

TERMS OF REFERENCE FOR EIA STUDY

A. INTRODUCTION:

The Ministry of Road Transport and Highways (MORTH), Government of India has proposed “Bharat Mala Pariyojana” an Umbrella scheme of road development project at an estimated cost of INR 5,35,000 crores. This is the second largest highways construction project in the country after NHDP, in that almost 50,000 km of roads targeted across the country.

This program aims to improve connectivity particularly on economic corridors, border areas and to remote areas with an aim of rapid and safe movement of cargo to boost exports. It has been cleared by the Union Cabinet on October 25, 2017. It has been decided to take up its part through National Highways Authority of India (NHAI) for the development of project under Lot-3.

B. THE PROJECT

Bengaluru has seen rapid growth in the IT industries and the rise in the number of job opportunities in the city. Due to it, the city is facing high increase in the number of vehicles in the city and a huge increase in the demand on land.

National Highways NH 648 (NH 207), NH 48 (NH 4), NH 275, NH 948, NH 209 & NH 75 (Hassan road), and majority of State Highways SH 3, SH 85, & SH 35 pass through Bangalore city comprising heavy commercial traffic movement. This traffic further aggravates the scenario in the city roads and resulting huge traffic jams. In order to ensure safe, smooth, efficient, and high-speed transport corridor to Bangalore city, it is impetus that the infrastructure of city and adjoining towns anticipated the development.

It is proposed to develop the Satellite Ring Road (STRR) of Bangalore (West Side). The proposed STRR corridor passes through three districts of Karnataka (Bangalore Rural, Bangalore Urban and Ramanagaram) and one district of Tamil Nadu (Krishnagiri). The length of entire corridor is 179.969 km. The project will be taken up in following three phases:

Phase I: Ch. 0+000 to Ch. 82+200

Phase II: Ch. 82+200 to Ch. 138+000

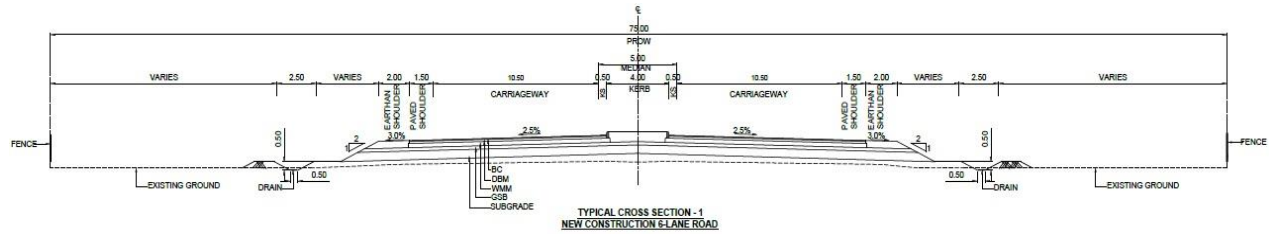
Phase III: Ch. 138+000 to Ch. 179+696

The alignment considered for the preliminary studies of STRR Phase-II, is a new Greenfield alignment (New NH-948A) which starts from Ch. 82+000 at cross point of SH-3- Km 52.700 in Ramanagara district (Karnataka) and end at Ch. 138+00 near at Karnataka/TN Border.

There are total two districts falling under proposed STRR Phase-II alignment namely Ramanagara and Bangalore Urban. The project stretches lie over mostly plain to rolling terrain. The project area of the STRR Phase-I lies between 12°40'9.60"N and 12°38'26.21"N of North Latitude and 77°19'49.27"E and 77°43'24.52"E of the Eastern Longitude. The STRR Phase-II alignments pass through predominantly barren land, forestland followed by cultivation land. This project is a green field project with a proposed ROW of 75m right of way has to be acquired except in interchange locations additional width as per requirement will be proposed.

