Initial Environmental Examination

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India: Connecting Economic Clusters for Inclusive Growth in Maharashtra

Part 3

Prepared by the Public Works Department, Government of Maharashtra for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 6 May 2022)

Currency unit	–	Indian Rupee (₹)
INR1.00	=	$0.013
$1.00	=	₹76.55

ABBREVIATIONS

AE	–	Authority Engineer
ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
BIS	–	Bureau of Indian Standard
BOQ	–	Bill of Quantities
CAMPA	–	Compensatory Afforestation Fund Management Authority
CBD	–	Convention on Biological Diversity
CCF	–	Chief Conservator Forest
CD	–	Cross Drainage
CECIGM	–	Connecting Economic Clusters for Inclusive Growth in Maharashtra
CGM	–	Chief General Manager
CGWA	–	Central Ground Water Authority
CGWB	–	Central Ground Water Board
CPCB	–	Central Pollution Control Board
CTE	–	Consent to Establish
CTO	–	Consent to Operate
CFO	–	Certificate for Operation
COP 26	–	26TH UN Climate Change Conference of Parties
CSC	–	Construction Supervision Consultant
dBA	–	Decibel
DEIAA	–	District Environment Impact Assessment Authority
DFO	–	Divisional Forest Officer
DGM	–	Deputy General Manager
DPR	–	Detailed Project Report
EA	–	Executing Agency
EAC	–	Expert Appraisal Committee
EARF	–	Environmental Assessment and Review Framework
EFP	–	Environment Focal Person
EIA	–	Environmental Impact Assessment
EMP	–	Environmental management plan
EMOP	–	Environmental monitoring plan
ERDAS	–	Earth Resources Data Analysis System
FGD	–	Focused Group Discussion
FSO	–	Focal Safeguard Officer
FHWA	–	The Federal Highway Administration
GHG	–	Green House Gas
GIS	–	Geographic Information System
GM	–	General Manager
GOB	–	Government of Bihar
GOI	–	Government of India
GOR	–	Government of Rajasthan
GRC	–	Grievance Redress Committee
GRM	–	Grievance Redress Mechanism
GSDP	–	Goss State Domestic Product
IS	–	Indian Standard

IEE	–	Initial Environmental Examination
IMD	–	Indian Meteorological Department
IRC	–	Indian Road Congress
IUCN	–	International Union for Conservation of Nature
MSPCB	–	Maharashtra State Pollution Control Board
MDR	–	Major District Road
Leq	–	Equivalent Continuous Noise Level
MFF	–	Multi-tranche Financing Facility
MOEFCC	–	Ministry of Environment, Forests and Climate Change
MORTH	–	Ministry of Roads Transport and Highway
NAAQS	–	National Ambient Air Quality Standard
NSDP	–	Net State Domestic Product
NH	–	National Highway
ODR	–	Ordinary District Road
PCR	–	Physical Cultural Resources
PCU	–	Passenger Car Unit
PF	–	Protected Forest
PM	–	Particulate Matter
PD	–	Project Director
PIU	–	Project Implementation Unit
PPP	–	Public-Private Partnership
REA	–	Rapid Environmental Assessment
RF	–	Reserved Forest
RCD	–	Road Construction Department
ROB	–	Road Over Bridge
ROW	–	Right-of-Way
RR	–	Rural Roads
SE	–	Superintendent Engineer
SEIAA	–	State Environment Impact Assessment Authority
SH	–	State Highway
SOE	–	Safeguard Officer – Environment
SPS	–	ADB Safeguard Policy Statement, 2009
TEEMP	–	Transport Emissions Evaluation Model for Projects
TNM	–	Traffic Noise Model
UNESCO	–	United Nations Educational, Scientific and Cultural Organization
UNFCC	–	United Nations Framework Convention on Climate Change
USEPA		Unite States Environment Protection Agency
WLS	–	Wildlife Sanctuary
WPA	–	Wildlife Protection Act

CONTENTS

EXECUTIVE SUMMARY i
I. INTRODUCTION 1
A. Background and Rationale 1
B. Connecting Economic Clusters for Inclusive Growth in Maharashtra (CECIGM) 2
C. Project Objectives and Outcome 3
D. IEE Objectives 5
E. Extent of IEE 6
F. Approach and Methodology 6
G. Structure of the report 8
II. DESCRIPTION OF THE PROJECT 9
A. Location of the Project 9
B. Project Category 10
C. Traffic 11
D. Characteristics of Existing Roads 12
E. Improvement / Strengthening Proposal 12
F. Construction Material (Quantity and Sourcing) 25
G. Cost and Implementation Schedule 26
III. POLICY AND LEGAL FRAMEWORK 27
A. International Agreements and Commitments 27
B. Country Legal Framework and Regulatory Requirements 28
C. Procedure for Obtaining Key Clearances/Permits 31
D. Relevant Indian Road Congress (IRC) Codes to the Project Road 36
E. ADB Safeguard Requirements 37
IV. DESCRIPTION OF EXISTING ENVIRONMENT 38
A. Physical Environment 38
B. Ecological Resources 64
C. Economic Development 75
D. Social and Cultural Resources 76
V. IMPACT ASSESSMENT AND MITIGATION MEASURES 81
A. Methodology 81
B. Screening of Impacts 82
C. Assessment of Alternatives (Alignment Options) 86
D. Typical Potential Beneficial Impacts 86
E. Typical Potential Adverse Impacts 87
F. Pre-construction Phase Impacts and Mitigations 87
G. Construction Phase Impacts and Mitigations 95
H. Post Construction and Operational Phase 106
VI. GREEN HOUSE GAS EMISSION 112
A. Climate Change Mitigation 112
VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE 119
A. Meaningful Consultation 119
B. Objectives of the Public Consultations 119
C. Methodology 119
D. Project Stakeholders 119
E. Consultations with Government Agencies 120
F. Consultations with Local People/ Beneficiaries 123
G. Consultations with Women and Vulnerable Groups 124
H. Disclosure of Information 124

VIII. GRIEVANCE AND REDRESS MECHANISM 145
IX. ENVIRONMENTAL MANAGEMENT PLAN AND INSTITUTIONAL ARRANGEMENT 147
A. Environment Management Plan 147
B. Environment Monitoring Program 147
C. Organizational Set-up to Implement the EMP 148
D. Environment Management Budget 153
X. CONCLUSION AND RECOMMENDATION 154

LIST OF TABLES

Table 1: List of CECIGM Sub-Project Roads 2
Table 2: Importance of Sub-Project Roads 4
Table 3: Present and Projected Traffic of Sub-project Roads 11
Table 4: Design Speed 13
Table 5: CECIGM Sub-project Road's Salient Features and Improvement Proposals 15
Table 6: Quantity of Construction Material 26
Table 7: Summary of Environmental Legislation Applicable to the Proposed Project 28
Table 8: Workflow with Timeline for Forest Clearance 32
Table 9: Work Flow with Timeline for Wildlife Clearance 35
Table 10: Key Activities with Timeline for Obtaining Tree Cutting Permission 36
Table 11: Applicable Indian Road Congress (IRC) Codes 36
Table 12: Topography of Project Districts 39
Table 13: Major Geological Formation of Project Districts 40
Table 14: Soil Formation of Project Districts 41
Table 15: Flood-prone/Overtopping Sections 43
Table 16: Compliance Status of AAQ around the Project Area 56
Table 17: Compliance Status of Noise Level around the Project Area 57
Table 18: District-wise Groundwater Detail 58
Table 19: Compliance Status of Ground Water Quality around the Project Areas 59
Table 20: Compliance Status of Surface Water Quality around the Project Areas 60
Table 21: List of Waterways/ Water Bodies 61
Table 22: Forest Cover in Project Districts (Sq. Km) 65
Table 23: Details of Forest along the Project Roads 66
Table 24: Project Affected Trees 68
Table 25. Important Mammalian Species in the Project Area of EPC-23 72
Table 26: Mammalian Species in Project Area EPC-24 73
Table 27: Mammalian Species in Project Area of EPC-26 74
Table 28: Demography of the Project Districts 76
Table 29: Noise Sensitive Structures along Sub-Project Roads 78
Table 30: Criteria for rating the significance of impacts 82
Table 31: Screening of Environmental Impacts 83
Table 32: Locations of Rumble Strips and Wildlife Signages along Sub-Project Roads 89
Table 33: Locations of Cross Drainage Structures Proposed for Upgrading 93
Table 34: Results of Predicted Noise Level in dB along Sub-Projects 109
Table 35: Predicted Noise Levels along the Project Road (with out mitigation and with mitigation) 111
Table 36: Maximum PCU based on Terrain Considered in the TEEMP 113
Table 37: Fuel Type Scenario Considered in the TEEMP (Year 2020 and Year 2042) 113
Table 38: CO2 Emission Factors for Different Vehicle Types (Year 2020 and 2049) 114
Table 39: Input Parameters for TEEMP 114
Table 40: Estimated Total CO2 Emission During Road Construction 115
Table 41: Overall Project CO2 Emissions Intensity Indicators 116
Table 42: Summary of Consultation Held with Government Departments 120
Table 43: Outcome of Consultations Held in the Project Area 125
Table 44: Estimated Environment Management Cost as Part of Civil Works 153

LIST OF FIGURES

Figure 1: Project Location Map for CECIGM 9
Figure 2: Average Annual Rainfall in the State and Project Districts 38
Figure 3: Geology and Mineral Map of Maharashtra 40
Figure 4: Earthquake Zone of Maharashtra 43
Figure 5: Flood Risk Map of Maharashtra 44
Figure 6: Cyclone Map of Maharshtra 45
Figure 7: Land Use/ Land Cover of Maharshtra 45
Figure 8: Landuse Map of EPC-10 47
Figure 9: Landuse Map of EPC-13 47
Figure 10: Landuse Map of EPC-14 48
Figure 11: Landuse Map of EPC-11 48
Figure 12: Landuse Map of EPC-12 49
Figure 13: Landuse Map of EPC-15A 49
Figure 14: Landuse Map of EPC-15 B 50
Figure 15: Landuse Map of EPC-16 50
Figure 16: Landuse Map of EPC-17 51
Figure 17: Landuse Map of EPC-18 51
Figure 18: Landuse Map of EPC-19 52
Figure 19: Landuse Map of EPC-20 52
Figure 20: Landuse Map of EPC-21 53
Figure 21: Landuse Map of EPC-22 53
Figure 22:Landuse Map of EPC-23 54
Figure 23: Landuse Map of EPC-24 54
Figure 24: Landuse Map of EPC-25 55
Figure 25: Landuse Map of EPC-26 55
Figure 26: Portions of EPC-10 Sub-projects Passing through/adjacent to GIB Sanctuary 69
Figure 27: Landuse Surrounding Bhambhore village passing through GIB 70
Figure 28: Map Showing Sub-project EPC-23 and its Proximity to YCWLS 71
Figure 29: Map Showing Proximity to YCWLS from Sub-project EPC-24 72
Figure 30: Map Map Showing Sub-project EPC-26 and its Proximity to YCWLS 73
Figure 31: Consultation with Forest Officials and Pathway used by leopards near km 203+900 74
Figure 32: Locations of Speed Breakers & Wildlife Signage EPC-11 90
Figure 33: Locations of Speed Breakers & Wildlife Signage at EPC 18 91
Figure 34: Locations of Speed Breakers & Wildlife Signage at EPC 23 91
Figure 35: Locations of Speed Breakers & Wildlife Signage at EPC 24 91
Figure 36: Locations of Speed Breakers & Wildlife Signage at EPC 25 92
Figure 37: Locations of Speed Breakers & Wildlife Signage at EPC 26 92
Figure 38: Sample Contour Map showing Noise Levels due to Traffic along EPC-10 sub-project (during 1st year of Operation) at the homogenous intersections 110
Figure 39: Grievance Redress Mechanism 146
Figure 40: Institutional Arrangement to Implement Environmental Management Plan 152

V. IMPACT ASSESSMENT AND MITIGATION MEASURES

118. Road improvement projects are likely to bring several changes in the local environment both **beneficial** and adverse. This section of IEE identifies nature, extent and magnitude of all such likely changes vis-a-vis project activities for all stages of the project cycle, i.e., pre-construction, construction and operation. Beneficial impacts are mostly long-term and permanent whereas adverse impacts are localized and temporary in nature and are likely to occur mostly during construction stage.

A. Methodology

119. The methodology of assessing environmental impacts from the project entailed clearly identifying the environmental components that will be impacted, type of impacts, assessment area where the impacts will be felt and defining the criteria for assessing the significance of each type of **impact**. After defining these aspects, a screening of project impacts during design and pre-construction, construction and operation stages of the project was carried out to identify the minor, moderate and major impacts to guide development of mitigation measures and ensure that there are no or minimal residual impacts.

120. **Identification of impacts**. This includes identifying the valued environmental components (VEC) of the physical, biological, and human environments that are at risk of being impacted by the project. The VECs for this project which are based on the environmental baseline and are:

a. Physical environment – air quality and greenhouse gas emissions, land and soil, and groundwater quality and quantity; land use in 10 km radius
b. Biological environment – terrestrial and aquatic vegetation, mammals, avifauna, and ecologically important/sensitive areas in 10 km radius
c. Human environment – private land and buildings, public infrastructure including utility structures, noise and vibration levels, cultural/heritage buildings, and occupational health and safety for the construction workers and local community living within the vicinity of the project area.

121. **Area of impact assessment.** The area covered for assessing **direct impacts** include:

a. An average of 30m corridor (ROW) along the sub-project sections. This includes 100 m on either side studied for direct impacts.
b. Other indirect impact area covers location of quarries; borrow areas, storage area of construction material etc.

122. **Type of impact on the VECs:** The type of impact can be described as:

a. Positive: Improvement in the quality of the VECs because of the project
b. Negative: Degradation or reduction in the quality of the VECs because of the project
c. Neutral: No noticeable change in VECs

123. **Duration of the impact:** Duration means the time dimension of the impact on the VECs. The terms permanent, temporary and short-loved are used to describe the duration of impact:

(a) **Short-lived:** The impact disappears promptly
(b) **Temporary:** The impact is felt during one project activity or, at most, during the construction period of the project
(c) **Permanent:** The impacts are felt throughout the life of the infrastructure

124. **Extent of impact:** The extent of impact entails the spatial scale of impact on one or more of the VECs. The terms regional, local and limited are used to describe the area of impact:

(a) Limited: The impact is felt within the direct impact zone
(b) Local: The impact is felt withi the indirect impact zone
(c) Regional: The impact is felt beyond the indirect impact zone

125. **Severity of impact**. The severity or seriousness of an impact entails understanding the repurcussion or risks posed by the impact. This is a subjective criterion, which is defined as high, medium or low as below:

(d) **High**: The severity of impact is high if grave repurcussions are expected as a result of the impact due to any of the following or similar situations: the impact will be felt by a large number of people or receptors; the receptors are highly sensitive; the impacts will cause serious health issues; there is already a history of complaints from the project area and people have raised significant concerns during public consultation; some of the VEC in the project area already severely degraded and maybe further worsened by the project; there will be a significant change in one or more VEC because of the project

(e) **Medium:** The severity of impact is medium due to any of the following or similar situations: the impact will be felt by a small number of people; some receptors are affected but they are not sensitive; the impact will not cause serious health issues; some concerns were raised during public consultations, but they were not significant; there will be minor changes in one ore more VEC because of the project

(f) **Low:** The severity of impact is low due to any of the following or similar situations: the impact will not be felt by anyone; no or limited receptors are affected; no concerns were raised during public consultations; there will be no noticeable changes in one ore more VEC because of the project or activity.

126. **Significance of impacts**. The assessment of the significance of the impacts on the VECs requires understanding on the rating of type of impact, duration, extent and severity of impact as demonstrated in the criteria **Table 31** which described above the overall significance of each impact as major, moderate or minor.

Table 30: Criteria for rating the significance of impacts

Type of Impact	Duration	Extent	Severity	Significance
+ve	Short lived	Limited	Low	Minor
-ve	Temporary	Local	Medium	Moderate
Neutral	Permanent	Regional	High	Major

B. Screening of Impacts

127. **Based** on the rating criteria provided in **Table 30**, environmental impacts anticipated during the project design and pre-construction stage, construction stage and operation stage were screened for their level of significance as demonstrated in **Table 31** below. The screening was carried out for impacts that are expected without mitigation. Hence, it guided the identification

of impacts that need mitigation and clearly point out significant/major negative impacts that need to be prioritized for mitigation.

128. The **significance** of each environmental impact or project activity is indicated by the colors of the cells in the last column of the table. Red indicates major impact, orange indicates moderate impact, yellow indicates minor impact and green indicates positive impact. The following section discusses the details of impacts on each of the VECs in line with identification of major, moderate, minor impacts in the screening matrix. Major impacts have been given priority for identification of mitigation measures to ensure that there are minimal or no residual impacts.

Table 31: Screening of Environmental Impacts

VEC	Impact/ Activity	Project stage	Type of Impact	Duration	Area	Severity	Significance of impact
1.	**2. Physical environment**						
2.1 Air quality	Location of project roads alignment	D	+ve	permanent	Local	medium	+ve Minor
	Dust, PM, emissions from construction equipment and vehicles, Transport and storage of construction materials,	C	-ve	temporary	limited	medium	-ve moderate
	Emissions from road traffic	O	+ve	permanent	regional	low	+ve Minor
2.2 GHG emissions	Emissions from construction equipment and vehicles	C	-ve	temporary	limited	medium	-ve Minor
	Emissions from road traffic	O	+ve	permanent	regional	low	+ve minor
2.3 Surface water quality	Pollution from liquid and solid waste from camps and construction activities leakage from vehicles Siltation in water bodies due to construction activities /earthwork Extraction of water for construction works and use in camps Alteration of rivers/ streams for construction of cross drains	C	N	N	N	N	N
	accidental oil spillage	O	-ve	permanent	limited	low	-ve minor
2.4 Ground water quality	Pollution from liquid and solid waste from camps and construction activities;	C	-ve	temporary	limited	low	-ve minor
2.5 Ground water quantity	Location of site in already groundwater scarce region	D	-ve	temporary	limited	medium	-ve moderate
	Extraction of ground water for construction works and use in camps	C	-ve	temporary	limited	medium	-ve moderate
2.6 Land degradation/ pollution	Opening of borrow area and quarries	C	-ve	permanent	limited	medium	-ve Moderate
	Solid waste from construction works and camps, muck disposal	C	-ve	temporary	local	medium	-ve Moderate

VEC	Impact/ Activity	Project stage	Type of Impact	Duration	Area	Severity	Significance of impact
	Operation of borrow areas and quarries	C	-ve	permanent	limted	medium	-ve Moderate
	Contamination of soil due to leakage/ spillage of oil, bituminous and non-bituminous debris generated from demolition and road construction	C	-ve	permanent	limited	low	-ve minor
3.	**4. Biological environment**						
2.1 Trees/Forest/ terrestrial vegetation	Location of project alignment through forest area	D	-ve	permanent	Limited	medium	-ve Minor
	Removal of trees, shrubs and grasses	C	-ve	permanent	local	medium	-ve Moderate
	Growth of the compensated trees and additional plantation.	O	+ve	permanent	local	medium	+ve Moderate
2.2 Terrestrial fauna (mammals, birds, insects)	Accidents invovling wild mammals/ birds/ insects.	D	-ve	permanent	limited	low	-ve Minor
		C	-ve	permanent	limited	low	-ve Minor
		O	-ve	permanent	limited	low	-ve Minor
2.3 Migratory birds and ecologically important areas	Sub-projects SH-158 (Part-1), SH-23 and SH-54 passing nearby Sagareshwar Deer sanctuary and Kalsubai Harishchandragad Wildlife Sanctuary respectively.	D	-ve	permanent	limited	low	-ve minor
	Habitat Loss and disturbance in feeding, breeding and migration of birds.	C	-ve	temporary	limited	medium	-ve moderate
	None	O		N	N	N	N
5.	**6. Social environment**						
3.1 Private land and buildings	Location requiring removal of private structures/ buildings	D	-ve	permanent	limited	medium	-ve moderate
	Acquisition of private land. Demolition of private structures. Possible complaints, opposition from disgruntled or unhappy affected persons	C	-ve	permanent	limited	medium	-ve moderate
	Increase in value of land and property. Easier access to some areas and property.	O	+ve	permanent	local	high	+ve major
3.2 Public property/infrastructure/ utility structures	Location removal of public structures/buildings and utility structures	D	-ve	permanent	limited	medium	-ve Moderate
	Demolition of public structures. Removal and shifting of utility structures. Possible complaints from local public due to disruption of utility services	C	-ve	permanent	local	high	-ve Moderate

VEC	Impact/ Activity	Project stage	Type of Impact	Duration	Area	Severity	Significance of impact
	none	O	N	N	N	N	N
3.3 Noise	Location near residential areas, sensitive receptors (places of worship, hospitals, educational institutes, cultural/ heritage sites etc.)	D	-ve	permanent	limited	medium	-ve moderate
	Disturbance caused to local residents from noise generated from construction activities, campsite activities using heavy equipment, movement of heavy-duty trucks during day and night time. Noise levels exceeding standards. Complaints from local residents near construction sites.	C	-ve	temporary	local	medium	-ve moderate
	Noise levels exceeding baseline levels by more than 3dBA and causing disturbance to residents and sensitive receptors near project alignment	O	-ve	permanent	limited	low	-ve minor
3.4 Vibration	Location near residential areas, sensitive receptors (places of worship, hospitals, educational institutes, cultural/heritage sites etc.)	D	-ve	permanent	limited	low	-ve minor
	Vibration disturbance felt by local residents due to construction activities using heavy equipment and movement of heavy-duty trucks during day and night time.	C	-ve	temporary	limited	low	-ve minor
3.5 Occupational health and safety	Death, accident or injury of construction workers, due to poor safety standards. Illness of construction workers due to poor hygiene, health and sanitary facilities at the construction sites and camp sites.	C	-ve	temporary	limited	high	-ve major
	Accidents, injuries to operational staff	O	N	N	N	N	
3.6 Public health and safety	Design of road safety features	D	+ve	permanent	limited	medium	+ve moderate
	Accident or injury or death of local public living or moving near the project construction/camp sites due to poor safety standards. Illness of project	C	-ve	temporary	limited	high	-ve major

VEC	Impact/ Activity	Project stage	Type of Impact	Duration	Area	Severity	Significance of impact
	construction/camp sites, mosquito breeding due to poor camp management, excessive dust/air pollution caused by project related activities. Traffic jams and accidents caused by project related activities.						
	Accident, injury or death of public using the road. Health problems caused to people residing near road due to increased noise and air pollution	O	+ve	permanent	limited	medium	+ve Moderate

Note: +ve = positive impact; -ve = negative impact; AG = above ground; C = construction stage; D = design & pre-construction stage; N = neutral; O = operation stage; PC = pre-construction; UG = underground; VEC = valued environmental component

C. Assessment of Alternatives (Alignment Options)

129. Project scope includes widening and Improvement of roads along existing alignments within **available** ROW not necessitating alternative assessment vis-à-vis alignment except for EPC-17 and EPC 18. 3 realignments/new portions, namely Brahmanwada (Km 0+00 to Km 1+590), Amdura (Km 0+000 to Km 3+330 and Malkota (Km 0+000 to km 1+975) roads aggregating 6.895 km are proposed due to constricted built-up areas. This is less than 1.5% of the CECIGM total length. Due to river Godavari flowing parallel to these sub-projects, aligning the road on other side is environmentally more feasible. Encroachment in the flood-plain of Godavari River could have triggered more environmental risk and that too considering the future widening option. New road alignments are mostly along agricultural with some uncultivable land portions. No worth mentioning environmental features are falling inside or close to the alignment except cutting of some private trees of indigenous species (total =85 trees combined for all new alignments).

