Initial Environmental Examination

May 2022

India: Connecting Economic Clusters for Inclusive Growth in Maharashtra

Part 2

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

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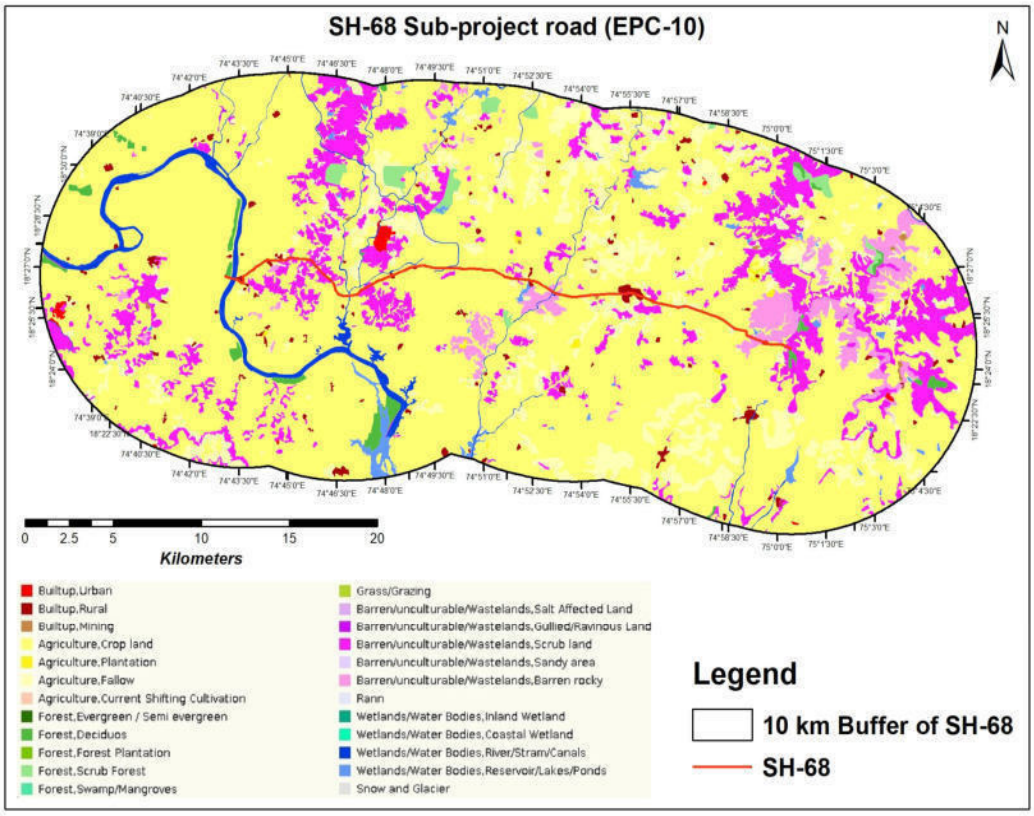

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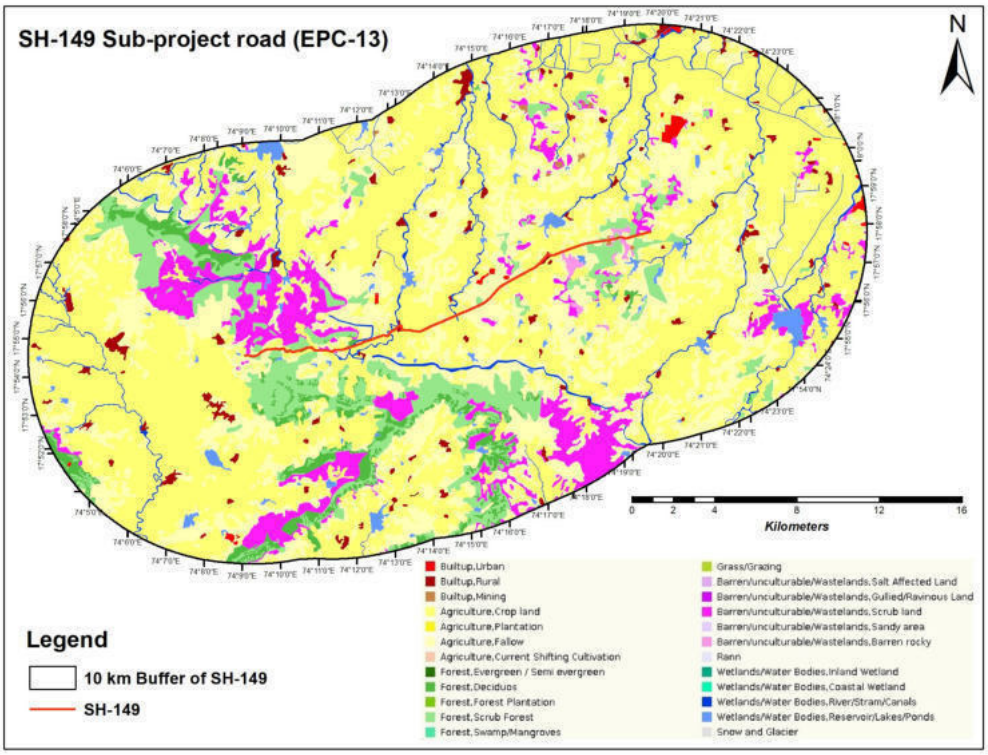

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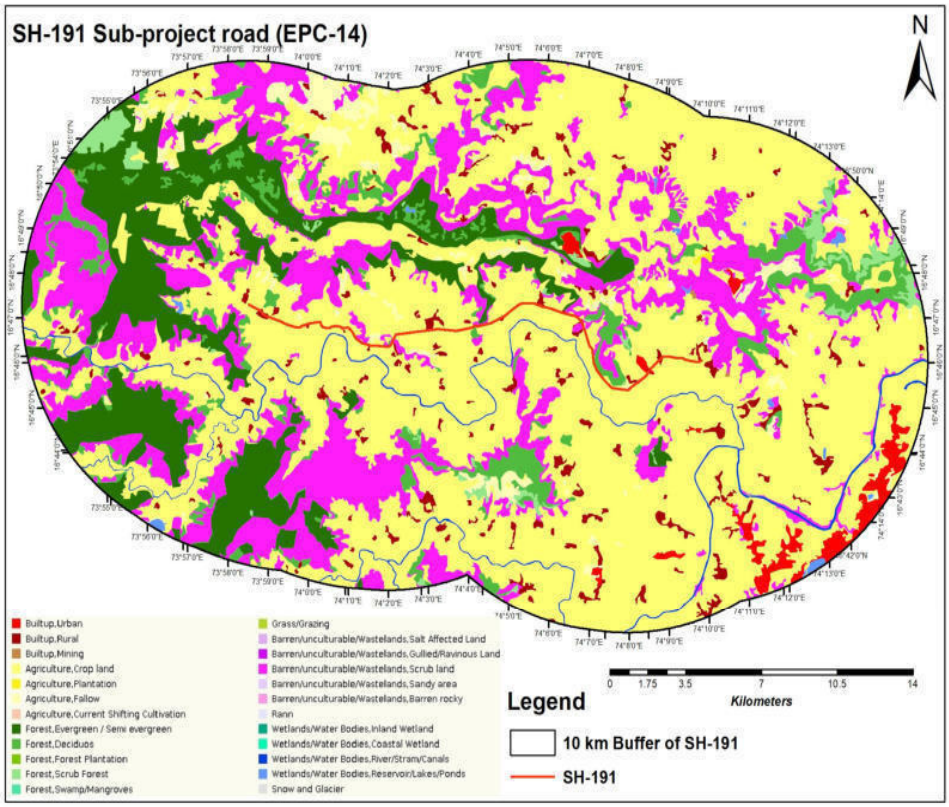

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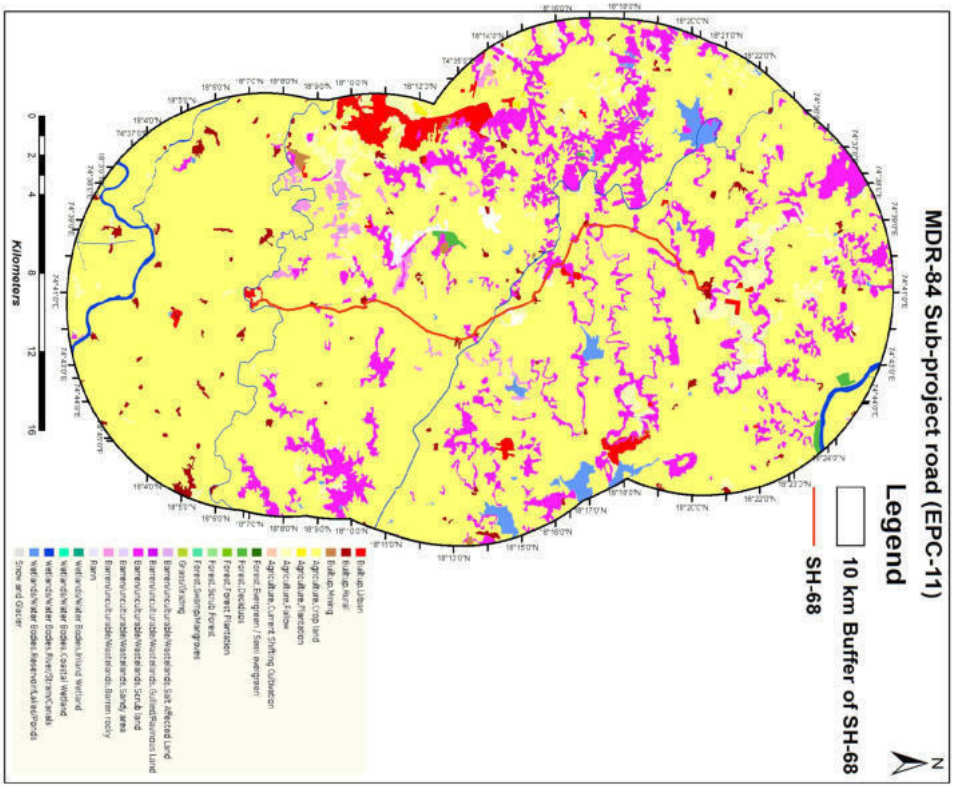

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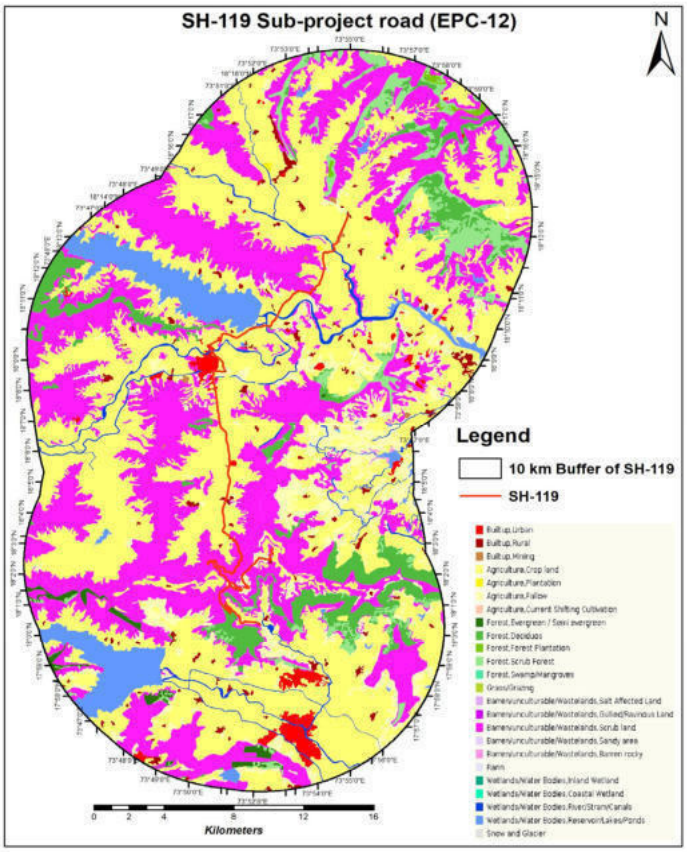

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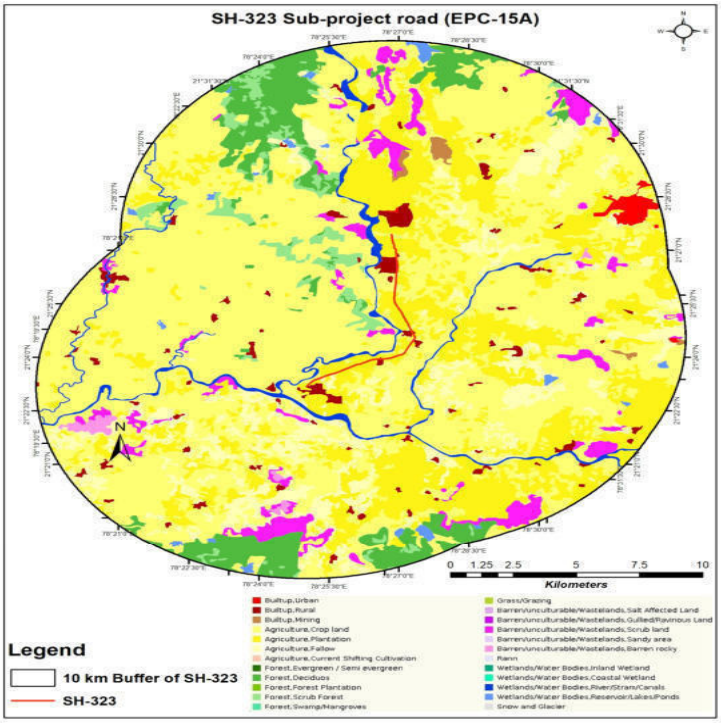

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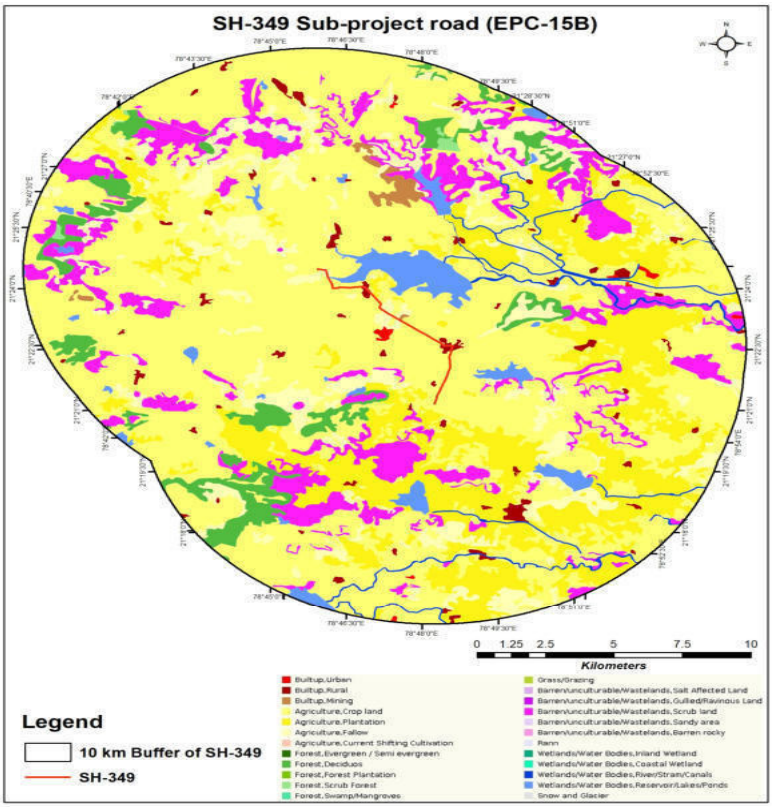

