തലശ്ശേരി	9846372706	
5.	രാജൻ സാമൂഹിക ഭവനം തലശ്ശേരി	9539018830	
6.	വി. വി. തുവാർ തെക്കേ അറ്റം പാലാസ്സ് തലശ്ശേരി		

Public Consultation

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	Punaloor		
Date :		Time	11:50 am

SL No	Name & Address	Phone Number	Signature
1.	എബി വിദ്യുദ്ധി നെല്ലിഭജാനാട എബി ദുവന കൂട്ടടൻ	9746181721	
2.	ദോർ പടക്കു വീട്ടിൽ Gentilly കൂട്ടടൻ	9495537202	
3.	വിനയ് കുന്നൻ മിട് കൂട്ടടൻ	9846138770	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

26:100

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:	Kottayam Muttam		
Venue:	26:100		
Date :		Time	12:15

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	ഭദ്രൻ നമ്പ്യാർ മുൻപുരുത്തം റോഡ് കോട്ടയം എ.ഒ.	9495236243	
2	ഭദ്രൻ നമ്പ്യാർ മുൻപുരുത്തം റോഡ് കോട്ടയം എ.ഒ.	9447248879	
3	Jacob K.V. PST Bakery, Kottayam Muttam Kottayam	9495717107	
4	Thomas Koduvannur PST Bakery, Kottayam Muttam Kottayam	9745779645	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	B 81 m		
Date :		Time	12:26 pm

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	Jacob Populen Shore Mund Central Ju. Konni	9496142989	
2.	Char Sahib Kallathoorath (A) Tamilur, Konni	9495834588	
3	Sajin K. Kallathur Varappur Konni, Ramnagar	9886645456	
4	Salim A Shamzeelun Narsu Konni	9446187753	
5.	Regan Malupavambal Konni	9446565824	
6.	A. Salim Bismi (ime) Konni	9447557286	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

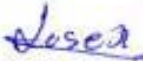
Kerala State Transport Project (Phase – II)

36:400

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	മിസ്സ		
Date :	3/10/12	Time	2:15

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	ഗോവിന്ദൻ താമരയിൽ മിസ്സ പുത്തമംഗലം	9539232621	
2.	Joseph Murugudel Puthanveech Kumbanga	9646080819	
3.	ബിനീ മുഖ്യാലയത്തിൽ വെള്ളാട് പി.ഒ മിസ്സ	9645655733	
4.	വിദ്യ തൊണ്ടിയിൽ മിസ്സ	9744414013	
5.	മോൻ താമരയിൽ മിസ്സ	9735606432	
6.	ലീല പുത്തമംഗലത്തിൽ മിസ്സ	9647954927	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	മുക്കുറുപുഴ		
Date :	3/10/12	Time	2:45

Registration Form

Sl No	Name & Address	Phone Number	Signature
1.	സുബാഷ് കുമാർ പി. കെ. ടൗൺ മുക്കുറുപുഴ	9608643300	Sy
2.	രതനദാസ് കെ. കെ. ടൗൺ മുക്കുറുപുഴ		
3.	ബാബു പി. കെ. ടൗൺ മുക്കുറുപുഴ	8281375307 96182	
4.	ജയ് കെ. കെ. ടൗൺ മുക്കുറുപുഴ	9744993863	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	2nd Floor - 2nd floor.		
Date :	3/10/12	Time	3:10 pm

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	2nd floor of 2nd floor Geiri Heliwalling Suban Menchirvan, Punalur	9388562455	
2.	Prasanna Regan Reg Geiri Center Menchirvan	9745578265	
3.	Ragu M.N. Metedhri Menchirvan	9605747491	
A.	C.D. Gibbon Cheruvakkal Menchirvan	9746152849	
5.	K.K. Vasudevan Neri Pachiyarak Kalyan Menchirvan Pz	9745304472	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

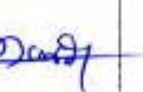
Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	റാന്നി		
Date :	31/10/2012	Time	3:30

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	K.C. കുഞ്ഞുണ്ണി കുഞ്ഞുണ്ണി റാന്നി.	-	
2.	പി.ജെ.ജി. തോമസ് ചെങ്കൽക്കൽ വയലത്തു, റാന്നി	9745270137	
3.	P.S. Rajappan Pillai താഴെക്കൽക്കൽ റാന്നി.	9744940420	
4.	ദോഷ മുക്കുളം റാന്നി.	9847678262	
5.	മുക്കുളം മുക്കുളം മുക്കുളം റാന്നി	9446199743	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	റാന്നി - തട്ടിയമ്പാറ		
Date :	31/10/12	Time	3:50 pm

53.600

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	ബിജു സിം പുനക്കുട തട്ടിയമ്പാറ പട്ടാമ്പാറ റാന്നി	9562592390	
2.	രമീ. P.P. (Auto Driver) പുലയംകുളം തട്ടിയമ്പാറ വി.ഒ, തട്ടിയമ്പാറ	9605534744	
3.	തൊമ്മൻ. (Auto Driver) പുലയംകുളം പട്ടാമ്പാറ റാന്നി	9446931924	
4.	ചന്ദ്രൻ സക്കൽ Dry cleaner തട്ടിയമ്പാറ റാന്നി	9446890575	
5.	താമരൻ പുലയംകുളം തട്ടിയമ്പാറ പട്ടാമ്പാറ, റാന്നി	9744451391	
6.			

