Initial Environmental Examination

May 2022

India: Connecting Economic Clusters for Inclusive Growth in Maharashtra

Main document Part 1

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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EXECUTIVE SUMMARY

1. The scope of works under Connecting Economic Clusters for Inclusive Growth in Maharashtra (CECIGM) project involves widening and upgrading of existing rural state highways/ major district roads to two-lane with paved/ earthen shoulder. Expansion is within range of 3-5m of additional formation width and generally confined within available right of way (ROW). Most of the sub-projects are outside any legally protected area or through notified eco-sensitive zone boundary except small portions of SH-68 which is passing through the ESZ Boundary of Great Indian Bustard Sanctuary[1] (GIB) at Bhambore from km 110+900 to km 111.400 and adjacent to two small patches of Baradgaon Sudrik at km 115.700 (LHS) and Yeswadi at km 122.300 (RHS) of the GIB Sanctuary. Thus, environment and wildlife clearance from MoEF&CC is required for sub-project of SH-68. However, public hearing is not required as no private land acquisition is involved. Other nearest Protected Area is the Sagareshwar Deer sanctuary found around 250 m and Eco-sensitive zone boundary is at 150m away from proposed SH-158 (Part-1). Similarly, Protected Area of Kalsubai Harishchandragad Wildlife Sanctuary which is around 2.2 km and Eco-sensitive zone boundary is at around 1.2 km from SH-23 sub-project road and Bhigwan Flamingo Bird Sanctuary in around 1.6 km from SH-54. These all are also found outside the Eco-sensitive zone boundaries of the sanctuaries as per MoEF&CC Gazette Notifications (S.O.1565(E) dated 15.05.2017;[2] S.O.1367(E) dated 28.04.2017).[3]

2. Eight sub-projects viz. MDR-84, SH-119, SH-149, SH-191, MDR-, MDR-83, SH-54 and SH-23 involve diversion of 22.745 ha forest area. Wildlife movement of the mammalian species like black bucks, chinkara, wolf, wild boar, Indian fox, Indian grey mongoose is rarely reported along the road in the adjoining areas of the forest. 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 signages combined with speed control measures, creation of new slab/box culverts or retrofitting of existing cross drainage (CD) structures have been proposed to avoid or at least minimize collision of animals with vehicles. Remaining project roads either passing through or located along the forest areas are largely devoid of wildlife and vegetation. Proposed measures were further validated by the forest department to be useful in reducing animal-vehicle collision.

3. Most of the other adverse impacts are co-terminus with the construction stage, site specific, mostly limited within the ROW, and are easily mitigated through good engineering and housekeeping practices. Hence, the project is classified as environment **Category B** in accordance with the ADB's SPS 2009.

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[1] The Great Indian Bustard Sanctuary was formerly known as the Jarwarharlal Nehru Sanctuary which is mentioned in the BirdLife International website as a key bird and biodiversity area but is also noted as unsuitable for the GIB.

[2] The Sagareshwar Wildlife Sanctuary (recently rename as Yashvantrao Chavan Sagareshwar Wildlife Sanctuary) in Sangli District of Maharashtra and extends over an area of 10.87 square kilometers and the Eco-sensitive Zone is spread over an area of 3.68 square kilometers with an extent up to 100 meters from the boundary of Yashvantrao Chavan Sagareshwar Wildlife Sanctuary. Forest type found in the said Sanctuary are Southern dry mixed deciduous and Southern thorn forest with hill slopes covered with grasslands most of the wildlife species of the aforesaid Sanctuary were artificially introduced in the year 1980 and the important wild animals include Black Buck (antelope cervicapra), Wolf (Canis lupas pallipes), Jackal (Cannis aureus) etc.

[3] Kalsubai Harishchandragad Wildlife Sanctuary is located in Akole and Rajur Tehsils of Ahmad nagar District and shares boundary with Lgatpuri Taluka of Nashik District, Shahapur and Murbad Talukas of Thane District and Junnar Taluka of Pune District in the State of Maharashtra is spread over an area of 361.71 sq. kms is rich in floral and faunal diversity is nestled in the Western Ghats, a recognised hot spot of biodiversity and the adjoining area is home to wildlife comprising Leopard (Panthera pardus), Giant Squirrel (Ratufa indica) Wild Boar (Sus scrofa), etc and with about 130 different avi- faunas.

4. Existing roads under CECIGM have varying width and road conditions. ROW is generally 7–40 meters with reduced width in built-up sections. Majority of the roads are intermediate lane with or without shoulder. Terrain is mostly plain and rolling profiles. Abutting land use is predominantly open-agricultural. Pavement conditions are generally poor to fair. Conditions are generally poor in sections underlain predominantly by black cotton soil. Roadside drains are present in some urban stretches but mostly choked and non-functional. Overtopping of roads is not observed in general but waterlogging is common in built-up areas. Waterways crossed by some project roads are mostly seasonal. Project road improvement will mostly follow special codal provisions relevant to state highways prescribed by Indian Road Congress (IRC: SP: 73-2018 Manual of Standard and Specification for two-laning of State Highways with Paved shoulders) and Ministry of Road Transport and Highways (MORTH) Guidelines. Provisions for cases of any compromise or variation have been specifically highlighted and justified in relevant sections of the report.

5. Maharashtra has tropical monsoon climate, with hot, rainy, and cold weather seasons. The towering presence of the western ghats cause good rainfall in the Konkan region. The average annual rainfall of the state is around 1,300 mm. About 85% rainfall is from the south-west and occurs June to September. The number of rainy days generally vary from 40 in the scarce zone to 100 in the heavy rainfall zone. Temperature varies between 22°C-45°C during summer and 12°C-34°C during winter season. The spatial changes in minimum temperatures are observed to be decreasing in most parts of Western Ghats. Pre-monsoon maximum temperatures have increased significantly over the west coast. Average summer temperatures reach to 38–41°C, and winter temperatures average about 21–23 °C in the inland areas.

6. The entire State forms a part of the “Peninsular Shield”, which is composed of rocks of diverse origin that have undergone considerable metamorphism. These are covered by extensive sheets of horizontally bedded lava flows comprising the Deccan trap. More than 80% of the State is covered by the Deccan trap, which have concealed geologically older formations. The soil is residual, derived from the underlying basalts. In the semi-dry plateau, the soil is clayey, rich in iron and moisture-retentive, though poor in nitrogen and organic matter. The higher plateau areas have pather soils, which contain more gravel. The soil in the Deccan plateau is made up of black basalt soil. This type of soil is rich in humus. Soil in the project district is mainly underlain by black soil intermittently spread over with red soil and morrum among others.