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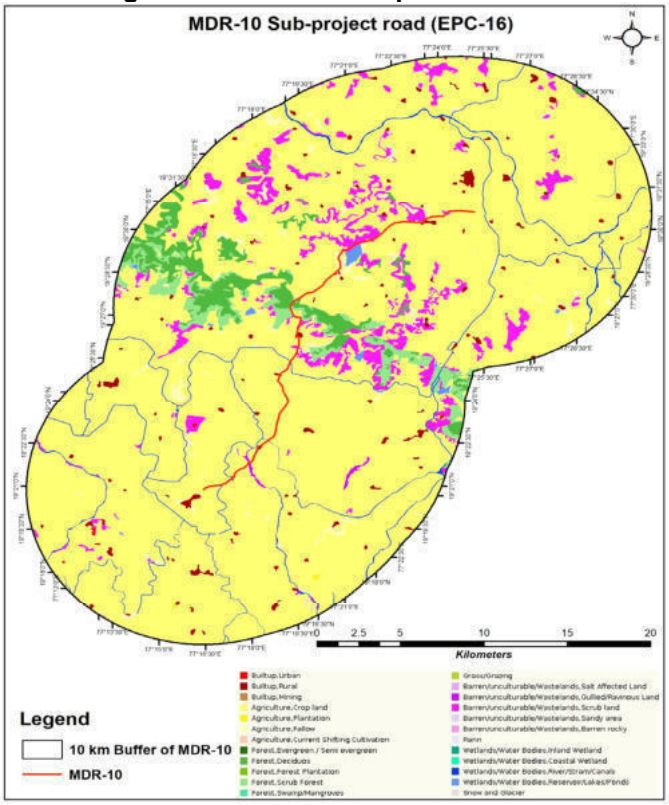

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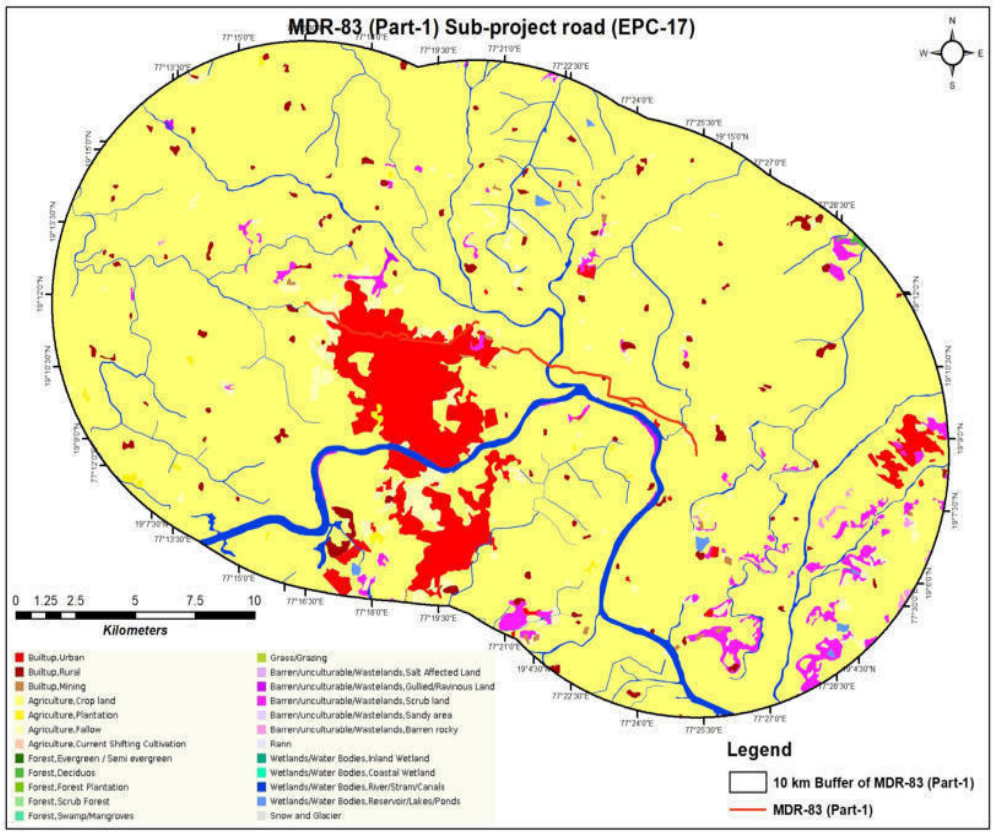

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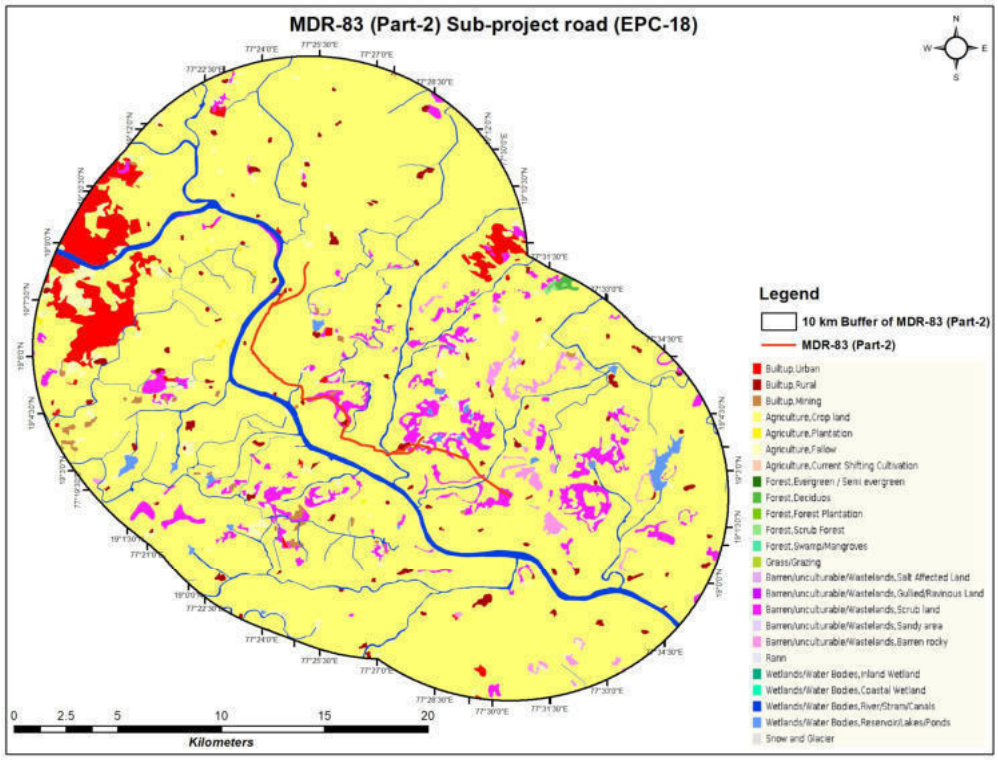

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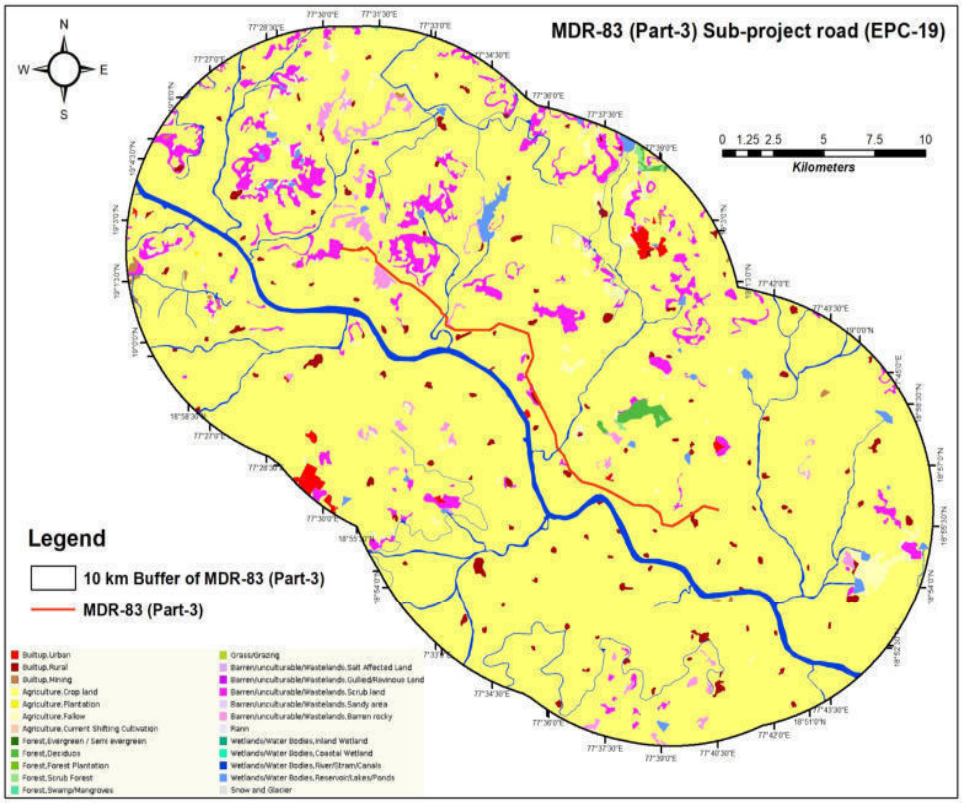

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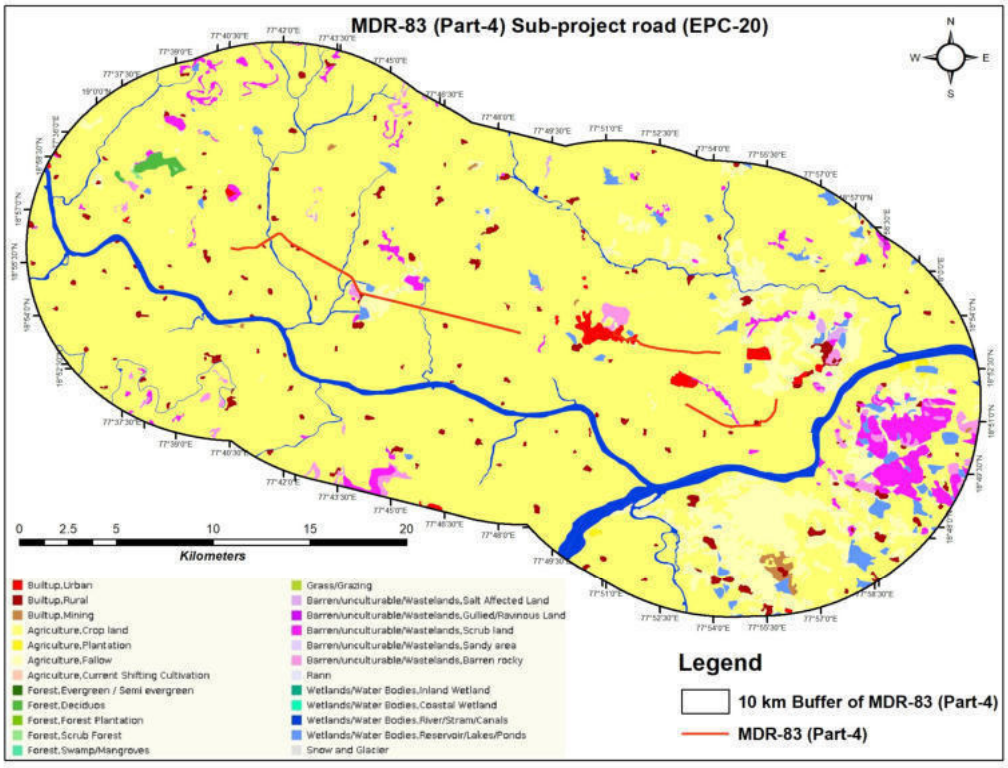

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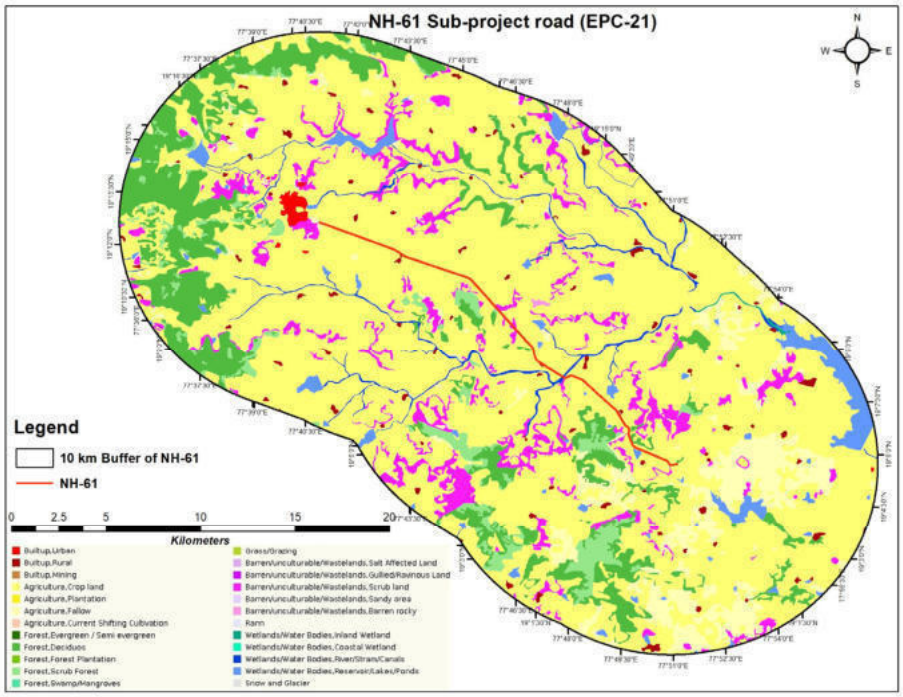