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punalur-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	Punalur - Ponkunnam		
Date :	3/10/12	Time	4:15 pm

63-600

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	(Auto Driver) Sathosh. Isuray KG	98442522	Sathosh
2	(Auto Driver) REGU. PM.	9645777187	REGU.
3	Rafelme, Auto Driver Ponkunnam	8129066727	Rafelme
4	Rahul Vijayan Auto Driver	9745672161	Rahul
5	Joseph	9747328461	Joseph
6.	Tom Joseph	9048415055	Tom

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:	മനോര - മിറങ്ങി ഇ.		
Venue:			
Date :	3/10/2012	Time	4.45 am

68.600

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	Malheer	9447135148	
2.	Varghese മനോര - മിറങ്ങി ഇ.	9605163067	PTV
3.	മിറങ്ങി ഭാഗ്യമം മിറങ്ങി ഭാഗ്യമം മനോര	9947036826	ETIBU
4.	K.C. Joseph Kollampuzha Mannimala.	9605965684	Joseph
5.	E.T. Mannimala മനോര - മിറങ്ങി ഇ. മിറങ്ങി ഭാഗ്യമം	9447022531	
6.	മനോര - മിറങ്ങി ഇ. മിറങ്ങി ഭാഗ്യമം	9606064216	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	പൊന്നമം		
Date :		Time	5:30

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	Saji N.K. ന.ന.ത.പ.പ.കെ.യുടെ അതിർത്തി P.O. പൊന്നമം	9961018377	
2.	എ.കെ.ജി. യൂ.എസ്. പട്ടണത്തിൽ പൊന്നമം	"	
3.	തൊ.എ.കെ.എം. പട്ടണത്തിൽ തൊ.എ.കെ. P.O. തൊ.എ.കെ.	9444748345	
4.	അബ്ദുൾ ഹലീം തൊ.എ.കെ.യുടെ പൊന്നമം	9447601318	
5.	എ.കെ.ജി. തൊ.എ.കെ.യുടെ പൊന്നമം	"	
6.	കി.എ.സി. വെ.എസ്. തൊ.എ.കെ.യുടെ പൊന്നമം	984642088888	

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Kerala State Transport Project

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

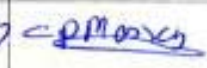
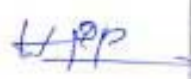
Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	മുളയ്ക്കൽ കോമ്പം		
Date :	4/10/2012	Time	9:30 am

88' 30"

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	P. MARVIN കോട്ടാപ്പാലം കോട്ടാപ്പാലം P.O.	8086957922	
2	സുരേഷ് മുളയ്ക്കൽ മുളയ്ക്കൽ വി.ഒ.	9947346258	
3	രാജ്കുമാർ ചെറിയ പാലം മുളയ്ക്കൽ വി.ഒ.	9495107353	
4	വിജ്ഞാ പാലം കോമ്പം മുളയ്ക്കൽ വി.ഒ.	9744324024	
5	ഹരിദാസ് P. മുളയ്ക്കൽ കോമ്പം മുളയ്ക്കൽ P.O.	9961311080	
6	മിസ്. K.K. മുളയ്ക്കൽ മുളയ്ക്കൽ വി.ഒ.	9495393645	

Public Consultation

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:			
Date :	4/10/17	Time	9:45

488:700

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	ബി.ജി. ജെയിംസ് കുറുപ്പി	9447870231	
2	രാധാ കൃഷ്ണൻ പത്തനംതിട്ട പനമംഗലം പി.ഒ.	9605844250	
3	സി.ജി.റാജ് രാജ് നിവാസ് ചിറയടത്ത് ട്രാൻസ് പെരിയപ്പള്ളം	9947339332	
4	P.V. John അമ്പലമുക്ക് കുറുപ്പി	—	
5	അനൂപ് ജി.എസ് കുറുപ്പി	9656357400	
6	ജി.ഡി.റാജ് കാട്ടാമുക്ക് പനമംഗലം P.O	9946741334	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	പുനലൂർ - പുനകുന്ദം ജം.		
Date :	4/10/12	Time	10:20