130. For the road section passing through GIB, it is quite evident that distribution of PA patches are on both sides. Therefore, any major realignment option could have resulted in significant increase in design length with huge land acquisition and its induced impacts. However, a very narrow strip (2.5 m on either side) additionally is required for widening which is confined within the available ROW. No acquisition of forest land is proposed. In remaining sub-projects, for the locations/stretches where wildlife movement is anticipated, realignment alternatives is not considered since movement paths are not defined. It is mostly erratic.

D. Typical Potential Beneficial Impacts

131. The immediate benefits of road construction and improvement will come in the form of direct employment opportunities during construction for the roadside communities engaged as wage laborer, petty contractors and suppliers of raw materials. During operation stage, road-side economic activities supporting transport like gasoline stations, automotive repair shops, lodging, and restaurants will increase due to increased number of vehicles. Increase in agro-industrial activities are also expected to take advantage of improved access to urban centers where there are higher demands and better prices for agricultural products. Project will accelerate the economic opportunities resulting in reduced migration. Other benefits of project road

improvement are: (i) reduction in travel time, (ii) better mode and frequency of transport, (iii) access to quality health care, educational, and other infrastructural facilities (iv) improved quality of life of rural population, (v) reduced accidents, and (vi) better investment climate for industries creating more employment opportunities for local people. Furthermore, the project is designed with concrete pavement which has various benefits compared to bituminous roads. This has been explained in detailed from para 30-33 of Chapter-II.

132. Environment-friendly construction methods have also been included in the project design such as utilization of fly-ash as mandated by law, in-situ soil stabilization technique, cut-and-fill method, and utilization of recycled asphalt for access roads. These methods will reduce the need for raw materials, including emissions reduction through lessened need for transport of such materials.

133. For fly ash, the major areas selected for the large-scale applications are the construction of roads and embankments. There are several other important eco-friendly and viable reasons for using fly ash in preference to conventional materials, thus diminishing the total emissions of greenhouse gases. Fly ash is light in weight in comparison to other conventional materials, with a dry unit weight between 10.9 and 14.10 kN/m³, it makes material savings, reduces the costs of transportation and underlying soils settlement. When coal ash is used in concrete for building roads and bridges, its constituents—such as heavy metals—are bound (encapsulated) in the matrix of the concrete and are very stable.

134. Ingestion, inhalation, and skin contact are the ways that humans and other living things could be exposed to coal ash. Other issues that may need to be addressed are leaching of elements such as mercury and metals into ground water, contamination of vegetation and the impact of other elements on the food chain, and airborne dust. In most cases, however, the way that coal ash is used, the engineering requirements for that use, and the handling and management methods applied minimizes exposure to the ash. Mitigation measures have been included under occupational safety and health during construction.

E. Typical Potential Adverse Impacts

135. Major anticipated impacts arising from the improvement of sub-project roads are: (i) economic displacement of some households, (ii) cutting of trees and disruption in wildlife movement, (iv) adverse impacts due to borrowing and quarrying, (v) increased risk of accident due to faster vehicular movement, and (iv) increased air and noise pollution due to increased traffic. Most of the impacts are reversible, temporary, localized in nature, and can be easily mitigated/ minimized/ avoided by effective implementation of EMP.

F. Pre-construction Phase Impacts and Mitigations

1. Loss of Land and Other Assets

136. Since widening and improvement are confined to available ROW, extent of land acquisition is limited to the proposed new road portions only. Land acquisition of 19.27 Ha is involved for proposed three realignments(Brahmanwada road, Amdura and Malkota) only in two sub-projects of MDR-83 (Part-1 and Part-2). Private properties affected are either squatted or encroached. Impact on common property resources is also minimal. Total 85 numbers of private trees are likely to be affected under Brahmanwada, Amdura and Malkota realignments of MDR-83. For all other private assets, such as hand pumps, wells, etc., pls refer to the Resettlement

Plans.

137. Adequate compensation and rehabilitation assistance has been proposed for affected households consistent with ADB's involuntary resettlement policy and GOI's Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR), 2013. Income restoration measures for vulnerable/resource poor and other affected persons shall be implemented. All impacted CPRs will be relocated in consultation with the local communities under the project cost.

2. Terrestrial Vegetation/ Trees, Forest, and Wildlife Movement

138. **Trees:** A total of 7,679 trees (approx. 14 trees/km) have been enumerated in proposed ROW. Most of them are indigenous and none of them are of rare, endangered, or threatened category. Geometric adjustment till final design by the contractors will be made to minimize affected trees. Further, tree cutting will be restricted to toe line of the formation width without compromising road safety elements. The mandatory compensatory plantation will be done on 1:3 basis by the Forestry Department. Additional plantation will be done as a strategy to minimize GHG emissions from increased traffic due to road upgrading. No tree will be uprooted without prior approval of competent authority.

139. **Forest:** Forest **diversion** of 22.7451 ha of area is required for eight sub-project roads is given in **Table 23**.

140. Diversion of forest land is regulated. Forest department prescribes a set of measures to be **implemented** by the user agency to ensure that there is no net loss incurred due to diversion of forest land. Worth-mentioning specific conditions while granting the diversion permissions are (i) payment of Net Present Value (NPV) (ii) allocation of at least equivalent or double degraded land for development of forest area (iii) compensatory afforestation etc. while securing the forest clearance. EA has already applied for forestry clearances to MOEFCC.

141. **Wildlife:** Magnitude of adverse impacts by development of linear infrastructure like (i) loss, degradation and fragmentation of habitat; (ii) traffic induced physiological and behavioral change; (iii) disruption in wildlife movement, injury and mortality is proportional to the width and length of the disturbance corridor. Widening in the forest stretches is confined to available land except some small patches of eight sub-projects. Forest patches requiring diversion of land along these roads are largely devoid of dense vegetation. Due to erratic/ undefined movement and crossing of wildlife along these roads, proposition of any structural mitigations is neither warranted by forest department nor established during IEE survey. Forest department suggested for installation of signboards and speed breakers where wildlife crossings are anticipated. For some sections, they also recommended bituminous or khandki roads to provide better grip/traction for the hooved animals to cross the roads. MPWD has also decided to expand the vent size of culverts close to/along the wildlife crossings.

142. Rapid assessment of wildlife movement was conducted for all subprojects for those in close proximity to any protected area viz EPC-26, EPC-23 and EPC 24. In EPC-10, despite a few locations being crossed or traversed adjacent to GIB sanctuary, wildlife crossing is very infrequent along/across the alignment. Ecological features, likely impacts, and its status as a critical habitat have already been performed during improvement of a portion of same state highway during MSRIP. The reference has been already made in relevant sections of Baseline Chapter of this report. However, the set of measures devised for other sub-project roads with wildlife crossing will be implemented for EPC-10 also. Furthermore, since the project is under

purview of Environmental Clearance from MOEFCC, MPWD necessarily has to comply with all general and specific conditions prescribed by MOEFCC in obtaining the environmental clearance. Based on rapid bio-diversity assessment, following mitigation measures are proposed to avoid/minimize the risk of animal-traffic collision along the sub-project roads.

143. **Speed Breakers/Rumble Strips**: These form the primary set of mitigation which keeps the vehicular speed in control and allows the driver to notice the crossing mammals or foraging birds on the road. The locations of speed breakers/rumble strips have been identified based on the survey findings and consultations held with forest officials are as below.

144. **Signage:** The sign boards (informatory cum cautionary) shall be placed 100 m before the speed breakers/rumble strip. This will inform the driver of potential animal crossings and increase effectiveness of speed breakers put ahead. These sign boards must include both information and cautionary note and signage indicating (i) the wildlife/forest area and animal crossing sections ahead (ii) maximum speed limit (30kmph) (iii) no honking (both day and night) and use of dipper at night since such a sudden change in illumination saturates their retinas temporarily blinding animals like black bucks and causing their abrupt movement.

145. The specific locations identified for speed breakers/rumble strips and wildlife signages suggested for EPC-11, EPC-18, EPC-23, EPC-24, and EPC-25 & EPC-26 is tabulated in **Table 32** and illustrated in **Figure 32 to Figure 37**.

Table 32: Locations of Rumble Strips and Wildlife Signages along Sub-Project Roads

EPC	Location with Ch. and coordinates for Speed Breaker/ Rumble strip	Location with Ch. and Coordinates for Signage
EPC 11	12+000 (18°15'38.04"N 74°40'44.73"E)	11+900 (18°15'39.92"N 74°40'41.13"E)
	10+550 (18°16'10.12"N 74°40'14.49"E)	10+650 (18°16'7.20"N 74°40'13.77"E)
EPC 18	29+950 (19° 3'38.17"N 77°28'15.00"E)	30+050 (19°3'37.08"N 77°28'18.86"E)
	34+200 (19° 2'29.73"N 77°30'12.59"E)	31+200 (19° 3'33.90"N 77°28'21.21"E)
	----------	34+100 (19° 2'31.65"N 77°30'9.89"E)
EPC 25	153+350 (18°17'56.48"N 74°45'43.57"E)	153+450 (18°17'53.83"N 74°45'41.17"E)
	159+000 (18°16'18.61"N 74°43'17.53"E)	158+900 (18°16'20.24"N 74°43'20.05"E)
	167+820 (18°13'35.01"N 74°39'12.65"E)	167+720 (18°13'37.45"N 74°39'15.10"E)
	171+650 (18°12'10.32"N 74°37'37.59"E)	171+550 (18°12'12.58"N 74°37'40.30"E)
EPC 23	30+700 (17°12'51.86"N 74°22'45.59"E)	30+800 (17°12'48.71"N 74°22'43.15"E)
	41+500 (17° 7'47.93"N 74°24'30.02"E)	39+900 (17°08'30.1"N 74°24'08.1"E)
	----------	41+400 (17° 7'48.58"N 74°24'29.32"E)
EPC 24	Km. 79+60, Km. 85+200, 99+100, Km,103+500 and Km112+400	79+700 (17° 5'23.52"N 74°19'0.08"E)
		85+300 (17°06'26"N 74°16'17"E)
		93+400 (17°08'01"N 74°12'58"E)
		99+200 (17°06'33"N 74°10'29"E)
		103+200 (17°05'52"N 74°08'37"E)
	----------	110+600 (17°04'27"N 74°06'20"E)
	----------	105+800 (17° 5'18.27"N 74° 7'14.71"E)
		110+600 (17° 5'1.61"N 74° 6'57.28"E)
EPC 26	193+050 (19°42'8.92"N 73°41'10.51"E)	193+150 (19°42'6.35"N 73°41'12.16"E)
	200+580 (19°39'3.17"N 73°43'6.24"E)	195+800 (19°39'28.02"N 73°43'9.34"E)
	204+950 (19°37'15.23"N 73°43'55.70"E)	200+680 (19°39'0.37"N 73°43'7.77"E)
	----------	202+500 (19°38'22.90"N 73°43'25.36"E)
	----------	203+450 (19°37'53.97"N 73°43'35.46"E)
	----------	204+850 (19°37'18.31"N 73°43'55.36"E)

Figure 32: Locations of Speed Breakers & Wildlife Signage EPC-11

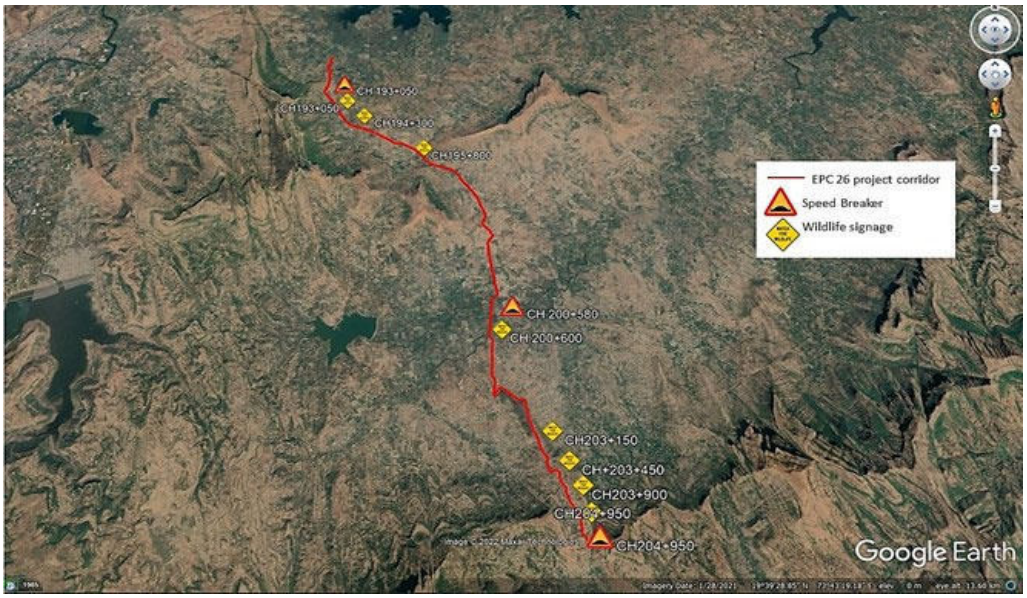
Figure 33: Locations of Speed Breakers & Wildlife Signage at EPC 18

Figure 34: Locations of Speed Breakers & Wildlife Signage at EPC 23

Figure 35: Locations of Speed Breakers & Wildlife Signage at EPC 24

Figure 36: Locations of Speed Breakers & Wildlife Signage at EPC 25

Figure 37: Locations of Speed Breakers & Wildlife Signage at EPC 26



146. While construction of dedicated animal underpasses is not deemed as warranted based on Forest Range Officers' assessment and IEE survey, provision of underpasses through retrofitting existing or adapting design of additional/new culverts will certainly improve passage and lessen the barrier effect of the upgraded roads. Therefore, for the EPC packages where wildlife movement has been reported and assessed, all existing cross drainage structures proposed to be upgraded can also serve as underpass for wildlife crossings. These structures generally do not cater to perennial flow of water. The PMC will review final design of such structures to ensure effectiveness based on available ADB and Wildlife Institue of India

guidance.[30] Table 33 summarises the different types of existing structures proposed for upgradation along sub-projects with anticipated wildlife crossings. Minimum vertical clearance of 2.5 m and above is sufficient for the passage of higher vertebrates reported in the wildlife crossings areas of the subprojects.

Table 33: Locations of Cross Drainage Structures Proposed for Upgrading

Up-gradation of CD Structure	No.	Sub-project with Chainage	Proposed Height in m (min-Max)
Minor Bridge to Major Bridge	1	**EPC 11**: at Km 0.675	6
Widening of Existing Minor Bridge	8	**EPC 24** (78+663, 79+563, 101+230, 103+555, 108+600, 109+210) **EPC 18:** 17+735, 17.735	4.2 to 7.2 10
Slab Culverts to Minor Bridge	7	**EPC 25:** (149+603, 163+100,166+843, 171+210,172+780) **EPC 18:** 15+380, 28.050	8 to 12 8 to 20
Pipe Culverts to Minor Bridge	1	**EPC 10:** 107+446	2.5
Pipe Culverts to Slab Culverts	7	**EPC-26:** 193+700, 194+075, 194+870, 195+215, 195+280, 196+840 **EPC-18:** 21.065	2.5 to 6.0 10
Pipe to Box Culvert	12	**EPC-11:** 6+820, 19+399, 15+435 **EPC-26:** 193+195, 194+010, 195+030 **EPC-18:** 27+190, 30+795 **EPC-23:** 31+221,40+711, 43+490, 52+815	4 3 to 4 8 3 to 6
Causeways to Minor Bridge	1	**EPC-25:** 151+784	12
Causeways to Slab/Box culverts	2	**EPC-11:** 12+650, 15+662	4
Box Culvert to Slab Culvert	5	**EPC-10:** 113+616, 114+143, 116+027, 117+610, 122+279	2.5
Reconstruction/Widening of Slab Culvert	3	**EPC-11:** 2+380 **EPC-26:** 194+300, 194+545	4 6

147. **Other Mitigations Suggested by Forest Department:** Apart from above measures like signage and speed breakers/rumble strips, other provisions like (i) Tar or Khandki stone pavement type road shall be constructed along anticipated wildlife crossing stretches developed so as to provide better grip/traction for the hooved; (ii) wherever reconstruction of existing culverts are proposed near wildlife crossing locations and, their vent size and height may be increased. Those structures which are not catering to the perennial flow of water may be utilized by wild animals for crossing. All causeways are proposed to be converted either to a minor bridge or box/slab culverts. This will significantly facilitate wild animals in crossing.

[30] Asian Development Bank. 2019. Green Infrastructure Design for Transport Projects: A Road Map to protecting Asia's Wildlife Biodiversity.

1. Community Safety

148. With increased traffic volume, communities including road users may be at risk due to road crashes in absence of adequate safety provisions such as crash barriers at accident prone areas. Safety provisions in accordance with IRC guidelines which include provision of (i) speed breakers in habitat areas to regulate speed, (ii) retro-reflective warning signboards near schools, hospitals, and religious places, (iii) proper sidewalks/pedestrian zones along the road near habitat areas, schools, hospitals, and religious places are included in preliminary design which will be further reviewed during detailed design by EPC contractor, and (iv) compliance with IRC codal provisions of state highway for curvature and grading. Provision of safety kerb at all bridges is also proposed. The design should attempt to equalize cut and fill.

2. Flooding/Over-topping

149. Since several sub-project roads are vulnerable to flooding. To avoid overtopping of pavement all low-lying sections are proposed for raising of embankment height above the HFL, provision of adequate CD structures with increased vent size/waterways and provision of side drains.

3. Worker's Camp Siting

150. Poor siting and layout of workers camp may cause (i) loss of agricultural produce if sited on cultivable land, (ii) health hazard to workers and nearby community, (iii) surface water pollution in case sited near water bodies, (iv) local drainage problem (v) wear and tear to haul routes if material is transported via village roads, and (vi), fire, electrical and other safety risks.

151. The location, layout and basic facility provision of each labor camp will be submitted to Authority Engineer (AE) and PIU prior to their construction. All camps should maintain minimum distance from habitation, water bodies, and through traffic routes as prescribed by MPCB and other applicable local guidelines. The construction shall commence only after approval of AE and MPWD. Contractors shall prepare solid waste management plan that includes collection, storage, and disposal subject to the review and approval of the AE.

4. Utility Shifting, Aesthetic and Visual Impacts

152. Delayed and unplanned shifting of public utilities like telephone and electrical poles, water pipelines, and OFC cables causes disruption of utility services to local community. Digging, shifting, and re- establishment of poles may also impair the view of community areas. All efforts shall be made to reduce the duration of utility shifting impact and restore the disturbed areas. All utilities should be shifted before start of construction. Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services. Visual barriers are to be provided, as necessary, on active construction zones. Consultation with affected people prior to the start of utility shifting, presentation of construction timelines and guidelines should be conducted. Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services, if any.