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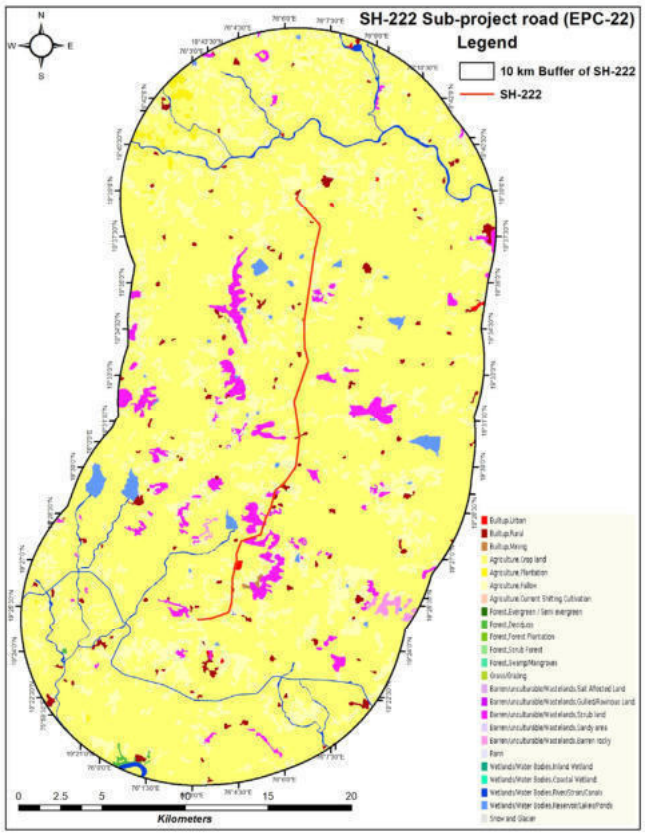

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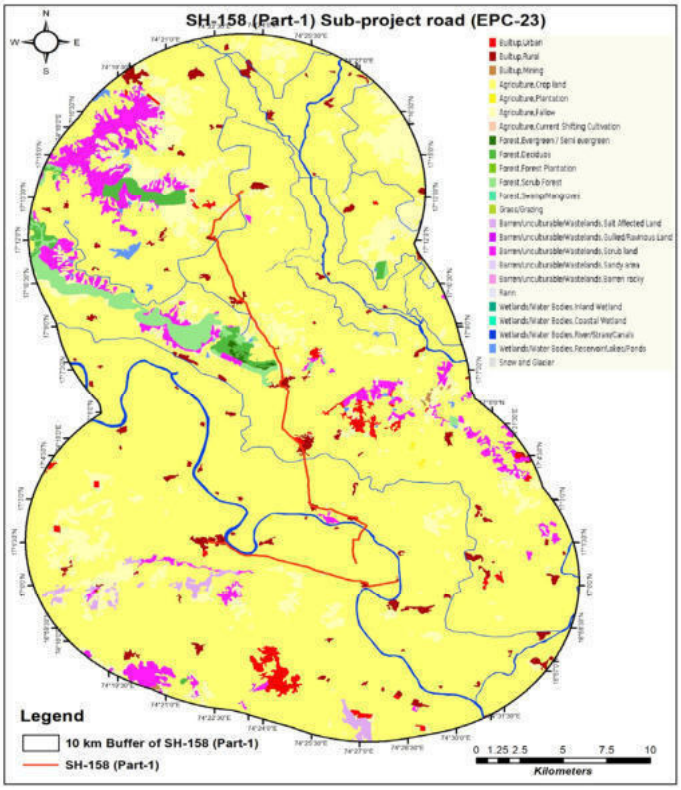

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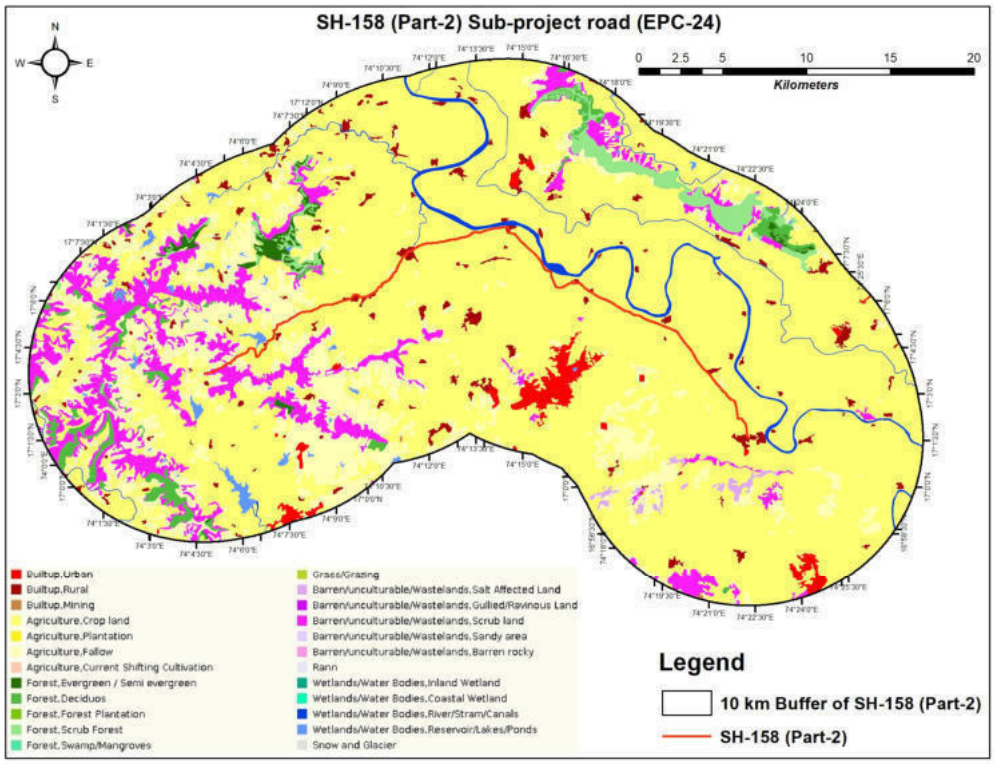

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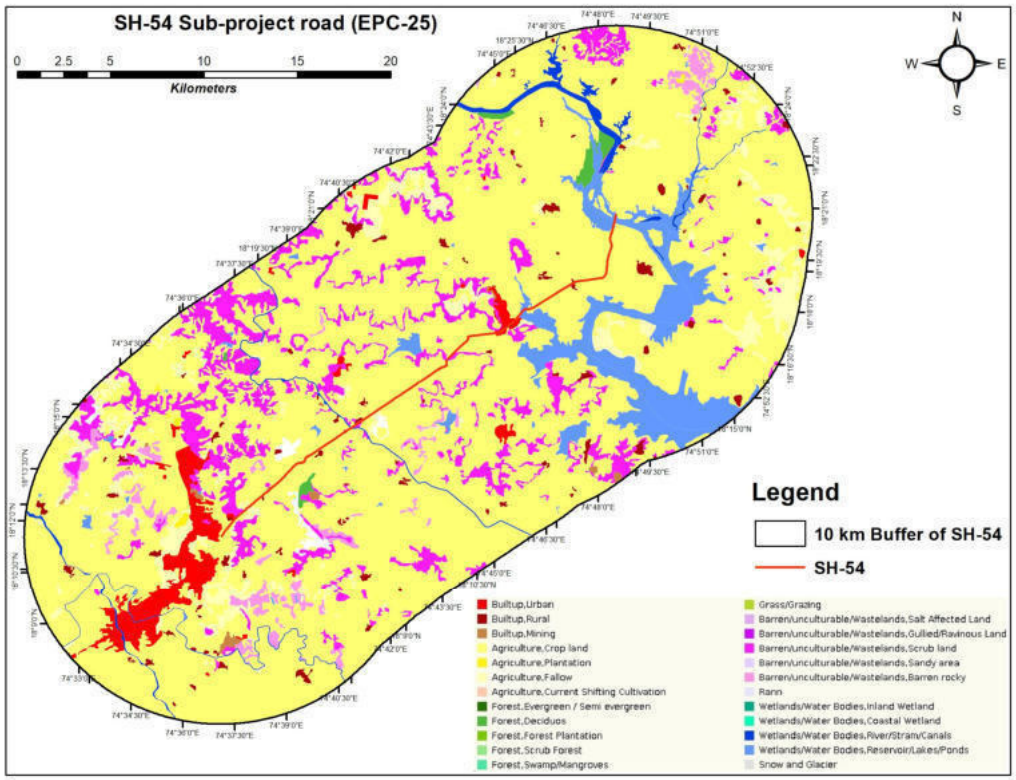

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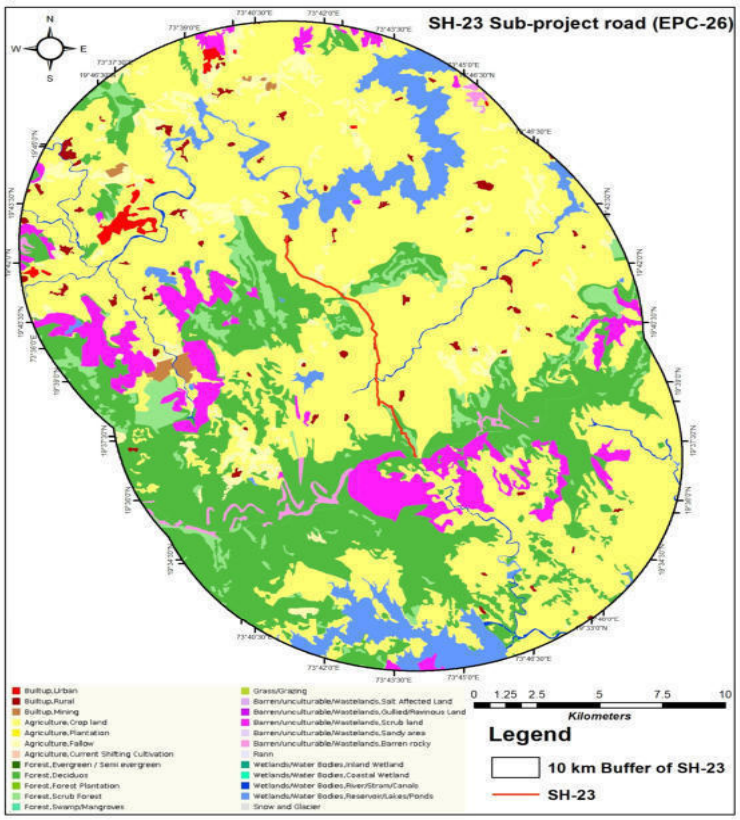


Figure 25: Land use Map of EPC-26

6. Air Quality

82. Project area is characterized mainly by open/ agriculture, forest and plantation areas. Sources of air pollution in the project area are mainly vehicular emissions, dust emanation due to use of unpaved shoulders/ deteriorated roads by vehicles, and domestic fuel burning. Considering the vast open landcover, all such emissions will be very well dissipated.

83. Monitored parameters of ambient air quality largely meet the prescribed limit **(Appendix 3)** of the World Bank (WB), National Ambient Air Quality Standard (NAAQS) and Central Pollution Control Board (CPCB) with few exceptions of particulate matter (PM_{10}) and particulate matter ($PM_{2.5}$). Detailed 24-hourly data for each sub-project is appended as **Appendix 4**. Analyzed results corresponding to World Bank and CPCB prescribed standards of air quality data are presented in **Table 16**. Summarised data represents the range value i.e lowest to highest concentration values considering all monitored locations for each sub-project.

Table 16: Compliance Status of AAQ around the Project Area

S. No	Road Sections	PM 10 µg/m³	PM 2.5 µg/m³	SOX µg/m³	NOx µg/m³	CO mg/m³
1.	SH-68	52.7-56.6	21.2-22.6	4.0-4.6	6.4-7.36	0.1-0.12
2.	MDR-84	74.6-89.8	24.8-48.4	8.8-15.2	12.2-23.4	0.87-1.85
3.	SH-119	52-62	22-30	9-14	20-26	
4.	SH-149	61.6-66.8	18.3-19.7	8.7-10.9	11.8-15.4	1-1.3
5.	SH-191	42.6-68.1	22.3-42.5	6.24-8.63	10.5-15.5	<1.1
6.	SH-323	50.8-81.5	24.7-40.6	5-7.2	12-19.3	<0.1-1.18
7.	SH-349	44.6-80.5	22.3-39.4	4.7-8.3	10.3-22.8	<0.1-1.25
8.	MDR-10	27.2-51.1	16.8-30.2	14.4-16.6	27.1-29.6	-
9.	MDR-83 (Part-1)	60.4-65.3	31.2-35.9	10-10.3	30.3-32.7	0.461-0.472
10.	MDR-83 (Part-2)	60.4-65.4	31.2-35.10	10-10.4	30.3-32.8	0.461-0.473
11.	MDR-83 (Part-3)	19.8-32.6	22.3-51.5	6.5-7.64	15.5-22.7	0.313-0.415
12.	MDR-83 (Part-4)	19.8-32.7	22.3-51.6	6.5-7.65	15.5-22.8	0.313-0.416
13.	NH-61 (222)	40.5-42.6	20.3-22.3	7.63-7.64	14.2-15.5	0.452-0.470
14.	SH-222	42.5-60.9	30.1-37.4	18.1-24.3	14.8-19.7	-
15.	SH-158 (Part-1)	48-62	20-32	9-14	21-30	-
16.	SH-158 (Part-2)	50-72	20-32	9-18	22-32	
17.	SH-54	73.5-76.9	31.2-34.9	19.15-22.98	26.23-27.2	0.42-0.48
18.	SH-23	41.6-64.2	21.6-26.4	7.24-7.89	0.4-38.9	0.39-0.54
GOI NAAQS		100	60	80	80	2
WB (interim Target 1)		150	75	125	No prescribed limit for 24 hrly averaging period	No prescribed limit for CO
WB (interim Target 2)		100	50	50		
WB (interim Target 3)		75	37.5	-		
WB (Guideline)		50	25	-		

Source: Primary Monitoring

7. Noise Level

84. Traffic noise is the principal source of noise in the project area. The area mostly includes rural open areas with good vegetation cover along some of sub-projects. There are some agro-based industries, sugar mills, oil industries etc. in the project area but not close to the roads hence not contributing any significant noise level to the ambient levels and therefore, the noise levels are relatively low. Noise level monitoring indicates that the noise levels generally meet the GOI NAAQS prescribed noise standards **(Appendix 5)** for all land use categories (commercial, industrial as well as residential zones). Noise levels in residential zone of SH 119 (EPC-12), commercial zone of SH-149 (EPC-13) and residential, commercial zone of SH-158 (Part-1) of