Registration Form

Sl. No	Name & Address	Phone Number	Signature
	P. K. ഗോപിനാഥ് പി. പി. ടി. ടി. ടി. പുനലൂർ	9446287589	
	ഭാഗ്യ താലൂക്ക് മുക്കുട, പുനലൂർ	9961276429	
	ചിത്ര പള്ളി പുനലൂർ	9744602800	
	വിജ്ഞാപനം മുക്കുട പുനലൂർ	9947498823	
	നാഥി താലൂക്ക് പുനലൂർ	9495692370	
	നാഥി താലൂക്ക് പുനലൂർ	9995940184	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	ചങ്ങനാശ്ശി		
Date :	4/10/12	Time	10:10 am

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	വിനീഷ് തൈച്ചറയിൽ കുറുപ്പി പി.ഒ	9961695836	
2	തോമസ് തൃക്കരപ്പള്ളിയിൽ കുറുപ്പി	9495081121	
3	സദ്യ വേലം പാലിൽ കുറുപ്പി പി.ഒ.	9744386160	
4.	ദേവനാഥൻ പട്ടമണിയിൽ മടയ്ക്കൽക്കുന്ന് P.O കുറുപ്പി	9495645340	
5.	ബിനോയ് തൃക്കരപ്പള്ളിയിൽ കുറുപ്പി P.O	9746414208	
6	നന്ദജിവാർ തൃക്കരപ്പള്ളിയിൽ കുറുപ്പി P.O	9495109282	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	തെപ്പുക		
Date :	4/10/12	Time	10:30 am

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	ചിങ്കോലൻ പുതിക്കുട പുലാശ്ശി.	0482 215596	
2	ഗോപിനാഥൻ നായർ പത്തുക്കൽ വളിതലേരി	9747593611	
3	ന.പ. ഭാസ്കർ മുക്കുടക്കൽ പുലാശ്ശി P.O.	9388575195	
4	K.M. പുഷ്പകുമാരൻ തോട്ടമുക്ക് പുലാശ്ശി P.O. മുക്കുടക്കൽ	225114	
5	ഭാ.മ. ഭാസ്കർ തൊപ്പുപുറക്കൽ പുലാശ്ശി	9747736556	
6	മമ്മൂൾ പക്കിയന്നം തെപ്പുക.	9497883736	

Consultancy Engineering Services for Detailed Engineering Designs
and Financing Option Study for KSTP II

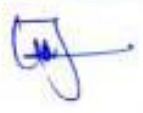
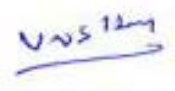
Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:	99-100		
Venue:	വിളക്കുപുഴ		
Date :	4/10/12	Time	10-55 am

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	ഭോമൻ ഭാഗ്യദാസ് പള്ളിപ്പുഴ മുഖർ	9747 736553	
2	(പവിൽ) അലക്സാണ്ടർ മുഖർ	9496115482	
3	ഭാഗ്യദാസ് ഭാഗ്യദാസ് മുഖർ/മുഖർ മുഖർ	9744967441	
4	സുധീഷ് താരിടാസ് മുഖർ	9961666896	
5	സുധീഷ് മുഖർ/മുഖർ മുഖർ	9495395659	
6	മുഖർ/മുഖർ പള്ളിപ്പുഴ മുഖർ	9747571781	

Consultancy Engineering Services for Detailed Engineering Designs
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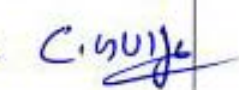
Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	104.300		
Date :	4/10/2012	Time	11:10

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	മുഹമ്മദ് വെട്ടിമുക്ക് ചുവരൂർ ചുവരൂർ	9447284914	
2	ദേശമൻ തോമസ് ചുവരൂർ ചുവരൂർ	9447827795	
3	V. A. Joseph Bobby Engineers works Mutukumpurath, Palen	9249773552	
4.	Bigu. C.K. രണ്ടാമത്ത് ചുവരൂർ, ചില	9605107822	
5.	ദേശമൻ മടയൂർ ചുവരൂർ	9605108258	
6.	C.G. വിജയകുമാർ ചുവരൂർ ചില	9287557304	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	211d1		
Date :		Time	11:30

106+100

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	എ.പി.പി.എസ്. ഓഫീസ് പുനലൂർ-പാലക്കാട് റോഡ് പാലക്കാട് പ.ഒ. പാലക്കാട് ജില്ല	9495847605	
2	Baby Francis (Driver) Kurissunthuthi Kizhuthasaliyur Palam	9447044386	
3	Biju Jose Kurissunthuthi Kavikuram, Palam	9447226781	
4	Manoj Mathew Kurissunthuthi Kizhuthasaliyur P.O Palam	9444593814	
5	എ.പി.പി.എസ്. ഓഫീസ് പാലക്കാട് പ.ഒ. പാലക്കാട് ജില്ല	9947324391	
6	എ.പി.പി.എസ്. ഓഫീസ് പാലക്കാട് പ.ഒ. പാലക്കാട് ജില്ല	9447367303	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	പ്രവീണനഗരം		
Date :	4/10/12	Time	11:45