The traffic congestion in urban areas will be reduced due to diversion of heavy traffic in the proposed STRR. There will be reduction in vehicular air and noise pollution in the urban areas. The proposed Right of Way (ROW) is 75 m throughout the project sections except in interchange locations additional width as per requirement will be proposed.

Typical cross sections of proposed project sections are presented in APPENDIX-A. The Salient feature of the project is given below:



APPENDIX-A Proposed Typical Cross Section of Road

SALIENT FEATURES OF THE PROJECT:

Item	Phase-II (Design Ch. 82+200 to Ch. 138+00)
Length of the existing alignment	This is a Greenfield project
Length of new alignment proposed (kilometers)	55.800
Administrative locations	3 districts (Ramanagara and Bangalore Urban district and Krishnagiri)
State	Karnataka and Tamil Nadu
Terrain	Plain/Rolling
Width of the new alignment/ PROW (meters)	75m except 28.5 m in Bannerghatta National Park
Built-up locations	15 Locations near Chikkenahalli, Anajawadi, Chikka Madhawadi, Alisab Doddi, Aralalusandra, Varager Halli, Chathra, Dodda, Maralawadi, Banavasi, T. Maniyambal, Indalavadi, Thimmasandra, Vanakanahalli, Menasiganahalli, Muttur
Existing Carriageway	Nil
Proposed Carriageway	6 Lane
No. of Proposed Minor Bridge	5
No. of Proposed Major Bridge	2
Total No. of Proposed Bridges	7
ROBs	-
Existing RCC/Slab/Pipe/ Arch	0
Total No of Box/Pipe Culverts	98
Proposed Vehicular Underpass	11
Proposed Viaduct	It is proposed to elevated corridor through the BNP. Viaduct section would start from Design Ch. 113+410 to Design Ch. 119+680 (length = 6.270 km)
Proposed Interchanges	2
Existing Bus Bays	0
Proposed Bus Bays	0
Ex.Truck Lay byes	0
Proposed Flyover	0
Project road within 15 Km of Wildlife Sanctuary	The proposed road location boundary is passing through the Bannerghatta National Park and its ESZ. (a Protected areas notified under the wild life (Protection) Act, 1972)

Item	Phase-II (Design Ch. 82+200 to Ch. 138+00)
Proposed design Speed (kmph)	100 Kmph
Water requirement in m ³ /day	2,188,488
Aggregate requirement in lakh Cum	18.46
Cement requirement in lakh Tonne	1.56
Bitumen requirement in lakh Tonne	0.30
Earth requirement in lakh Cum	84.85
Sand requirement in lakh Cum	6.31
Steel Requirement in Tonnes	0.39
Proposed LA on the Alignment in ha. (A)	$49.1 \times 75 = 368.800$ $6.7 \times 28.5 = 19.095$ $= 387.895$
Approx. Interchange Area in ha.(B)	$2 \times (650\text{m} \times 650\text{m}) = 84.5 \text{ ha.}$
Total LA in ha. (A+B=C)	472.4
Total Project Cost Rs.	17,643,017,295
Environmental cost Rs.	Approx. 2% of the project cost

As per Environmental Impact Assessment Notification, 2006 and its amendment 2009; the Project will fall under Category A and would require prior Environmental Clearance from MoEFCC, Govt. Of India and hence an EIA study will be required to be carried out for the purpose. For carrying out the EIA study the Terms of Reference (TOR) has been proposed.