7. The state of Maharashtra is largely vulnerable to floods. Most floods are flash floods due to nallah-overflows and poor drainage systems. Very few floods, like the one in Konkan in 1983, are due to heavy rains in the region. The floods of 2005 and 2006 have shown that almost all the districts in the State are vulnerable to floods. All the project districts except Ahmednagar, Nagpur, and Sangli are vulnerable to flood. Due to its proximity to the western coast, Maharashtra is moderately vulnerable to cyclone. Severe cyclonic storms have been recorded in the Arabian Sea in the past which have affected the Maharashtra-Goa coast.

8. Land use of the study area varies in different project districts. Land use of the study area within 10 km of all is dominated by plantations/vegetation, shrubs/grassland. Water bodies occupy a significant portion of the 10 km buffer of the sub-projects. Land use of the study area of SH-68 within 10 km is dominated primarily by agricultural land followed by residential, barren land and a small portion with water bodies. Considerable portion of the study area of sub-projects viz; SH-191, SH-323, SH-349, MDR-10, MDR-83 and SH-222 in Kolhapur, Nagpur, Hingoli, Nanded and Jalna district is under cultivable agricultural land followed by barren/ built-ups/ forest/ scrubland and others. Land use of the study area of SH-158 in Sangli district is dominated by

plantations/ vegetation, shrubs/ grassland. Study area of SH-23 under Nashik district is predominantly agricultural fallow land followed by barren land, forest areas, built-up areas and water bodies with significant portion is under hills/ ghat area. Thus, we can see that agricultural/ fallow land followed by built-up, forest/plantations/vegetation is the predominant land use categories in most of the sub-projects. Similarly, the abutting land use of immediate vicinity is also mostly devoid of vegetation and virtually not serving as habitat to many faunal elements with few exceptions in Reserve Forest and ghat sections.

9. Since the project area is characterized mainly by rural/open areas and intermittently traversed by few semi-urban settlements/ built-up areas, sources of air pollution are mainly vehicular emissions, dust from unpaved shoulders/ deteriorated roads, and domestic fuel burning. Monitored parameters of ambient air quality largely meet the prescribed limits of the World Bank (WB), National Ambient Air Quality Standard (NAAQS), and Central Pollution Control Board (CPCB). Monitoring indicates that the noise levels meet the prescribed standards for all land use categories except in silence zone and commercial zone during daytime at some locations in SH-68, SH-119, SH-149 and SH-158 (Part-1 and Part-2) and during nighttime in SH-119, SH-149 and SH-158 (Part-1). Noise modelling was done to determine increase in noise due to road operations and to determine appropriate mitigation measures. Groundwater samples of project area in Sangli and Jalna districts meet both desirable and permissible limits of the prescribed standard for drinking water. In remaining sub-projects, most of the samples pass the permissible limit but not the desirable limit. Parameters exceeding the desirable limits are mainly total dissolved solids (TDS), hardness, dissolved iron, calcium, magnesium, and, in a few cases, fluoride, alkalinity, among others. Surface water is not used for drinking or domestic purpose. No perennial surface water bodies along the project roads are likely to be affected by the project.

10. Forest diversion is required in eight sub-project roads of MDR-84 (1.45 km along both side with diversion area of 1.02 Ha), SH-119 (4.10 km in 2 patches through RF area with diversion area of 6.56 Ha), SH-149 (2.48 km in 5 patches through RF and PF area with diversion area of 4.6051 Ha), SH-191 (0.840 km in 1 patch through RF with diversion area of 0.8 Ha), MDR-10 (1.615 km in 2 patches through RF with diversion area of 3.876 Ha), MDR-83 (1.11 km in 2 patches through Malkota RF and Daregaon RF with diversion area of 2.664 Ha), SH-54 (3.86 km in 4 patches of RF with diversion area of 1.25 Ha) and SH-23 (2.07 km in 2 patches through RF with diversion area of 1.97 Ha). These forest patches are mostly devoid of or scantily vegetated except few reserved forests sections or along ghat portions of SH-23. A total of 7,679 affected trees under non-forest category in govt land have been enumerated within the ROW for the entire project. Additionally, 85 private trees are impacted in sections under the Brahmanwada, Amdura and Malkota realigned sections. All are of indigenous species.

11. Main pre-construction impacts are: (i) cutting of 7,679 green and mature trees, (ii) waterlogging in built-up areas due to absence/blockade of side drains, (iii) disruption in wildlife movement, and (iv) accident risk due to poor horizontal and vertical profile. All CD structures have been designed for a 50-year return period, considering climate change impacts. Compensatory afforestation on 1:3 basis and additional plantation proposed will improve the microclimate of the region in the long-term. Afforestation in SH-158 and SH-23 will consider the habitat preferences of the nearby sanctuaries and planned accordingly. Vent size of CD structures have been proposed for widening to avoid overtopping of road. A free board of 0.6 to 1m has been considered for all bridges. Lined side drains are proposed in market areas/ habitation to prevent waterlogging. To facilitate wildlife movement and avoid their collision with vehicles, several measures have been recommended such as informatory and cautionary sign boards indicating (i) the wildlife movement/ forest area and animal crossing sections ahead, (ii) maximum speed limit (20kmph), (iii) no honking (both day and night) and prohibiting the use of

dipper at night since such a sudden change in illumination saturates their retinas temporarily blinding animals like black bucks, causing their abrupt movement, (iv) installing rumble strips/ speed breakers, and (v) retrofitting the existing culverts and constructing new ones to double as underpasses.

12. Significant impacts anticipated during construction phase are: (i) increase of local air pollution and noise level due to construction and site clearance activities, earthworks, borrowing and quarrying, operation of hot mix plants, etc.; (ii) deterioration of surface water quality due to silt run-off, spillage from vehicles and discharge from labour camps; (iii) health impacts from labour camps; (iv) traffic disruption; and (v) occupational health and community safety. Mitigation measures include: (i) utilizing least noisy equipment and regulating time of construction near settlements and sensitive receptors; (ii) sprinkling of water on earthworks, active construction sites, material storage locations, and haulage roads; (iii) installation of silt and oil traps; (iv) slope stabilization to control erosion and protection work for ponds; (v) camp siting and management as per IRC guidelines and best practices; (vi) traffic management to avoid congestion and maintain access of local residents; (vii) implementation of compensatory plantation to offset impacts from tree cutting and additional plantation to curb effects of greenhouse gas emissions and enhancement of micro-climate; (ix) no camp, materials storage, hot mix plant near forest areas/ water bodies/ residential areas; and (x) no construction in the stretches of potential wild animal crossings during night time.