110+700

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	അനിയൻ തെക്കേ അമ്പലമുക്ക് കുളങ്ങര റോഡ് പാലം	9495735121	
2	ഭാഗ്യദാസ് താഴെ ചാറയിൽ ഭാഗ്യദാസ് ഹിംസ	04822 220070	
3	കുളങ്ങര നീലിയാനി കുളങ്ങര പ്രവീണനഗരം		
4	മൈക്കിൾ ചെങ്കൽ പ്രവീണനഗരം	9446924013	
5	അനിയൻ കുളങ്ങര അമ്പലമുക്ക് P.O.	9446984988	
6	അനിയൻ ചെങ്കൽ അമ്പലമുക്ക് P.O.	9947154724	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:	Kollappally		
Venue:	കൊല്ലപ്പള്ളി		
Date :	4/10/12	Time	12:10 pm

112:800

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	ഭൂമി വെട്ടി കൈതോള തട്ടുമാട് P.O.	04822- 244631	
2	തൊന്നി മെമ്പർഷിപ്പ് നടുവിലേക്കു കടന്നു P.O.	9846136290	
3	ഭൂമി വെട്ടി പോക്കുട്ട കടന്നു P.O.	9744189648	
4	രാജുവർ P.K. ചാമ്പലം താക്കിത്തട്ട് P.O.	9142524962	
5.	ദിനേശ് മനിക്കൽ കുടുംബശ്രീ P.O.	9447910886	
6.	Munaf Chembilavil Anbinadu P.O.	8281532103	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punalur-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	Dg8		
Date :	4/10/2012	Time	12:30 pm

116+750

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	Peter Jose Mundakkal Pizhaku	9846685072	Peter
2	Baiju Joseph Kalamulayi Pizhaku	9495316810	Baiju
3	Arch. Anilosey Nigavallil Pizhaku P.O.	9447605325	A
4	Mr. K. Joseph Mundakkal Pizhaku	04822 260546	Joseph
5	K.T. Sebastian Kavipattukudi Pizhaku P.O.	8281414821	Sebastian
6	Ragu John Mundakkal Pizhaku	9946483415	Ragu

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	122.5		
Date :	മെല്ലച്ചിറ	Time	1:00 pm
	4/10/2012		

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	നരകുളം കല്ലേക്ക മെല്ലച്ചിറ	9495773096	
2.	സാമുവൽ വർഗ്ഗീസ് വെള്ളാമ്പലം മെല്ലച്ചിറ	9946438021	
3	Baby Mathew Kunmadhel Nellappara	9747199214	
4	അനീഷ്. അരിച്ചിത്തറ മെല്ലച്ചിറ	9946593107	
5.	Raju M-D Malayya Mundayil Kuriyath P.O. Nellappara	9447897612	
6.	Ramachandran Veliyerattu Karimkunnath P.O. Nellappara.	9961344624	

Consultancy Engineering Services for Detailed Engineering Designs
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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punalur-Ponkunnam-Thodupuzha		
Link No.:			
Local place name:			
Venue:	Punalur Junction		
Date :		Time	12.57.00

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1.	Bittay Augustine Kochiyankunnam Kunni P.O. Nalappan	9495613731	Bittay
2.	Baby Joseph Kochiyankunnam Kunni P.O.	9745137344	Baby
3.	V. K. John Vazhakattu Kazimkunnom	9846943654	John
4.	Vasudevan Pavithan Kazimkunnom P.O.	9745979814	Vasudevan
5.	Jose Chandy Paradiyil Kazimkunnom	8547342896	Jose
6.	Mathew P.P. Paradiyil Kazimkunnom P.O.	317176	Mathew

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Public Consultation

Kerala State Transport Project (Phase – II)

Public Consultation Details

Project Area:	Punaloor-Ponkunnam-Thodupuzha	
Link No.:		
Local place name:		
Venue:	Bodiyem Junction	
Date :		Time 1:40 pm

131.00

Registration Form

Sl. No	Name & Address	Phone Number	Signature
1	A.P. Gnanan Aaylurathu Kazumkunnam	242385	
2	M. J. B. 2300013-217 Bodiyem	9496308771	
3	K.N. Gnanan KalepDallu Kolam	228696	
4	Sathyan Puthu Veele Kolam	2386561	

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