EPC-23 and EPC-24 are exceeding the GoI norms. There is no continuous sound frequency of impulsive nature in the area. In some cases, monitored baseline noise level may not always be corroborated directly with the traffic volume since the monitoring period may or may not coincide with the seasonal traffic generated due to various reasons. Further, this seasonal traffic also have variations in its timing. For example, seasonal traffic generated due to transport of goods/agri or mine products are observed during night whereas traffic during any religious/pilgrimage season ply mostly in daytime. It is anticipated that noise level will decrease significantly after road expansion and improvement work enabling decongestion at existing built-up areas. Noise level in the project area has been appended as **Appendix 6.** Compliance status of Noise level data is presented in **Table 17.**

Table 17: Compliance Status of Noise Level around the Project Area

S. No	PKG NO.	ROAD NO.	WB EHS					GOI NAAQS							
			Res		Inst		Indl	Res		Indl		Comm.		Silence	
			D	N	D	N	D/N	D	N	D	N	D	N	D	N
1.	EPC-10	SH-68	√	√	**x**	√	--	√	√	--	--	√	√	**x**	√
2.	EPC-11	MDR-84	√	√	√	√	--	√	√	--	--	--	--	√	√
3.	EPC-12	SH-119	--	--	**x**	**x**	--	**x**	**x**	--	--	√	√	**-**√	√
4.	EPC-13	SH-149	--	--	--	--	--	--	--	--	--	**x**	√	**-**	--
5.	EPC-14	SH-191	√	√	--	--	--	√	√	--	--	--	--	√	√
6.	EPC-15A	SH-323	√	√	√	√	√	√	√	√	√	√	√	√	√
7.	EPC-15B	SH-349	√	√	√	√	√	√	√	√	√	√	√	√	√
8.	EPC-16	MDR-10	--	--	--	--	--	--	--	--	--	--	--	√	√
9.	EPC-17	MDR-83 (Part-1)	√	√	--	--	--	√	√	--	--	--	--	√	√
10.	EPC-18	MDR-83 (Part-2)	√	√	--	--	--	√	√	--	--	--	--	√	√
11.	EPC-19	MDR-83 (Part-3)	√	√	--	--	--	√	√	--	--	--	--	--	--
12.	EPC-20	MDR-83 (Part-4)	√	√	--	--	--	√	√	--	--	--	--	--	--
13.	EPC-21	NH-61 (222)	√	√	--	--	--	√	√	--	--	--	--	√	√
14.	EPC-22	SH-222	√	√	√	√	--	√	√	--	--	√	√	-	-
15.	EPC-23 and 24	SH-158 (Part-1)	**x**	**x**	**x**	**x**	--	**x**	**x**	--	--	√	**x**	**-**	-
16.	EPC-25	SH-54	√	√	√	√	--	√	√	--	--	√	√	√	√
17.	EPC-26	SH-23	√	√	--	--	--	√	√	--	--	--	--	√	√

--; Not Monitored because no such zones are present along the road section, D= Day, N= Night, Res= Residential, Inst= Institutional, Indl= Industrial, Comm = Commercial

8. Groundwater

85. Ninety percent of the State's rural population uses groundwater resources. In the agriculture sector, groundwater utilization is 85%. Some 10% of the ground water is utilized for industrial purpose and only 5% is used up for drinking. In large parts of western and central Maharashtra, where groundwater abstraction for sugarcane cultivation has reached unsustainable levels, groundwater resources are getting depleted fast. The most important aquifers in Maharashtra are the Deccan basalts, where groundwater occurs within the shallow weathered and fractured zones extending to depths of 15-20 meters.

86. The average water table depths in the shallow aquifer range from 5 to 10 meters below ground level during the post-monsoon period and from 15 to 20 meters below ground level during the pre-monsoon period. The behavior of the aquifer during drought conditions depends on a number of site-specific factors, such as the intensity of drought, extent of groundwater abstraction, storm pattern, and location of the village in the watershed. District wise details related to ground water are given under in **Table 18.**

Table 18: District-wise Groundwater Detail

District	Water Bearing Formations	Water Table		Ground Water Zone Taluka Wise	Mitigation Measure
		Pre-Monsoon	Post Monsoon		
Ahmednagar	Hard Rock: Deccan Traps Weathered/Fractured/Jointed massive or vesicular Basalt Soft Rock: Alluvium- Sand and gravel.	2.15- 19.10 mbgl	1.40- 19.70 mbgl	Over-Exploited: 1, Critical: 0, Semi-Critical :5 Safe Taluka: 9	Rainwater harvesting structure included in the design shall improve groundwater levels
Pune	Alluvium (Recent age) and Deccan Trap Basalt (Upper cretaceous to Eocene)	0.40 to 20.10 mbgl	0.09 to 14.65 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 2 Safe Taluka: 12	
Satara	Basalt- weathered/fractured/ jointed vesicular/massive, under. phreatic and semi-confined conditions	0.09 to 16.20 mbgl	0.02 to 13.65 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 0 Safe Taluka: 10	
Kolhapur	Basalt- Weathered/fractured/ jointed vesicular/ massive, under phreatic condition and semi-confined to confined conditions.	0.0 to 16.28 mbgl	0.30 to 9.60 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 0 Safe Taluka: 12	
Nagpur	Archean- Weathered and fractured Granite Gneiss, Gondwana-Kamptee and Barakar Sandstone, Trap covered Gondwana; Deccan Trap-Weathered/ Fractured / Jointed Massive or Vesicular Basalt; Alluvium- Sand and Gravel	0.08 to 15.59 mbgl	0.60 to 10.60 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 0 Safe Taluka: 14	
Hingoli	Basalt (Deccan Traps) weathered, vesicular fractured, jointed. Under phreatic and confined conditions.	6.27 to 9.32 mbgl	3.60 to 6.90 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 0 Safe Taluka: 5	
Nanded	Basalt- Weathered/fractured/ jointed vesicular/ massive, under phreatic and semi-confined to confined conditions. Alluvium- Sand and Gravel, under semi-confined to confined conditions.	2.93 to 13.98 mbgl	1.9 to 7.93 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 0 Safe Taluka: 16	
Jalna	Basalt (Deccan Traps) weathered, vesicular fractured, jointed. Under phreatic and confined conditions.	3.84 to 16.20 mbgl	1.05 to 14.65 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 0 Safe Taluka: 8	
Sangli	Basalt- Wathered /fractured / jointed / vesicular/ massive/ under phreatic, Semi confined, Confined	0.35 to 16.45 mbgl	0.2 to 11.0 mbgl	Over-Exploited: 0, Critical: 1, Semi-Critical: 1 Safe Taluka: 10	
Nashik	Basalt – Weathered / fractured / jointed vesicular / massive, under phreatic and semi-confine to confined conditions.	GL to 18.36 mbgl	0.20 to 18.42 mbgl	Over-Exploited: 0, Critical: 0, Semi-Critical: 4 Safe Taluka: 15	

Source: District wise brochure, CGWA.

9. Groundwater Quality

87. Monitored parameters largely conforms to the drinking water standards (IS:10500-1991) prescribed by Bureau of Indian Standard **(Appendix 7).** This was also ascertained by the study done by Central Ground Water Board (CGWB) in the project districts. All sub-project districts shows that the concentrations of all the parameters in most of the samples are either within the desirable limit or within the maximum permissible limit of BIS standards and thus are found

suitable ground water for drinking and irrigation purpose. However, the ground water sample in all the districts is mainly affected by high nitrate concentration above the maximum permissible limit (MPL) in all districts. High value of Total Hardness (TH) values is also recorded in most of the districts. Project site-specific compliance of the permissible and desirable limits followed GOI standards which is comparable to the World Health Organization's standards and is tabulated in **Table 19** and results of samples are given in **Appendix 8.**

Table 19: Compliance Status of Ground Water Quality around the Project Areas

S. No.	Pkg	Road	GOI limits		Remarks
			Desirable	Permissible	
1.	EPC-10	SH-68	x	√	Hardness and chlorides exceed desirable limits but are well within permissible limits. BOD levels are high.
2.	EPC-11	MDR-84	x	√	Alkalinity, TDS and Magnesium are higher than desirable but within permissible limits.
3.	EPC-12	SH-119	x	x	Hardness is exceeding desirable limits but are well within permissible limits.
4.	EPC-13	SH-149	x	√	Chlorides, hardness, TDS, Calcium and Magnesium are higher than desirable but are well within permissible limits.
5.	EPC-14	SH-191	x	√	Hardness, alkalinity is slightly higher than desirable but well within permissible limits.
6.	EPC-15A	SH-323	x	x	TDS and alkalinity are higher than desirable but well within permissible limits. Total coliform and E Coli exceed recommended values in a few samples.
7.	EPC-15B	SH-349	x	√	Alkalinity exceeds desirable limits but is well within permissible limits.
8.	EPC-16	MDR-10	x	√	Hardness exceeds the desirable limit but is well within permissible limits.
9.	EPC-17	MDR-83 (Part-1)	x	√	Hardness and alkalinity exceed desirable/ limits but are well within permissible limits
10.	EPC-18	MDR-83 (Part-2)	x	√	
11.	EPC-19	MDR-83 (Part-3)	x	√	
12.	EPC-20	MDR-83 (Part-4)	x	√	
13.	EPC-21	NH-61	x	√	
14.	EPC-22	SH-222	√	√	All are well within permissible limits.
15.	EPC-23	SH-158 (Part-1)	√	√	
16.	EPC-24	SH-158 (Part-2)	√	√	
17.	EPC-25	SH-54	x	√	TDS exceeds the desirable limit but is well within permissible limits.
18.	EPC-26	SH-23	x	√	Hardness and alkalinity exceed desirable/ limits but are well within permissible limits

Source: Baseline Monitoring conducted at project sites.

10. Surface water

88. **Availability:** The estimated average annual availability of water resources in Maharashtra consists of 164 km^3 of surface water and 20.5 km^3 of subsurface water (http://www.mwrra.org). Out of the 5 river basin systems, only 55% of the dependable yield is available in the four river basins (Krishna, Godavari, Tapi and Narmada) east of the Western Ghats. These four river basins comprise 92% of the cultivable land and more than 60% of the population in rural areas. An approximate 49% of the area of these four river basins consisting 43% of the population is already considered as deficit or highly deficit in water availability. About 45% of the State's water resources are from west-flowing rivers which are mainly monsoon specific emanating from the ghats and draining into the Arabian Sea. However, this water cannot be fully utilized as the average altitude west of the ghats is 60 m above sea level

89. **Quality:** Surface water is not used for drinking/ domestic purpose in the project area except for outdoor bathing and irrigation in some places Therefore, surface water samples from rivers and ponds have been analyzed to confirm its suitability for different classes prescribed for freshwater classification by CPCB. Analyzed samples are summarized in **Table 20** for its compliance with the prescribed limits appended as **Appendix 9.**

Table 20: Compliance Status of Surface Water Quality around the Project Areas

Pkg	Road	GOI (CPCB)			Remarks
		Drinking Water without treatment	Outdoor bathing	Irrigation	
EPC-10	SH-68	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-11	MDR-84	X	√	√	DO doesn't meet the drinking water criteria
EPC-12	SH-119	X	√	√	DO and BOD do not meet drinking water criteria.
EPC-13	SH-149	√	√	√	Fit for all usage
EPC-14	SH-191	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-15A	SH-323	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-15B	SH-349	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-16	MDR-10	No sampling done since no water available during monitoring period in any of these natural streams as all are non-perennial in nature			
EPC-17	MDR-83 (Part-1)	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-18	MDR-83 (Part-2)	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-19	MDR-83 (Part-3)	X	X	√	DO doesn't meet the drinking water and outdoor bathing criteria. BOD doesn't meet the drinking water criteria
EPC-20	MDR-83 (Part-4)	X	X	√	DO doesn't meet the drinking water and outdoor bathing criteria. BOD doesn't meet the drinking water criteria

Pkg	Road	GOI (CPCB)			Remarks
		Drinking Water without treatment	Outdoor bathing	Irrigation	
EPC-21	NH-61	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.
EPC-22	SH 222	x	√	√	DO and BOD do not meet drinking water criteria.
EPC-23	SH-158	X	√	√	DO and BOD do not meet drinking water criteria.
EPC-24	SH-158	X	√	√	DO and BOD do not meet drinking water criteria.
EPC-25	SH-54	X	X	√	BOD doesn't meet the drinking water and outdoor bathing criteria.
EPC-26	SH-23	X	X	√	DO and BOD do not meet drinking water and outdoor bathing criteria.

Source: Baseline Monitoring conducted at project sites

11. Waterways and Water Bodies in the Project Area:

90. Project roads cross many important rivers. All rivers, streams, nallahs crossed by the project roads are mostly non-perennial except Gunjawani River and Nira River in SH-119, Bodh River and Asna River in MDR-83, Bhima River and Ujani dam backwaters in SH-54 which hold some water throughout the year. There is no water body nearby or waterway crossed by sub-project roads in SH-191 and MDR-83 Part-3. All types of water bodies/ waterways crossed by the project roads or located nearby have been summarized in **Table 21.**

Table 21: List of Waterways/ Water Bodies

S. No	Pkg	Chainage (Km)	Water Bodies	Dist. from C/L (m)	Side	Nature (Perennial/ Non-perennial)	Usage
1	EPC-10	104.016	Bhima River	0	Crossing	Perennial	Irrigation, Water Supply & Hydropower
2		108.16	Canal	0	Crossing	Non-Perennial	Irrigation
3		111.982	Canal	0	Crossing	Non-Perennial	Irrigation
4		122.1	Canal	0	Crossing	Non-Perennial	Irrigation
5		123.688	Canal	0	Crossing	Non-Perennial	Irrigation
1	EPC-11	0.66	Nala	0	Crossing	Non-Perennial	Storm & Drainage water
2		2.35	Canal	0	Crossing	Non-Perennial	Irrigation and water supply
3		6.41	Canal	0	Crossing	Non-Perennial	Irrigation and water supply
4		6.8	Nala	0	Crossing	Non-Perennial	Storm & Drainage water
5		8.5	Nala	0	Crossing	Non-Perennial	Storm & Drainage water
6		12.11	Canal	0	Crossing	Non-Perennial	Irrigation and water supply
7		12.6	Nala	0	Crossing	Non-Perennial	Storm & Drainage water