13. Anticipated operation stage impacts are increased road accidents, accidental spillage, sub-mergence/ overtopping of CD structures, waterlogging due to blockage of side drains, increased air pollution and noise levels, poor survival of compensatory afforestation and additional plantation, and animal-traffic collision, among others. All these are mainly associated with maintenance and monitoring of effectiveness of mitigation measures taken during design and construction stage. Executing agency is mandated to undertake regular maintenance of the road conditions and its appurtenances.

14. The total CO_2 emission as estimated for business-as-usual and with project scenario for all the roads individually is less than ADB's threshold of 100,000 tons per year. However, total CO_2 emission at business-as-usual and with project scenarios (over the design life of road) were estimated as 1,62,780 tons/year, and 57,730 tons/year respectively. It is therefore evident that 'with project scenario' will reduce more than 64% of CO_2 emissions in comparison with the business-as-usual scenario. Business-as-usual scenario will continue to have more CO_2 emissions due to the poor road condition 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.

15. The total budget provided in the civil works contract and MPWD budget to implement the environmental management plan (EMP) and (EMoP) is **INR 602 million** comprising a) Mitigation cost which includes dust suppression, installation of noise barriers, connection water harvesting, compensatory plantation, additional plantation; and b) Monitoring cost which includes pollution monitoring for air, water, noise, and soil.

16. 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 for affected persons 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 or PIU level then PMU level. Most serious complaints which cannot be addressed at the PIU level will be forwarded to the PMU. The PMU level will be comprised of members from the MPWD (HQ), Authority Engineer, contractors, local community, and local forestry authority.

I. INTRODUCTION

A. Background and Rationale

1. The state of Maharashtra is located in the central and western part of India and shares borders with the states of Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Karnataka, and Madhya Pradesh. It is the third largest in terms of area at 0.3 million square kilometers (9.4% of India's total area) and the second most populated state with 112.4 million people.

2. Maharashtra being the most industrialized state in India, provides the highest contribution to India's gross domestic product (13% in 2020–21). Key export products are gems and jewelries, petrochemicals, textiles, garments, metal, motor vehicles, ships and boats, pharmaceuticals, and plastics. The state contributes to about 25% of India's cotton production. The agriculture sector contributes 14%, industry 35%, and the services sector 55% to the state economy. While Maharashtra has a strong state economy, the benefits of economic growth have not been distributed equally across the state's regions and districts, partly on account of poor road connectivity.

3. While Maharashtra ranks high in terms of per capita income compared to other states, it houses a large proportion of India's poor. The state also records wide rural-urban disparity in terms of income, human development, and poverty. While the overall poverty level for Maharashtra is lower than the national average, this is skewed by the relatively high average income levels in the four main urban centers (Mumbai, Nagpur, Pune, and Thane). While the head count number of poor for the state (15%) is lower than the national average (25%), this statistic is skewed by the high average income levels in the state's three main urban centers compared to the rural districts where poverty is higher than the national level, including districts such as Jalna (29%), Hingoli (28%), and Nanded (27%).

4. Strong economic growth over the last decade has generated significant passenger and freight traffic demand. The capacity of the state highways/ major district roads network is constrained. Despite boasting a vast road network of state highways and major district roads, nearly 80% of them are either single or intermediate lane standard.[4] Road safety indicators have also worsened. In 2020, 24,971 road accidents were reported in Maharashtra, including 11,569 fatalities (9.5% of India's national road deaths). The state ranked second-highest number of deaths in terms of total traffic accident deaths recorded in 2020 as per National Crime Records Bureau (NCRB). Key challenges in the road sector currently include road widths, poor pavement condition, road quality, and a lack of holistic planning incorporating road asset management, maintenance and safety. This leads to inefficiencies including high vehicle operating costs, increased travel times, and road safety risks.

5. Appreciating the importance of better road infrastructure in meeting transport accessibility needs of the growing economy and providing further momentum to it, Government of Maharashtra (GOM) has poured significant investment in (i) capacity augmentation by widening and upgradation of roads, (ii) road safety improvement, and (iii) improvement of the condition of road network assets. Besides, consistent increase in its financial outlay through state fund, GOM partnered with Asian Development Bank (ADB) in upgradation of 450 Km of State Highways and Major District roads which are already under implementation. ADB provided financial assistance

[4] As of 31 March 2018, Maharashtra has a total of 17,725 km of national highways, 3,258 km of Major State Highways (MSH), 29,132 km of state highways (SH), and 55,383 km of major district roads, 63,886 km of other district roads and 14,5881 km of rural roads.

of USD177 m under **Maharashtra State Road Improvement Project (Loan 3911-IND).** In this series, GOM sought additional funding to upgrade another set of prioritized 468.37 km of state highways and major district roads amounting approximately USD 350 m Connecting Economic Clusters for Inclusive Growth in Maharashtra. The project aligns with the Government's Vision 2030 and country partnership strategy for India (2018–2022). These overarching policy frameworks emphasize the pivotal role of transport infrastructure in poverty reduction and social development in line with the state's Road Development Plan 2001-2021.

B. Connecting Economic Clusters for Inclusive Growth in Maharashtra (CECIGM)

6. The Connecting Economic Clusters for Inclusive Growth in Maharashtra (CECIGM) intends to upgrade and maintain 18 SH/MDRs aggregating 468.37 kilometers **(Table 1)** forming part of the core road network in Maharashtra to two-lane standard and performance-based maintenance contracts to maintain the improved road assets for 10 years after construction. Project will improve transport connectivity in 10 districts of the state: Ahmednagar, Hingoli, Jalna, Kolhapur, Nanded, Nagpur, Nashik, Pune, Sangli, and Satara It also includes initiatives to build institutional capacity within the Public Works Department, Government of Maharashtra, focusing on improved road safety and road asset management.

7. CECIGM will support development needs by (i) connecting underdeveloped rural communities, in particular women and other disadvantaged groups, with city centers and nearby industrial zones; (ii) providing direct and indirect opportunities to the primarily agrarian population, in particular women and other disadvantaged groups, through improved access to markets, health and social services; (iii) strengthening weak links in the CRN and improving road connectivity of border districts such as Nanded to neighboring states; (iv) improving industrial value chains for small-scale industry by reducing transportation costs; and (v) improving disaster risk and climate change resilience in flood-prone areas.