5. Heritage and archaeology

153. Mata Sahib Gurudwara which is a historical monument for Sikh pilgrims is situated near

Brahmanwada at km 12.400 and Hira ghat Gurudwara at km 11.550 along the sub-project road of MDR-83 (Part-1) but are not listed under regulated or prohibited category of ASI. Apart from these the project areas are not rich in historical and archeological resources. However, digging for various road construction purposes may unearth chance artifacts. A rapid response procedure to protect chance finds while minimizing disruption to project activities must be in place. Relevant provisions of Ancient Monuments and Archeological Sites and Remains Act (1958) should be implemented, to include: i) consultation with the Maharashtra Archeology Department, ii), demarcation of the discovery site, iii) chance finds report, iv) arrival and actions of cultural authority, and v) suspension/non- suspension/ further suspension of work.

G. Construction Phase Impacts and Mitigations

1. Topography and Geology

154. Project scope is limited to expansion of existing roads with widening of 2.5-3m on either side and will be confined within available ROW except in the realigned portions of MDR-83 (Part-1 and Part-2) sub-project sections. Abutting topography is predominantly plain rolling terrain. There are some ghat sections (hilly) along SH-23 and SH-119. Cut-and-fill operations are confined to ROW to improve/ maintain the vertical profile of road. The surplus soil from cut operations, which is unsuitable for selected sub grade, will be used to reinstate the borrow areas. Therefore, overall impact on the topography of the project area is unlikely. Likely impact on the geological resources may occur from the extraction of materials (borrow of earth, granular sub-base and aggregates for base courses and bridges). Maharashtra being naturally endowed with rock/ mineral deposits, a large number of licensed/ approved quarries under operation are readily available. All construction material such as aggregates, sand and boulder material are to be procured only after requisite permission from mining department like requisite valid consent from MPCB is available for operating the existing Crusher and environmental clearance from SEIAA have been obtained. Specific measures are:

a. Sources/ sites of construction material sites have been identified within the immediate vicinity of the road. No new quarry has been proposed for the project. Only licensed quarries will be used as sources of coarse and fine aggregates.
b. The AEs will ensure that the quarries have environmental clearance from SEIAA and all appropriate licenses and are being operated as per conditions of mine lease and CPCB norms.
c. Cut slopes should be re-vegetated immediately after widening activities
d. Borrow areas should be rehabilitated and brought back as far as possible to their previous appearance. Some borrow areas will be converted into ponds to compensate loss of water bodies. This will also enhance the local aesthetics
e. Cut materials should be used to widen the road or disposed of at proper sites

2. Air Quality

155. The specific locations affected by the air pollutants during construction are working areas, construction plant sites, quarries, and construction machinery and construction vehicles. Activities which generate air pollutants are: (i) dust generation from the construction zone during different stages of the construction such as clearing and grubbing, materials dumping, drying of materials, brushing of surfaces; (ii) dust generation from the access roads to the soil borrow areas, aggregate quarries, construction plants, and construction camp sites; (iv) operation of the construction plants such as hot mix plants, crushers, WMM plants, and concrete batching plants; and (iv) material storage, transportation and handling (loading/unloading) of different construction

materials such as sand and earth from borrow pits and aggregates. Some of the pollution control measures have been incorporated in the design stage by relieving congestion in built-up stretches at critical sections, improving road geometry, and widening of road to smoothen the traffic flow. The specific measures to control air pollution during construction are:

a. Vehicles delivering loose and fine materials are covered.
b. Loading and unloading of construction materials in covered area or provisions of water fogging around these locations
c. Storage areas are located downwind of the habitation area.
d. Water will be sprayed on earthworks periodically
e. Regular maintenance of machinery and equipment. Vehicular pollution check will be made mandatory.
f. Hot mix plants to be located at a suitable distance from the nearest habitation, school, hospital, forest, rivers, ponds, and national highway, from state highway, prescribed by SPCB and other applicable national laws, unless otherwise required by statutory requirements after securing a No-Objection Certificate (NOC) from the SPCB. Hot mix plant will be fitted with stack of adequate height as prescribed by SPCB to ensure dispersion of exit gases.
g. Bitumen emulsion and bitumen heaters should be used to extent feasible.
h. Only crushers licensed by PCB will be used.
i. LPG should be used as fuel source in construction camps instead of wood.
j. Regular water sprinkling of unpaved haulage roads.
k. Mask and other PPE will be provided to the construction workers
l. DG sets will be fitted with adequate height as per CPCB/ MoEF guidelines.
m. Contractor should submit a dust suppression and control program to the MPWD
n. Additional plantation proposed to improve the micro-climate

3. Noise and Vibration

156. Increases in noise due to construction activities (land clearing, site preparation, material, equipment, machinery movement, establishment of camps/site offices) are expected. The impacts of noise exposure on the community residing near the work zones will be significant and intensity of the exposure to different receptors will also vary widely. These impacts are temporary in nature as the construction site moves along different road stretches. For these operations, the noise levels will increase during the construction period. The machinery involved in the construction operation (dozer, roller, grader, paver, tractors, brooms/rotary brushing, tippers, generators, excavators, etc.) produce noise levels in the range of 80 – 95 dB(A) (at a distance of about 5 m from the source). Although this level of noise is higher than permissible limit, it will occur intermittently and temporarily. This noise level will attenuate fast with increase in distance from noise source. There is a number of noise sensitive receptors, especially schools, close to the alignment. Adequate mitigations have been proposed for the remaining structures near the road. Since hill cutting in ghat section is not envisaged noise and/or vibration impact due to blasting is not expected. Specific measures are:

a. All equipment will be timely serviced and properly maintained to minimize its operational noise. Noise level will be one of the considerations in equipment selection which will favor lower sound power levels. Construction equipment and machinery will be fitted with silencers and maintained properly.
b. Stationary noise making equipment will be placed along un-inhabited stretches.
c. Timing of noisy construction activities will be regulated near residential areas and sensitive receptors. Maximum construction activities will be undertaken during

nighttime and weekends when sensitive receptors such as schools are not functioning. Alternatively, construction work will be executed during daytime near residential areas. The health centres along the project roads are of primary level with first aid outdoor treatment facility and are anticipated not to require any permanent noise barriers.

d. Noisy operations will be separated to reduce the total noise generated, and, where feasible, traffic will be re-routed during construction to avoid the accumulation of noise beyond standards.
e. If the abovementioned schemes prove to be inadequate, temporary noise barrier will be provided near identified sensitive locations or near the noise source during construction.
f. Protection devices (ear plugs or earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines.
g. Noise monitoring will be carried out to ensure the effectiveness of mitigation
h. Complaints on noise from local community will be received and addressed through the grievance redress mechanism system discussed in chapter VI.

157. **Vibration:** Vibration can be felt during construction due to equipment movement, pile driving, compaction, hammering, operation of batching plant and generators, etc. Vibration can cause general annoyance, sleep disturbance, architectural and structural damage to properties.

158. In general, structural damage to the building caused by vibration phenomena are extremely rare and generally generated by the contribution of other factors. Other forms of damage defined “threshold level," is the one that, without compromising the structural safety of the buildings, can cause a reduction of the value or the use. The damage threshold takes the form of cracks in the plaster, enhancements of existing cracks, damage of architectural elements.

159. It is recommended that the Contractor undertakes condition surveys of all properties within 15 meters from road edge as well as vibration monitoring during heavy machinery/equipment operation. If there are any claims or reports of damage the affected house will be surveyed against the pre-project survey and repairs will be undertaken as appropriate by the Contractor. There are several technical standards, which can serve as reference for the evaluation of the disturbance and damages caused by vibration phenomena. For damage to the buildings the main references are: UNI 9916 "Criteria for measuring and assessing the effects of vibration on buildings", DIN 4150 and BS 7385. These standards provide a guide for the selection of appropriate methods of measurement, data processing and evaluation of the vibratory phenomena for the evaluation of the effects of vibration on buildings (risk of structural damage), with reference to their structural response and architectural integrity.

4. Land and Soil

160. **Loss of Productive Soil and Change in Land use:** Topsoil from borrow areas shall not be used for embankment formation as it is very fertile and shall be used for closure of disturbed are as after the completion of construction work. Loss of topsoil is envisaged during construction stage if construction plant, offices, workers camps, stockyards, and borrow areas are located on fertile areas and if haul roads and traffic detours during construction are routed through agricultural land. Change in land use is insignificant since widening and improvement is mostly within available ROW. Hence, no specific mitigation proposed for land use change. Specific measures for topsoil preservation are:

a. The topsoil will be stripped to a maximum of 1.5 m depth and stored in stockpiles. At least 10% of the temporarily acquired area will be earmarked for storing topsoil.
b. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile will be restricted to 2 m.
c. Stockpiles will not be surcharged, or otherwise loaded and multiple handling will be kept to a minimum and stockpile will be covered with gunny bags or tarpaulin.
d. It will be ensured that the topsoil will not be trafficked either before stripping or when in stockpiles.
e. To prevent any compaction of soil in the adjoining productive lands, the movement of construction vehicles, machinery and equipment will be restricted to project corridor as much as possible.
f. The stored topsoil will be utilized for covering disturbed areas including redevelopment of borrow areas after filling dressing of the slopes of embankment.

161. **Soil Erosion/ Silt Runoff:** Slopes of the project roads are relatively stable as the **embankments** of the roads are not high compared to the adjacent lands. Soil erosion may take place near cutting areas, at steep and un-compacted embankment slope, bridge locations and wherever vegetation is cleared. Soil erosion may have cumulative effect like siltation, embankment damage, drainage problem, etc. Loss of soil due to runoff from earth stockpiles may also lead to siltation. Specific measures are:

a. Bank protection measures will be taken at erosion prone areas.
b. Provision of side drains to guide the water to natural outfalls.
c. Retaining walls and breast walls have been included in the design to check erosion.
d. Covering the slope surface with grass and bushes, by simple planting of grass roots and saplings;
e. In conditions where simple planting and seeding is not effective, the slopes are covered with open mesh of natural fibers such as coir or jute, or of geo-synthetics, followed by planting of grass and bushes. This is often termed slope reinforcement method of vegetation; and,
f. Where slopes are of highly erodible materials or other adverse conditions prevail, the vulnerable slope surface is covered with protective surfacing. Stone or brick pitching are most commonly used in India for this purpose.
g. Side slopes of the embankment will not be steeper than 2H: 1V. Turfing of embankment slopes will be done along the stretch.
h. IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control will be taken into consideration.

162. **Borrow Areas and Quarries:** Extraction of the soil from borrow area and boulders/ aggregates/ granular sub-base from the riverbeds can result in some direct and indirect impacts on the local and regional environment. Impacts may be positive or negative and vary from case to case. Borrow areas may cause some adverse impacts if left un-rehabilitated. It may pose risk to people, particularly children, and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector-borne diseases. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, and cause air and noise pollution. The following specific provisions should be followed:

a. Borrow areas will not be located near habitation. The edges of borrow sites will be no closer than 3 m from any fence line or boundary.

b. Adequate clearance will be provided for the construction of catch drains. Borrow sites will have adequate drainage outlets unless the relevant landowner has agreed that the borrow area is to create a permanent tank or dam. Written clearance from the landowner/village head will be obtained before leaving a site
c. Borrow pits will be selected from barren land/wasteland to the extent possible. The topsoil will be preserved, and depth will be restricted to 1.5 m to comply with IRC guidelines.
d. Borrow areas should be excavated as per the intended end use by the owner. IRC:10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.
e. The depths in borrow pits are to be regulated as per IRC guidelines. Borrow areas will be levelled with salvaged material or other filling materials which do not pose contamination of soil.
f. Transportation of fine aggregates and earth material by covered trucks.
g. Sprinkling of water near loading/downloading and stockpile locations.
h. The contractor will evolve site-specific redevelopment plans for each borrow area, which will be implemented after the approval of the Supervision Consultant.
i. If necessary, opening of new quarries only after environmental clearance from SEIAA, NOC from SPCB and permission from state mines department.

163. **Compaction and Contamination of Soil:** Soil of the haulage roads and construction camp area may be compacted due to movement of construction vehicles, machineries and equipment, and due to siting of construction camps and workshops. Soil may get contaminated due to inappropriate disposal of liquid waste, (lubricant and fuel spills, vehicle/equipment washing effluent) and solid waste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment and machinery. Soil may also get contaminated due to inappropriate disposal of domestic solid waste and sewage from construction camps. Sub-soil contamination may also be attributed to: scarified bitumen wastes, operation of the emulsion sprayer and laying of hot mix, storage and stockyards of bitumen and emulsion, excess production of hot mix and rejected materials. As such, the following specific measures are proposed:

a. Fuel and lubricants will be stored at the pre-defined storage location. The storage area will be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils.
b. Unavoidable waste will be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fueling areas, oil interceptors will be provided. Oil and grease spill and oil-soaked materials are to be collected and stored in labelled containers and sold off to SPCB/MoEF authorized re-refiners.
c. Movement of construction vehicles, machinery and equipment will be restricted to the designated haulage route.
d. Approach roads will be designed along the barren and hard soil area to reduce the compaction induced impact on soil.
e. The productive land will be reclaimed after construction activity.
f. Septic tank/mobile toilets fitted with anaerobic treatment will be provided at camp.
g. Domestic waste at construction camp will be segregated into biodegradable and non-biodegradable waste. Non-biodegradable waste will be given or sold to relevant agents for recycling or disposed in the nearest dumping site following environmentally friendly practices.

5. Groundwater and Loss of Water Sources

164. Groundwater is in safe category in most of the project districts except Ahmednagar, Pune and Sangli and districts. In Ahmednagar only 1 Taluka is over-exploited and 5 semi-critical. Pune has also only 2 talukas under semi-critical zone. Similarly, in Sangli 1 taluka is in critical and 1 in semi-critical zone. All remaining blocks of both districts are under safe zone category. None of the project districts has been notified by the Central Groundwater Authority. In notified areas, abstraction of ground water is not permissible for any purpose other than drinking and domestic use. However, prior permission/ NOC is mandatory for abstracting groundwater for project purposes including road infrastructure. Uncontrolled abstraction may hamper water need of communities along the road. Other than these, specific measures are:

a. All efforts have been taken while finalizing the alignment to minimize the impact on ponds and other water sources.
b. Rainwater harvesting pits are proposed in all sub-projects. It is also recommended to convert some of the borrow areas into ponds. These measures will significantly augment the groundwater conditions in the project areas.
c. All hand pumps and wells proposed for relocation at suitable locations in consultation with local community.
d. In view of the recent order by the National Green Tribunal, it is a pre-condition to recharge groundwater while granting permission for abstraction of groundwater by CGWA for any infrastructure project.
e. The contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.
f. No change in groundwater regime is envisaged hence no mitigation is proposed.
g. MPWD needs to consider construction of Bridge cum Bandharas wherever new/reconstruction of existing structures are proposed subject to site suitability.

6. Siltation and Deterioration in Surface Water Quality

165. Construction activities may increase turbidity level increasing the sediment load. Sometimes contamination of surface water may take place due to accidental spills of construction materials, oil, grease, fuel, and paint. Degradation of water quality is also possible due to accidental discharges into water courses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas. During construction phase, care would be exercised to control silt so that the water available in the ponds and wells, especially those located very near to the ROW may not be contaminated.

166. Extraction of sand from the riverbed may increase turbidity and affect propagation of fishes and other aquatic life mainly benthic organisms. The macro-benthic life which remains attached to the riverbed material may get dislodged and carried away downstream by turbulent flow. Mining and dredging activities, poorly planned stockpiling and uncontrolled dumping of overburden, and chemical/fuel spills from equipment and machinery involved in dredging may cause deterioration of water quality for downstream users and poisoning of aquatic life. However, the riverbed sand quarries identified for the project have no density and diversity of benthic fauna. No fishing was observed or reported. This is mainly because all riverbeds are dry for most part of the year. Moreover, any extraction of riverbed material is regulated by different authorities like State Environmental Impact Assessment Authority (SEIAA), State Pollution Control Board (SPCB), and State Mining Department with an objective to conserve topsoil, avoid impact on aquatic biodiversity, hydrological regime, etc. by haphazard and unscientific mining of minor

minerals. The project will utilize riverbed materials from existing licensed quarries with all stipulated conditions of abovementioned authorities. Moreover, specifically:

a. Construction works near waterways/water bodies will not be undertaken during the monsoon season
b. Retaining walls, stone pitching and toe walls have been proposed to prevent erosion
c. Contractors will install temporary silt traps or sedimentation basins along the drainage leading to the water bodies,
d. No construction camp will be located within 500 m of any water body.
e. All parking, repair and fuel and hazardous material storage areas will be located away from any waterbody. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.
f. Vehicles will be refueled only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge
g. All waste oil will be collected and stored in sealed damage-proof containers and disposed to recyclers.
h. All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual cleanup.
i. Temporary retention ponds, interception drains, and silt traps will be installed to prevent silt laden water from entering adjacent water bodies/waterways.
j. The slopes of embankments leading to water bodies will be modified and rechanneled to prevent entry of contaminants.
k. Contractors will comply with requirements of the clearance issued by the relevant state authority for mining in rivers

7. Hydrology and Drainage

167. Large number of rivers, streams, and nallahs drain the project area. Although most of them are seasonal in nature, waterlogging/ flood situation may arise due to construction of road embankment which may act as impediment to flow of water without adequate cross drainage/ side drains. Water logging along the road will also have ill effects on the stability of embankment especially in shallow water table areas. Diversion of water channels during construction of cross drainage structures or otherwise is not envisaged. Sub-structure construction should be limited to the dry season. The following have also been taken or should be taken to mitigate these impacts:

a. Adequate cross drainage structures have been provided to avoid impediment to natural flow of water. Additional balancing culverts have been provided. The embankment height has been designed consistent with the existing topography of the region.
b. Effective drainage system will be provided to drain the storm water from the roadway and embankment and to ensure minimum disturbance to natural drainage of surface and subsurface water of the area.
c. Drainage system design such as surface and sub-surface drainage will be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes, and service roads will be discharged through longitudinal drains, designed for adequate cross section, bed slopes, invert levels, and outfalls. If necessary, the walls of the drains will be designed to retain the adjoining earth.
d. In the absence of sufficient guidance materials on how a (Representative Concentration Pathways) RCP scenario can be used with confidence in actual

engineering practice, a shift to a higher design frequency, 50-year return period instead of 10-15 year, was considered to cope with climate change uncertainties.

e. All existing causeways are proposed to be reconstructed as minor bridge or slab/box culverts.

8. Construction Debris/ Waste

168. Debris can be generated by dismantling of pavement. Depending on the type and place of recycling asphalt pavements, the most frequently used methods are plant (hot-mix asphalt) recycling, cold in-place recycling, and hot in-place recycling. Although hot-mix plant recycling has been widely used, both cold and hot in-place recycling are recommended only for low-traffic roads. Nevertheless, asphalt can be recycled numerous times.

169. Debris generated due to the dismantling of the existing road need to be suitably reused in the road construction, subject to the suitability of materials and as follows;

f. Sub grade of the existing pavement shall be used as embankment fill material.

g. Existing base and sub-base material shall be recycled as sub-base of the haul road or access roads

h. Existing bitumen surface may be utilized for the paving of crossroads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.

i. Contractor will suitably dispose off unutilized debris materials either through filling up of borrow areas located in wasteland or at pre-designated disposal locations

j. At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The concessionaire will ensure that the surface area of such disposal pits is covered with a layer of soil.

170. Quarry dust and unused iron bars or damaged support structures constitute significant wastes. Mitigation for solid waste from construction camp has been given in construction camp section. However, other specific mitigation measures are as follows:

a. Unusable debris material should be suitably disposed at pre-designated disposal locations to the satisfaction of AE.

b. Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.

c. Following considerations will be made during selection of dumping sites.
   - 1.5 km from habitation and forest areas and 500 m from ponds.
   - Dumping sites do not contaminate any water sources, rivers etc., and
   - Consent from the village council has to be obtained before finalizing the location.
   - Form works will be re-used to the extent possible. All stripped formworks will be examined for any damage and rectified in the workshop for re-use.

9. Ecological Resources

171. **Terrestrial Vegetation/ Trees**: The cutting of 7,679 trees spread over a vast geographical area is unlikely to cause any change in microclimate. The roads are also passing through largey modified habitats and removal of trees will be done only along the existing alignment except in realigned portions and will therefore not cause significant ecological impact.

Compensatory plantation at 1:3 ratio will improve the local climate in the long term. No loss of any rare/endangered species is envisaged. Detailed measures to be taken are as follows:

a. Avoid or minimize the number of trees to be cleared through minor geometric realignment or eccentric widening.
b. Requisite permission from Forest Department will be secured for cutting of roadside trees.
c. Ensure timely commencement of compensatory plantation. Roadside Plantation Strategy as per IRC including manuring and controlled use of pesticides/ fertilizers
d. Additional plantation/avenue plantation is also proposed subject to availability of land.
e. Provision of LPG in construction camp as fuel source to avoid tree cutting for firewood, wherever possible.
f. For safe traffic operation, vertical clearance between the crown of the carriageway and lowest part of overhang of the tree available across the roadway will conform to IRC: SP: 21-2009. The pit size, fencing, watering, and manuring requirements will also conform to the above standard. Use of pesticides will be restricted.
g. In the event of design changes during the construction stages, additional assessments including the possibility to save trees shall be made by the EA

172. **Faunal Elements**: Several mitigation measures recommended in design stage will reduce if not totally avoid collisions of wild animal with vehicles. These include the following:

a. Placing signage/ information boards on wildlife crossing points/presence of wildlife along the road
b. Retrofitting/construction of CD structures to serve as underpasses.
c. Replacing all causeways to a minor bridge or box/slab culverts
d. Speed limitations in wildlife crossing sections
e. Speed breakers or rumble strips to control vehicle speed.