S. No	Pkg	Chainage (Km)	Water Bodies	Dist. from C/L (m)	Side	Nature (Perennial/ Non-perennial)	Usage
8		14.14	Canal	0	Crossing	Non-Perennial	Irrigation and water supply
9		15.4	Canal	0	Crossing	Non-Perennial	Irrigation and water supply
1	EPC-12	78.395	Gunjawani River	0	Crossing	Perennial	Irrigation and water supply
2		84.49	Nira River	0	Crossing	Perennial	Irrigation and water supply
3		84.7	Natural water way /crossing	0	Crossing	Non-Perennial	Domestic/ cattle/ fishing
4		85.44	Nira River	0	Crossing	Perennial	Irrigation and water supply
5		89.37	Nira River	0	Crossing	Perennial	Irrigation and water supply
6		91.5	Natural water way /crossing	0	Crossing	Non-perennial	Domestic/ cattle/ fishing
7		92.07	Canal	0	Crossing	Non-perennial	Domestic/ cattle/ fishing
8		93.4	Natural water way /crossing	0	Crossing	Perennial	Domestic/ cattle/ fishing
9		95.35	Natural water way /crossing	0	Crossing	Non-perennial	Domestic/ cattle/ fishing
10		99.96	Nere nala	0	Crossing	Non-perennial	Domestic/ cattle/ fishing
1	EPC-13	5.7	Natural water way /crossing	0	Crossing	Non-perennial	Natural source with no specific use
2		10.75	Natural water way /crossing	0	Crossing	Non-perennial	Natural source with no specific use
3		14.75	Natural Pond	24	LHS	Non-perennial	Natural source with no specific use
1	EPC-14	Nil					
1	EPC-15A	51.774	Stream	0	Crossing	Non-Perennial	Natural source with no specific use
1	EPC-15B	0.722	Stream	0	Crossing	Non-Perennial	Natural source with no specific use
2		0.936	Stream	0	Crossing	Non-Perennial	Natural source with no specific use
3		7.657	Stream	0	Crossing	Non-Perennial	Natural source with no specific use
1	EPC-16	1.988	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
2		2.785	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
3		4.61	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
4		5.527	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
5		11.1	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use

S. No	Pkg	Chainage (Km)	Water Bodies	Dist. from C/L (m)	Side	Nature (Perennial/ Non-perennial)	Usage
6		11.26	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
7		12.27	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
8		12.345	Natural waterway	0	Crossing	Non-Perennial	Natural source with no specific use
9		12.5	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
10		13.375	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
11		14.13	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
12		15.4	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
13		17.595	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
14		18.15	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
15		25.395	Natural waterways	0	Crossing	Non-Perennial	Natural source with no specific use
1	**EPC-17**	3.4	Bodh river	0	Crossing	Perennial	Bathing cattle /fishing
2		7	Asna river	0	Crossing	Perennial	Bathing cattle /fishing
3		13.6	Nallah	0	Crossing	Non-Perennial	Bathing cattle
4		14	Nallah	0	Crossing	Non-Perennial	Bathing cattle
1	**EPC-18**	15.2	Nallah	0	Crossing	Non-Perennial	Domestic, bathing/ Cattle bathing
2		17.6	Nalaah	0	Crossing	Non-Perennial	Domestic, bathing/ Cattle bathing
3		20.8	Nalaah	0	Crossing	Non-Perennial	Domestic, bathing/ Cattle bathing
4		27.8	Sita river	0	Crossing	Non-Perennial	Domestic, bathing/ Cattle bathing
1	**EPC-19**	Nil					
1	**EPC-20**	62.6	River	0	Crossing	Non-Perennial	bathing/ Cattle bathing
2		68.6	Pond	50 m	RHS	Non-Perennial	bathing/ Cattle bathing
3		79.5	Nallah	0	Crossing	Non-Perennial	bathing/ cattle bathing
1	**EPC-21**	145.43	Nalaah	0	Crossing	Non-Perennial	domestic, bathing/ Cattle bathing
1	**EPC-22**	1.994	Devali Nala	0	Crossing	Non-Perennial	Natural source with no specific use
2		10.133	Local Nala	0	Crossing	Non-Perennial	Natural source with no specific use
3		14.723	Local Nala	0	Crossing	Non-Perennial	Natural source with no specific use
4		19.565	Local Nala	0	Crossing	Non-Perennial	Natural source with no specific use
5		23.44	Local Nala	0	Crossing	Non-Perennial	Natural source with no specific use
6		26.78	Local Nala	0	Crossing	Non-Perennial	Natural source with no specific use
7		30.061	Local Nala	0	Crossing	Non-Perennial	Natural source with no specific use

S. No	Pkg	Chainage (Km)	Water Bodies	Dist. from C/L (m)	Side	Nature (Perennial/ Non-perennial)	Usage
8		31.926	Canal	0	Crossing	Non-Perennial	Natural source with no specific use
1	EPC-23	28.97	Canal	0	Crossing	Non-perennial	Cattle/ fishing
2		29	Pond	8	RHS	Non-perennial	Cattle/ fishing
4		32.745	Canal	0	Crossing	Non-perennial	Cattle/ fishing
5		46.43	Canal	0	Crossing	Non-perennial	Cattle/ fishing
6		48.79	Canal	0	Crossing	Non-perennial	Cattle/ fishing
7		51.205	Canal	0	Crossing	Non-perennial	Cattle/ fishing
8		58.47	Pond	8	LHS	Non-perennial	Cattle/ fishing
9		60.44	Canal	0	Crossing	Non-perennial	Cattle/ fishing
10		66.26	Natural waterways	0	Crossing	Perennial	Cattle/ fishing
1	EPC-24	78.665	Natural waterways	0	Crossing	Perennial	Cattle/ fishing
2		79.565	Natural waterways	0	Crossing	Perennial	Cattle/ fishing
3		83.815	Natural waterways	0	Crossing	Perennial	Cattle/ fishing
4		101.245	Natural waterways	0	Crossing	Non-perennial	Cattle/ fishing
5		103.57	Natural waterways	0	Crossing	Non-perennial	Cattle/ fishing
6		106.735	Natural waterways	0	Crossing	Non-perennial	Cattle/ fishing
7		108.6	Natural waterways	0	Crossing	RHS	Cattle/ fishing
8		109.23	Natural waterways	0	Crossing	RHS	Cattle/ fishing
1	EPC-25	145	Bhima river	0	Crossing	Perennial	Irrigation, Water Supply & Hydropower
2		152.9	Ujjani Dam Backwater	0	Crossing	Perennial	Irrigation, Water Supply & Hydropower
3		160.1	Canal	0	Crossing	Non-Perennial	Irrigation
4		161.8	Canal	0	Crossing	Non-Perennial	Irrigation
5		163.45	Canal	0	Crossing	Non-Perennial	Irrigation
6		164.2	Canal	0	Crossing	Non-Perennial	Irrigation
1	EPC-26	194.78	River	0	Crossing	Perennial	Perennial
2		199.48	Bhima river	0	Crossing	Perennial	Perennial
3		200.08	Kadwa River	0	Crossing	Perennial	Perennial

B. Ecological Resources

91. **State's Forest Resource:** The recorded forest area of the state of Maharashtra is 61,579 Sq.km which is 20.01% of total geographic area. The total 49,546 sq Km is Reserved Forests, 6,733 sq km is Protected Forest and 5,300 sq km is Unclassed Forests. A net decrease of 17 sq. km has been observed in the state in comparison to year 2015. This can be attributed to rotational fillings, submergence, agricultural expansion and other development activities. Maharashtra has five forest types as per the Champion and Seth's classification. Each forest type represents a

unique Eco-system. Southern Tropical Semi Evergreen Forests occur mostly on upper hilly slope. Southern Tropical Dry Deciduous Forest occupy a major part of state. Southern Tropical Thorn Forest type characterizes the forests of the low rainfall areas of Marathwada, Vidarbha and Western Maharashtra. The swamp forests occur along the creeks and littoral in Sindhudurg and Thane district. Southern Tropical Moist Deciduous Forests are mainly confined to Melghat region of Amravati, Chandrapur, Gadhchiroli and Thane districts.

92. **Forest in the Project Districts:** Project districts are predominantly open forest and moderate dense forest cover with the exception of Satara, Kolhapur, Nagpur and Nanded having small area with very dense forest. Quantitatively the total forest area in Kolhapur (23.24%) and Nagpur (20.22%) and have total forest area greater than state total (16.50%) forest cover. Proportion of open forest is highest followed by moderately dense and very dense forest. Forest cover in different canopy classes of the project districts is given in **Table 22.**

Table 22: Forest Cover in Project Districts (Sq. Km)

District	Geographic Area	Very Dense Forest	Moderately Dense Forest	Open Forest	Total Forest Area	% to Total Geo. Area
Ahmednagar	17,048	0	68.82	198.07	266.89	1.57
Pune	15643	0	760.93	949.93	1710.86	10.94
Satara	10480	117	569.68	591.69	1278.37	12.2
Kolhapur	7685	64	1020.44	701.88	1786.32	23.24
Nagpur	9892	401.06	902.56	696.76	2000.38	20.22
Hingoli	4827	0	9	101.01	110.01	2.28
Nanded	10528	58	442.91	435.85	936.76	8.9
Jalna	7694	0	9.65	26.83	36.48	0.47
Sangli	8572	0	95	55.13	150.13	1.75
Nashik	15530	0	346.34	730.21	1076.55	6.93

Source: Forest Survey of India; state of Forest, 2019

12. Forest Types and Diversions Required for the Project

93. Within the protected area, a combination of both natural and modified forests was observed. Natural forest in this context is described as naturally occurring grassland or southern thorny bush vegetation, while modified refers to plantations carried out by the Forest Department. Forests along the sub-projects are mostly devoid of dense vegetation other than ghat portions of SH-119 and SH-23. No floral and faunal diversity is observed despite owning its legal status as reserved forests.

94. Forest diversion is required for eight sub-project roads totally to 22.7451 ha of forest area,

some portion fall in protected forest[26] and some portions in reserve forest[27] as explained in **Table 23**. These forest patches are mostly devoid of or meagerly vegetated except reserved forests along ghat portions of SH-119 (Kapurhol-Bhor-Wai Road) and SH-23 (Bari-Ghoti-Sinnar). All details such as locations, area to be diverted, status of forest proposal, etc. has been summarized below in **Table 23**.

Table 23: Details of Forest along the Project Roads

S. No.	Pkg	Village Involved	Forest Type and Area for Diversion	Status of Forest Diversion Application
Khadki to Bhawani Nagar (MDR-84)				
1	11	Shetphalgade	1.45 km of the project road (MDR-84) passes through Forest area in 1 patch. **Total Diversion = 1.02 Ha**	Proposal No. FP/MH/ROAD/144816/2021 Submission Date: 15.07.2021 Status: Query raised by DFO, Pune on:28/12/2021
Kapurhol-Bhor-Wai Road (SH-119)				
2	12	Ambade, Gundewadi	4.10 km of the project road (SH-119) passes through in 2 patches through Reserve 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). **Total Diversion = 6.56 Ha**	Proposal No. FP/MH/ROAD/57652/2020 Submission Date: 07.12.2020 Status: Queries raised on 14.02.2022 by Nodal Officer for submitting hard copy of proposal by PWD.
Adarki-Mirgaon-Phaltan (SH-149)				
3	13	Nandal, Hanumantawadi, Adarki khurd, Mirgaon	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**	Proposal No. FP/MH/ROAD/50309/2020 Submission Date: 01.10.2020 Status: Queries raised on 22.12.2020 by DFO, Satara for compliance by PWD.
Kerli-Kotoli-Nanadari (SH-191)				

[26] Protected forest: The State Government is empowered to constitute any land other than reserved forests as protected forests over which the Government has proprietary rights and the power to issue rules regarding the use of such forests. This power has been used to establish State control over existing rights of individuals or local communities over trees, whose timber, fruit or other non-wood products have revenue-raising potential. Source: Indian Forest Act of 1878 and 1927.

[27] Reserve forest: Reserve forests are the most restricted forests and are constituted by the State Government on any forest land or wasteland which is the property of the Government. In reserved forests, local people are prohibited, unless specifically allowed by a Forest Officer in the course of the settlement. Source: Indian Forest Act of 1878 and 1927.

S. No.	Pkg	Village Involved	Forest Type and Area for Diversion	Status of Forest Diversion Application
4	14	Porle Tarf, Utre, Nandari, Malapude, Katlewadi	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**	Proposal No. FP/MH/ROAD/115156/2020 Submission Date: 04.01.2021 Status: Proposal is pending at DFO due to EDS raised by Nodal Officer
Kandil-Bothi-Rameshwar-Tanda-Wadgaon-Girgaon (MDR-10)				
5	16	Koparwadi	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**	Draft Submission Status: SW/166380/2020
Mugat Junction-Khujda Junction-Amdura and Malkota Realignment (MDR-83, Part-2)				
6	18	Malkautha, 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**	Proposal No. FP/MH/ROAD/49778/2020 Submission Date: 23.09.2020 Status: C.A land allotted. FRA awaited. Query raised by DFO, Nanded on: 18/01/2021. Proposal is pending due to EDS raised by DFO
Bhigwan-Baramati (SH-54)				
7	25	Bambadwadi, Madanwadi, Pimpale, and Sawal	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), setion 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**	Proposal No. FP/MH/ROAD/144584/2021 Submission Date: 10.07.2021 Status: Queries raised on 28.12.2021 by DFO, Pune for compliance by PWD. Proposal is pending at User Agency due to EDS raised by DFO
Bari-Ghoti-Sinnar (SH-23)				
8	26	Wasali	2.07 km of the project road (SH-23) passes through Reserve Forest in 2 patches. **Total Diversion = 1.97 Ha**	Proposal No. FP/MH/ROAD/49832/2020 Submission Date: 19.09.2020 Status: Proposal pending at DFO, Nashik level.

13. Trees within Right of Way:

95. A total of **7,679** trees for the entire project have been enumerated within ROW which are likely to be affected due to proposed widening and improvement. Girth size classification indicates that most of the trees are quite mature. All are of indigenous species.