Table 1: List of CECIGM Sub-Project Roads

S No.	Pkg No.	District	Road	Road Sections with Chainage (Km.)	Length (km)
1.	EPC-10	Ahmednagar	SH-68	Siddhatek to Korti (km 103/650 to 127/200 & Km 0/0 to 0/430)	23.98
2.	EPC-11	Pune	MDR-84	Khadki to Bhawani Nagar (Km 0/0 to 21/900)	21.90
3.	EPC-12	Satara & Pune	SH-119	Kapurhol - Bhor to Wai Road, (Km 76/0 to 117/100) and Mandhardeo Approach (Km 0/0 to 4/257).	45.36
4.	EPC-13	Satara	SH-149	Adarki Mirgaon Phaltan Road (km 0/0 to 21/00)	21.0
5.	EPC-14	Kolhapur	SH-191	Kerli Kotoli Nanadari Road (Km 0/0 to 24/0)	24.0
6.	EPC-15A	Nagpur	SH 323	Karanja Bharsingi Mowad Bangaon Road (Km 51/600 to 62/100)	10.5
7.	EPC-15B	Nagpur	SH-349	Kalmeshwar Ghorad Mohapa Telgaon Tidangi Road (Km 0/00 to 9/250)	9.25
8.	EPC-16	Hingoli	MDR-10	Kandil Bothi Rameshwar Tanda Wadgaon Girgaon up to NH-161 MDR-10 Km 0/00 to 28/672	28.67
9.	EPC-17	Nanded	MDR-83	NilaJunction–Brahmanwada–Amdura– Malkota –Balegaon–Karegaon Phata – Babli Phata– Bellur to Naigaon State Border MDR-83.(Part-1 Nila junction to Mugat junction Km 0/0-14/815, Part-2 Chaitanya Nagar to Asna Bridge junction	19.92

S No.	Pkg No.	District	Road	Road Sections with Chainage (Km.)	Length (km)
				Km 0/00 to 3/515, Part-3 Brahmanwada road Km 0/00 to 1/590).	
10.	EPC-18	Nanded	MDR-83	Nila Junction–Brahmanwada – Amdura – Malkautha – Balegaon – Karegaon Phata – Babli Phata – Bellur to Naigaon to State Border MDR-83. (Part-1 Mugat junction to Khujda junction Km 14/815 to 34/750, Part-2 Aamdura Road Km 0/00 to 3/330, Part-3 Aamdura Link Road/realignment Km 0/00 to 0/595, Part-4 Malkautha realignment Km.0/00 to 1/975).	25.84
11.	EPC-19	Nanded	MDR-83	Nila Junction – Brahmanwada – Amdura – Malkautha – Balegaon – Karegaon Phata – Babli Phata – Bellur to Naigaon to state border MDR-83.(Khujda Junction to Karegaon Phata km 34/750 to km 60/400).	25.65
12.	EPC-20	Nanded	MDR-83	Nila Junction – Brahmanwada – Amdura – Malkautha – Balegaon – Karegaon Phata – Babli Phata – Bellur to Naigaon to state Border MDR-83. (Part-1 Karegaon Phata to State Border km 60/400 to km 82/065, Part-2 of Dharmadabad to Balapur IIT up to State Border km 0/00 to km 5/715).	27.38
13.	EPC-21	Nanded	NH-61	Bhokar Rahati Road (km 592/00 to km 615/00)	22.03
14.	EPC-22	Jalna	SH-222	Ranjani Kumbharpimpalgaon Rajatakali Road SH 222 (km 177/400 to km 214/815)	37.42
15.	EPC-23	Sangli	SH-158	Pusesavali Vangi Nagathane Walwa Borgaon Bahe Tambae Kasewgaon Takave Road (Vangi to Walwa km 28/470 to km 69/460 and km 0/00 to km 0/340)	41.33
16.	EPC-24	Sangli	SH-158	Pusesavali Vangi Nagathane Walwa Borgaon Bahe Tambavi Kasewgaon Takave Road (Walwa to Wakurde km 70/00 to km 112/620).	42.62
17.	EPC-25	Pune	SH. 54	Amrapur - Kada - Pathardi - Karjat- Bhigwan to Baramati Road (km 145/00 to km 173/200)	28.20
18.	EPC-26	Nashik	SH-23	Bari to Ghoti Sinnar Highway (km 191/980 to km 205/380)	13.32
				Total	**468.37**

8. The GOM decided to implement the Investment Program through Public Works Department (PWD) Maharashtra.

C. Project Objectives and Outcome

9. The project aims to improve transport efficiency of the state road network, which will contribute to expansion of economic opportunities and poverty reduction. This will be realized through: (i) improving the state highway and major district road network; (ii) facilitating safe and efficient transport services; and (iii) enhancing PWD's capacity for road asset development and management. The project's immediate outcomes will be improved accessibility to social services and markets, increased fuel efficiency, reduced travel time, accidents, vehicle emissions and better employment opportunities outside agriculture, both through improved access to economic centers, and increased industrial activities within the state. This will also help address the regional disparities by promoting trade opportunities to non-urban population.

10. To achieve these objectives, candidate roads will be improved to two-lane with paved and earthen shoulders consistent with Indian Road Congress (IRC) guidelines. Widening and improvement components will include: (i) improvement in pavement conditions and road geometry, (ii) reconstruction/widening and provision of additional CD structures, and (iii) provision of lined drains in built-up sections, junction improvement, protection works, bus bays/truck lay-bys and installation of safety measures among others.

11. The 18 sub-projects selected under the program were prioritized (**Table 2)** due to deficient conditions and economic/ financial viability aside from traffic count.