173. **Invasive Species:** Soil brought into the project area from outside may contain seeds of alien invasive species. Also, the construction machinery and vehicles can accidentally introduce seeds of such plants if used without proper cleaning. Temporary facilities such as labor camps, dumping sites, soil storage sites are potential locations where invasive plant species can get established in quick succession. This will negatively affect both the natural and manmade habitats. Securing soil from locations close to the project area will reduce the chances of transporting any seeds of alien invasive species to the project area. Land area of labor camps, dumping sites and soil storage sites should be frequently checked for any growth of invasive plant species. If found, they should be burned and destroyed within the premises in which they were found. Information on invasive plant species will be provided in camps.

174. **Aquatic Ecology:** Temporary sedimentation and water quality deterioration is expected during the construction stage. Increase in turbidity due to erosion will lead to reduction of light penetration and make it an undesirable place for aquatic fauna and flora. Further due to the reduced light penetration to the water body, the primary productivity of the biota in the water body will be reduced resulting in increased mortality. In addition, when these particles settle on the bottom it will affect the breeding ground of aquatic animals. Improvement of existing embankments particularly along the waterways may increase silt while accidental spill of materials, chemicals, and fuels will deteriorate receiving water quality. The impact is insignificant since most of the waterways are non-perennial and construction of bridges will be mostly during

summer. Siltation will be avoided by measures suggested above in impact on surface water resource section.

10. Construction Camp and Immigration of Workers

175. Poor siting and improper management of construction camp may lead to several adverse impacts on environment like: (i) loss of vegetation due to use of wood as fuel source for cooking, (ii) deterioration in nearby surface water bodies' quality, (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste, and (iv) poor sanitation may result to transmission of communicable diseases among the workers and the host communities. This includes the possible spread of sexually transmitted disease, diseases from improper handling and supply of food, poor water supply, insect-borne diseases, and alcohol and drug abuse. The following specific measures should be taken to avoid/minimize negative effects:

a. No productive land will be utilized for camp. All sites must be graded and rendered free from depressions to avoid water stagnation. Accommodation and ancillary facilities will be erected and maintained to standards and scales approved by the resident engineer. All camps will be sited at the SPCB prescribed distance from habitation and water bodies.
b. All construction camps will be provided with sanitary toilet with septic tanks attached with soak pits. Storm water drains will be provided for the flow of used water outside the camp. Drains and ditches will be treated with bleaching powder on a regular basis. Garbage bins must be provided in the camp and regularly emptied and disposed in a hygienic manner. LPG cylinders will be provided as fuel source for cooking to avoid any tree cutting.
c. At every workplace, the Contractor will ensure that a first-aid unit is readily available. Workplaces away from regular hospitals will have indoor health units. Suitable transport will be provided to reach the nearest hospital. An ambulance containing the prescribed equipment and nursing staff will be provided, as appropriate
d. The Contractor will ensure the good health and hygiene of all workers to prevent sickness and epidemics. These measures include the HIV/AIDS prevention program to reduce the risk and transfer of HIV. Activities under the program include regular information, education, and communication campaigns to workers, drivers, delivery crew, and communities on the risk.
e. The Contractor will provide adequate and safe water supply for workers. No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community.
f. Migrant workers may be the potential carriers of various diseases. Regular health check-up and immunization camps will also be organized for the workers and nearby population.
g. In the event of any unanticipated, conditions one like COVID-19 pandemic situations, Government protocols must be followed and precautions shall be taken.

11. Workers and Community Health and Safety

176. The following safety aspects will be observed: (i) safety of construction workers, (ii) safety of road users including pedestrians, (iii) safety to cattle, (iv) safety of local community, (iv) unsafe/ hazardous traffic conditions due to construction vehicle movement to be considered during design and construction stage, and (v) conduct of safety audit. Impact and mitigations due to construction activities have already been detailed in Noise and Vibration section but specific

safety measures are outlined below:

a. During the construction phase, contractors will be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during: (i) road works, (ii) handling of large construction equipment and machineries, (iii) handling of chemicals and hazardous materials and inflammable substances, (iii) welding, and(iv) electrical works among others.
b. Contractor will arrange all PPE for workers, first aid and fire-fighting equipment at construction sites. An emergency plan will be prepared duly approved by engineer in charge to respond to safety hazards.
c. To avoid disruption of the existing traffic due to construction activities, comprehensive traffic management plan will be drawn up by the contractor. Traffic in construction zones will be managed as per the provisions of IRC SP 55.
d. After construction is completed in a particular zone, it will be opened for normal operation. All diversions should be closed before start of normal operation.
e. Use of retro-reflectorized traffic signs, and cantilever/gantry type overhead signs, thermoplastic road marking paints, delineators, traffic cones, empty bitumen drums, barricades, and flagmen will be used to ensure traffic management and safety. Conduct of regular safety audit on safety measures will be adopted during construction.

177. Fly/coal ash will be utilized in the project to the extent feasible. When used as a fill for roadbeds and embankments, unlike that used in concrete, requires greater care to ensure its safe use. The use of engineering standards and guidelines pertaining to coal ash will help ensure that the use of these materials will not negatively impact the environment. Following measures shall be followed in order to reduce occupational health safety of workers involved in construction are as follows:

a. Cleaning work areas regularly by wet sweeping or vacuuming.
b. Wearing basic personal protection such as safety goggles with side shields to protect the eyes from dust.
c. Adding water to the ash to prevent fly ash from blowing during handling.
d. Using standard dust filters on vehicles and silos.
e. Using mechanical ventilation or extraction in areas where dust could escape into the work environment.

12. Obstruction and Disruption of Traffic

178. Disruption of access to infrastructure or social resource due to construction activity will cause nuisance and additional cost to the public in terms of longer travel period due to diversion or heavier traffic. It will also pose risk of accident to motorist at night if these blockage and disruption are not clearly demarcated. As such, specific measures outlined below should be followed:

a. The contractor will submit a traffic plan to the Project Engineer before the construction. This Plan will recommend for approval, the safe and convenient temporary diversion of traffic during construction, design of barricades, delineators, signs, markings, lights, and flagmen, among others.
b. For widening of existing carriageway and part of it will be used for passage of traffic, paved shoulder will be provided on one side of the existing road by the contractor
c. At least one 3.5 m lane to remain open to traffic at all times

d. The surface used by the through traffic will be firm bituminous compacted surface free of defect
e. The maximum continuous length over which construction under traffic may take place should be limited to 750 meters as much as practicable.
f. Construction activity will be restricted to only one side of the existing road.
g. On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed.
h. Transportation of quarry material to the construction sites through heavy vehicles will be done through existing major roads to the extent possible. This will restrict wear and tear to the village/ minor roads. Small vehicles/ un-motorized vehicle can also be used for its further transportation to the construction sites from temporary storage areas.

13. Transport and Storage of Materials

179. The construction material primarily will consist of aggregate, sand, cement, bitumen, and lubricating oil and fuel for vehicle and construction equipment. These will be primarily stored temporarily at construction camps. The oils, fuels and chemicals will be stored on concreted platform with spills collection pits. The cement will be stored under cover. All these temporary storage areas will be located at least 150m away from the habitat. The likely impacts due to transportation and storage including fugitive emission have already been covered under different sections above.

H. Post Construction and Operational Phase

180. Road aesthetics will be improved after tree plantation, landscaping of embankment slopes, improving the road cross sections, more bus bays, side drains, installation of safety signages, crash barriers, and road markings. The aesthetics will further be improved due to the enhancements/ creation of new ponds as a rehabilitation measure for borrow areas. However, due to lack of proper maintenance the road condition may deteriorate over the years resulting into numerous problems such as rise in accidents, disruption of transportation services, tree survival, and functioning of side drains. MPWD will allocate adequate resources and logistics to ensure that the road and its furniture are being maintained and intended benefits are generated thereof.

1. Site Restoration

181. Contractor will prepare site restoration plans, which will be approved by the AE. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. All construction zones including riverbeds, culverts, roadside areas, camps, hot mix plant sites, crushers, batching plant sites, and any other area used/ affected by the project will be left clean and tidy, at the contractor's expense, to the satisfaction of the Environmental Officer of the AE. All the opened borrow areas will be rehabilitated and AE will certify it.

2. Road Repair/Maintenance Work and Increase in Traffic

182. Emissions from hot patch work, fumes from pavement marking works, dust from concrete grinding, and dust demolition debris may deteriorate local air quality. Mitigation measures recommended are:

a. Provision of PPE to workers
b. Water sprinkling to control dust

c. Covered haul trucks
d. Maintain an adequate vehicle road capacity as congestion decreases vehicle speed, deteriorates fuel efficiency, and increases emission per kilometer travel.
e. Maintain optimum range of vehicle speed. CO_2 emissions drastically increase when vehicles are travelling less than 30 kph and faster than 70 kph.
f. Maintain good riding quality of the toll road, expressed in roughness

3. Soil Erosion and its Cumulative Impacts:

183. The consequences of soil erosions are far wider than repair and maintenance of the road. Along the project road, the inflow of water into ponds during rains causes erosion of the embankment besides seepage of water into embankment and sub-grade resulting in softening and possible, pavement failure. This may also increase siltation in water bodies. Project design includes provisions of retaining walls for the protection. Regular checks will be made to check its effectiveness.

4. Water Resources

184. Improvements to the road drainage will result in improved storm water flows and reduce the tendency of blockages to occur in roadside drains. Risks to the public health caused by such stagnant water bodies by acting as disease vector breeding places will be reduced. Designing the drains to withstand appropriate storm events, adjusted to climate change projections, and implementing regular maintenance will further reduce the chances of drainage system failure. Accidental oil spillage, washing of vehicles, used engine oils, paints used in maintenance can contaminate the water bodies. Proper handling of such chemicals under strict supervision will help to minimize the water pollution during the maintenance period. Rejuvenation of the drainage system by removing encroachments/congestions should be regularly conducted.

5. Pedestrian and Commuter Safety

185. Improvements to the road surface will be conducive to safe vehicle travel at higher speeds. Such speeds may increase the incidences of accidents. Incorporating the following measures could offset this negative impact;

a. Provision of centerline road marking where possible, edge delineation, etc.
b. Provision of clearly marked signing at townships, sensitive areas such as potential wildlife crossings, schools, temples, etc.
c. Enforcement of speed limits and other traffic rules, especially near potential wildlife crossings and built-up sections.
d. Safety of road users could be ensured during repair of carriageway and hydraulic structures by placing standard sign boards, barricading of the repair site, etc.

6. Air Quality

186. Air emissions due to vehicular movement are one of the prime sources of air pollution in the study area. The project roads are currently having 1.5 or 2-lanes without shoulders. Based on the traffic estimation for the next few years, widening and upgradation is proposed for all the sub-projects. This will result in better road condition and will ease the traffic movement which will result in less congestion. In the existing scenario, due to lesser width and higher roughness, the average vehicle speed is low, which results in more exhaust gas emissions. In the sub-projects, proposed road construction with concrete material and periodic maintenance will result in

reduction of gas emissions from the traffic flow. Also, currently the land use is majorly agriculture along the sub-projects. Therefore, improved road conditions and congestion-free traffic movement will reduce emissions and air quality in the sub-project region will be improved.

7. Noise

187. During the operational phase, movement of traffic, traffic congestion, pedestrian interferences and increased use of horns due to interface between local/slow moving traffic with through traffic will be the prime source of noise. The noise levels at nearby schools, religious place may cause nuisance and irritation. Noise modelling has been carried out for all sub-projects (EPC 10, EPC11, EPC 12, EPC 14, EPC 15, EPC 16, EPC 17, EPC 18, EPC 19, EPC 20, EPC 21, EPC 22, EPC 23, EPC 24, EPC 25, EPC 26)) by using noise prediction tool DHWANIPRO to predict the noise generation due to the traffic movement as well as its propagation on the surrounding environment. The road is divided various sections/lines, traffic generated and projected for each horizon year is taken and noise levels were calculated. Assumptions considered in the modelling study include:

- Meteorological data of sub-project road is taken in base map creation.
- Cartesian Grid with an interval of 500mX500m or 1000mX1000m is considered based on the length of each sub-project.
- Various receptors such as residential, commercial and silence zones have been identified along the road
- Height of sources is 0.6 m above the carriageway.
- Background noise at receptors is considered as baseline noise levels present in the sub-project alignment.
- Though the design speed of the project road is 100 kmph, as a conservative approach and speed restrictions in built-up areas, forest areas, bridges approaches, etc. average speed for modelling has been considered as 65 Kmph
- Traffic forecast data provided in the DPR (also summarized in **Table 3** of this report) has been used to generate different scenarios of noise propagation during the project lifecycle
- Model does not take into account background noise such as noise generated due to anthropogenic activities, industrial activities, movement/ operation of other noise generating sources, such as trains, aero planes, etc.
- Model considers the topography and terrain effect.
- Since segregated data for traffic is not available for daytime and nighttime, prediction has been done for entire 24 hr.
- Scenarios covering with mitigation and without mitigation is modelled.

188. The prediction of noise propagation had considered following five assessment years based on the traffic projections provided in the DPR:

- 1st Prediction (Year 2020, i.e., current operation)
- 2nd Prediction - Year 2030
- 3rd Prediction Year 2035
- 4th Prediction Year 2040
- 5th Prediction Year 2050

189. For all the five assessment years, prediction of noise has been carried out all along the project road with a grid size of 500 m x 500 m as part of grid noise assessment. In addition to that, noise prediction was also carried out for sensitive receptors along the project roads, where noise levels were recorded during the baseline monitoring.

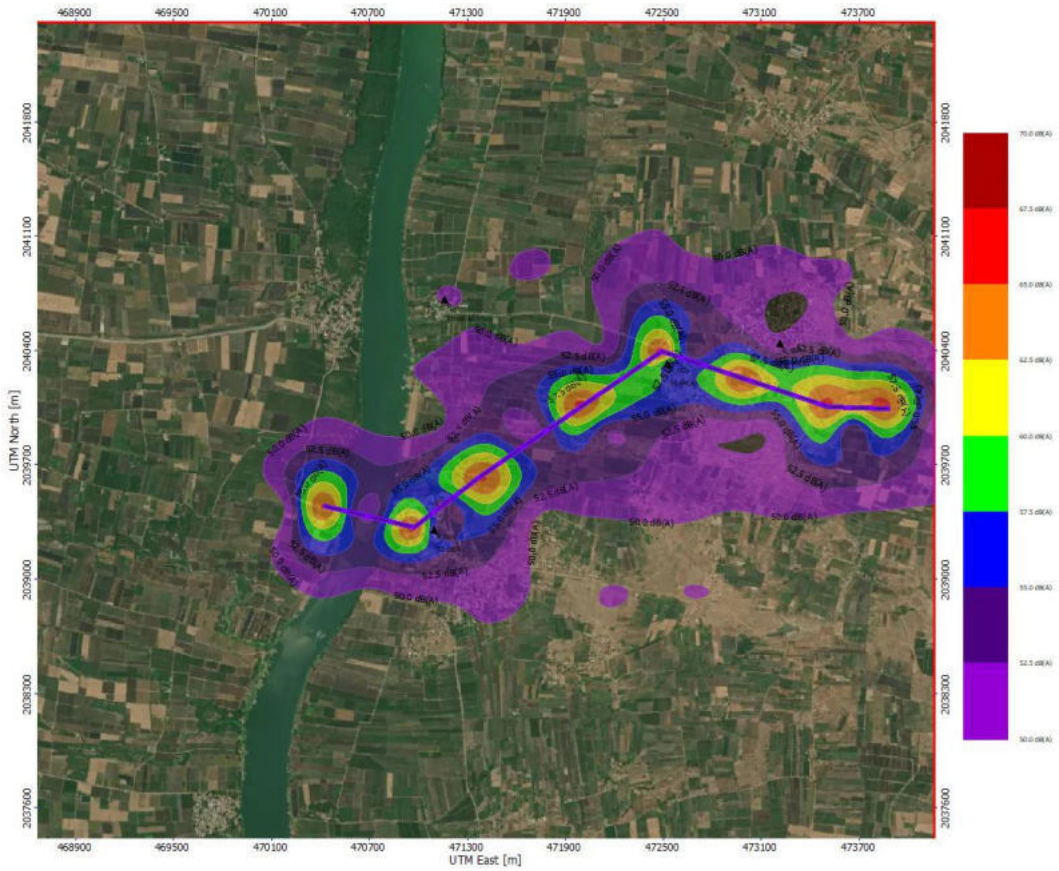
190. It can be seen that without mitigation measures the noise levels are already exceeding with respect to applicable ambient noise standards for all sensitive landuse locations as well as in some of the residential receptors. Furthermore, additional traffic density in the project roads with better speed due to widening and strengthening of the road will result into further exceedances in the noise levels. However, implementation of the mitigation measures will significantly help to reduce the noise levels and infect help to even lower the noise levels in comparison to the baseline conditions in the initial 10 years of project operation.

191. **Table 33** provides noise predicted levels for five traffic horizon years and the distance wise noise levels were measured at 15m, 30m, 50m and 100m from the noise contours generated. A sample noise propagation contour for EPC 10 sub-project is shown in **Figure 37**. Representative scenarios predicted for all sub-proejcts during various traffic horizon years is given as **Appendix 11**.

Table 34: Results of Predicted Noise Level in dB along Sub-Projects

Road Number	Start of operation				2030				2035				2040				2050			
	Prediced Noise from Road Edge (m)																			
	15	30	50	100	15	30	50	100	15	30	50	100	15	30	50	100	15	30	50	100
SH-68	54	52	51	50	56	55	54	52	58	57	56	54	59	58	57	55	60	59	57	56
MDR-84	58	57	56	55	59	58	57	56	60	59	58	57	60	59	58	57	60	59	58	57
SH-119	58	56	55	54	59	57	56	54	60	59	57	55	60	59	57	55	60	58	57	56
SH-149	56	54	52	51	57	56	55	54	58	56	55	54	59	57	56	54	60	59	58	57
SH-191	54	53	51	50	56	55	54	52	57	55	54	51	58	56	55	54	59	57	55	54
SH-323	55	54	53	51	56	54	52	50	57	55	53	51	58	57	55	54	59	57	55	54
SH-349	55	53	52	50	56	55	52	49	57	55	54	52	58	56	53	51	59	57	55	53
MDR-10	48	46	45	43	49	46	44	42	49	47	46	44	50	47	46	45	50	48	46	44
MDR-83 (Part-1)	56	54	52	50	58	55	54	52	58	56	55	54	59	57	56	55	60	58	57	56
MDR-83 (Part-2)	59	58	56	55	60	57	55	53	60	57	56	54	60	58	57	56	60	59	58	56
MDR-83 (Part-3)	51	48	46	43	51	49	45	43	52	49	47	45	52	49	47	45	53	50	48	45
MDR-83 (Part-4)	46	43	41	39	47	44	42	39	47	45	44	39	48	46	45	43	49	47	45	43
NH-61 (222)	54	51	49	46	55	51	49	46	55	52	49	47	56	53	51	49	57	54	52	50
SH-222	51	49	48	45	52	49	47	45	53	51	49	48	53	52	50	49	54	52	51	49
SH-158 (Part-1)	56	54	52	49	56	54	52	49	56	54	51	49	56	54	52	49	57	55	53	51
SH-158 (Part-2)	58	57	55	53	58	56	54	52	58	56	54	51	58	56	54	51	58	56	54	52
SH-54	55	54	52	50	56	53	51	49	56	54	52	50	56	54	51	48	57	53	55	51
SH-23	54	53	49	46	57	55	53	51	58	55	52	49	58	56	54	52	60	56	54	50

Figure 38: Sample Contour Map showing Noise Levels due to Traffic along EPC-10 sub-project (during 1st year of Operation) at the homogenous intersections



192. Results summarized in above table are with out mitigation measures and impacts on sensitive receptors including residential areas are of vital concern and needs mitigation. Speed limits imposed in built-up sections to 30 kph can reduce noise by 3 dB. Most of the residential structures along the road are of concrete wall. The wall of a house (for a resident inside the house) can cause a reduction of noise of atleast 3 dB. Therefore, these two factors combined together will easily attenuate noise by 6 dB thereby confirming the limits of residential areas. Most of the schools are beyond 15-20 m. For all those sensitive receptors closer than 15 m are proposed for solid noise barrier. Solid noise barrier can reduce noise by 8- 9 db. Calculations made with this assumption show that noise barriers will be very effective in lowering noise levels. In fact, the noise levels will remain below baseline levels even with the traffic increases during daytime. Despite any exceedance of noise level during night, it would not affect the receptor, considering that the schools are occupied only during the daytime.

193. **Sensitive Receptors Necessitating Noise Barrier**: Noise barriers are proposed at all sensitive receptor locations where predicted noise level exceeds WHO guidline values for community noise. Various literatures and case studies establish that regardless of its material type, noise barrier with density of 20 kilograms/square meter can achieve a 5dB noise level reduction when it is tall enough to break the line-of-sight from the highway to the home or receiver. After it breaks the line-of-sight, it can achieve approximately 1.5dB of additional noise level reduction for each meter of barrier height. Assuming line of sight at 1.5 m, a noise barrier of 3.5 m proposed in this case can attenuate noise level by 8 dB. Further, the speed limit of 30

kmph and wall of existing receptors can reduce noise by 3 dB each. Project envisages multilayered plantation near sensitive location which can reduce noise by another 2 dB. All measures together can offset noise level by 16dB. The predicted values at sensitive receptors indicate that noise levels exceed WHO Guidelines at several locations. However, with mitigation values are already below baseline values and meet the GOI NAAQS limit at all locations. **Table 34** lists the receptors for which noise barriers are proposed.