Predominant tree species along project corridors are: 1) **Ahmednagar-** *Azadirachta indica* Neem, *Vachellia nilotica* Babool, *Mangifera indica* Aam, *Madhuca longifolia* Mahua, *Dalbergia sissoo* Shisham, *Terminalia arjuna* Arjun, *Neolamarckia cadamba* Kadam, *Eucalyptus globulus* Eucalyptus, *Senegalia catechu* Khair, *Peltophorum pterocarpum* Radhasura, *Borassus flabellifer* Tal, *Syzygium cumini* Jamun, *Delonix Regia* etc., 2) **Pune-** *Alstonia scholaris* Saptaparni, *Senna auriculata* Tarawad, *Azadirachta indica* Neem, *Terminalia catappa* Kadu Badam (Karanji), *Polyalthia longifolia* Ashok, *Cocos nucifera* Coconut, *Delonix regia* Gulmohar, *Eucalyptus globulus* Nilgiri, *Ficus racemosa* Umbar, *Acacia leucophloea* Hiwar, *Vachellia nilotica* Babul, *Limonia acidissima* Kawath, *Ziziphus mauritiana* Bor, *Dalbergia sissoo* Shisam, *Vitex negundo* Nirgud,*Annona reticulata* Ramphal, *Tamarindus indica* Chinch, *Moringa oleifera* Shevaga, *Cordia dichotoma* Gondan etc. 3) **Satara**-*Terminalia chebula* Arra, *Polyalthia longifolia* Ashok, *Vachellia nilotica* Babool, *Terminalia catappa* Badam, *Terminalia bellirica* Bahera, *Ficus benghalensis* Bargad, *Ziziphus mauritiana* Ber, *Tamarindus indica* Chinch, *Buchanania lanzan* Chirhol, *Cocos nucifera* Coconut, *Ficus racemosa* Gular, *Syzygium cumini* Jamun, *Pterocarpus marsupium* Kanji, *Senegalia catechu* Khair, *Mangifera indica* Aam, *Azadirachta indica* Neem, *Bombax ceiba* Semar, *Casuarina equisetifolia* Suru, & *Diospyros melanoxylon* Tendu etc. 4) **Kolhapur**- *Vachellia nilotica* Babool, *Delonix Regia* Gulmohar, *Ziziphus mauritiana* Ber, *Azadirachta indica* Neem, *Dalbergia sissoo* Sisam, *Ficus benghalensis* Bargad, *Syzygium cumini* Jamun, *Tectona grandis* Sagvan, *Terminalia tomentosa* Saja, *Millettia pinnata* Karanj, *Diospyros melanoxylon* Tendu, *Senegalia catechu* Khair, *Holoptelea integrifolia* Chilbil, *Ficus racemosa* Umbair, *Psidium guajava* Amarud, *Terminalia chebula* Harra, *Terminalia arjuna* Kahua, *Tamarindus indica* Temarnika, 5) **Nagpur**- *Bixa orellana* Bija, *Diospyros montana* Bistendu, *Ziziphus mauritiana* Ber, *Buchanania lanzan* Chironji, *Tamarindus indica* Imli, *Azadirachta indica* Neem, *Butea monosperma* Palas, *Erythrina variegata* Pangara, *Soymida febrifuga* Rohan etc. 6) **Hingoli**- *Azadirachta indica* Neem, *Vachellia nilotica* Babool, *Tamarindus indica* Chinch, *Ficus Benghalensis* Vad, *Moringa oleifera* Shevga, *Tectona grandis* Sagwan, *Ficus religiosa* Peepal. 7) **Nanded**- *Vachellia nilotica* Babool, Moringa oleifera Shevga, Senna siamea Kashid, *Azadirachta indica* Neem*, Tamarindus indica* Imli, *Ficus Benghalensi* Vad, *Syzygium cumini* Jamun, *Butea monosperma* Palash, *Tectona grandis* Sagwan, *Aegle marmelos* Bel,. 8) **Jalna**-*Phyllanthus emblica* Awla, *Vachellia nilotica* Babul, *Ziziphus mauritiana* Ber, *Delonix regia* Gul Mahur, *Tamarindus indica* Imli, *Psidium guajava* Jamfal, *Millettia pinnata* Karanji, *Azadirachta indica* Neem, *Eucalyptus globulus* Nilberi, *Ficus religiosa* Pipal,*Albizia lebbeck* Sirash, *Ficus glomerata* Umbar etc. 9) **Sangli**- *Mangifera indica* Aam, *Polyalthia longifolia* Ashok, *Vachellia nilotica* Babool, *Melia azedarach* , *Ziziphus mauritiana* Ber, Coconut, Eucalyptus, *Delonix regia*Gulmohar, *Syzygium cumini* Jamun, *Limonia acidissima* Kaith, Pterocarpus marsupium Kanji, Khair, Liptish, Neem, Oraneem, Peepal, Sagwan, Sahjan, Semar, Sheesham, Senegalia catechu Shirsha, Ficus racemosa Umbar etc. 10) **Nashik**- *Ficus religiosa* Pipal, *Tamarindus indica* Imli, *Mangifera indica* Aam, *Vachellia nilotica* Babul, *Ziziphus mauritiana* Ber, *Delonix regia* Gulmohar, *Syzygium cumini* Jamun, *Ficus benghalensis* Bargad etc.. Details of the trees enumerated in project district are given in **Table 24.**

Table 24: Project Affected Trees

S. No	PKG	ROAD NO.	Girth Size of Affected Trees (in cm)					
			30-60	60-90	90-120	120-180	>180	Total
1.	EPC10	SH-68	11	7	13	13	49	**93**
2.	EPC11	MDR-84	558	192	135		13	**898**
3.	EPC12	SH-119	479	188	74	92	116	**949**
4.	EPC13	SH-149	294	180	120	118	86	**798**
5.	EPC14	SH-191	1	46	226	16	38	**327**
6.	EPC15A	SH-323	66	14	9	0	5	**94**

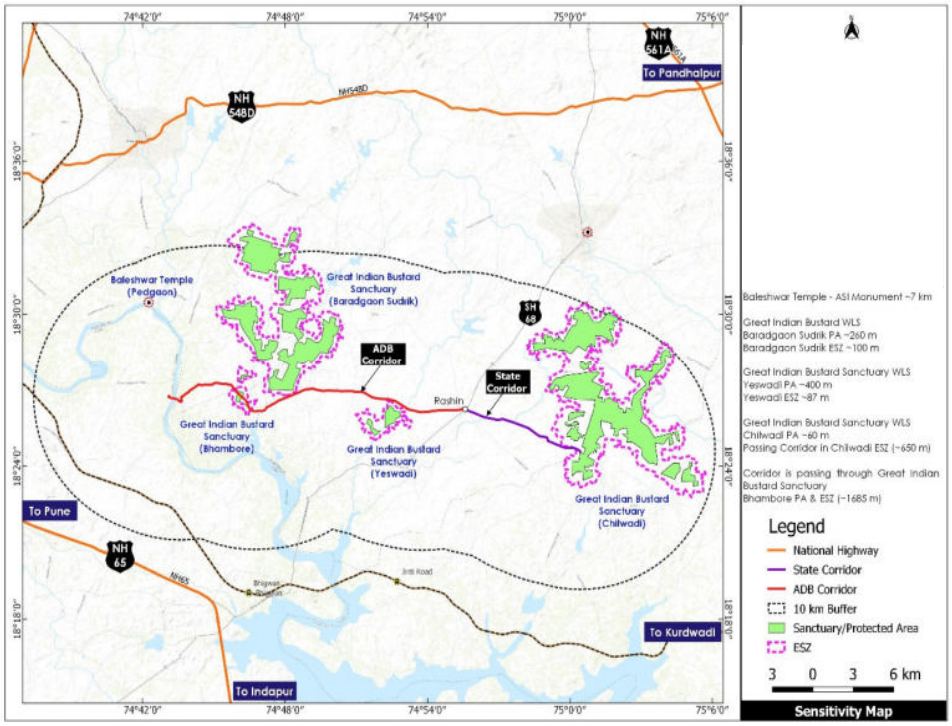
S. No	PKG	ROAD NO.	Girth Size of Affected Trees (in cm)					
			30-60	60-90	90-120	120-180	>180	Total
7.	EPC15B	SH-349	65	8	6	0	5	**84**
8.	EPC16	MDR-10	124	131	25	6	0	**286**
9.	EPC17	MDR-83 (Part-1)	29	36	7	1	1	**74**
10.	EPC18	MDR-83 (Part-2)	57	49	12	4	0	**122**
11.	EPC19	MDR-83 (Part-3)	93	134	93	36	5	**361**
12.	EPC20	MDR-83 (Part-4)	37	52	89	37	12	**227**
13.	EPC21	NH-61 (222)	13	12	5	2	0	**32**
14.	EPC22	SH-222	217	411	236	143	22	**1029**
15.	EPC23	SH-158 (Part-1)	291	172	117	66	29	**675**
16.	EPC24	SH-158 (Part-2)	77	31	29	10	817	**964**
17.	EPC25	SH-54	123	73	100	35	16	**347**
18.	EPC26	SH-23	11	19	66	25	198	**319**
		Total	**2546**	**1755**	**1362**	**604**	**1412**	**7679**

Source: Tree Inventory Conducted by DPR Team

14. Protected Area, Eco-sensitive Zone and Wildlife Movement in the Project Area

96. Maharashtra has 6 National Parks and 36 Wildlife Sanctuaries under protected area network. Most of the sub-projects are outside any legally protected area or passing through notified eco-sensitive zone boundary. However, **EPC-10** is partially passing through Bhambore, Chilwadi Protected Forests within both PA and ESZ of Great Indian Bustard Wildlife Sanctuary (GIB), Yaswadi PA is at a distance of 400 m from the alignment and 84 m from ESZ, Baradgaon Sudrik PA is 260 m and 100 m from ESZ. Road intersecting with PA/ESZ is shown in **Figure 26**.

Figure 26: Portions of EPC-10 Sub-projects Passing through/adjacent to GIB Sanctuary



97. PA patches of Bhambore, Chilwadi, Yaswadi and Baradgaon Sudrik falls within the village limit. The entire surroundings area is developed with agricultural and built-up area. Typical land use near the village/PA is shown in **Figure 27**. Major mammals recorded/reported near sub-project road are; Indian grey wolf-*Canis lupus pallipes* (IUCN LC, WPA Schedule I),Indian gazelle-*Gazella bennettii* (IUCN LC, WPA Schedule I), Striped hyena-*Hyaena hyaena* (IUCN LC, WPA Schedule III),Bengal fox-*Vulpes bengalensis* (IUCN LC, WPA Schedule II)**.** No recent sighting of Indian Bustards was observed/recorded by the forest department in the vicinity of the project road. Wildlife crossing is also not frequent.

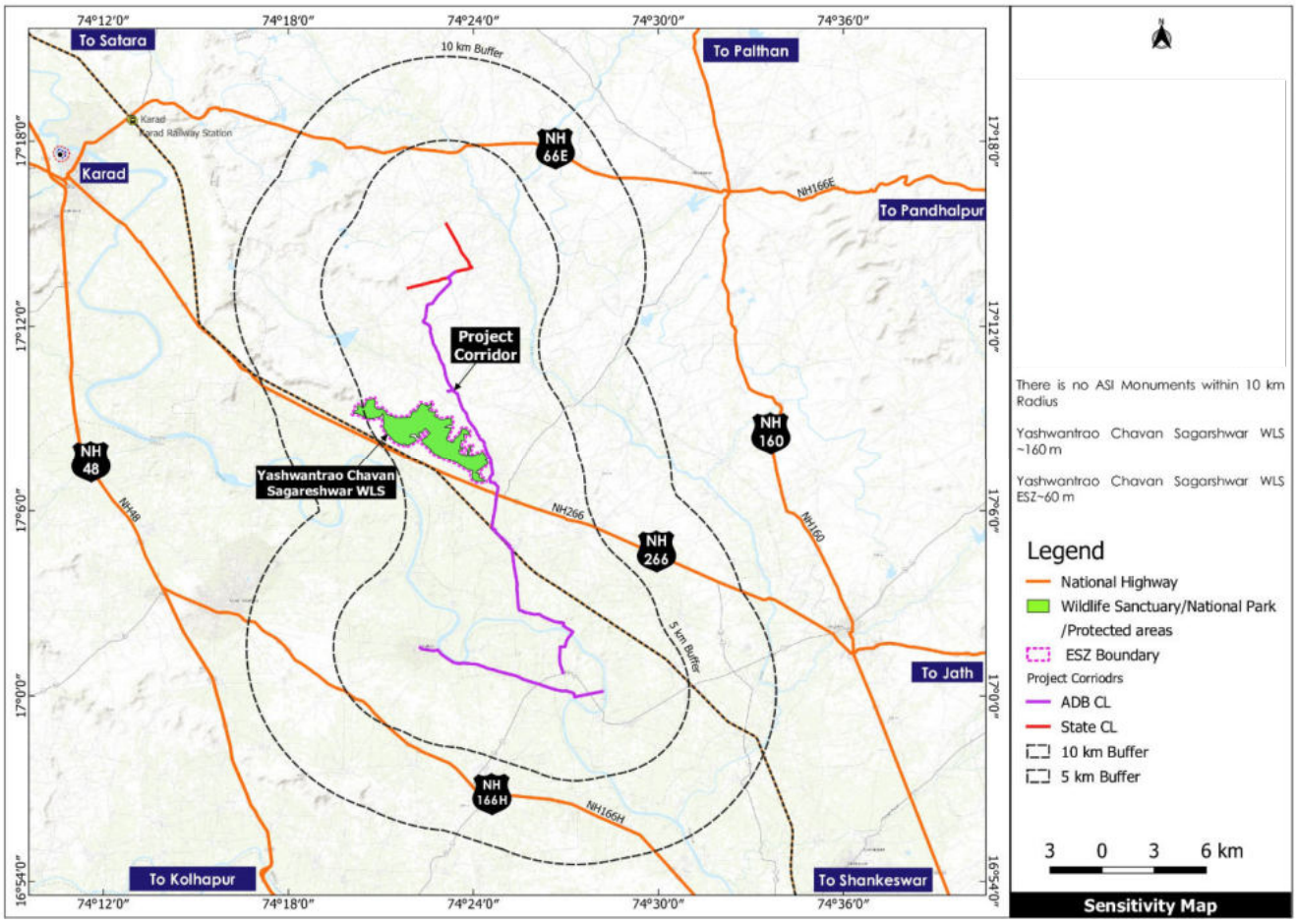
98. Integrated Biodiversity Assessment Tool (IBAT)[28] was used to screen the Korti-Karmala section of same state highway (SH-68) under Maharashtra State Road Improvement Program (MSRIP). Critical Habitat Assessment was done in line with ADB SPS 2009 and IFC Guidance Note 6: definitions of critical habitats based on a bio-diversity assessment as a part of environmental assessment for this road. The findings concluded that GIB sanctuary and the project area are not considered as critical habitats. EPC 10 is located near to area assessed in the earlier project. Please refer to the ecological resources section of chapter-4 of the IEE report available at https://www.adb.org/sites/default/files/project-documents/52298/52298-001-iee-en.pdf.

Figure 27: Land use Surrounding Bhambhore village passing through GIB

[28] An online tool developed through the collaboration of BirdLife International, Conservation International, IUCN, and the UNEP World Conservation Monitoring Center (WCMC).

99. Other sub-projects close to or within 10 km of protected areas are EPC-23, EPC-24 and EPC-26. **EPC-23** is passing close to Yashvantrao Chavan Sagareshwar Wildlife Sanctuary (YCS WLS) at a distance of 160 m from Protected Area and 60 m from ESZ boundary (**Figure 28**). YCS WLS is one of the rare experiments in conservation where the entire Sanctuary is a cultivated forest without any perennial source of water created under planned afforestation programme. Most of the wildlife species of the aforesaid Sanctuary were artificially introduced in the year 1980.