Table 2: Importance of Sub-Project Roads

Road Sections	Importance of Sub-Project Roads
Siddhatek to Korti (km 103.650 to 127.200 & Km 0.0 to 0.430)	Connects NH-516A, NH-160, NH-65 and NH-52 with each other and their abutting industries and religious destinations viz. Siddhivinayak and Jagdamba temple in Rashin, Bhagvant, Tulja Bhavani and Kamladevi Temple in Barshi, Tuljapur and Karmala respectively. Shirdi of Shree Saibaba and Avtar Meherbaba"s Mehrabad are religious places in Ahmednagar district.
Khadki to Bhawani Nagar (Km 0.0 to 21.900)	Connects NH-65 at Khadki village, Indapur taluka, SH-54 Baramati Bhigwan Road and NH-965 i.e., Baramati Indapur Road.
Kapurhol to Bhor to Wai Road, (Km 76.000 to 117.100) and Mandhardeo Approach (Km 0.0 to 4.257).	Connects to national Highway (NH-04) important pilgrim centers viz; Mahabaleshwar Temple and Mandhardev Temple and major centres of Pune and Satara districts. It has direct connectivity to Bhor dam and its back waters. It also provides connectivity to Dhom Dam near Koyna Wildlife Sanctuary at a distance of 20 km from Wai.
Adarki Mirgaon Phaltan Road (km 0.0 to 21.00)	Improved connectivity to major settlemnts like Hanumantwadi, Dasturi, Adarki Kh., Adarki Bk., Kapashi and Ghadgewadi.
Kerli Kotoli Nanadari Road (Km 0.0 to 24.0)	Act as link between important State Highways like NH-166 (Kolhapur –Ratnagiri), SH-193 (Kolhapur – Anuskura road), SH-150 (Anuskura – Malkapur) and other important roads and district HQ of Kolhapur & Ratnagiri and also to important industrial centres like Dalmiya Sugarcane factory and tourist destination of Panhalagad fort, Vishalgad fort.
Karanja Bharsingi Mowad Bangaon Road (Km 51.600 to 62.100)	Provides shortest connectivity for people of Jalakheda town to travel Madhya Pradesh and connectivity to settlements like Khairgaon, Thugaon Deo, Dewali and Mowad.
Kalmeshwar Ghorad Mohapa Telgaon Tidangi Road (Km 0.000 to 9.250)	Project road will serve as a collector's road which collects traffic from villages along it mainly from Tidangi, Telgaon, Nandi Kheda, Mandvi, Khumari, Mohpa and Sawangi etc. and connects it to NH-47 via MDR-04. This also will provide connectivity to Sawner and Kamleshwar and Saoner railway station.
Balapur MSH-7 to Kandil Bothi Rameshwar Tanda Wadgaon Girgaon up to NH-161 MDR-10 Km 0.000 to 28.672	Connects to important pilgrim centers viz; Narsi village (birth place of Namdev Damaji Relekar), Shirad Shahapur village in Anudha Nagnath (Holy Jain temple) and other important places of Hingoli district.
Nila Junction to Naigaon to State Border MDR-83. (Part-1 Nila junction to Mugat junction Km 0.000-14.815, Part-2 Chaitanya Nagar Shiv Mandir to Asna Bridge junction Km 0.000 to 3.515, Part-3 Brahmanwada realignment Km 0.000 to 1.590).	Provides interstate connectivity between States of Maharashtra and Telangana and shortest connectivity between Taluka HQ of Dharmabad and District HQ of Nanded. Provides direct connectivity to 4 nos. of important Gurudwaras of Nanded district. Besides, in continuation it connects Gnana Saraswati Temple at Basar (Telangana). It also provides connectivity for sand quarrying from Godavari River and connectivity to major industrial setup like sugarcane factories, educational institutes like IIIT, Basar and 2 major national highways.
Nila Junction–Brahmanwada – Amdura – Malkautha – Balegaon – Karegaon Phata – Babli Phata – Bellur to Naigaon to State Border	

MDR-83. (Part-1 Mugat junction to Khujda junction Km 14/815 to 34/750, Part-2 Aamdura realignment Km 0/00 to 3/330, Part-3 New Aamdura Link Road Km 0/00 to 0/595, Part-4 New Malkautha realignment Km.0/00 to 1/975).	
Nila Junction to Naigaon to state border MDR-83. (Khujda Junction to Karegaon Phata km 34.750 to km 60.400).	
Nila Junction to Naigaon to state Border MDR-83 (Part-1 Karegaon Phata to State Border km 60.400 to km 82.065, Part-2 of Dharmadabad to Balapur IIT up to State Border km 0.000 to km 5.715).	
Bhokar Rahati Road NH 61 (km 592.000 to km 615.000)	Provides interstate connectivity between States of Maharashtra and Telangana and shortest connectivity between Taluka HQ of Bhokar and district HQ of Nirmal. Provides direct connectivity to 1 no. of Cotton Mill. Besides, on route there are many small scales to medium scale industries and 2 major national highways.
Ranjani Kumbharpimpalgaon Rajatakali Road SH 222 (km 177.400 to km 214.815)	Provides inter-district connectivity between Jalna & Beed. The project road provides connectivity to important nearby holy places viz; Matsyodari Devi Temple of Ambad, Guru Ganesh Tapodham (Jain temple), and Ganesh temple of Rajur.
Pusesavali Vangi Nagathane Walwa Borgaon Bahe Tambae Kasewgaon Takave Road (Vangi to Walwa km 28.470 to km 69.460 and km 0.000 to km 0.340)	Provides inter-state connectivity to Karnataka. It also connects inter-district between Satara and Sangli along with its important Talukas. It provides immediate access to industrial centres like Kirloskar brother Ltd. Company, Sonhira sugar factory, Kranti Sugar factory and Audumbar pilgrimage site.
Pusesavali Vangi Nagathane Walwa Borgaon Bahe Tambavi Kasewgaon Takave Road (Walwa to Wakurde km 70.000 to km 112.620).	Provides inter-state connectivity to Karnataka. It also connects inter-district between Satara, Sangli and Kolhapur along with its important Talukas. It also has connectivity to Sagareswar Deer Sanctuary.
Amrapur - Kada - Pathardi - Karjat- Bhigwan to Baramati Road (km 145.000 to km 173.200)	NH-65 at Bhigwan village, Indapur taluka and MDR84 at Shetphalgade. It has direct connectivity to proposed Bhigwan (Kumbhargaon) Bird Sanctuary and Ujaini Dam and can also be reached the Mayureshwar wildlife Sanctuary is located at some 43 kms away from Bhigwan village.
Bari to Ghoti Sinnar Highway (km 191.980 to km 205.380)	Provides connects inter-district between Nashik & Ahmadnagar. It also provides important tourist destinations like Bhandardhara & Kalasubai Shikar (highest peak of Maharashtra). As the road passes through tribal areas so it has importance in upliftment of the tribal population

D. IEE Objectives

12. The project is categorized as category 'B' in accordance with ADB Safeguard Policy Statement (SPS) 2009 warranting an initial environmental examination (IEE). IEE identifies the environmental issues to be considered at project planning and design stage. The IEE report covers the general environmental profile of the study area and includes an overview of the potential environmental impacts and their magnitude on physical, ecological, economic, and social and cultural resources within the project's influence area during design, construction, and operation stages. An Environmental Management Plan (EMP) for each sub-project forms part of this report which includes mitigation measures for significant environmental impacts during

implementation of the project, environmental monitoring program (EMoP), and the responsible entities for mitigation and monitoring. IEE has four basic objectives; (i) identify the environmental issues that should be taken into account due to project activities; (ii) determine the magnitude of potential environmental concerns and to ensure that environmental considerations are given adequate weight at planning/design stage; (iii) identify need for further environmental studies or Environmental Impact Assessment (EIA); and (iv) suggest enhancement measures, if any.