Table 35: Predicted Noise Levels along the Project Road (with out mitigation and with mitigation)

Road Number	Land use	Start of operation		2030		2035		2040		2050		GoI Noise Standard		WB-EHS Noise Standard	
		WoM	WM	WoM	WM	WoM	WM	WoM	WM	WoM	WM	Leq Day	Leq Night	Leq Day	Leq Night
SH-68	Res	54	38	56	40	58	42	59	43	60	44	***55***	***45***	***55***	***45***
MDR-84	Com	58	42	59	43	60	44	60	44	60	44	***65***	***55***	***70***	***70***
SH-119	Com	58	42	59	43	60	44	60	44	60	44	***65***	***55***	***70***	***70***
SH-149	Com	56	40	57	41	58	42	59	43	60	44	***65***	***55***	***70***	***70***
SH-191	Res	54	38	56	40	57	41	58	42	59	43	***55***	***45***	***55***	***45***
SH-323	Res	55	39	56	40	57	41	58	42	59	43	***55***	***45***	***55***	***45***
SH-349	Res	55	39	56	40	57	41	58	42	59	43	***55***	***45***	***55***	***45***
MDR-10	Sil	48	32	49	33	49	33	50	34	50	34	***50***	***40***	***55***	***45***
MDR-83 (Part-1)	Res	56	40	58	42	58	42	59	43	60	44	***55***	***45***	***55***	***45***
MDR-83 (Part-2)	Com	59	43	60	44	60	44	60	44	60	44	***65***	***55***	***70***	***70***
MDR-83 (Part-3)	Sil	51	35	51	35	52	36	52	36	53	37	***50***	***40***	***55***	***45***
MDR-83 (Part-4)	Sil	46	30	47	31	47	31	48	32	49	33	***50***	***40***	***55***	***45***
NH-61 (222)	Res	54	38	55	39	55	39	56	40	57	41	***55***	***45***	***55***	***45***
SH-222	Res	51	35	52	36	53	37	53	37	54	38	***55***	***45***	***55***	***45***
SH-158 (Part-1)	Com	56	40	56	40	56	40	56	40	57	41	***65***	***55***	***70***	***70***
SH-158 (Part-2)	Com	58	42	58	42	58	42	58	42	58	42	***65***	***55***	***70***	***70***
SH-54	Res	55	39	56	40	56	40	56	40	57	41	***55***	***45***	***55***	***45***
SH-23	Res	54	38	57	41	58	42	58	42	60	44	***55***	***45***	***55***	***45***

WoM: With out Mitigation; WM: With Mitigation

194. **Conclusions**: It is evident from the above tables that there will be significant increase in the noise levels due to increase in traffic intensity as well as average speed of vehicles over the road's design life. However, with appropriate mitigation measures such as lowering of speed from 80km/hour to 30km/hour in residential and commercial areas which has already been included

in the project design, the natural barrier effect from the wall of houses, and the provision for noise barriers near sensitive receptors the noise levels will be kept even below the baseline levels

195. **Vibration:** Highway traffic is not likely to have any measurable impact on the structures or on comfort. The Federal Highway Administration of the USA has determined that "all studies the highway agencies have done to assess the impact of operational traffic induced vibrations have shown that both measured and predicted vibration levels are less than any known criteria for structural damage to buildings. In fact, normal living activities (e.g., closing doors, walking across floors, operating appliances) within a building have been shown to create greater levels of vibration than highway traffic.

8. Wildlife and Ecology

196. With the improved road surfaces, number of vehicles and the speed will be increased. This may **result** in the increased number of collision and run over of animals. As set of mitigation measures have been suggested above in pre-construction and construction stage sections. MPWD need to support jurisdictional forest departments to monitor the effectivity and adequacy of these mitigation measures. Performance-based maintenance to include monitoring of effectiveness of wildlife crossings during the maintenance period. Fresh assessment is suggested in case of future widening

VI. GREEN HOUSE GAS EMISSION

A. Climate Change Mitigation

197. One of the main triggering factors for climate change is increase in greenhouse gas emissions. Transportation sector in India contributes to around 7.5% of the total GHG emission, of which road transportation alone has a significant share of 87%.[31] Road construction accounts for 5% of its total life cycle in GHG emission whereas operational traffic accounts for rest 95%[32]. GHG emissions likely to be generated from the project roads have been computed using the Transport Emissions Evaluation Model for Projects (TEEMP)[33] developed by Clean Air Asia[34] to assess the CO_2 gross emissions with and without the project.

198. The main improvements from the project that were considered for the model are better surface roughness with less than 2m/km and widening of roads from 1.0 or 1.5 lanes to 2-lane standard. These changes were translated into increase in traffic speed and smooth movement of traffic and, hence, reduction in fuel consumption during the operation after upgradation and improvements. The model also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes and volume/capacity saturation limit. Information that were used for projecting the CO_2 emissions were:

a. The project will rehabilitate and widen 18 rural roads (SH-68, MDR-84, SH-119, SH-149, SH-191, SH-323, SH-349, MDR-10, MDR-83 (Part-1), MDR-83 (Part-2),

[31] Emissions from fuel combustion highlights (2012 Edition) by International Energy Agency.
[32] Indian Network for Climate Change Assessment, MoEFCC, 2010.
[33] TEEMP is an excel-based, free-of-charge spreadsheet models to evaluate emissions impacts of transport projects.
[34] A network of 250 organizations in 31 countries established by the Asian Development Bank, World Bank, and USAID to promote better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas emissions from transport, energy and other sectors.

MDR-83 (Part-3), MDR-83 (Part-4), NH-61, SH-222, SH-158 (Part-1), SH-158 (Part-2), SH-54, SH-23) with total road length of 468 km.

b. The road configuration will change from 1.0 or 1.5 lanes to uniform 2.0 lanes with carriageway width of 7 m that will have both bituminous and concrete surface.
c. Existing road roughness is mostly 6.0 to 7.0 m/km and will be improved to less than 2.0m/km and will be maintained within this limit in the future.
d. Construction will take place over a period of 24 months in 2022-24 and road operations will begin in 2024.
e. Other improvements include the repair or reconstruction of damaged culverts, introduction of lined longitudinal and cross drains for road and removal of irregularities on the existing vertical profile and road safety appurtenances.
f. Traffic studies suggest that the project roads do not connect to major corridors and, therefore, induced traffic is only expected from few industrial set-ups like sugarcane factories.
g. Traffic forecasts were taken from the design report, which has assumed increase in traffic over the project life as 5%.

199. Since the project roads are located in different terrains, the maximum PCU for existing 1/1.5 lanes as well as upgraded 2 lanes have been aligned with the IRC guidelines.

Table 36: Maximum PCU based on Terrain Considered in the TEEMP

Number of Lanes	Maximum PCU		
	Plain Terrain [1]	Rolling Terrain [2]	Hilly Terrain [3]
1	2,000	1,800	1,400
1.5	6,000	5,700	4,500
2	18,000	13,000	9,000

Source: [1] & [2] IRC: SP-64:1990; [3] IRC: SP-73:2015

200. It has been noted that fuel types in the transportation sector are constantly moving towards use of cleaner fuel and have already started in metropolitan cities. Considering this, it has been assumed that predominantly petrol and diesel driven vehicles will be operated, there will be a least share of LPG/ CNG and electric vehicles in the modal share. Assumptions made for fuel type from year 2020 to 2049 is given in **Table 36**.

Table 37: Fuel Type Scenario Considered in the TEEMP (Year 2020 and Year 2042)

Fuel Type (%)	2020					
	Gasoline	Diesel	LPG	Electric	Other	Sum
2-wheeler	100.00%					100%
3-wheeler	10.00%	85.00%	5.00%			100%
Car	55.00%	40.00%	0.00%			100%
Multi Axle		100.00%				100%
Bus		100.00%				100%
2 Axle		100.00%				100%
Fuel Type (%)	**2049**					
	Gasoline	**Diesel**	**LPG**	**Electric**	**Other**	**Sum**
2-wheeler	50.00%			50.00%		100%
3-wheeler	10.00%	40.00%	30.00%	20.00%		100%
Car	40.00%	30.00%	10.00%	20.00%		100%

Fuel Type (%)	2049					
	Gasoline	Diesel	LPG	Electric	Other	Sum
Multi Axle		100.00%				100%
Bus		75.00%	5.00%	20.00%		100%
2 Axle		100.00%				100%

201. Emission factors were taken from a variety of sources including CPCB, MoEFCC, Automotive Research Association of India (ARAI) and other published reports, considering different types of vehicles and fuel. It has also been assumed that the emission factors will be improved over a period of time due to improved fuel efficiency as well as changes in regulations and use of cleaner fuels. Emission factors referred for different type of vehicles and fuel is given in **Table 37**.

Table 38: CO_2 Emission Factors for Different Vehicle Types (Year 2020 and 2049)

	2020				2049			
Fuel	**Gasoline**	**Diesel**	**LPG**	**Electric**	**Gasoline**	**Diesel**	**LPG**	**Electric**
Unit	**kg/liters**	**kg/liters**	**kg/kg**	**kg/kwh**	**kg/liters**	**kg/liters**	**kg/kg**	**kg/kwh**
2-wheeler	1.78			0.82	1.51	-	-	0.41
3-wheeler	3.41	3.97	3.23	0.82	2.89	3.37	2.75	0.41
Car	2.10	2.63	2.40	0.82	1.79	2.23	2.04	0.41
Multi Axle		2.21		0.82	-	1.88	-	-
Bus		2.37	2.10	0.82	-	2.02	1.79	0.41
2 Axle		2.37			-	2.02	-	-

202. The model demands information on length of road or section, lane configuration, mode-wise count of AADT in vehicles, average trip length, share or local traffic, trip length of local traffic, fleet characteristics i.e., breakdown of fleet based on fuel type, percentage breakdown of vehicle-fuel type based on Euro standard. Input parameters as considered for all the project roads are given in succeeding tables. Design period is 30 years and volume capacity saturation limit is considered based on the current traffic velocity and hence varies in each project road. Traffic forecasts were taken from the traffic surveys, which are assumed as 5% per annum for each of the project road.

Table 39: Input Parameters for TEEMP

Road Section	Length (km)	Business as Usual (BAU)			With Project Scenario (WPS)		
		Lanes	Lane width (m)	Roughness (m/km)	Lanes	Lane width (m)	Roughness (m/km)
SH-68	23.98	1.5	3.75	6	2	3.5	2
MDR-84	21.90	1.5	3.75	6	2	3.5	2
SH-119	45.36	1.5	3.75	6	2	3.5	2
SH-149	21.00	1.5	3.75	6	2	3.5	2
SH-191	24.00	1.5	3.75	6	2	3.5	2
SH-323	10.50	1.5	3.75	6	2	3.5	2
SH-349	9.25	1.5	3.75	6	2	3.5	2
MDR-10	28.67	1.5	3.75	6	2	3.5	2
MDR-83 (Part-1)	19.92	1.5	3.75	6	2	3.5	2
MDR-83 (Part-2)	25.84	1.5	3.75	6	2	3.5	2
MDR-83 (Part-3)	25.65	1.5	3.75	6	2	3.5	2

Road Section	Length (km)	Business as Usual (BAU)			With Project Scenario (WPS)		
		Lanes	Lane width (m)	Roughness (m/km)	Lanes	Lane width (m)	Roughness (m/km)
MDR-83 (Part-4)	27.38	1.5	3.75	6	2	3.5	2
NH-61	22.05	1.5	3.75	6	2	3.5	2
SH-222	37.415	1.5	3.75	6	2	3.5	2
SH-158 (Part-1)	41.33	1.5	3.75	6	2	3.5	2
SH-158 (Part-2)	42.62	1.5	3.75	6	2	3.5	2
SH-54	28.20	1.5	3.75	6	2	3.5	2
SH-23	13.40	1.5	3.75	6	2	3.5	2

203. Carbon emissions from road construction were estimated by using the emission factor for rural/ urban roads, by using ADB - Carbon footprint 1), which is equivalent to 48,400 kg CO_2/km of road construction.

Table 40: Estimated Total CO_2 Emission During Road Construction

Road Section	Length (km)	Emission factor (kg CO_2/km)	CO_2 emission (kg)
SH-68	23.98	48,400	11,60,632
MDR-84	21.90		10,59,960
SH-119	45.36		21,95,424
SH-149	21.00		10,16,400
SH-191	24.00		11,61,600
SH-323	10.50		5,08,200
SH-349	9.25		4,47,700
MDR-10	28.67		13,87,628
MDR-83 (Part-1)	19.92		9,33,152
MDR-83 (Part-2)	25.84		12,50,656
MDR-83 (Part-3)	25.65		12,41,460
MDR-83 (Part-4)	27.38		13,25,192
NH-61	22.05		10,67,220
SH-222	37.415		18,10,886
SH-158 (Part-1)	41.33		20,00,372
SH-158 (Part-2)	42.62		20,62,808
SH-54	28.20		13,64,880
SH-23	13.40		6,48,560
Total	**468 km**		**22,642,730 kg (22,643 tons)**

204. The road upgradation brings about changes in surface roughness value and road capacity value which have implications in CO_2 emissions. Improved roughness (lower value) results in higher speed and lesser emissions while increased road usages increases emissions. These are further affected by traffic congestion once reach the volume/capacity saturation limit is reached. On the other hand, CO_2 emissions are also generated as a result from the processing and manufacturing of raw materials needed to upgrade the project road and in the case of the project, to upgrade and strengthen the road length of approximately 468 km. Thus, the total CO_2 emissions that is likely to be generated as a result of the road construction will be of the order of approximately 22,643 tons, which will be mostly generated during the first 2 years of road construction period (as the total construction period is limited to 2 years).

205. The design life of road is considered to 30 years. Emission of CO_2 as estimated in scenarios as Business-As-Usual BAU and With Project Scenario (WPS) for all the project roads individually is estimated and found to be below 100,000 tons per year threshold set by ADB. The total CO_2 emission at BAU and WPS (over the design life of road) were estimated as 1,62,780 tons/ year and 57,730 tons/ year (with induced traffic) respectively.

Table 41: Overall Project CO_2 Emissions Intensity Indicators

Road Sections	Road Length (km)	Particular	CO_2 Emission		
			Business-As-Usual	Project (without Induced Traffic)	Project (with Induced Traffic)
SH-68	23.98	tons/km	6056.75	1472.32	1736.50
		tons/year	4841.36	1176.87	1388.04
		tons/km/year	201.89	49.08	57.88
		g/pkm	1915.98	209.42	206.33
		g/tkm	412.65	45.29	44.63
MDR-84	21.9	tons/km	12561.53	4467.66	5204.91
		tons/year	9169.92	3261.39	3799.59
		tons/km/year	418.72	148.92	173.50
		g/pkm	1358.85	218.87	221.02
		g/tkm	239.43	38.57	38.95
SH-119	45.36	tons/km	5133.71	789.11	938.04
		tons/year	7762.17	1193.13	1418.32
		tons/km/year	171.12	26.30	31.27
		g/pkm	2498.68	178.12	184.79
		g/tkm	1039.54	74.14	76.91
SH-149	21	tons/km	11948.49	4184.16	4333.97
		tons/year	8363.94	2928.91	3033.78
		tons/km/year	398.28	139.47	144.47
		g/pkm	685.61	159.66	160.42
		g/tkm	179.35	41.77	41.97
SH-191	24	tons/km	2562.46	475.90	559.33
		tons/year	2049.97	380.72	447.46
		tons/km/year	85.42	15.86	18.64
		g/pkm	1370.42	113.70	111.62
		g/tkm	902.12	75.65	74.28
SH-323	10.5	tons/km	6794.03	2342.06	2817.35
		tons/year	2377.91	819.72	986.07
		tons/km/year	226.47	78.07	93.91
		g/pkm	1088.91	168.22	173.23
		g/tkm	261.82	40.87	42.09
SH-349	9.25	tons/km	5183.80	1523.43	1829.45

Road Sections	Road Length (km)	Particular	CO_2 Emission		
			Business-As-Usual	Project (without Induced Traffic)	Project (with Induced Traffic)
		tons/year	1598.34	469.72	564.08
		tons/km/year	172.79	50.78	60.98
		g/pkm	1010.60	131.09	131.87
		g/tkm	360.78	47.88	48.17
MDR-10	**28.67**	tons/km	19105.16	11423.74	12505.00
		tons/year	18259.44	10918.05	11951.44
		tons/km/year	636.84	380.79	416.83
		g/pkm	786.15	236.47	237.87
		g/tkm	119.40	35.94	36.15
MDR-83 (Part-1)	**19.28**	tons/km	17690.15	4460.03	5319.91
		tons/year	11746.26	2961.46	3532.42
		tons/km/year	589.67	148.67	177.33
		g/pkm	1901.49	220.06	221.22
		g/tkm	357.58	41.62	41.84
MDR-83 (Part-2)	**25.84**	tons/km	15944.62	3659.47	4368.04
		tons/year	13733.63	3152.02	3762.34
		tons/km/year	531.49	121.98	145.60
		g/pkm	2129.39	220.63	221.91
		g/tkm	412.77	42.78	43.03
MDR-83 (Part-3)	**25.65**	tons/km	14073.20	3018.25	3579.26
		tons/year	12032.59	2580.60	3060.26
		tons/km/year	469.11	100.61	119.31
		g/pkm	2265.17	218.91	216.87
		g/tkm	460.13	44.56	44.15
MDR-83 (Part-4)	**27.38**	tons/km	13004.55	3535.34	4189.07
		tons/year	11867.95	3226.35	3822.95
		tons/km/year	433.49	117.84	139.64
		g/pkm	1851.81	227.25	224.95
		g/tkm	333.91	40.99	40.58
NH-61	**22.05**	tons/km	30467.77	7539.86	8743.89
		tons/year	22393.81	5541.80	6426.76
		tons/km/year	1015.59	251.33	291.46
		g/pkm	1959.92	220.86	224.00
		g/tkm	374.70	42.23	42.83
SH-222	**37.415**	tons/km	2989.54	547.54	644.37
		tons/year	3728.46	682.87	803.64
		tons/km/year	99.65	18.25	21.48

Road Sections	Road Length (km)	Particular	CO_2 Emission		
			Business-As-Usual	Project (without Induced Traffic)	Project (with Induced Traffic)
		g/pkm	2133.92	171.92	168.96
		g/tkm	676.11	55.91	54.97
SH-158 (Part-1)	41.33	tons/km	5852.23	2293.03	2746.80
		tons/year	8062.42	3159.03	3784.18
		tons/km/year	195.07	76.43	91.56
		g/pkm	1225.06	216.70	220.53
		g/tkm	213.07	37.70	38.36
SH-158 (Part-2)	42.62	tons/km	5007.38	2143.74	2573.82
		tons/year	7113.82	3045.54	3656.54
		tons/km/year	166.91	71.46	85.79
		g/pkm	1125.60	218.15	224.19
		g/tkm	189.94	36.83	37.85
SH-54	28.2	tons/km	17970.64	5537.45	5384.06
		tons/year	16892.40	5205.20	5061.02
		tons/km/year	599.02	184.58	179.47
		g/pkm	1054.66	240.70	230.70
		g/tkm	180.28	41.14	39.43
SH-23	13.4	tons/km	1758.23	438.62	518.41
		tons/year	785.34	195.92	231.56
		tons/km/year	58.61	14.62	17.28
		g/pkm	634.45	71.38	71.09
		g/tkm	1242.71	139.98	139.42
Total	**468**	tons/year	**1,62,780**	**50,899**	**57,730**

206. It is therefore evident that 'with project scenario' will reduce more than 64.00% of CO_2 emissions relative to the business-as-usual scenario. Business-as-usual scenario will continue to have more CO_2 emissions due to the poor road conditions with increasing traffic. With project scenario will bring wider roads, improved road conditions, ease in traffic movement, and better fuel efficiency. Major reduction comes from the improvement of road carrying capacity, as the traffic volume will reach saturation limit with existing road infrastructure and it would be difficult to sustain 60 km/hr speed with existing 1 or 1.5 lanes during the entire project life.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Meaningful Consultation

207. Meaningful consultations[35] were carried out in the project area during IEE preparation. All the five principles of information dissemination, information solicitation, integration, co-ordination, and engagement into dialogue were incorporated in the consultation process. A framework of mitigating the project's different environmental impacts was strengthened and modified based on inputs of all those consulted, especially at the micro level by setting up a dialogue with the village people from whom information on site facts and prevailing conditions were collected.

B. Objectives of the Public Consultations

208. Public consultations were held to allow the incorporation of relevant views of the stakeholders in the final project design, mitigation measures, implementation issues, and enhancement of the distribution of benefits. Stakeholder consultations were held with intent to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design and implementation. Informal meetings and interviews were done during the entire project design stage. Consultations provide affected people a platform to ensure incorporation of their concerns in the decision-making process and foster co-operation among officers of MPWD, the community, and other stakeholders to achieve a cordial working relationship for smooth implementation of the project. It inculcates the sense of belongingness in the public about the project.

209. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project and the proposed improvements and road works in their respective stretches. Their opinions were sought particularly in identifying and mitigating any potential adverse impact.