Figure 28: Map Showing Sub-project EPC-23 and its Proximity to YCWLS



100. In EPC-23 (SH-158 Part 1) both the side of the road prominently cultivated with sugarcane. Since the protected area boundaries are fenced, the chances of wildlife venturing outside the protected area is very low. Stake holder consultations with locals revealed that sometimes the Indian gaur which thrives outside the fenced protected area, cross the road for foraging. The population density of gray langur was observed to be relatively high compared to any other wild species and were infrequently reported crossing the road along with their troops. Wildlife crossing locations identified during field survey, local consultation and forest departments are Km. 30+700 and Km. 41+500. Major mammals recorded/reported near EPC-23 is listed in **Table 25.**

Table 25. Important Mammalian Species in the Project Area of EPC-23

Sr. No.	Species	Scientific Name	IUCN Status	WPA Schedule
1	Black Buck	*Antilope cervicapra*	Least Concern	Schedule I
2	Bengal fox	*Vulpes bengalensis*	Least Concern	Schedule II
3	Indian gaur	*Bos gaurus*	Vulnerable	Schedule I
4	Grey langur	*Semnopithecus entellus*	Least Concern	Schedule II

101. EPC-24 (SH-158 Part 2) is the extension of EPC-23 and part of the same state highway (considered as separate construction package). This sub-project is at a distance of 6.5 km from the protected area of YCS WLS and 6.6 km from ESZ boundary (**Figure 29**). Unlike EPC-23, this section of the road passes through small patches of undulating scrub areas from chainage 115+000 to 115+800, open scrub from 110+300 to 112+000, yet sugarcane cultivation is the main land use abutting project highway. Interviews conducted with the locals revealed frequent crossings of the Indian leopard and rarely Indian gaur in the area with sugarcane cultivation, along with sporadic records of Indian jackal, striped hyena, Indian grey wolf (Schedule 1, WPA 1972) which consist dry savannah like habitats and monocultures. Crucial wildlife crossings locations as reported by locals and also confirmed by forest department are Km. 79+60, Km. 85+200, 99+100, Km.103+500 and Km112+400. List of major mammals recorded/reported near EPC-24 is given in **Table 26.**

Figure 29: Map Showing Proximity to YCWLS from Sub-project EPC-24

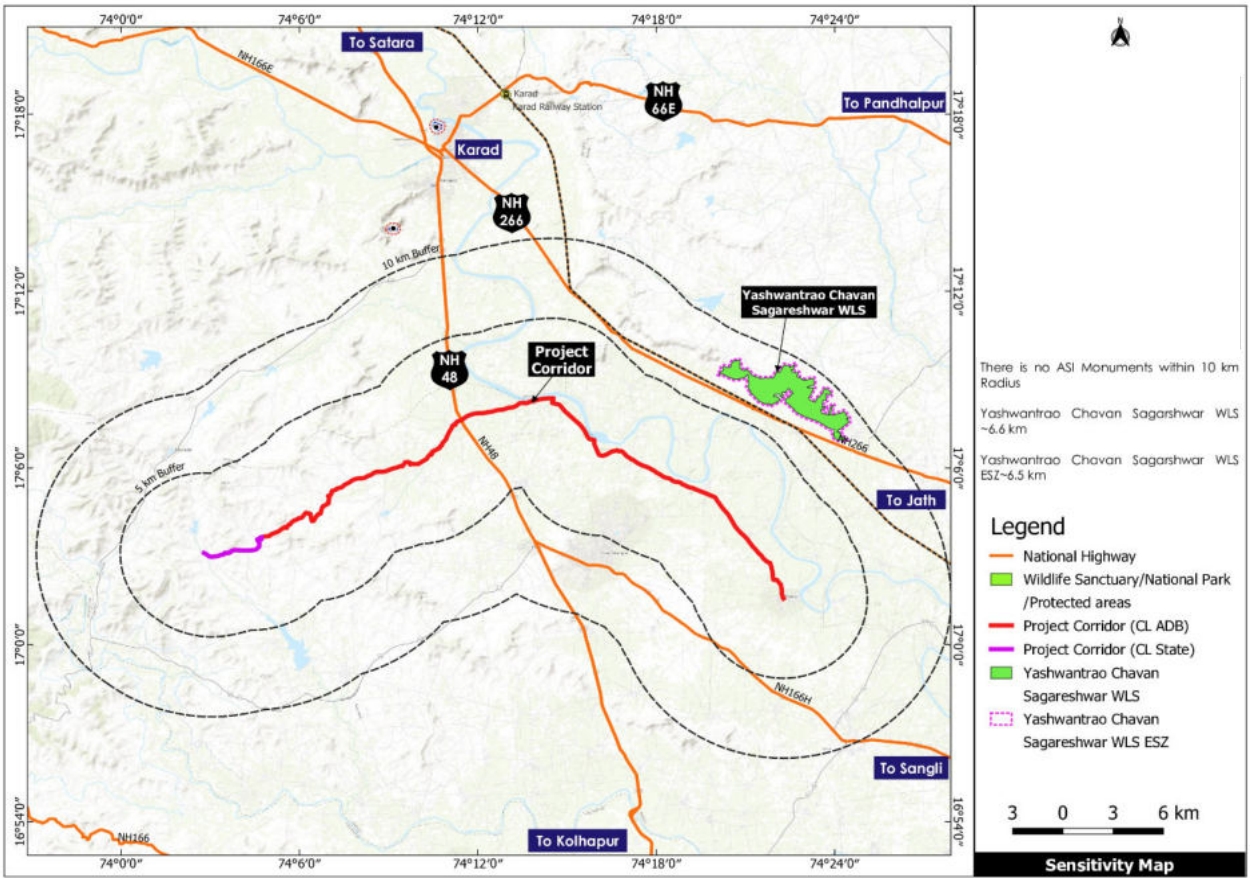


Table 26: Mammalian Species in Project Area EPC-24

Sr. No.	Species	Scientific Name	IUCN Status	WPA Schedule
1	Indian leopard	*Panthera pardus fusca*	Vulnerable	Schedule I
2	Indian gaur	*Bos gaurus*	Least Concern	Schedule I
3	Striped hyena	*Hyaena hyaena*	Least Concern	Schedule III
4	Indian grey wolf	*Canis lupus pallipes*	Least Concern	Schedule I
5	Indian jackal	*Canis aureus indicus*	Least Concern	Schedule II

102. EPC-26 traverses close to Kalsubai Harishchandragad Wildlife Sanctuary (KH WLS) with its protected area is at a distance of 2.2 km and ESZ boundary at 1.5 km. The adjoining area is home to wildlife comprising Indian leopard (*Panthera pardus fusca*) (**Figure 30**). At EPC-26 crossing of wild mammals like Indian leopard (Schedule 1, WPA 1972; IUCN Red List Vulnerable for the species and likely Vulnerable for the subspecies), Indian Striped hyena (Schedule 3, WPA 1972) Wild Boar, Indian Jackals, Bengal fox, Grey langur, Barking deer (Schedule 3, WPA 1972) were noticed and confirmed by the forest department. List of major mammals recorded/reported near EPC-26 is given in **Table 27.**

Figure 30: Map Showing Sub-project EPC-26 and its Proximity to YCWLS

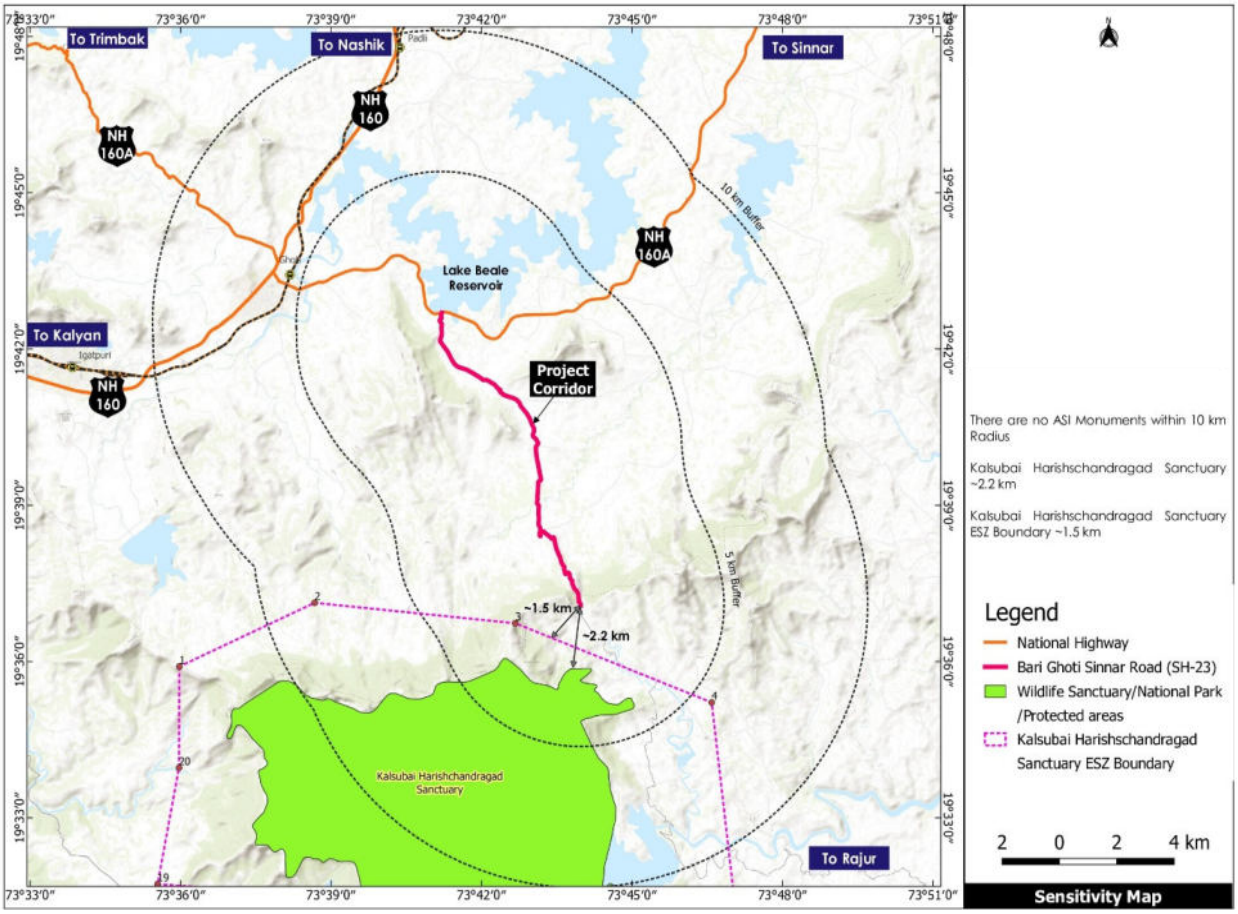


Table 27: Mammalian Species in Project Area of EPC-26

Sr. No.	Species	Scientific Name	IUCN Status	WPA Schedule
1	Indian leopard	*Panthera pardus fusca*	Vulnerable	Schedule I
2	Striped hyena	*Hyaena*	Least Concern	Schedule III
3	Indian jackal	*Canis aureus indicus*	Least Concern	Schedule II
4	Bengal fox	*Vulpes bengalensis*	Least Concern	Schedule II
5	Barking deer	*Muntiacus muntjak*	Least Concern	Schedule III

103. Prominent locations of wildlife crossings identified by the forest department within the forest stretches are km 202+060, Km 202+400, Km 203+130, km 203+50 and Km 205+000. The terrain is hilly along these sections and movement was reported from either side (both hill and valley sides). Near the third location, regular pathway of leopards (**Figure 31**) were also identified on both sides of the road, indicating high chance of crossing. Near the last location, a culvert has been constructed on the edge of the valley which obstructs the water and forms a small water body which remains for 6-7 months even after the monsoons, forming a regular water source for both domestic as well as wild animals. Indian jackal pugmarks were identified on the edge of this water body, hence indicating its presence and active crossing of the road for water. Local shepherds were also noted grazing their cattle at this location and claim to have seen leopards near the road.

Figure 31: Consultation with Forest Officials and Pathway used by leopards near km 203+900

Consultation with Forest Persons at km203+150

Pathway used by leopards near Km 203+900

104. Apart from above locations of wildlife crossings confirmed by forest departments, the field survey identified few other potential locations outside forest areas.

- **Location 1-** Shows mosaic of agriculture and tree canopy area providing a suitable refuge for the wildlife on both sides of the road near Km 193+050.
- **Location 2-** Proximity to the forest and non-agricultural fallow land on both sides of the road near Km 194+300.
- **Location 3-** Small ghat section with a water body on the RHS, enough tree canopy cover to provide refuge to wildlife near Km 195.800.
- **Location 4-** Small meandering gorge providing tree cover and water, ideal for crossing. A crossing path with animal tracks was observed. Pugmarks recorded near km 200.600.

105. Besides, the sub-projects traversing in close proximity to protected areas, wildlife

crossings were also reported along other- subprojects (EPC-11, EPC-25 and EPC-18) which are passing intermittently through forest section though not densely vegetated or rich in biodiversity. Wildlife crossings along/across EPC-11, EPC-25 and EPC-18 are:

- **EPC-11:** Indian gazelle/chinkara (Gazella bennettii) crossing was recorded ranging between 3-4 times in a month and frequency increases during summer months between chainage 11+800 to 11+900.
- **EPC-18**: Indian leopard was recorded crossing Ch. 30.050, 31.200 & 34.090. The leopard comes from Medkakala Jungle during the sugarcane harvesting period which is January to March. Frequency is once in 4-5 days. Other wild animals like deer, wild boar, also crosses the road frequently. They cross from left side and goes upto Godavari River on RHS 1.5 km from road. First two tracks are entry path and third is used as return path.
- **EPC-25:** Indian Gazelle (Chinkara) have been observed infrequently crossing the road and into the agricultural fields by the locals near Km 167+200 to 167+820. Crossings also reported between 57+300 to km 159+000. Although it is not a forest area, it is an ideal semi-arid habitat for Indian gazelle, striped hyena and Bengal fox were observed. Being close to main pondage/backwater of Ujjani Dam large number of migratory birds can be seen but at a distance of 300 m and beyond from the road and otherwise also no impact on avifauna is anticipated.

C. Economic Development

106. Maharashtra is situated in the western region of the country. It is the most industrialized state in India and has maintained its leading position in the industrial sector in the country. The state is a pioneer in small scale industries and boasts of the largest number of special export promotion zones. It has a large base of skilled and industrial labour, making it an ideal destination for knowledge-based and manufacturing sectors. GSDP (Gross State Domestic Product) of the state grew at around 11.77% from 2011-12 to 2017-18 whereas the Net State Domestic Product (NSDP) grew at a CAGR of around 11.75% from 2011-12 to 2017-18.

15. Agriculture and Allied Sectors

107. The agriculture is the primary source of livelihood in the State with nearly 60% of the working population engaged directly in farming activities (HDR, 2003). Though the proportion of area under agriculture in the State is 57.2%, which is more than the national average of 43.4%, the share of agriculture and animal husbandry in the GSDP has remained comparatively low at 13%. More than 30% of the area of the State falls under rain-shadow region where scanty and erratic rains occur and about 84% of the total area under agriculture is directly dependent on the monsoon. The proportion of irrigated area in the State is only around 16%, as opposed to the national average of 38%. Principal crops grown in the State are rice, jowar, bajra, wheat, tur, mung, urad, gram and other pulses. The State is a major producer of oilseeds. Groundnut, sunflower, and soybean are the major oil seed crops. The important cash crops are cotton, sugarcane, turmeric and vegetables.