E. Extent of IEE

13. IEE extent has been decided considering all likely impacts and risks analyzed in the context of the project and its area of influence. It encompasses (i) the primary project roads and related facilities; (ii) associated facilities whose viability and existence depend exclusively on the project; (iii) areas and communities potentially affected by cumulative impacts from further planned development of any existing project or condition, and other project-related developments that are realistically defined at the time of assessment; and (iv) areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. After identifying the environmental components that will 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 and guide mitigation measures. An average of 30m corridor (ROW) along the sub-project sections. This includes 100 m on either side studied for direct impacts. Other indirect impact area covers location of quarries; borrow areas, storage area of construction material etc. Baseline data was collected in an area of 10 km on either side of road alignment for larger analysis of ambient air, land use and other environmental sensitivity. Assessment is carried out for all components of environment covering terrestrial and aquatic ecology, soil, water, noise, and socio-economic aspects.

F. Approach and Methodology

14. This IEE report has been prepared on the basis of environmental assessment carried out by detailed design teams as prescribed in their TORs to fulfill Government of India (GOI) requirements. Since most of the sub-projects were outside purview of EIA requirements, the environmental assessment period including pollution monitoring was limited to one season other than monsoon. The period of assessment varied among different detailed design teams amidst the COVID-19 situation, which coincided with their contracted period from 2020 to 2021. The reports were reviewed and validated by ADB environment consultant team from November 2021 to March 2022. Site assessments were conducted to validate resource inventory and to collect additional primary data, conduct meaningful consultations, and key informants interview including with forest and wildlife authorities to fill in gaps and bring the assessment to compliance with ADB SPS 2009. The reports and findings were then consolidated and structured as prescribed in the ADB SPS 2009. The IEE commenced with the review of legal requirements for the project. Next, technical details were collected and compiled by detailed design consultants and ADB environment consultant team. This was followed by a discussion with the implementing agency to reconfirm the technical details. Further steps followed for IEE have been concisely described in the following paragraphs.

1. Reconnaissance Survey and Initial Consultations

15. Reconnaissance survey and initial consultations facilitated in designing the nature of the environmental survey and extent of consultations to be carried out along the road alignment. It

helped to identify data gaps, decide valued environment components, key stakeholders and key informants who can further substantiate the collected information. Reconnaissance survey and initial consultations also recognized the need to conduct rapid bio-diversity assessment and wildlife movement study for the stretches where movement of wildlife was reported.

2. Primary Data Collection

16. Environmental resource inventory was prepared for all environmental features such as terrain, land use, waterways/ water bodies, roadside vegetation, sensitive receptors, common property resources, utilities, drainage, flooding/ water logging, accident prone areas, etc. within the area of interest/core zone. Information about wildlife movement such as species, location, reason for crossing the road, potential wildlife accident locations, frequency, season and timing of crossings, etc. were also collected. This was done by trained persons under the supervision of an expert team comprised of wildlife experts. Similarly, floral survey was also carried out.

3. Secondary Data Collection

17. Secondary sources included environmental assessment done by detailed design team, published government reports, government websites, recognized institutions and relevant government departments (forests and wildlife, pollution control board, statistics, Indian Meteorological Department (IMD), etc.) Recent Google images were captured to view environmental features at regional scale. References made to the secondary sources have been mentioned in the text and tables throughout the length of the report.

4. Public Consultations

18. Meaningful consultations were organized with the government agencies, and local people/ beneficiary population to know the level of project acceptability, understand their concerns, apprehensions, and overall opinion. Information was gathered about existing baseline environmental condition like ambient levels and effects on health, water resources, water logging/ flooding, flora and fauna, wildlife movement, socio-economic standing of local people, impact due to loss of land, other assets, and common property resources, accident risk during construction and operation stage, perceived benefits and losses, etc. Information thus gathered was integrated in project design, mitigation measures, and environmental management plans.

5. Other Tools, Additional Surveys and Studies

19. The Transport Emissions Evaluation Model for Projects (TEEMP)[5] developed by Clean Air Asia[6] was utilized to assess the CO_2 gross emissions. Required input data on road length and configuration, traffic, road roughness, emission factors, etc. were collected from different sources. Remote sensing and GIS technique have been used for assessment of land use/ land cover for the larger area (10 km radius) beyond the project site, which help in better planning and decision-making before creating any physical infrastructure in the region.

[5] TEEMP is an excel-based, spreadsheet models to evaluate emissions impacts of transport projects.

[6] 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.

6. Assessment of Potential Impacts

20. The assessment of the type, nature, direct, indirect, cumulative or induced impacts and their significance to the physical, biological, and socio-economic components of the environment has been done to ascertain the project's environmental sustainability. Nature of impacts has been classified as significant, insignificant, short-term, long-term, reversible, irreversible, etc. After identification of nature and extent of impacts, mitigation measures were suggested.

7. Preparation of the Environment Management Plan

21. The road specific EMPs were formulated with the aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. These include: (i) mitigation of potentially adverse impacts; (ii) monitoring of impacts and mitigation measures during project implementation and operation; (iii) institutional capacity building and training; (iii) compliance to statutory requirements; and (iv) integration of EMP with project planning, design, construction and operation.