C. Methodology

210. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questions. Questionnaire survey/discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders, and experts. Personal discussions with officials, on site discussion with affected stakeholders, and reconnaissance visits have also been made to the project areas.

D. Project Stakeholders

211. All types of stakeholders were identified to ensure as wide coverage as possible such as residents, shopkeepers, and businesspeople who live and work along the road, especially the

[35] A process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

project affected persons, road users/commuters, executing agency, government institutions whose remit includes areas or issues affected by the project, and, most importantly, the beneficiary community in general.

E. Consultations with Government Agencies

212. The first round of meetings was held with officers of the executing agency at the regional/PIU level to get familiar with sub-project roads' characteristics. This helped to identify the consultation needs with other government departments. Since most of the secondary information relevant to the study are available on official websites, and road specific information other than forest and wildlife are available with PWD, physical interaction was focused on conducting meetings with forest and wildlife officials. The list of officials from various government departments contacted during IEE preparation and issues discussed are summarized in the **Table 41**.

Table 42: Summary of Consultation Held with Government Departments

Pkg	Road Section	Designation	Issues Discussed and Information Obtained
EPC-10	SH-68	Range Forest Officer	Some part of the road lies in the GIB sanctuary Necessary clearances must be obtained prior to start of construction. Necessary measures will be set out in the environment clearance and wildlife clearance as in the previous loan.
EPC-11	MDR-84	Ulhas More, Forest Guard, Indapur	1.45 km of the project road (MDR-84) pasess through Forest area in 1 patch. **Total Diversion = 1.02 Ha** Required safety measures along road from road accidents, increase in noise level due to road traffic, affected structures along road and required sanitary facilities.
		Head, ZP School	
		Gram Sevak	
EPC-12	SH-119	Deputy Conservator of Forest, Pune and satara	Data collection on the proposed alignment of sub-project road of SH-119 and the forest stretches falling along road. DCF provided the exact chainages of road passing through forest patches. Data was also collected about existing flora, fauna and wildlife movement along/ across the project road to devise mitigation measures.
		Shri. Misal Bhor, Range Forest officer, Bhor	Project road under Pune and Satara Forest division is approx. 4.100 km section passes through two patches of Reserved Forest area. Section from km 102.950 to km 105.550 under Bhor Range Forest, (Comp. No. 442) and section from km 112.750 to 114.250 under Wai Range Forest (Comp. No. 21). Forest officials shared data about animal crossing, water holes and types of animals, but did not confirm crossing locations.
		Shri Patkare, Vanpal, Wai	
		Forest Watchmen, Wai and Bhor	
		Divisional Forest Officer, Pune and Satara	Data was collected about forest cover in project stretches falling under Pune and satara forest division. Forest patches were confirmed by forest officers after verification along the project road showing availability of Reserved Forest patches with very little or no vegetation.

Pkg	Road Section	Designation	Issues Discussed and Information Obtained
		Divisional Forest Officer, Pune and Satara	Information sought about the availability of forest cover/ land along within the RoW of project alignment under pune and Satara Forest division. As confirmed, forest diversion is applicable for the widening and improvement of project road.
EPC-13	SH-149	Smt Komal Kakade: Sarpanch- Aadarki Budrak	Details on the likely impact of the project and obtaining prior consent to organise conduct public consultations/ meetings in the respective village. 2.48 km of the project road (SH-149) passes through Reserve Forest and Protected Forest area through 5 small patches. **Total Diversion = (2.6051 RF + 1.9848 PF) = 4.6051 Ha**
		Shri. Shivaji Kare: Sarpanch- Mirgaon	
		Shri. Dattu Pisal Pisalvasti: Sarpanch- Ghadgewadi	
		G Inkkar, Forest Guard Bit-Aadarki	
		Saurabh Nimbalkar: Sarpanch- Aadarki Khurd	
		Shankar Darade: Executive Engineer, Satara	Various aspects of project including feasibility and execution of the project objectives
		M.R. Namde: Deputy Engineer, Satara	
EPC-14	SH-191	Amar mane, Forest Guard, Kolhapur	0.840 km project road (SH-191) passes through Reserve Forest areas in 1 patch under section 20 from km 5.260 to km 6.100 (Porle T. thane and Utre Villages). **Total Diversion = 0.8 Ha** No animal crossing on road
EPC-15-A	SH-323	Superintendent, Archaeological Survey of India (Regional Office, Nagpur)	Data collection on the availability of structures of historic and archaeological importance within the vicinity of proposed sub-project corridor.
		Deputy Conservator of Forest (Territorial), Nagpur	Information was collected on availability of forest stretches if any falling along proposed alignment and required help for rapid biodiversity assessment.
EPC-15-B	SH-349	Superintendent, Archaeological Survey of India (Regional Office, Nagpur)	Data collection on the availability of structures of historic and archaeological importance within the vicinity of proposed sub-project corridor.
		Deputy Conservator of Forest (Territorial), Nagpur	Information was collected about forest stretches if any falling along proposed alignment and required help for biodiversity assessment.
EPC-16	MDR-10	Forest Beat guard, Bothi	1.615 km of project road (MDR-10) passes through Reserve Forest area in 2 patches from km 14.465 to km 14.825 and from km 12.780 to km 14.035. **Total Diversion = 3.876 Ha** No wildlife crossing along the road
		Medical Officer and other staff Primary Health centre, Rameswar tanda	Benefits of proposed projects for patients, especially for pregnant women and staff as anticipated noise level is likely to be reduced during operation period due reduction in traffic congestion.
		Head and staff of Govt. Primary School and Govt. Middle School, Rameswar Tanda	Improvement in transportation will be beneficial for students and staff enabling increase in the number of candidates.
			Anticipated noise impact is considerable low as traffic is low.

Pkg	Road Section	Designation	Issues Discussed and Information Obtained
		Head and staff of Govt. Primary, Middle, High School, Dholkyachiwa Head and Staff of ZPPS Dhanora Jagir (School)	Improvement in transportation will be beneficial for students and staff enabling increase in the number of candidates.
		Some other primary schools	Anticipated noise impact is considerable low as traffic is low.
EPC-17	Pkg 1A	Divisional Forest Officer, Nanded	DFO has confirmed that project road does pass through forest area.
EPC-18	Pkg 1B	Sheikh Khayyum, Forester, Daregaon	1.11 km of Project Road (MDR-83) passes through Reserve Forest areas in 2 patches. Section from km 30.0 to km 30.49 in Malkota Range and from km 34.09 to km 34.71 in Daregaon Range. **Total Diversion = 2.664 Ha**. Confirmed crossing of leopard and other wild animals, especially during sugarcane harvesting season from Jan to March First two crossings are from LHS to Godavari River area and 3rd spot is their route of return No case of collision with traffic
EPC-19	Pkg 2A	Divisional Forest Officer, Nanded	DFO has confirmed that project road does pass through forest area.
EPC-20	Pkg 2B	Divisional Forest Officer, Nanded	DFO has confirmed that project road does pass through forest area.
EPC-22	SH 222	R K Rathod, Forest Guard Ghansawangi Bit, Jalna	Information sought about forest along the sub-project falling under Aurangabad Forest division. As confirmed, no forest diversion is applicable for the widening and improvement of project road.
EPC-23 and EPC-24	SH-158	Deputy Conservator of Forest, Sangli	Information was collected about forest stretches falling along SH-158. DCF provided the exact chainages of road passing through forest patches. Information was also collected on flora, fauna and wildlife movement along/ across the project road to devise mitigation measures.
		Deputy Conservator of Forest and in charge wildlife division, Nagpur	Sagareshwar deer sanctuary passes very close to the road, but it is totally fenced and hence no animal crosses the road
		Range Forest officer, Sangli	
		Amir Alim Mulani, Clerk	
		Forest Watchmen, Walwa and Shirala	
		Divisional Forest Officer, Sangli	No forest area along the project corridor. Information was collected about forest stretches falling under Sangli forest division.
		Divisional Forest Officer, Sangli	Information sought about forest along the project is not falling under Sangali division. As confirmed, no forest diversion is required for the widening and improvement of project road.

Pkg	Road Section	Designation	Issues Discussed and Information Obtained
EPC-25	SH-54	Amrapali Hanumant Thorat, Forest guard Baramati subdivision Ulhas More, Forest Guard, Indapur	3.86 km of project road (SH-54) pasess through 4 patches of forest areas. Section from km 153.350 to km 154.450 (1.1 km Takrarwadi and Madanwadi), section from km 157.300 to km 159.000 (1.7 km Madanwadi), section from km 167.200 to km 167.820 (0.62 km, Lamjewadi) and section from km 171.210 to km 171.650 (0.44 km Pimple). **Total Diversion = 1.25 Ha**
		Principal of Loknete Sharadchnadraji Pawar Shikshan Shastra, Mahavidyalaya Bhigwan.	Concerns on road safety measures along road, Noise elevation due to road traffic, affected structures along road, Sanitary facilities along road and possible accidents.
		Head of Aayushyman Bharat Sub- center Takrarwadi.	
		Principal of Shri. Nageshwar Vidyalaya and Junior College Shetphalgade.	
EPC-26	SH-23	Dattu Dhonnar, Forester, Nashik	2.07 km of the project road (SH-23) passes through Reserve Forest in 2 patches. **Total Diversion = 1.97 Ha** Five regular animal crossings were informed by the forest officials

F. Consultations with Local People/ Beneficiaries

213. The informal consultation generally started with explaining the project, followed by an explanation of potential impacts. Participants' views were gathered regarding all aspects of the environment which may have direct or indirect impacts on local people. **Table 42** summarizes the details of consultation with local people. Key issues discussed were:

a. Awareness and extent of the project and development components;
b. Benefits of the project for the economic and social upliftment of community;
c. Waterlogging and drainage problem, if any;
d. Environment and health;
e. Flora and fauna of the project area;
f. Socio-economic standing of the local people

214. Consultations were held along all sub-projects. Local communities welcomed the decision of road widening and improvement proposals. They perceived several benefits like faster and cheaper connectivity, improved accessibility to better infrastructure facilities, reduction in migration, increased economic activities and appreciation in value of land and many others. But at the same time, they apprehended that the risk of accident, air and noise pollution will increase due to high traffic density after widening. Main request/ suggestions made by the participants are:

a. Adequate compensation and rehabilitation assistance to affected households
b. Preference to locals in employment and petty contracts during construction
c. Active role of gram-panchayats in road development activities
d. Labor availability in the project area or requirement of outside labor;

e. Minimization of local disturbances due to project construction work;
f. Improvement in vertical profile of the roads
g. Provision of side drains, culverts, safety measures, avenue plantation, bus shelters, parking and lighting in markets/ built-up areas
h. Creation of new ponds/ water harvesting structures assisted by project
i. Water sprinkling in built-up areas.
j. Signage and speed restriction near schools and active animal crossing
k. Protection of water bodies
l. Restriction on honking near built-up areas and sensitive receptors
m. Extensive plantation
n. Lighting in built-up areas and sensitive receptors
o. Measures to minimize air and noise pollution

215. Design considerations have been made to incorporate most of the suggestions and demands of the local people except those which are beyond the scope of the project like improvement of already deteriorated water quality, drinking water facility and reconstruction of link roads, etc.

G. Consultations with Women and Vulnerable Groups

216. Focused group discussions were held with women and vulnerable groups. The purpose of these exclusive discussions was to ensure women were aware about the project and to understand their unique concerns and expected benefits out of the project. The women expressed a number of both key benefits and concerns that they perceive out of sub-projects. The improvement of the road network will have positive impacts as it will increase the frequency and quality of the transportation. It will not only improve accessibility but also increase the value of land. They also opined that the augmentation of the road network will help in creating employment opportunities for the local people. However, the women participants voiced their concerns regarding their safety of their children as they foresee that the widening of the road would increase the frequency of the vehicles, leading to increased risk of accidents. They were informed that adequate provisions for road safety have been integrated in the road design to address these risks. Necessary measures to reduce noise levels such as speed control, tree plantation, and noise barriers will also be installed in locations with sensitive receptors. Further details on the discussions held with women are provided in the RPs.

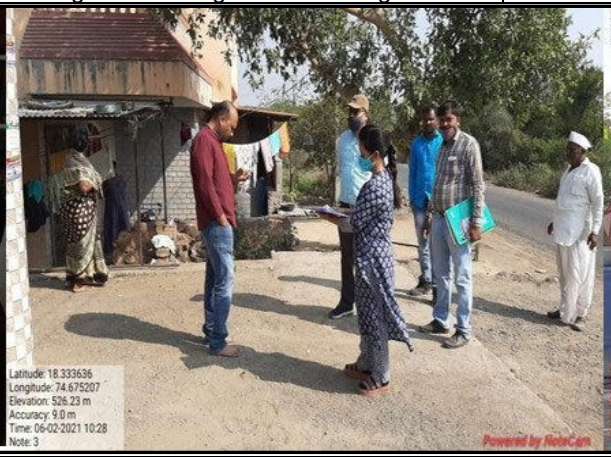
H. Disclosure of Information

217. Pertinent project information has been disclosed with affected people and communities during consultations. Regular consultations will continue throughout project implementation following COVID-19 protocols as prescribed by the Ministry of Health and local health offices. The IEE report will be made available at the gram panchayat offices, MPWD and respective PIUs. The same will be posted on PWD's website. Based on ADB disclosure requirements, it will also be posted on its website.

Table 43: Outcome of Consultations Held in the Project Area

EPC-10 SH-68 (Siddhatek to Korti)				
Location	**Male**	**Female**	**Demands and Suggestion**	**Response of Authorities**
Siddhatek	**17**	**0**	• Participant sought information about the rate of compensation for loss of their residential structure. • Participants were concerned about the safety of local population and structures along the proposed roads. • Requested for construction of a bus stop in the village • Requested for sign boards and speed breakers to avoid accidents. • Drinking water arrangements in villages	• Villagers were informed that proposed improvement will be confined to available ROW and there is no acquisition of private land is involved for widening and improvement. In case of non-titleholders, assistance will be extended as per ADB guidelines. • Arrangement for drinking water is out of project scope. However, project design includes rain water harvesting structures along road to augment the groundwater. • Design encompasses all warranted safety measures and roadside facilities including bus stops.
Rashin	13	**10**		

EPC-11 MDR-84 (Khadki to Bhawani Nagar)				
Location	**Male**	**Female**	**Demands and Suggestion**	**Response of Authorities**
Khadki	2	0	• Participants sought information about the rate of compensation for loss of their residential structure.	• Villagers were informed that proposed improvement will be confined to available ROW and there is no acquisition of private land is involved for widening and improvement.
Bhawani Nagar	5	0		

			• Participants were concerned about the safety of local population and structures along the proposed roads. • Requested for construction of a bus stop in the village • Requested for sign boards and speed breakers to avoid accidents • Drinking water arrangements in villages	• Arrangement for drinking water is out of the project scope. However, project design includes rainwater harvesting structures along road to augment the groundwater. • Design encompasses all warranted safety measures and roadside facilities including bus stops.
				
Location	**Male**	**Female**	**Consultation conducted by ADB Safeguard team**	
Khadki (00+050)	14	3	• Participants were concerned about the safety of children • Participants were concerned about their shops being damaged • Requested for construction of streetlights and a footpath • Requested for sign boards and speed breakers to avoid accidents	• Villagers were informed that proposed improvement is confined to available ROW and there is no acquisition of private land for widening and improvement along the existing alignment. All such apprehensions regarding likely impact were clarified. • Arrangement for footpath cannot be managed within available ROW. However, rumble strips and signages are provided. • Design encompasses all warranted safety measures and roadside facilities including bus stops.
Z.P. School, Khadki (00+130)	2	7		

EPC-12 SH-119 (Kapurhol-Bhor-Wai)

Location	Male	Female	Demands and Suggestion	Response of Authorities
Bhor	42	0	• Participants highlighted the importance of the road and its poor condition. • They also mentioned that the road gets submerged during normal rainfall in some sections in their area. • They also requested for provision of speed breakers where the road passes through settlements • Requested design to consider hydrological aspects • Engagement of local people for construction related work	• The non-title holders shall also be compensated as per NTH guidelines. • Drainage system is provided in built-up area and earthen drainage for rural area. • Proposed widening and strengthening of the road will provide better level of services in terms of improved riding quality and smooth traffic flow • There will be considerable reduction in the number of accidents and level of pollution • Accessibility to social health and educational infrastructure will increase through all-weather road.

<table>
<tr><td colspan="5">   </td></tr>
<tr><td>Location</td><td>Male</td><td>Female</td><td colspan="2">Consultation conducted by ADB Safeguard team</td></tr>
<tr><td>1) Kapurhol Vidya Pratishthan</td><td>2</td><td>2</td><td rowspan="3">The children mostly come from the other side of the road (around 80%) and hence crossing the road is critical
Especially when the festival season starts, there is heavy traffic on the road and the school has employed two people (one male and female watch people) just to help the children cross the school
They have written several times to the PWD office to errect speed breakers in the past
Children in the 7th standard and above mostly use bicycles to enter the school
Teachers are happy that the road will improve but stressed repeatedly on safety measures
The school will also be shifted to a new location (Ch. 92) in a year and they have also asked for speed reduction measures around that chainage.</td><td rowspan="3">The teachers and principal were informed that road construction encompasses adequate safety measures
Safety measures will also be given near the newly proposed school on the main road even though the structure is far away from the road.
Project Authority has assured to provide all necessary measures during construction stage. Since the school is likely to be shifted at other place, all provisions as demanded by school authority and otherwise necessary for children safety and maintain noise level within prescribed limit near proposed new location will be installed. If not included in BOQ, these provisions will made as “Incidental to work”.</td></tr>
<tr><td>2) Bhor English Medium school (88+500)</td><td>6</td><td>3</td></tr>
<tr><td>3) Bhavwadi (92+000)</td><td>1</td><td>6</td></tr>
</table>




EPC-13 SH-149 (Adarki-Mirgaon-Phaltan)

Location	Male	Female	Demands and Suggestion	Response of Authorities
Aadarki	12	2	• Around 20-25 % of participants have expectation of getting a job during the construction period. • Most participants felt the need of drinking water facility, toilet facility and solar lights at bus stops and other populated area. • 100% of them in view of good and covered drainage in village and market area • 100% of them are in view that the schools and temples must be connected with approach road to main road with speed breaker and proper signboards • Another 90% expressed the requirement of approach roads and facility for passage of water for agricultural fields	• For vulnerable groups like Women Headed Households draft micro plans will be prepared including all provisions as per the applicable policy and shall be implemented. • Draft ID cards shall be prepared once they get finalized formally, with all due diligence the provisions shall be implemented. • 100% of people/participant of consultation supported or have no opinion. None of them opposed the project. • 60% of them feel they may have better job opportunities due to better transportation after the construction of the road. Another 30% do not have any opinion on this issue.
Bibvi	7	2		
Ghatgewadi	4	1		
Total	**24**	**6**		

Location	Male	Female	Consultation conducted by ADB Safeguard team	
Adarki (Km 5.6 to km 5.7) School (Km 1.8)	4 1	**5** **1**	• They expressed concerns about the safety of school students in Adarki, majority of whom cross the road to get to school. They demanded rumble strips, zebra crossing and safety signages. • Locals were apprehensive of accident risk due to inconsistent vertical profile/gradient of the road. Seasonal traffic is present during sugarcane season. • On market days at Adarki also, there is a lot of traffic on the road. • The villagers sometimes face problems from wild boars in their agri fields especially that of jowar cultivation. They have reduced cultivating jowar to avoid the menace.	• Project team shared the design elements to the participants • They were assured by EA PIU team that the proposed road would encompass adequate safety measures especially schools and built-tup sections • The forest officials present during consultations were not in favor of any structural mitigations since movement of animals is quite erractic and crossing of road is very rare. • They suggested some signages to caution the drivers for speed reduction in the section. • Vertical geometry of all roads are proposed to be improved as per technical specifications.