C. SCOPE OF STUDY:

The Scope of Surveys and studies for the project including all engineering aspects, environmental and socio-economic aspects of the projects are as follows:

- Review of all available reports and published information about the project road and the project influence area;
- Environmental and social impact assessment, including such as related to cultural properties, natural habitats, involuntary resettlement, environmental features and impact, environmental mitigation and management plan, Resettlement and rehabilitation plan, etc.
- Public consultation, including consultation with Communities located along the road, NGOs working in the area, other stake-holders and relevant Govt. Depts at all the different stages of assignment (such as inception stage, feasibility stage, preliminary design stage and once final designs are concretized).
- Detailed reconnaissance;
- Identification of possible improvements in the existing alignment and bypassing congested locations with alternatives, evaluation of different alternatives comparison on techno-economic and other considerations and recommendations regarding most appropriate option
- Traffic studies including traffic surveys and Axle load survey and demand forecasting for next thirty years;
- Inventory and condition surveys for road;
- Inventory and condition surveys for bridges, cross-drainage structures and drainage provisions;
- Detailed topographic surveys using LiDAR technology and GPS;
- Pavement investigations;
- Sub-grade characteristics and strength: investigation of required sub-grade and sub-soil characteristics and strength for road and embankment design and sub soil investigation
- Identification of sources of construction materials;
- Detailed design of road, its x-sections, horizontal and vertical alignment and design of

- embankment of height more than 6m and also in poor soil conditions and where density consideration require, even lesser height embankment.
- xiv. Detailed design of structures preparation of GAD and construction drawings and cross drainage structures and underpasses etc.
 - xv. Identification of the type and the design of intersections;
 - xvi. Design of complete drainage system and disposal point for storm water
 - xvii. value analysis / value engineering and project costing;
 - xviii. Economic and financial analyses;
 - xix. Contract packaging and implementation schedule.
 - xx. Strip plan indicating the scheme for carriageway, location of all existing utility services (both over and underground) and the scheme for their relocation, trees to be felled and planted and land acquisition requirements including schedule for LA: reports documents and drawings arrangement of estimates for cutting of trees and shifting of utilities from the concerned department;
 - xxi. To find out financial viability of project for implementation and suggest the preferred mode on which the project is to be taken up.
 - xxii. Preparation of detailed project report, cost estimate, approved for construction drawings, rate analysis, detailed bill of quantities, bid documents for execution of civil works through budgeting resources.
 - xxiii. Design of toll plaza and identification of their numbers and location and office cum residential complex including working drawings
 - xxiv. Design of weighing stations, parking areas and rest areas.
 - xxv. Any other user oriented facility en-route toll facility.
 - xxvi. Preparation of social plans for the project affected people as per policy of the lending agencies/ Govt. of India R&R Policy.

D. TERMS OF REFERENCE (TOR) FOR EIA STUDY:

1. STUDY AREA

A detailed study of all the environmental features falling within the immediate corridor of impact, which has been considered as 500 m on both sides from centerline of road. The other sensitive environmental issues such as protected areas notified under wildlife (protection) Act 1972, critically polluted areas as notified by Central Pollution Control Board, notified eco-sensitive areas, interstate boundaries and international boundaries, water bodies of ecological significance, etc, will be identified within 15 km from the alignment. The detailed information shall be collected from the right of way as well as the area falling within 500 meters on the either side of proposed highway will mainly be collected from primary sources and the other environmental features within 15 kms aerial distance as explained above will be collected from secondary data sources. The project corridors alignments under the study have been shown in **Appendix-I**.

The detailed EIA study would be carried out for the proposed project in accordance with the Environmental Impact Assessment Notification, 2006 and amendment thereof as well as EIA Manual. The EIA study will include the following tasks:

2. DESCRIPTION OF THE ENVIRONMENT

The Baseline data on various environmental features shall be collected both from Secondary and Primary sources from field surveys and investigations in order to describe the environmental settings of the project area. The data on different environmental components along the project corridor would be collected followed by site reconnaissance in order to establish environmental condition of the project area. The study area will cover 15 km either side of the project stretch.