G. Structure of the report

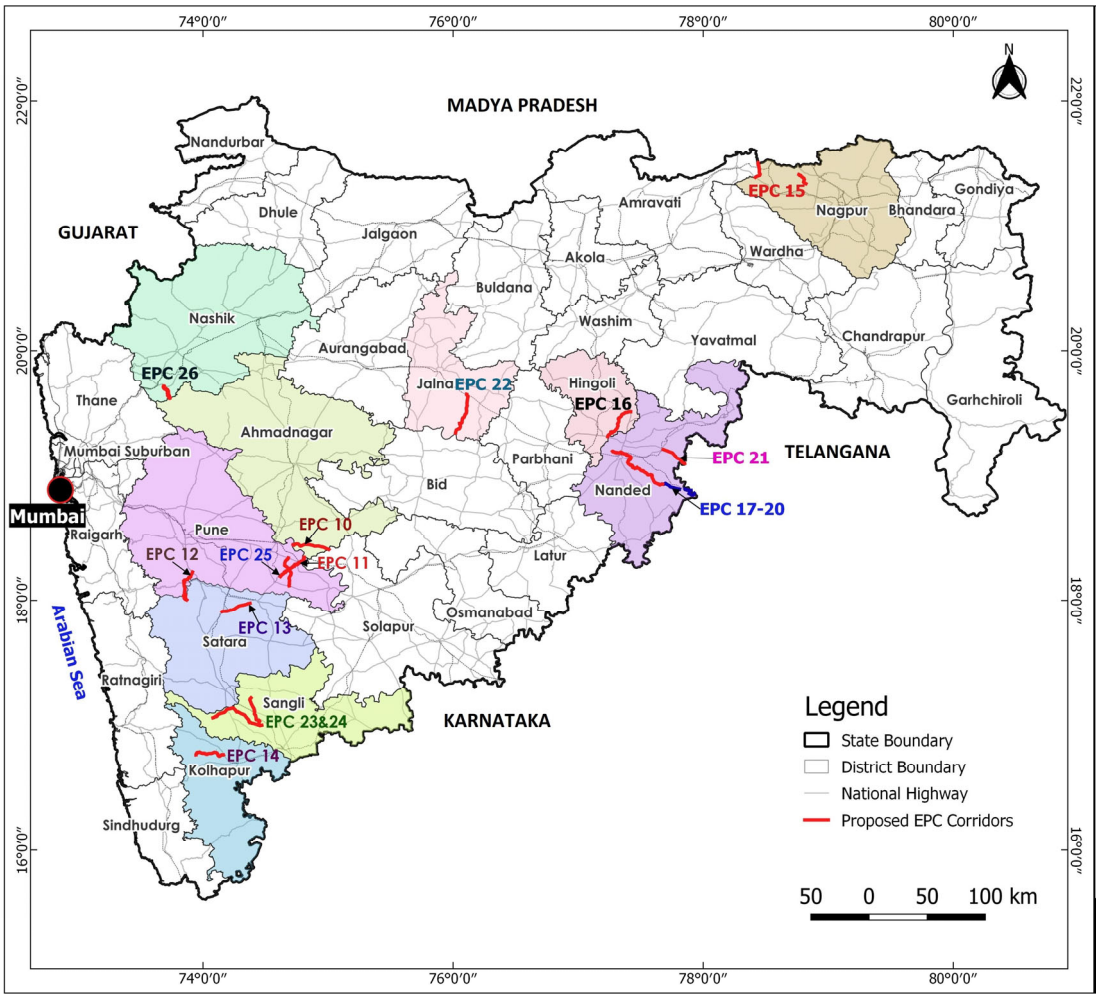
22. The IEE has been structured in accordance with SPS, 2009. An executive summary describing critical facts, significant findings, and recommended actions has been presented in the beginning of the report. The report has been compiled and presented from the description of the project sites and the environment, assessment of impacts, discussion of information disclosure and consultation process, summary of mitigation measures in the EMP and grievance redress mechanism, then culminating with overall conclusions and recommendations.

II. DESCRIPTION OF THE PROJECT

A. Location of the Project

23. The state of Maharashtra extends between 15° 44' N to 22° 6' N and 72° 36' E to 80° 54' E with geographical area of 3, 07,713 sq km and occupies west-central part of India along the Arabian Sea. It is bounded on the north by Gujarat, northeast and east by Madhya Pradesh, southeast and south by Andhra Pradesh, southwest by Karnataka and Goa and west abutting on the ArabianSea. It spreads about 800 km from east to west and about 720 km from north to south and located in the north centre of Indian Peninsula with Arabian Sea in the west. Administratively the state of Maharashtra is divided into 36 districts which are grouped into six divisions namely Konkan, Pune, Nashik, Aurangabad, Amravati and Nagpur. The State has further been divided into five regions namely Konkan, Western Maharashtra, Khandesh, Marathwada and Vidarbha. The 18 sub-project roads under CECIGM are located in 10 districts of Maharashtra namely: Nashik, Jalna, Pune, Satara, Nagpur, Ahmednagar, Kolhapur, Sangli, Hingoli and Nanded. District-wise locations and other details of the sub-projects are given in **Table 1**. **Figure 1** show the location of sub-project roads within the state. The sub-projects EMP is given as **Appendix 1**.

Figure 1: Project Location Map for CECIGM



B. Project Category

24. Project categorization has been done using Rapid Environment Assessment (REA) checklist of ADB for roads and highways **(Appendix 2)** after survey and initial consultations. Project scope is limited to improvement and widening of existing mostly single/ intermediate lane roads to two-lane with earthen/paved shoulders. Hence it expected that stress on existing natural resources such as land, water, soil, and aggregates is not significant. Widening and improvement are confined to available right of way except in EPC 17 and 18 where 3 realigned 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) aggregating 6.895 km are proposed due to flood-prone, constricted built-up areas. This is less than 1.5% of the CECIGM total length. Further these new alignments are mostly passing through the agricultural land and also not located inside/nearby any environmentally sensitive areas.

25. Most of the sub-projects are outside any legally protected area[7] and notified eco-sensitive zone[8] boundary. But EPC-10 (SH-68) is passing through the protected Area and ESZ Boundary of Great Indian Bustard Sanctuary (GIB) at Bhambore from km 110+900 to km 111.400 and adjacent to two small patches of Baradgaon Sudrik at km 115.700 (LHS) and Yeswadi at km 122.300 (RHS) of the GIB Sanctuary. GIB Sanctuary was primarily notified for the conservation of critically endangered GIB (as classified by the International Union for Conservation of Nature or IUCN).[9] Any adverse impact on this species due to the proposed road improvement is not anticipated. Bio-diversity assessment conducted during Maharshtra State Road Improvement project (MSRIP) for a portion of same state highway also clearly established that it is not a Critical Habitat as per IFC Performance Standard 6 and its accompanying Guidance Note (2019). Other protected area adjacent to/nearby the sub-project roads are (i) Sagareshwar Deer sanctuary of which protected area and eco-sensitive zone boundary are at 160m and 60 m respectively from sub-project EPC-23; and (ii) Protected Area and ESZ boundary of Kalsubai Harishchandragad Wildlife Sanctuary is at 2.2 km and 1.5 km respectively from sub-project EPC-26. No encroachment of any precious ecology is envisaged. However, undefined, erractic and infrequent crossing of wild animals were reported along few sub-projects (EPC-11, EPC-18 EPC-24, EPC-25 and EPC-26) passing through intermittent forest patches other than those close to protected areas. Assessment is detailed in Chapter IV. Forest diversion is required for eight sub-project roads which are mostly devoid of or meagerly vegetated except reserved forests portions and ghat portion of SH-119 and SH-23. A total of 7,679 affected trees have been enumerated within the ROW under non-forest category for the entire project. All details such as locations, area to be diverted types of forest and status of forest diversion are summarized in **Table 23** of Chapter 4.