EPC-14 SH-191 (Kerli-Kotoli-Nanadari)

Location	Male	Female	Demands and Suggestion	Response of Authorities
Asurle	11	0	• Participants demanded safety measures near habitations and provision of bus stops near villages. • Participants were concerned about degradation of water and noise quality due to construction activities. • All participants have a negative perception on the impact of construction activities on existing religious, archaeological and cultural sites. • Locals were majorly concerned about water scarcity in the region as they didn't have a perennial water source in their villages • Requested engagement of local poor/ vulnerable population including women members in construction by contractor	• All safety measures are considered in DPR. • Bus stops provided at all major habitations. • EMP formulated for the project includes necessary mitigation measures to ensure that noise level remains in prescribed limit. EMP also addresses any anticipated impact on water sources and location specific measures have been recommended. • No physical impact is anticipated on any CRPs. Contractor will ensure that accessibility to these infrastructures is not affected during construction. • To augument the groundwater situation in the area, rainwater harvesting structures have been proposed. • Contract provisions includes preference of engaging local work force subject to requirement and skills
Utre	10	1		
Total	21	1		

Location	Male	Female	Consultation conducted by ADB Safeguard team	
Porle Grampanchayat (2+5 to 6+5)	**7**	**5**	• High traffic volume due to presence of dalmia Sugar Factory and Milk dairies A service road was suggested by the locals • Many villagers use the road to get to industrial areas of Gokul Shirgaon and Shiravane • Villagers expressed content at the road being chosen for widening. They had concerns related to safety and duration of the work which were addressed during the meeting.	• The people were assured that the road would improve connectivity and cut down time required for villagers to reach their places of work • An earthen shoulder has been accounted for • They were assured that the proposed road would encompasses adequate safety measures



EPC- 15A (SH-323: Karanja-Bharsingi-Mowad) and 15 B (SH-349: Kalmeshwar-Ghorad-Mohapa)

Location	Male	Female	Demands and Suggestion	Response of Authorities
Devgram	10	6	• No specific environmental concern. The region is scarce in water availability. Participants suggested to include water retaining structures like Bhandaras in the bridge design. • Demanded provision of public facilities like Bus stops toilet etc. • Suggested plantation of the tree species requiring comparatively less water for survival • Enquired about provisions for livelihood loss to small shop owners/kiosks. • Requests made for employment opportunities during construction	• Project team informed participants about provision of rainwater harvesting pits along the road, bus stops with lighting and toilet facilities. They assured that after examining the technical feasibility water retaining structures like bhandaras will be explored and encouraged. There is already a clause “inclusion of innovative technology” in the contract. • Preference to locals already included in contract clause • Compensation and assistance encompassing livelihood restoration as per ADB guidelines
Khairgaon	48	12		
Nandikheda	5	0		
Telgaon	24	5		


EPC-16 MDR-10 (Kandil-Bothi-Rameshwar-Tanda-Wadgaon-Girgaon)				
Location	**Male**	**Female**	**Demands and Suggestion**	**Response of Authorities**
Dholkyachiwadi (km 7.000) Dhanora (km 11.500) Bhabali (km 20.900) Belmandal (km 24.700) Tukaram (km 28.800) Kandly (km 24.009) Bothi (km 86.140) Rameshwar tanda (km 15.630) Wadgaon (km 23.960)	180	20	• Participants raised concern about the lack of traffic signals and safety signs during construction as well as issues with street crossing • Participants also worried about probable health issues during construction • They enquired about the location of labor camps • Speed limits were also enquired about • Extension of Government welfare schemes • Some PAPs have shown their concern due to acquisition of their properties and were very much concerned about the mode of compensation • Affected population wanted to know about the exact period when the work will start. Sufficient time should be given before the acquisition in order to avoid any inconvenience • Some of them asked about the tender process for the construction, as they were willing to be part of it.	• Provision of traffic signs • Consideration on the provision of service /slip road to provide safe access to villagers and children • Safety measures will be strictly followed by concessionaire and contractor • Consideration on the provision of PUP & VUP near schools. • Labor camps to be located away from settlements • Employment opportunities during construction and operation stage Concessionaire & contractor shall follow the measures given in EMP. • Need for improvement of intersection, curves, etc. has to be ascertained from people through consultation process. • Care will be taken to preserve sites of cultural heritage as far as possible. If unavoidable the religious structures within ROW to be relocated only after consultation with local community • Special provisions are made in the entitlement framework for assisting vulnerable groups to improve their quality of life.
Location	**Male**	**Female**	**Consultation by ADB Environmental Safeguard Team**	
Kandli	9	6	• Women participants at Kandli perceive that road improvement will be boost in agricultural activities and more income opportunities will be generated. • They also demanded employment during construction stage • Participants also informed water logging near flush causeways and at some other places due to runoff from surrounding hill sections and overflow of backwater of a barrage. • School teachers' school at Bothi suggested for safety installations near school. • Forest Team confirmed that there is no wildlife in the adjoining forest.	• Project Team (PIU, MPWD) informed the participants that all necessary safety measures have been included in the design. • All Hume pipe culverts and submersible/flush causeways are proposed to be converted as slab/box culvert or minor bridge depending on peak discharge. • Project authorities also informed about provisions of noise barriers and safety measures near schools. Noise barrier will be erected based on predicted noise level and effectiveness of other measures like speed restrictions and plantations near sensitive receptors etc. • Preference to locals in construction activities already included in contract clauses.
Bothi	4	0		



EPC-17, EPC-18, EPC-19, EPC-20 and EPC-21

Participants			Demands and Suggestion	Response of Authorities
Place	**Male**	**Female**	Due to present very poor conditions of the road local people were happy to hear about road improvement work. They are facing following difficulties making their life miserable. Such as : • Accesibility to physical and social infrastructure: School dropout cases have increased significantly. • Difficulty in accessibility to hospital especially during emergent situation is like a menace • Despite good agricultural produce both of cash and food crops, farmers are unable to get in any returns. They face severe difficulty both during cultivation and harvesting and most importantly timely transport to Galla Mandi. Demands and Suggestions: • Adequate compensation for livelihood losses • Improvement in Vertical geometry of the road • Many sections are vulnerable to overtopping and hence provision of additional cross drains • All flush causeways to be replaced with Box/slab culverts or minor bridges • Provision of side drains • Roadside facilities like bus tops, toilets etc. • Safety provisions as per site conditions and speed limitations in built-up section and near schools, health centres etc.	• Provision of transverse bar marking for speed calming shall be proposed in all built-ups. Only structures located within the proposed formation width will be affected. Adequate compensation as per ADB guidelines shall be paid to the affected households. Generation of employment during construction phase of the road. • Since several stretches are vulnerable to submergence, additional CD structures and widening of existing structures are included in the design. • RCC drains have been proposed in built-up area and unlined drains in open country. Profile has been raised in flood prone sections as per requirement. • Vertical geometry/profile proposed to be improved. • Safety measures in built-up shall be proposed in all built-up section. Bust stops near built-ups are proposed. Streetlights are also proposed at bus stops for safety. • Informatory and cautionary sign board shall be provided at sensitive locations. • Project team further informed that any further suggestions by local which are technically feasible and under mandate of PWD will be implemented as incidental works if already not covered as BOQ item
Brahmanwada	25	06		
Amdura	31	0		
Balegaon	12	3		
Malkota	10	0		
karegaon	7	1		
Saikhed	11	1		
Naigaon	12	0		

EPC-22 SH-222 (Ranjani-Kumbhar-Pimpalgaon-Rajatakali)				
Location	**Male**	**Female**	**Demands and Suggestion**	**Response of Authorities**
Ranjani	13	4	• Request to build CC Road in built-up area. • Participants requested compensation at local market rate/ replacement costs should be given in advance • Request to increase the width of road. • Request to provide drain in built-up section. • Request to provide job opportunities during construction work • Adequate R & R assistance should be provided to the community.	• All the issues raised are addressed will be taken up.
Rajatakli	18	3		
Kumbharpimpalgaon	15	3		
Devideh	14	4		
Total	60	14		

EPC-23 SH-158 (Part-1) (Wangi-Walwa)		
Participants	**Demands and Suggestion**	**Response of Authorities**
32 Male, 10 Female (combined figure for EPC 23 and24)	• Participants highlighted the importance of the road and its poor condition. • Participants mentioned that many small villages were connected by this road only. • They also mentioned that present road in some sections of this area are submerged during normal rainfall too • Requested for provision of speed breakers where the road passes through settlements • Requested design shall take into hydrological aspects into consideration • Involvement of local people for construction related work. • Waste material has been dumped on the left-hand side of the road by Sonhira Sugar factory (Kadam's ownership). There is heavy pollution in the two villages closest to the sugar factory, namely Jagdale vasti and Shelke vasti. • The villagers reported that ground water has an unhealthy look a foul smell with signs of anaerobic decomposition. The water is not potable for man and cattle or poultry. Water pumps installed have to be changed yearly. • The factory provides a half inch pipeline for the villagers' use which is deemed insufficient for them. Drip irrigation practiced in the area is also not sustainable. The turn in the village is accident prone and villagers have asked that adequate precautions be taken	• The non-title holders shall also be compensated as per NDB guidelines. • Drainage system is mentioned in built-up area and earthen drainage for rural area. • Proposed widening and strengthening of the road will provide better level of services in terms of improved riding quality and smooth traffic flow • There will be considerable reduction in the number of accident and level of pollution • Accessibility to social health and educational infrastructure will increase through all-weather road. • The people were assured that the road would improve connectivity and cut down time required for villagers to reach their places of work • Improvement of drinking water quality is out of project scope. • Adequate precautions to prevent accidents in the accident spot would be taken in form of curve improvement, rumbler strips and safety signages.
   		


EPC-24 SH-158 (Part-2) Walwa-Wakurde

Participants	Demands and Suggestion	Response of Authorities
32 Male, 10 Female (combined figure for EPC 23 and24)	• Participants highlighted the importance of the road and its poor condition. • Participants mentioned that many small villages were connected by this road only. • They also mentioned that present road in some sections of this area submerges during normal rainfall too • Requested for provision of Speed breakers where the road passes through settlements • Requested design shall take into hydrological aspects into consideration • Involvement of local people for construction related work	• The non-title holders shall also be compensated as per NDB guidelines. • Drainage system is mentioned in built-up area and earthen drainage for rural area. • Proposed widening and strengthening of the road will provide better level of services in terms of improved riding quality and smooth traffic flow • There will be considerable reduction in the number of accident and level of pollution • Accessibility to social health and educational infrastructure will increase through all-weather road.

Location	Male	Female	Consultation by ADB Environmental Safeguard Team	
Bahe (85+000)	1	4	• There is an accident-prone spot. A young boy riding a motorbike fell into the drain due to an oncoming high-speed truck. He was saved due to his helmet. There is vision obstruction at the curve and adequate precautions need to be taken to ensure minimal accidents after the road is built. They also asked for a 'School ahead' sign to further reduce the speed of villagers • Monkeys cause quite a lot of damage to crops in this village. • Homes in village Bahe were submerged up to 3 metres in recent floods since it is close to the river.	• The people were assured that the road would improve connectivity and cut down time required for villagers to reach their places of work • Adequate precautions to prevent accidents in the accident spot would be taken in form of curve improvement, rumbler strips and safety signages

EPC-25 SH-54 (Bhigwan-Baramati)

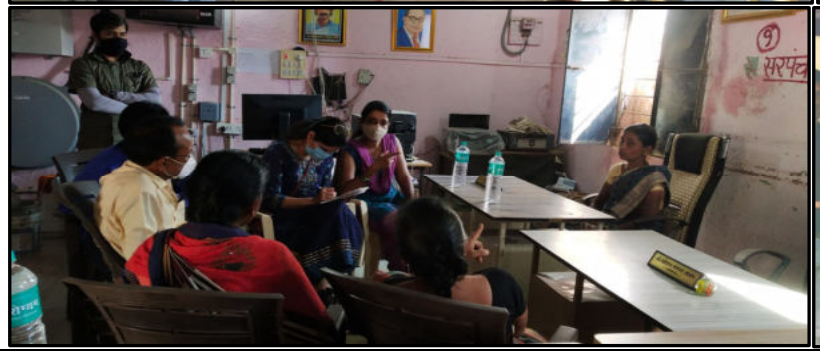
Location	Male	Female	Demands and Suggestion	Response of Authorities
Bhigwan (km 151.500)	3	2	• Participants required information about the rate of compensation for residential structure. • Participants were concerned about the safety of local population and structures along the proposed roads. • Requested for construction of a bus stop in the village. • Requested for sign boards and speed breakers to avoid accidents. • Drinking water arrangements in villages. • Submergence due to Ujjani dam backwater is dis- cussed and come to know that there is no submergence recorded in past decade.	• Villagers were informed that proposed improvement is confined to available ROW and there is no acquisition of private land is involved for widening and improvement along the existing alignment. All such apprehensions regarding likely impact were clarified. • Arrangement for drinking water is out of project scope. However, project design includes rainwater harvesting structures along road to augment the groundwater. • Design encompasses all warranted safety • measures and roadside facilities including bus stops.
Takrarwadi (km 154.000)	0	7		
Shetphalgade (km 163.900)	10	0		

EPC-26 SH-23 (Bari-Ghoti-Sinnar)

Location	Male	Female	Demands and Suggestion	Response of Authorities
Pimpalgaon More	8	2	• Participants requested employment to local people and construction of labour camps during construction phase • Health and hygiene shall be strictly maintained • They requested information on the benefits of the subproject in terms of economic and environmental enhancement	• Preference shall be given to local people in employment • laborers shall be screened medically before employing them and regular Medical Checkup shall be carried out. • Mobile Toilets latrines shall be provided in camps. • Labor Camp shall be located away from the settlements / water courses • Project information will be periodically shared with locals
Perdeshwadi	7	3		
Khed	7	7		
Total	**22**	**12**		

				
Location	**Male**	**Female**	**Consultation by ADB Safeguard Environmental team**	
Khed	5	3	• The local people wish for better roads also because hospital patients take a lot of time (40 min) to access nearest hospital due to extremely poor road condition which is at Ghoti. Snake bitten people and pregnant women are at great risk. • There is a central kitchen at Shenwad which prepares daily breakfast and lunch for students at this school as well as the Ashram school. The food takes a lot of time to get delivered because of the condition of the road. • Around 50 people cross the road daily to come to school. Speed breakers and rumble strips are necessary as well as signages of 'school ahead' and speed limits	• Design encompasses all warranted safety measures and roadside facilities including bus stops. • They were assured that the road construction would take place soon and speedily to cause minimum inconvenience to them
Pimpalgaon More	6	2		
Total	**11**	**5**		


सरपंच


सरपंच


ग्रामपंचायत कार्यालय

Photographs Showing Consultations with Forest officials

		
EPC-11 with Mr. Ulhas More (Forester Baramati)	**EPC-12 with Shri. Misal Bhor RFO, Bhor Division**	**EPC-25 Discussion with Ms. Amrapali Hanumant Thorat (Forest guard Baramati)**
		
EPC-13 with Mr. G Inkkar, Forest Guard Bit-Aadarki	**EPC-14 with Mr. Amar Mane, Forester, Kolhapur**	**EPC-26 Discussion with RFO and Forester Thorat Forest Range**
		
EPC-18 with Forester Daregoan	**EPC 10 with RFO and Forester GIB**	**EPC-14 With Forester and Forest Guard**

VIII. GRIEVANCE AND REDRESS MECHANISM

218. Grievances related to the implementation of the project, particularly regarding the environmental management plan will be acknowledged, evaluated, and responded. Response will include corrective actions proposed using easily understandable and transparent processes that are gender responsive, culturally appropriate, and readily accessible to all segments of the affected people. The Grievance Redress Mechanism for CECIGM will follow the setup of the first loan, MSRIP. Budget for administrative costs for GRM implementation will be sourced from project management allocation. The responsible agency for addressing the grievances along with proper timelines will be clearly indicated in all information materials. Records of grievances received, corrective actions taken, and their outcomes will be properly maintained and form part of the environmental monitoring report to ADB.

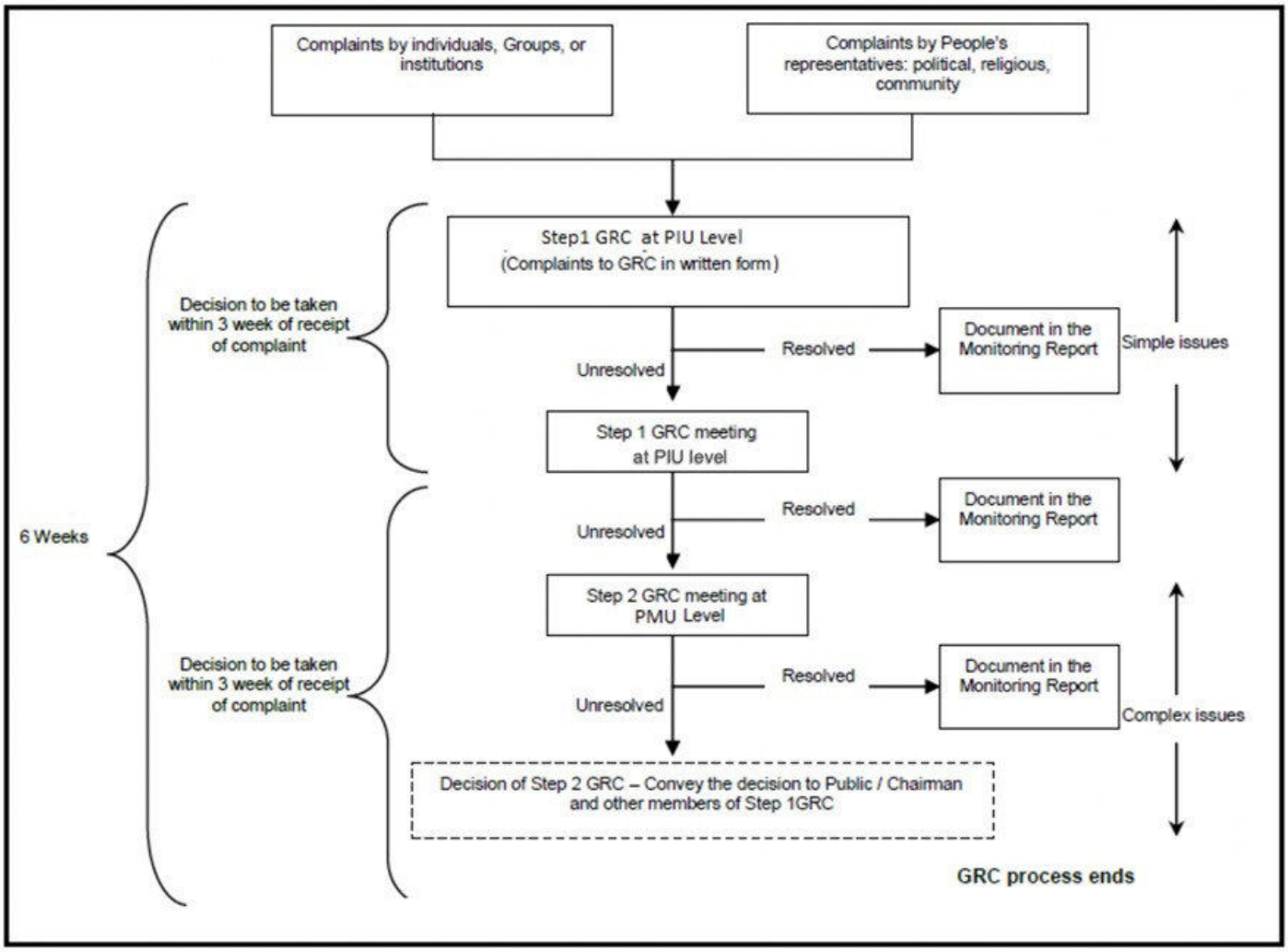
219. A Grievance Redressal Committee (GRC) will be established at two-levels: one at the District or PIU level and another at PMU level. The GRC will provide an opportunity affected person to have their grievances redressed. Depending on the nature and significance of the grievances or complaints, the GRM will comprise procedures to address grievances at the project site, PIU level or PMU level. Most serious complaints which cannot be addressed at the PIU level will be forwarded to the PMU.

220. Site level grievance redressal will be handled by the AE as the mediating party between the contractor and the aggrieved. The PIU level grievance redress committee (GRC) will be chaired by the respective Superintendent Engineer (SE) and composed of representatives from the contractor, AE, PIU, women's representatives, local community, and the local forestry officer, if necessary. The PMU level GRC will be chaired by the Project Director and will comprise members from the PWD, PMSC, AE, contractor, and women's representative.

221. At every consultation meeting, the local communities in the project area will be informed by the PIU on the grievance redress procedure and the contact persons for lodging complaints. Provisions shall also be made for lodging complaints at the respective PIUs and PMU offices. Contractors, and PWD will maintain logbooks/database of grievances and will report on formal and informal complaints and feedback received as part of regular safeguards reporting. In case of any complaints by the affected person remains unaddressed or addressed unsatisfactorily, he/she is free to access the country's legal system at any time and at any stage although Project GRM is the preferred route. Under this project, an online portal for lodging complaints will also be explored to broaden the reach of the mechanism.

222. If the established GRM is not able to resolve a grievance, the affected person can also use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer at the ADB Headquarters of the ADB India Resident Mission (INRM). Before submitting a complaint to the Accountability Mechanism, it is necessary that affected persons make a good faith effort to solve the problem by working with the concerned ADB operations department and/or INRM. Only after doing that, and if they are still dissatisfied, will the Accountability Mechanism consider the complaint eligible for review. The complaint can be submitted in any of the official languages of ADB's developing member countries. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

Figure 39: Grievance Redress Mechanism



IX. ENVIRONMENTAL MANAGEMENT PLAN AND INSTITUTIONAL ARRANGEMENT

A. Environment Management Plan

223. Environmental Management Plan (EMP) is intended to set out clearly and unambiguously the likely negative impacts of construction and/or operation of the project, action/s that is/are required to avoid or mitigate each impact and the responsibility for taking each action. Responsibility is made legally binding when actions are subsequently specified in contracts.

224. The EMP **(Appendix 1)** has been prepared based on all foreseen impacts at the time of preparing this IEE. Mitigation measures were identified to reduce the significant adverse impacts including residual effects. The project will be implemented based on engineering, procurement, and construction (EPC) modality a number of construction alternatives like location of camp and plant sites, borrow area, source quarries, and even minor geometric realignments to minimize the number of trees to be cut or other impacts remain to be decided. A host of impacts may be generated from these aspects and therefor this arrangement warrants the updating of the EMP under the supervision of MPWD and ADB.