16. Industries and Mineral Resources

108. Maharashtra is a leading industrial hub (13% of national industrial output), primarily contributing to the Indian economic growth. 64.14% of the people are employed in agriculture and allied activities. Almost 46% of the GSDP is contributed by industry. Maharashtra has had a long history in textiles with Mumbai being the original home of India's textile mills. Solapur,

Ichalkaranji, Malegaon and Bhiwandi are some of the cities known for the textile industry. Today, manufacturing, mass media, international trade, petroleum, tourism, fashion, apparel and aerospace are other major industries in Maharashtra. According to current economic indicators, it is one of the wealthiest states in India. The significant minerals occurring in Maharashtra are iron ore, coal, manganese, bauxite, limestone, dolomite, kyanite, silica sand and sillimanite. Other minerals are ilmenite, barytes, clay, copper, feldspar, chromite, fluorite, graphite, and tungsten among others.

17. Infrastructure Facility

109. **Roads:** The Maharashtra has the largest road network in India at 267,452 kilometres. 17 National Highways connect Maharashtra to six neighboring states. The length of National Highways in Maharashtra is 4,688 kilometers. Maharashtra has a large state highway network. 99.5% of the villages in the state were connected by all-weather roads as of March 2018. The Yeshwantrao Chavan Mumbai-Pune Expressway, the first access-controlled toll road project in India was made fully operational in April 2002.

110. **Railway:** The state is well-connected to other parts of the country with a railway network spanning 5,983 km between four railways. Maharashtra also has suburban railway networks in Mumbai and Pune that carry around 6.4 million passengers everyday. In addition to this, Maharashtra also has metro rail and monorail networks.

111. **Aviation:** Civil aviation in Maharashtra began in the 1920s with the establishment of Juhu Aerodrome as of one of the first aerodromes in British India. It served as a base for J.R.D. Tata's Tata Airlines in the 1930s. Maharashtra, being the economic powerhouse of India, consists of highest number of airports among all the states of India.

112. **Power:** Electricity demand of Maharashtra is high; the state constitutes 13.91% of the total installed electricity generation capacity in India. Maharashtra has 38,372.83 MW of installed capacity. Out of this, 28,145.20 MW is generated from thermal (coal and gas) plants, 690.14 MW from nuclear plants, 3,331.84 MW from hydro plants, and 6,205.65 from Renewable Energy Sources (RES) like solar, wind etc.

D. Social and Cultural Resources

113. **Demography:** According to 2011 census the total population of the state is about 112.37 million comprising 58.24 million male and 54.13 million females. Population of Maharashtra has increased by 15.99% in this decade (2001-2011) compared to past decade (1991-2001). The population density of the state is 365 per sq. km. (compared to the country's average of 436 sq. Km). Out of total population of Maharashtra, 45.22% people live in urban regions. The number of females per 1000 males (sex ratio) in Maharashtra was 929 in 2011 and had shown a slight increase to year 2001 at 922. The future demographic projections suggest a further increase. Facts and figures about demography of the project districts are summarized below in **Table 28.**

Table 28: Demography of the Project Districts

Indicators	Ahmednagar	Jalna	Hingoli	Nanded	Nagpur
Area sq. km	17048	7612	4526	10528	9892
Actual Population (million)	4.54	1.96	1.18	3.36	4.65
Male (million)	2.34	1.01	0.61	1.73	2.38

Female	2.20	0.95	0.57	1.63	2.27
Population Growth (%)	1.24	2.15	1.93	1.69	1.44
Density/ km^2	266	257	260	319	470
Sex Ratio (Per 1000)	1065	1067	1062	1061	1051
Child Sex Ratio (0-6 Age)	1174	1149	1134	1099	1074
Average Literacy (%)	69.38	61.03	67.16	65.14	78.95
Male Literacy (%)	75.69	69.15	74.31	72.55	82.15
Female Literacy (%)	62.65	52.35	59.57	57.27	75.58
Child proportion (0-6 Age) (%)	12.24	14.67	14.08	13.67	10.68
Indicators	**Pune**	**Kolhapur**	**Satara**	**Sangli**	**Nashik**
Area sq. km	15642	7685	10480	8572	15582
Actual Population (million)	9.43	3.88	3.00	2.82	6.11
Male (million)	4.92	1.98	1.51	1.44	3.16
Female	4.51	1.90	1.49	1.39	2.95
Population Growth (%)	3.04	1.00	0.69	0.92	2.23
Density/km^2	603	504	287	329	392
Sex Ratio (Per 1000)	1093	1045	1012	1036	1070
Child Sex Ratio (0-6 Age)	1132	1159	1117	1154	1124
Average Literacy (%)	76.06	72.91	74.10	72.62	71.15
Male Literacy (%)	80.02	78.75	79.49	78.12	75.94
Female Literacy (%)	71.73	66.80	68.64	66.93	66.03
Child proportion (0-6 Age) (%)	11.72	10.55	10.58	10.87	13.56

114. **Educational Facility:** There has been a leap in the literacy rate in the last ten years. The literacy rate has grown from 76.88% in 2001 to over 82.34% in 2011. Maharashtra has 36 districts, and each has an opportunity of excellent education. The world class training institute as well as several schools associated in the state provides excellent scope of education. There is one central university, twenty-three state universities and twenty-one deemed universities.

115. **Health Infrastructure:** The Government of Maharashtra has created three-tier health infrastructure to provide comprehensive health services. The primary tier comprises of Sub-centres, Primary Health Centres (PHC) and Community Health Centres (CHC). The sub-district hospitals and district hospitals constitute secondary tier whereas well equipped medical colleges and super-speciality hospitals located in major cities are at tertiary level. Maharashtra includes 10,580 sub-centres, 1,814 PHC, 360 CHC. Based on the data of registered medical practitioners estimated doctor population ratio is 1:1,365 in the State. Reproductive and Child Health Programme (RCH) – II is being implemented to enhance child health status and population stabilization thereby reducing Maternal Mortality Ratio (MMR), Infant Mortality Rate (IMR) and Total Fertility Rate (TFR).

116. **Tourism:** Maharashtra attracts tourists from different states and foreign countries. It was the second most visited Indian state by foreigners and fourth most visited state by domestic tourists in the country in 2014. Maharashtra brings a beautiful contrast of attractions which lures travellers of all age groups and likes to this majestic Indian state. From the city of dreams Mumbai to some enchanting hill stations like Mahabaleshwar, Lonavala and Khandala, there are plenty of places to visit in Maharashtra. As the state lies on the coastal area, it also has the best beaches in the country. Maharashtra proudly boasts a rich history which is depicted in some of the most significant caves sprawling here. From Ajanta Ellora caves in Aurangabad to Elephanta and Kanheri caves in Mumbai and Pandavleni – one can walk down the memory lanes by visiting these masterpieces from history.

117. **Archaeological and Historical Monuments and Sensitive Receptors:** 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) which are close to the project roads. However, there are a number of religious structures and other community property resources (CPR) including sensitive receptors like schools and health centres.[29] **Table 29** lists out the sensitive structures (schools and health centers- non-reseidential which are also called hospitals by locals) and the distance of each structure from the centerline of the road. Sample pictures of the sensitive structures are provided in **Appendix 10**.

Table 29: Noise Sensitive Structures along Sub-Project Roads

S. No	Chainage (Km)	Noise Sensitive Receptor	Boundary wall from edge of road (m)	Main Structure from edge of road (m)	Side
Siddhatek to Korti (SH-68), EPC-10					
1	107.07	Nursery School	No compound wall	12.9	LHS
2	107.11	Sambhuraje High school	No compound wall	15.3	RHS
3	110.641	High school	No compound wall	13.1	LHS
4	116.29	Prathamic Arogya Kendra	No compound wall	13.3	LHS
5	116.47	ZP School	No compound wall	16.15	LHS
6	124.35	ZP School	No compound wall	13.9	LHS
Khadki to Bhawani Nagar (MDR-84), EPC-11					
1	0.13	Z.P. Primary School	Compound wall	37.5	RHS
2	1.425	Z.P. Primary School	No compound wall	7.5	RHS
Kapurhol-Bhor-Wai Road (SH-119), EPC-12					
1	80	School	No compound wall	12.5	LHS
2	88.6	School	No compound wall	27.5	LHS
3	89.1	School	No compound wall	9.5	LHS
4	92	School	No compound wall	27.5	LHS
5	93	School	No compound wall	7.5	LHS
6	96	School	7.50	7.5	RHS
7	100.2	School	7.50	17.5	RHS
Adarki-Mirgaon-Phaltan (SH-149), EPC-13					
1	1.8	School	4	4	LHS
2	15.8	Boundary Wall (Hospital) non residential	1.5	1.5	RHS
Kerli-Kotoli-Nanadari (SH-191), EPC-14					
1	1.6	School	9.5	17.5	LHS
2	11.6	School	5.5	17.5	LHS
3	14.7	Health centre non residential	7.5	27.5	LHS
4	14.8	School	2.5	17.5	RHS
5	15.1	School	4.7	17.5	RHS
6	15.2	School	4.5	17.5	LHS
7	15.5	College	7.5	27.5	LHS
8	19.5	School	4.5	7.5	RHS
9	20.3	School	7.5	17.5	RHS

[29] In India CPRs are structures or facilities that belong to a community such as hand pumps, wells, schools, health centers, temples, graveyards, etc. Some Physical Cultural Resources (PCR) such as temples can also be a CPR if these belong to the community.

S. No	Chainage (Km)	Noise Sensitive Receptor	Boundary wall from edge of road (m)	Main Structure from edge of road (m)	Side
10	23.2	School	4.5	7.5	LHS
Karanja-Bharsingi-Mowad (SH-323), EPC-15A					
1	56.85	School	27.5	32.5	RHS
2	60.45	School	9.5	15.5	RHS
3	60.85	Hospital non-residential	17.5	17.5	RHS
Kalmeshwar-Ghorad-Mohapa (SH-349), EPC-15B					
1	2.4	School	7.5	12.5	RHS
2	6.3	School	7.5	12.5	RHS
3	6.315	Hospital- non residential	12.5	17.5	RHS
Kandil-Bothi-Rameshwar-Tanda-Wadgaon-Girgaon (MDR-10), EPC-16					
1	4.5	School	6.5	7.5	RHS
2	9.503	School	7.5	32.5	LHS
3	15.4	School	14	86	LHS
4	16.8	School	7	21	RHS
5	18.62	Community health centre non residential	10.5	11.1	RHS
6	21.063	School	9	16	LHS
7	23.74	School	No wall	8.1	RHS
Nila Junction to Mugat Junction and Brahmanwada Realignment (MDR-83, Part-1), EPC-17					
1	1.4	College	3, 1.5 ht, brick wall	12.5	RHS
2	2.7	School	8, 1.5 ht, brick wall	17.5	RHS
3	3.8	School	3, 1.5 ht, brick wall	12.5	LHS
4	4.5	School	4, 1.5 ht, brick wall	7.5	RHS
5	4.9	School	9, 1.5 ht, brick wall	12.5	LHS
6	5.8	School	14, 1.5 ht, brick wall	17.5	LHS
7	11.3	School	2, 1.5 ht, brick wall	5.5	LHS
8	11.7	School	2, 1.5 ht, brick wall	5.5	LHS
Mugat Junction-Khujda Junction-Amdura and Malkota Realignment (MDR-83, Part-2), EPC-18					
1	16.2	School	17, 1.5ht, Brick wall	17.5	RHS
2	20.2	School	5, 1.5ht, Brick wall	5.0	LHS
3	23.9	School	5, 1.5ht, Brick wall	5.0	LHS
4	24.8	School	7, 1.5ht, Brick wall	7.5	RHS
Khujda Junction-Karegaon-Phata (MDR-83, Part-3), EPC-19					
1	35.65	School	10, 1.5 ht, Brick wall	20	RHS
2	42.6	School	5, 1.5 ht, Brick wall	10	RHS
3	49.3	School	10, 1.5 ht, Brick wall	20	LHS
Karegaon-Phata-State Border Dharmadabad-Balapur IIT-State Border (MDR-83, Part-4), EPC-20					
1	62	School	7, 1.5ht, brick wall	7.5	LHS
2	64.5	School	7, 1.5ht, brick wall	7.5	LHS
3	72.8	School	7, 1.5ht, brick wall	7.5	RHS
4	72.9	School	7, 1.5ht, brick wall	7.5	LHS
5	80.6	School	2, 1.5ht, brick wall	2.5	RHS
Bhokar-Raheti (NH-61), EPC-21					
1	144.45	School	11, 1.5 ht, brick wall	13.5	LHS
2	146.19	School	28, 1.5 ht, brick wall	30.5	TBD
Ranjani-Kumbhar-Pimpalgaon-Rajatakali (SH-222), EPC-22					

S. No	Chainage (Km)	Noise Sensitive Receptor	Boundary wall from edge of road (m)	Main Structure from edge of road (m)	Side
1	9.58	School	10.4	50.7	LHS
2	15.535	School	_	22.9	LHS
3	21.52	School	_	61.3	RHS
4	25.06	School	5.63, 5ft, Pucca	17.82	LHS
5	30.966	School	65.51m, 5ft, Pucca	87.67	RHS
6	31.61	Hospital non-residential	_	15.73	RHS
7	184.15	School	6, Barbed wire	15	LHS
8	193.5	School	10	20	LHS
9	201	School	5	9.5	LHS
10	205.1	School	20	22	RHS
Wangi-Walwa (SH-158, Part-1), EPC-23					
1	46.1	School	No compound wall	17.5	LHS
2	48.5	College	4.5	9.5	RHS
3	50.8	School	No compound wall	12.5	RHS
4	51.6	School	No compound wall	17.5	LHS
5	59.5	School	No compound wall	15.5	LHS
7	62.5	School	No compound wall	9.5	LHS
8	63.2	School	No compound wall	12.5	RHS
9	65.59	School	No compound wall	12.5	LHS
Walwa-Wakurde (SH-158, Part-2), EPC-24					
1	74.9	School	No compound wall	9.5	RHS
2	90.5	School	No compound wall	16.5	LHS
3	98.2	School	5.5	12.5	RHS
4	99	School	No compound wall	12.5	RHS
5	100.3	College	5.5	22.5	RHS
6	101	School	6.5	47.5	LHS
7	106.4	School	No compound wall	15.5	RHS
Bhigwan-Baramati (SH-54), EPC-25					
1	151.5	School	No compound wall	17.5	LHS
2	163.9	School	No compound wall	17.5	LHS
Bari-Ghoti-Sinnar (SH-23), EPC-26					
1	199.28	School	25.60, 1.5m Bricks	27.5	RHS

Source: DPR