3. BASELINE DATA GENERATION:

- (a) **Secondary Data Collection:** Secondary data shall be collected from secondary sources like publishes literatures from various government and private agencies, NGOs, or institutions on physical, biological and social components of environment. The data will be reviewed for establishing existing environmental and ecological status within the project area.
- (b) **Field Survey:** The desk work will be followed by field survey of the project site for identification of the environmental sensitive zones within the study area and physical verification of all the identified sensitive zones with respect to the location of the project alignment and activities proposed. The field survey shall also include the measurement of environmental quality in terms of ambient air quality, water quality, soil quality, background noise level and ecology (Flora, fauna and roadside trees, etc.) along the existing alignment. The procedure for measurement of environmental quality would be done as per guidelines of the Ministry of Environment and Forests, Government of India.

Following details on different environmental features would be collected either from the secondary sources or from field surveys:

(A) PHYSICAL ENVIRONMENT:

- i. **Topography:** Topography, ground conditions, altitude, slope, etc.
- ii. **Soil and Geology:** Soil type and its characteristics, soil erosion and land slide problem, geology of the area.
- iii. **Water Environment:** An inventory survey of all water bodies located within 500 m on either side of the project road sections will be carried out. Details of rivers, streams, springs, lakes, reservoirs within 500 meters of the proposed road right of way will be collected from the site along with their usage and importance for the local population. Study of hydrology of the project road. The natural drainage of the project region, the existing drainage pattern of the project road, runoff flow direction, possible flooding, erosion will be collected. The information on ground water table, the ground water availability in the project area, the exploitation of ground water studied will be collected from secondary sources.

iv. Meteorological Data

Meteorological data covering maximum and minimum wind speed, wind direction, rain fall, relative humidity and temperature for last 10 years period will be collected from the nearest IMD Meteorological station. History of special weather phenomenon like cyclones, cloud bursts, etc. will be collected from the nearest meteorological station for a period of 50 years. The wind velocity, wind direction and wind rose, rainfall, temperature and relative humidity along the proposed alignment will be recorded during study period.

vi. Environmental Quality:

Baseline environmental quality data in terms of water, ambient air and Noise levels and soil quality would be generated as follows:

Ground & Surface Water Resources and Quality: The water samples from Ground water and surface water resources along the project road alignment will be collected to assess the physico-chemical parameters. Surface water samples from different water bodies/rivers/streams along the project stretch will be collected and analysed for physico-chemical parameters. Ground water samples will also be collected from most commonly used ground water sources along the project road. The Ground water samples will be analysed for Temperature, pH, Turbidity, EC, Colour, TSS, TDS, Odour,

DO, BOD, COD, TKN, Total Hardness, Sodium, Potassium, Calcium, Magnesium, Ammonia, Chloride, Sulphate, Phosphate, Nitrate, Fluoride, Surfactants, Dissolved Iron, Copper, Zinc, Manganese, Arsenic, lead, Mercury, Boron, Chromium, Phenols, Cadmium, Total Coliform, Faecal Coliform.

Surface water samples will be analysed for Temperature, pH, Turbidity, EC, Colour, TSS, TDS, Odour, DO, BOD, COD, TKN, Total Hardness, Sodium, Potassium, Calcium, Magnesium, Ammonia, Chloride, Sulphate, Phosphate, Nitrate, Fluoride, Surfactants, Dissolved Iron, Copper, Zinc, Manganese, Arsenic, lead, Mercury, Boron, Chromium, Phenols, Cadmium, Total Coliform, Faecal Coliform.

Ambient Air Quality: Ambient air quality monitoring will be carried out along the project stretch covering different category of land use, viz. residential, commercial/industrial and sensitive zone along the road with a frequency of twice a week for three months at different locations covering the sensitive locations. The ambient air quality monitoring will be carried out with respect to Particulate Matter (size less than $10\mu\text{m}$) or PM_{10} , Particulate Matter (size less than $2.5\mu\text{m}$) or $\text{PM}_{2.5}$, Sulphur dioxide (SO_2), Oxides of Nitrogen (NO_x), Carbon Monoxide, and Hydrocarbons by following the MoEFCC guidelines.