B. Environment Monitoring Program

225. The monitoring and evaluation are critical activities in implementation of the project. Monitoring involves periodic checking to ascertain whether activities are going according to plan or not. It provides the necessary feedback for project management to ensure project objectives are met and on schedule. The reporting system is based on accountability to ensure that the environmental mitigation measures are implemented. Environmental monitoring program has the underlying objective to ensure that the intended environmental mitigations are realized and result in desired benefits to the target population causing minimal deterioration to the environmental parameters. Such program targets proper implementation of the EMP. The broad objectives are:

(i) To evaluate the performance of mitigation measures proposed in the EMP.
(ii) To evaluate the adequacy of environmental assessment.
(iii) To suggest ongoing improvements in management plan based on the monitoring and to devise fresh monitoring on the basis of the improved EMP.
(iv) To enhance environmental quality through proper implementation of suggested mitigation measures.
(v) To meet the requirements of the existing environmental regulatory framework and community obligations.

226. The significant physical, biological, and social components affecting the environment at critical locations serve as wider/overall performance Indicators. However, the following specific environmental parameters can be quantitatively measured and compared over a period of time and are, therefore, selected as specific Performance Indicators (PIs) for monitoring. They are also selected because of their regulatory importance and the availability of standardized procedures and relevant expertise. A comprehensive monitoring plan for all performance indicators has been prepared for all stages and attached as supplementary table to the EMP. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. Performance indicators requiring quantitative measurements are:

a. Air quality with respect to $PM_{2.5}$, PM_{10}, CO, NOx and SO_2 at selected location
b. Water quality with reference to DO, BOD, Oil and grease, COD, Suspended Solids
c. Turbidity, Alkalinity rivers/streams and water bodies at selected points
d. Noise levels at sensitive receptors (schools, hospitals, religious places)
e. Survival rates of trees planted as compensatory and additional plantations

227. **Ambient Air Quality (AAQ) Monitoring:** Ambient air quality parameters recommended for monitoring road development projects are $PM_{2.5}$, PM_{10}, CO, NOx and SO_2. These are to be monitored, right from the commencement of construction activity at selected locations of plants and machinery, crushers on sites, excavation works, etc. Data should be generated once in a season excluding monsoon in accordance with the National Ambient Air Quality Standards as per CPCB notification 2009 and compared with IFC EHS/WHO standards.

228. **Water Quality Monitoring:** The monitoring of the water quality is to be carried out at locations identified along the project road during construction and operation phase according to the Indian Standard Specifications – IS10500: 1991. Surface water quality will be monitored as per freshwater classification of CPCB.

229. **Noise Level Monitoring:** The measurements for monitoring noise levels would be carried out at sensitive receptors and construction sites along the project roads. The Ambient Noise Standards formulated by IFC EHS, Central Pollution Control Board (CPCB) in 1989 or the standards by State Pollution Control Board, whichever are more stringent, are to be complied. Sound pressure levels would be monitored on twenty-four-hour basis.

230. **Success of Re-vegetation:** MPWD will implement the additional plantation**,** through strong community participation, and ensure at least 70% survival of trees after 3 years. Annual reports pertaining to the accomplishment and survival will form part of the annual environmental monitoring report to be submitted to the ADB.

231. **Records of Accidents:** Contractors to keep records of all types (construction sites/road accident) of accidents during construction period. During the operation stage monitoring, MPWD will maintain records of traffic accidents including vehicle-animal collisions through their field offices with support from forest department and local people**.**

C. Organizational Set-up to Implement the EMP

232. The Government of Maharashtra (GOM) through MPWD is the Executing Agency (EA) for the project. The PMU in MPWD will be responsible for ensuring that all components of the EMP are complied. Under the PMU, there will be a number of Project Implementation Units (PIUs) to manage individual road packages or groups of packages under the project. The PIU IS be headed by a Superintending Engineer (SE). The PMU will have two Focal Safeguard Officer (FSO) with a rank of Superintending Engineer to ensure social and environmental safeguards compliance of CECIGM is consistent with ADB SPS and GOI norms.

233. The Authority Engineer (AE) will be appointed for each contract package AE team will include an environmental specialist supported by an environment expert cum safety officer to guide, supervise and monitor all activities of contractors towards implementation of EMP. The contractor's team will include health and safety/environment officer to ensure implementation of the EMP and EMOP. The responsibilities of various agencies and parties for implementing environment safeguards are provided below.

234. Description of key responsibilities of various agencies and parties for implementing environment safeguards are provided below.

1. Project management unit (PMU). The PMU is headed by a project director and supported by an assistant chief engineer, deputy engineer, two focal safeguards officers, and a contract administration consultant. Eight field offices have been established under the PIU to support the PMU operation. Each field office is headed by a superintending engineer and supported by one, two or three executive engineers, deputy engineers and accounts officers. The executive engineer will serve as the social and environmental safeguards focal at the site level. The PMU and field offices will be responsible for ensuring the timely processing of environmental, wildlife and forestry clearances, tree cutting permits, and other similar clearances and permits required for the project. They will also ensure timely and effective planning and implementation of resettlement and social development activities. The PMU and the field offices will conduct at least bi-monthly/minimum every two months site visits and ensure the reports submitted by the contractor and AE are consistent with site conditions. The PMU with the support of the PMSC will review all social and environmental monitoring reports prepared by the contractor and the AE. The PMU will ensure that semi-annual environmental monitoring reports are submitted within three calendar months from the end of the respective reporting period to ADB for disclosure on the ADB website. Submission of semi-annual monitoring report will continue throughout construction and will be done annually during operations phase until the project completion report is issued by ADB.

2. Project implementation units (PIU). The project implementation unit through will be responsible for supervising implementation of the environmental management plan (EMP) and environmental monitoring plan (EMOP) by the contractor through the following:

(i) Review all sub-plans identified in the EMP to be prepared by the Contractor to include camp layout, waste/debris management plan, borrow area management plan, traffic management plan with guidance from the PMC;
(ii) Review monthly/quarterly/annual environmental monitoring reports prepared by the Contractors Environmental Focal Person (EFP);
(iii) Conduct monthly site and follow-up inspection to ensure the veracity of the submitted monitoring reports and enforce the EMP and EMOP;
(iv) Conduct compliance conference with the Contractor to discuss non-compliance and agree on corrective measures with guidance from the PMSC and PMU.

3. Project management services (PMS) consultant. Project implementation support, including safeguards implementation, will be provided to the PMU by the PMSC. The PMSC team will include an environmental specialist whose role will be to support the PMU in monitoring the implementation of environmental safeguards under the project and the review of environmental monitoring reports submitted by the AE and contractor. The PMSC will also carry out capacity building activities on the implementation of social and

environmental safeguards through training workshops and on-site training for the PMU, AE, and contractor, as necessary. Responsibilities of PMSC are precisely outlined below.

(i) Conduct environmental site induction training workshops to all contractors IE/AE and PIUs to ensure understanding of the EMP and domestic environmental laws and regulations requirements particularly on the required clearances and permits, training on occupational and community health and safety;
(ii) Ensure timely mobilization of the Contractor's EFP;
(iii) Review and verify revised EMPs, sub-plans submitted by the contractor and advise the PMU on adequacy;
(iv) Conduct monthly site inspections to check the contractor's compliance with the EMP and EMOP;
(v) Participate in public consultations on issues concerning the project and facilitate addressing environment related grievances that maybe submitted to the project GRM
(vi) Ensure contractors secure necessary permits and clearances;
(vii) Prepare an environmental monitoring report template for contractors self-monitoring reports;
(viii) Design monthly compliance assessment checklists for PIU/PMU to be used for monitoring EMP implementation during pre-construction stage, construction stage, post construction stage and status of statutory clearances and permits;
(ix) Prepare summary monthly, quarterly, and semi-annual environmental monitoring reports based on the monthly environmental self-monitoring reports prepared by the Contractor's EFP and site observations for the review and of PIUs/PMU and approval by PMU;
(x) Prepare semi-annual environmental monitoring reports for approval by PMU (copy to PIU, AE) and further submission to ADB for public disclosure;
(xi) Advise the Contractor through the PMU and PIUs on how to comply with requirements and address non-compliances;
(xii) Report apparent unanticipated impacts and recommend mitigation measures to the PMU for advising AE to issue necessary instructions to the respective contractor; and
(xiii) Update the IEE report in situations of unanticipated impacts when deemed necessary.

4. Authority Engineer.[36] Two AEs are engaged under the project and will be responsible for approving and supervising implementation of the EMP and EMOP by the contractor.

Each AE will include an environmental specialist and an environment expert cum safety officer who will be responsible for at least fortnightly site level supervision and monitoring. All subplans such as the construction camp layout, waste management, borrow area management, traffic management, tree plantation, and others prepared by the contractor will be reviewed and approved by the AE. [37] The AE will also provide guidance to the

[36] The AE is the supervising authority for contractors. They are also responsible for reviewing and approving the detailed engineering design prepared by the EPC contractor. The AE is not hired under ADB funding.
[37] Site induction training includes but not limited to: i) discussion and review of EMP and EMoP detailing how specific environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM.

contractor on corrective measures that must be taken and monitor their compliance. The environmental expert will review and verify all environmental reports prepared by each of the contractors. Based on site inspections and environmental reports from the contractors, he/she will prepare quarterly environmental monitoring reports for submission to the PMU. The quarterly reports will be consolidated into an annual environmental monitoring report and submitted to the PMU for their review and endorsement for further submission to ADB. More specific role of AE in implementing EMP are:

(i) Review the IEE and EMP to understand the background environmental issues of the respective subproject
(ii) Review and approve the revised EMP and other required sub-plans such as traffic management plan, health and safety plan, waste management plan etc. prepared by the contractor.
(iii) Conduct regular site inspections and monitor implementation of the EMP and EMOP by the contractor
(iv) Provide on-site training and technical guidance to the contractor workers as necessary
(v) Review the monthly/quarterly/annual reports prepared and submitted by the contractor.
(vi) Prepare monthly reports on monitoring activities, training and other environment safeguard activities implemented
(vii) Where necessary, identify the need for corrective actions and issue official notices to the contractor to implement the corrective actions with clear timeline
(viii) If there are any complaints or grievances, facilitate consultations with the respective complainant and ensure the grievances are addressed in accordance with the GRM
(ix) Regularly convene meetings to discuss progress or issues on environment safeguards to ensure that all parties (contractor, PMS, PIU, MPWD) are on the same page on requirements and milestones for environment safeguards
(x) Assist the PMS in preparing annual Environmental Monitoring Reports for review and approval by the MPWD and concurrence to ADB for disclosure on its website

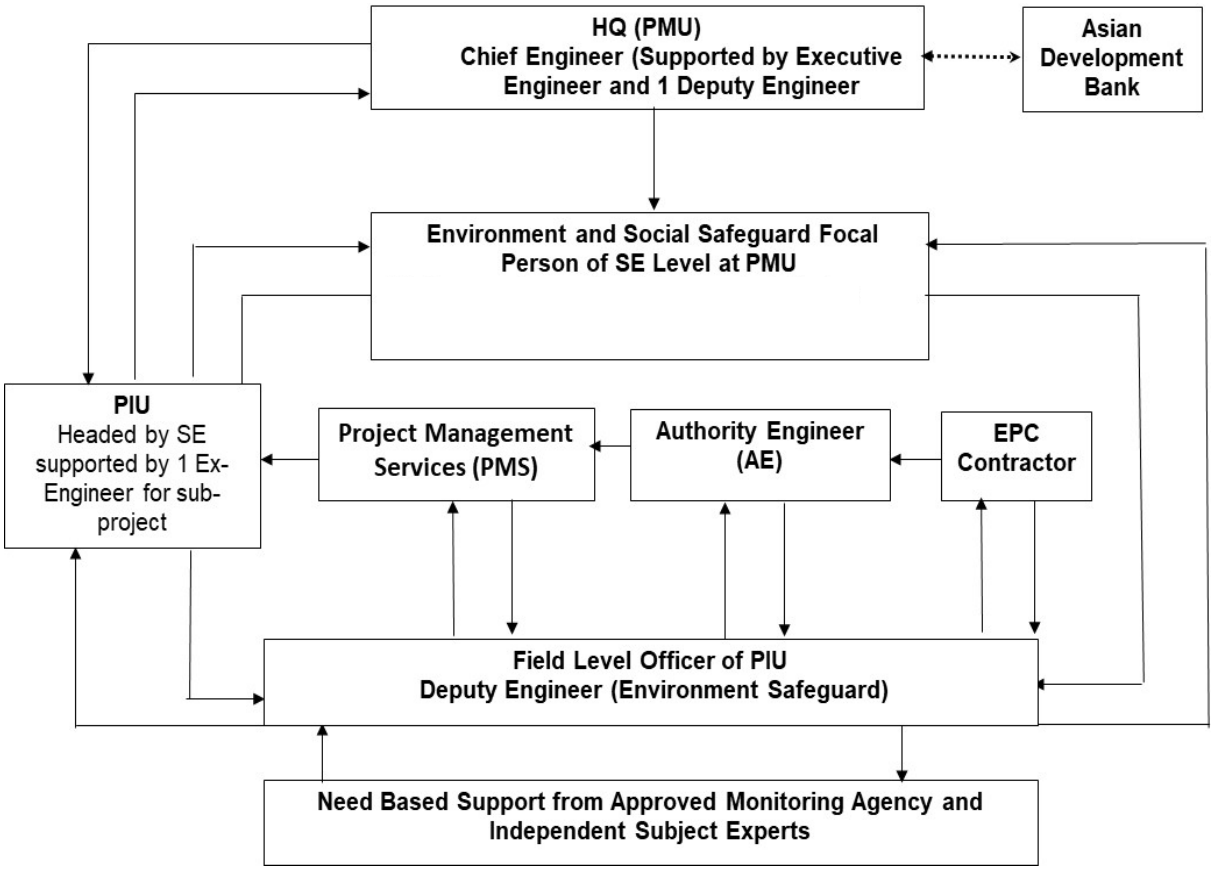
5. Contractor. The Contractor is the principal agent to implement the EMP and EMOP The contractor will prepare and implement site-specific EMP and EMOP attached to the bidding documents. Qualified environmental health and safety experts will be recruited within 30 days of contract signing. These personnel will have presence in all construction and campsites and ensure proper day-to-day implementation of the EMP. The contractor will cooperate with the AE, PMSC and PIU to implement environmental corrective actions and corrective action plans, as necessary. Specifically, the contractor will:

(i) Participate the site induction workshop to be organized by the PMSC;
(ii) Obtain necessary environmental license(s), permits etc., from relevant agencies for associated facilities for project road works viz. borrow areas, quarries, hot-mix plant etc. prior to commencement of civil works contracts;
(iii) Implement all mitigation measures in the EMP and activities in the EMOP; Pollution monitoring for air, water, noise/vibration, soil will be done on a quarterly basis through third-party laboratories and as approved by the AE. Other EMOP items will be monitored on a monthly basis.

(iv) Monitoring reports must include wildlife movement/sightings and incidence of collision if any for the sub-projects (SH-158, Part-1 and SH-23) located in proximity to wildlife sanctuary
(v) Submit monthly, quarterly, and semi-annual self-monitoring reports to for approval to the AE and further submission to PIU and PMC for final submission to PMU;
(vi) Ensure that all workers, site agents, including site supervisors and management participate in training sessions delivered by PMC;
(vii) Acquire all environmental statutory requirements (permits, NOCs etc.) and fulfill contractual obligations;
(viii) Collect the baseline data on environmental quality before the start of physical works and continue collection as given in the EMOP during construction and operation;
(ix) Participate in resolving issues as a member of the GRC; and
(x) Respond promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional environmental mitigation measures as necessary.

235. Proposed institutional arrangement has been illustrated below through a flow diagram.

Figure 40: Institutional Arrangement to Implement Environmental Management Plan



D. Environment Management Budget

236. **Table 43** presents the total budget provided in the civil works contract and MPWD budget to implement the EMP and EMoP. The total cost for implementing EMP is estimated to be about ₹602 million.

Table 44: Estimated Environment Management Cost as Part of Civil Works

S No.	Road No.	Road Sections	Environmental Management Cost		
			Mitigation	Pollution Monitoring	Total Cost (INR)
1.	SH-68	Siddhatek to Korti	29,84,579	8,51,400	38,35,979
2.	MDR-84	Khadki to Bhawani Nagar	27,39,079	7,07,400	34,46,479
3.	SH-119	Kapurhol-Bhor-Wai	25,99,079	8,70,600	34,69,679
4.	SH-149	Adarki-Mirgaon-Phaltan	24,44,079	7,07,400	31,51,479
5.	SH-191	Kerli-Kotoli-Nanadari	25,34,079	7,07,400	32,41,479
6.	SH-323	Karanja-Bharsingi-Mowad	24,70,079	5,95,200	30,65,279
7.	SH-349	Kalmeshwar-Ghorad-Mohapa	21,95,079	5,95,200	27,90,279
8.	MDR-10	Kandil-Bothi-Rameshwar-Tanda-Wadgaon-Girgaon	27,53,079	7,07,400	34,60,479
9.	MDR-83 (Part-1)	Nila Junction to Mugat Junctionn and Brahmanwada road	27,24,079	7,07,400	34,31,479
10.	MDR-83 (Part-2)	Mugat Junction-Khujda Junction-Amdura road and Malkota road	26,24,079	7,07,400	33,31,479
11.	MDR-83 (Part-3)	Khujda Junction-Karegaon-Phata	25,69,079	7,07,400	32,76,479
12.	MDR-83 (Part-4)	Karegaon-Phata-State Border Dharmadabad-Balapur IIT-State Border	27,13,079	8,08,200	35,21,279
13.	NH-61	Bhokar-Raheti	24,64,079	7,07,400	31,71,479
14.	SH-222	Ranjani-Kumbhar-Pimpalgaon-Rajatakali	27,88,079	7,07,400	34,95,479
15.	SH-158 (Part-1)	Wangi-Walwa	29,84,579	8,70,600	38,55,179
16.	SH-158 (Part-2)	Walwa-Wakurde	30,74,579	8,70,600	39,45,179
17.	SH-54	Bhigwan-Baramati	25,29,079	7,07,400	32,36,479
18.	SH-23	Bari-Ghoti-Sinnar	20,48,079	4,80,600	25,28,679
Total Cost (INR)					**6,02,54,322**

Note: EMP cost only includes the cost for the tendering items. All Non-civil costs of EMPs are seperatedly provided with individual EMPs

X. CONCLUSION AND RECOMMENDATION

237. The scope of works under CECIGM involves widening and upgrading of existing 468.37 Km of state highways/ major district roads to two-lane standard with paved/earthen shoulder. Expansion is within range of 3-5m of additional formation width and confined in available ROW. Small portion of EPC-10 SH-68 passess through the ESZ Boundary of Great Indian Bustard Sanctuary (GIB). The sanctuary was primarily notified for the conservation of critically endangered (classified by IUCN) Great Indian Bustard. Any adverse impact due to the project road improvement on this species is not anticipated. However, wildlife movement of some mammalian species like leopard, chinkara, Indian grey wolf, wild boar, Indian fox, Indian grey mongoose was reported along/ across the road in the adjoining areas of the sanctuary. Crossing is quite infrequent and erratic in nature and mostly in search of food and water causing risk of collision with vehicles. Effective and location-specific mitigation measures such as cautionary signage combined with speed control measures, creation of new slab/ box culverts or retrofitting of existing CD structures have been proposed to avoid/minimize collision of animals with vehicles. Remaining project roads either passing through or aligned along the forest areas are largely devoid of wildlife and vegetation except ghat section of SH-23 and SH-119 where undefined movement was reported but not warranting any structural mitigations.

238. Most of the other adverse impacts are co-terminus with the construction stage, site specific, limited within the RoW, and are easily mitigatable through good engineering and housekeeping practices. Hence, the project is classified as environment **Category B** in accordance with ADB SPS 2009. Although forest clearance is involved for Reserve Forest and Protected Forest in eight sub-projects. As per GOI requirements, as the sub-project road of SH-68 is in proximity to GIB wildlife sanctuary, so it is triggering environmental and wildlife clearance from MoEFCC. Process for securing the same has to be initiated by MPWD.

239. Potential environmental impacts identified are: i) pre-construction phase: permanent loss of trees, disturbance of national protected species, increased road crashes from inadequate road alignment and design, increase in animal-vehicle crashes from unregulated higher vehicular speed, and localized flooding from inadequate drainage design; ii) construction phase: loss of productive soil from new borrow areas, dust emissions, generation of noise, risks of accident from improper management of borrow areas, and inadequate clean-up operation, restoration and rehabilitation prior to decommissioning. Potential impacts during pre-construction is mitigated through design changes as permanent loss of trees is minimized through alignment selection including minor adjustments and eccentric widening. Residual impacts are compensated through mandatory compensatory plantation and additional plantation.

240. During construction phase, adequate guidance and resources are provided by MPWD to the Contractor to comply with the borrow area management requirements, suppress dust, control noise, and implement proper closure. An Authority Engineer will be engaged by the MPWD to ensure that mitigation and monitoring measures are implemented. As the project will be implemented based on engineering, procurement, and construction (EPC) modality, a number of construction alternatives like location of camp and plant sites, borrow area, source quarries, and even minor geometric realignments to minimize the tree cutting remains to be decided and from which a host of impacts will be assessed. As such, EMP updates will be necessary.

241. The road specific EMPs and concomitant costs is part of the bidding documents.

Meaningful consultations have been conducted during the project preparation stage and all concerns of the affected persons and stakeholders have been incorporated in the IEE and the EMPs. These consultations were represented by key informant's, roadside communities, and related government organizations. A Grievance Redress Mechanism has been formed to receive, feedback, suggestions and complaints, if any, from affected parties and addressing them during the construction stage and operation stage. This IEE report will be disclosed on the ADB.