Noise Environment: The noise monitoring will be carried out at representative locations along the alignment of the project covering sensitive locations such as residential, hospitals, schools, sanctuaries etc. The noise monitoring will be done for 24 hrs at each location. The night time and day time equivalent noise levels will be generated for each monitoring locations to have an idea of noise pollution levels in the study area.

Soil Quality: The soil samples of different area along the project stretch would be collected for assessing the physico-chemical characteristics of the soil in the project area. The quality parameters will include pH, Electrical conductivity, sand, silt, clay, texture, moisture retention capacity, infiltration rate, bulk density, porosity, organic matter, Nitrogen, potassium, phosphorous, Pb, iron and organic carbon.

- vii. **Existing Land Use Pattern:** Land use pattern will be established along the project road classifying, forest area, Agriculture land, cultivable wasteland and area not available for cultivation, urban and rural settlements, water bodies, hills, etc. along the project road.

(B) BIOLOGICAL ENVIRONMENT:

- i. **Flora and Fauna:** Information on vegetation within the study areas will be collected from secondary source as well as through site investigation. The vegetation study includes Forest area and road side plantation within the proposed ROW and the list of flora and fauna will be collected.
- ii. **Ecological Sensitive Locations:** Ecological sensitive locations, such as Wildlife Sanctuary, National parks, bio reserve, etc. will be identified within 15 km either side of project road and studied (if any).
- iii. **Ecological Studies:** Terrestrial and aquatic ecological studies will be conducted along the within the proposed ROW. Common trees, shrubs, other vegetation, common fauna, rare and endangered species will be identified, surveyed and studied. The roadside trees within the proposed ROW will be surveyed including botanical & vernacular name of trees species, girth wise enumeration, etc.

(C) SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT:

- (a) **Socio-economic Details:** Study of demographic details including population, schedule caste, schedule tribe, literacy, occupation pattern in the settlements along the project road, economic and social conditions, life styles, etc. along the project road. Study of infrastructure facilities in the settlements along the project road. The social study will comprise socio-economic survey

along the project road and reflect the number and details of Project Affected Persons (PAPs) along the project road. Following data will be collected:

- Details of the properties, houses, businesses etc.
 - Activities likely to be effected by land acquisition and their financial losses annually.
 - Data covering the vulnerable groups or persons including women, children, elderly, people below the poverty line, indigenous people and notified settlements
 - Data on diseases in the locality and existing health care facilities
 - Data on demography including traditional skills and sources of livelihood along the proposed site.
- (b) **Places of Tourist, Historic, Archaeological and Religious Interests:** Places of tourist interest, historical, archaeological places and places of religious interests (if any) identified along the project road- in the immediate vicinity and also within study area (15 km on either side of the project road).
- (c) **Common Resources:** An inventory of common community resources such as educational institutions, health centres, recreation centres, Courts, libraries, community centres, Public toilets, religious and cultural features etc. situated along the project corridor will be prepared.

4. ANALYSIS OF ALTERNATIVES TO THE PROJECT ROAD:

In-depth study of related maps, topographic sheets, physical inspection and environmental and social screening will be carried out in order to find out the technically and environmentally sound, most feasible and environmental friendly alignment. Alternatives will be considered for the analysis of “without” and “with” project situations and components.

Alternatives will be compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, institutional training and monitoring requirements. For each alternative, the environmental costs and benefits will be quantified to the extent possible and the basis for the selected alternative will be stated.

Analysis of alternative will include alignment selection, finalization of bypasses, road alignment to reduce the cutting of tree and minimizing the demolition of structures, grade separators, services roads, vehicular, pedestrian and cattle underpass, quarry materials, road safety, etc.

5. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The environmental impact assessment will be conducted in accordance with the requirement of the Ministry of Environment, Forest & Climate Change (MOEF&CC) norms and guidelines. The collected primary and secondary data will be compiled and analyzed to establish a comprehensive database and assess the existing baseline environmental condition.

After establishing the baseline status of the study corridor and analysis of the project proposals and activities, the potential impacts on environmental components would be identified for pre- construction, construction and operational stages of the project. On the basis of the existing baseline environmental condition within the project area and the nature and extent of activities envisaged in construction/operation phase, the impacts would be identified and assessed for the type and quantum. Wherever practicable, a quantitative analysis would be performed for the impacts by using appropriate modelling method. All potential direct and indirect influence due to the proposed project will be addressed. The scope of work will not be confined only to alignment but the impacts due to the associated construction activities will also be assessed.

The following aspects will be given due importance during assessment of impacts and recommending remedial measures:

- Alignment of the project road and topographical changes
- Roadside drainage to avoid water logging, erosion & environmental degradation
- Impact on soil along the project road.
- Impact of solid waste generated and solid waste management plan
- Impact on borrow area and quarries
- Impact of road safety
- Impact on ambient air quality due to air pollution during construction activities and vehicle movement. Prediction of ambient air quality due to projected vehicular traffic on the project road will be carried out using computer based CALINE - 4 software.
- Impact on noise level during construction activities and vehicle movement. Prediction of noise levels will be carried out using computer based Prediction of Noise level during Operation phase in future years to be determined.
- Assessment of impacts of road construction on ground and surface water sources in the study area
- Impact of solid waste generated during construction phase of the project.
- Nature, quantity and disposal of construction spoils, wastes and waste water.
- Impacts of flora and fauna and ecological resources due to construction and operation of the project
- Public health & sanitation, and occupational health & safety of construction workers
- Impact on safety of local people during construction and operation phases.
- Road safety features to avoid accidents need of underpass, service road, etc.
- Population affected and socio-economic impacts.

6. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Public consultation will be carried out in the affected areas along the project road. The issues discussed during consultation shall be incorporated in the design framework and environmental management and mitigation plan.

7. ENVIRONMENTAL MONITORING PROGRAMME

Environmental monitoring plan for construction and post construction phases of the project road will be formulated to ensure effectiveness of implemented environmental mitigation measures. Cost of Environmental Monitoring Plan for construction and post construction phase of the project will be worked out.

8. ENVIRONMENT MANAGEMENT PLAN

After detail analysis of all the environmental impacts and issues, a proper and adequate Environmental management plan will be prepared with the aim to avoid, mitigate or eliminate the adverse impacts due to the project. This will cover all the aspects of construction including roles and responsibilities for mitigation operations, emergency response procedures, supervision, financing, monitoring and reporting. The Environmental Management Plan shall further include the prospects of environmental enhancement within the project area wherever possible. The EMP will envisage the plans for the proper implementation of mitigation measures to reduce the adverse environmental impacts arising out of the project activities during construction and operation phase. The following issues will be addressed in the EMP:

- i. Preventive, mitigation, compensatory & enhancement measures for minimization & abatement of the undesirable impacts caused during the construction and operation stage.

- ii. Details of management plans (compensatory plantation, solid waste management plan, borrow area management plan, occupational safety and health plan etc.) including their implementation schedule and supervision programme.
- iii. Identified/recommended institutional set up for implementation of the EMP including institutional requirements, staffing and training.
- iv. Environmental monitoring programme during construction and operation phase including performance indicators, monitoring mechanisms, implementation programme and cost.
- v. Resettlement action plan for affected families as per NHAI Policy and NRRP 2007.
- vi. Environmental Management Budget: The preliminary environmental budget considering the environmental aspects for the project.

9. STRUCTURE OF EIA REPORT:

The EIA report will follow the structure as per EIA Notification, 2006 and will consist of the following chapters:

- Introduction
- Project Description
- Analysis of Alternatives (Technology and Site)
- Description of the Environment
- Anticipated Environmental Impact & Mitigation Measures
- Public Consultation
- Resettlement and Rehabilitation Plan
- Project Benefits
- Environmental Monitoring Program and Environmental Management Plan
- Summary & Conclusion