26. Most of the adverse impacts are co-terminus with the construction stage, site-specific, mostly limited within the ROW, and are easily mitigated through good engineering and housekeeping practices. Hence, the project is classified as environment **Category B** in

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[7] Protected Area: A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

[8] ESZ: Eco-Sensitive Zones (ESZs) are areas notified by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India around Protected Areas, National Parks and Wildlife Sanctuaries. The purpose of declaring ESZs is to create some kind of "shock absorbers" to the protected areas by regulating and managing the activities around such areas. They also act as a transition zone from areas of high protection to areas involving lesser protection.

[9] The Great Indian Bustard Sanctuary was formerly known as the Jawaharlal Nehru Sanctuary which is mentioned in the Birdlife International website as a key bird and biodiversity area but is also noted as unsuitable for the GIB.

accordance with the ADB's SPS 2009. According to Government of India EIA notification 2006 and its subsequent amendments, EPC-10 since passing through ESZ boundary requires prior environmental clearance and wildlife clearance[10] from Ministry of Environment Forest Clearance and Climate Change (MOEFCC). As no land acquisition is involved in this EPC package, it is exempt from the requirement of public hearing.

C. Traffic

27. The average daily traffic (ADT) on the project roads and surrounding network is presented in the succeeding table based on the traffic study prepared during the detailed project study. The traffic projection on the road consists of normal traffic[11], diverted traffic[12], and induced/ generated traffic.[13] Since the project corridors are not connecting major industrial places and no major activities are planned in the near future (except Ahmednagar), induced or diverted traffic is not expected. Traffic projection has been done assuming 5% growth rate. Existing and projected traffic in different road-sections is given in **Table 3**.

Table 3: Present and Projected Traffic of Sub-project Roads

Road Sections	2020		2030		2035		2040		2050	
	Vehicle	PCU	Vehicle	PCU	Vehicle	PCU	Vehicle	PCU	Vehicle	PCU
EPC-10	4753	5950	7739	10687	9409	1177 9	11436	1431 6	18629	23319
EPC-11	1591	3990	2561	6485	3265	8270	3865	10004	6466	15118
EPC-12	6086	5473	11330	10188	14462	13003	18457	16596	33147	29805
EPC-13	6251	7277	10855	12174	13854	15538	17682	19831	28802	32302
EPC-14	3485	4007	6245	7185	7971	9170	10173	11703	16570	19064
EPC-15A	6154	4521	10612	10507	13544	15047	17286	20799	28158	36008
EPC-15B	5610	4862	9119	11069	11639	15820	14855	21830	24197	37652
EPC-16	3794	5947	6180	9686	7888	12362	10067	15778	11,073	17,356
EPC-17	3255	5612	5567	9594	7105	12245	9068	15628	14771	25456
EPC-18	3255	5612	5567	9594	7105	12245	9068	15628	14771	25456
EPC-19	3255	5612	5567	9594	7105	12245	9068	15628	14771	25456
EPC-20	3255	5612	5567	9594	7105	12245	9068	15628	14771	25456
EPC-21	3794	8137	6180	13254	7887	16915	10067	21589	16397	35165
EPC-22	3655	4274	5954	6962	7599	8885	9698	11340	15796	18469
EPC-23	4922	4917	9163	9154	11694	11684	14926	14911	24314	24290
EPC-24	5584	4729	10395	8802	13268	11233	16933	14337	30409	25748
EPC-25	13779	10342	21374	16036.5	27282	20476.5	34819	26129	56716	425560
EPC-26	4797	4779	8204	8173	10471	10431	13364	13313	21769	21685

Source: Traffic Survey and Projection.

[10] As per MoEF&CC OM F.No. 22-43/2018-IA.III dated August 08, 2019, Proposals involving developmental activity/project located within the notified Eco-Sensitive Zones (ESZ) shall be regulated and governed by the concerned ESZ notification. However, for the developmental project/activity located within the notified ESZ and covered under the schedule of the EIA Notification 2006, prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) is mandatory.

[11] Normal Traffic is the traffic which is already plying on the project road sections and continues to use the project road after improvement

[12] Diverted traffic is the traffic which would be diverted to the project road sections from the alternative routes and also the traffic which might divert away from the project road due to toll. Traffic to be diverted on the project road is considered in the normal growth rates.

[13] Induced Traffic represents the new traffic because of new travelers making use of the improved or new facility. The induced traffic is considered in the normal growth rates.

D. Characteristics of Existing Roads

28. Existing sub-project roads under CECIGM have varying width and road conditions. ROW is generally 24-40 m in most cases except MDR-84 and SH-119 (7m - 8m at few constricted built-up sections). It further varies within the length of individual roads with comparatively reduced width in settlement areas. ROW is mostly available and proposed widening will be mostly involved within additional narrow strip (2.5 - 3m on either side). Minimal land acquisition is involved in due to some constricted built-up areas which are proposed to deviate from the existing alignments. Total private land acquisition of 19.27 Ha is thus involved in locations at Brahmanwada realignment (1.590 km with 3.87 Ha), Amdura (3.330 km) and Malkota realignments 1.975 km (15.40 Ha). Major parts of the sub-project roads are either single lane or intermediate lane with or without earthen shoulder. Pavement condition is generally poor to fair with some good sections. Pavement condition is mostly poor where roads traverse through predominantly black cotton soil.

29. Roadside drains are present in some urban stretches but mostly choked and non-functional. Overtopping of roads is not observed in general but waterlogging was observed and reported by local residents in built-up areas. Waterways are mostly non-perennial except few rivers crossed by SH-119 (Gunjawani river, Nira river), SH-158 (Krishna River), SH-54 (Bhima River, Ujjaini Dam backwater), SH-23 (river crossing) which hold water year-round. One major bridge will be newly constructed, 5 major will be reconstructed and 13 will be retained. There is one existing rail-over-bridge (ROB) in SH-149 which will be retained and a new ROB proposed for existing level crossing in MDR-83 under EPC-17. There is also one level crossing near Mowad Railway station without ROB in SH-323 and one at Wangi to Walwa section of SH-158. One vehicle under pass (VUP) is also proposed Walwa to Wakurde section of SH-158. Bus shelters are present in some built-up areas. Most of the roads have inadequate road safety provisions. Horizontal and vertical profiles are non-compliant with applicable codal provisions. Horizontal curve is mostly insufficient in built-up areas. Vertical curves are deficient to severely deficient throughout the stretches of all sub-project roads. Abutting land use is predominantly open agricultural. Green mature trees of indigenous species are present along the sub-project roads (refer to Chapter 4 for detail).

E. Improvement / Strengthening Proposal

30. Project road improvement will mostly follow special codal provisions relevant to state highways prescribed by Indian Road Congress (IRC: SP: 73-2018, Manual of Standard and Specification for two-laning of State Highways) and Ministry of Road Transport and Highways (MORTH) Guidelines. Any compromise or variation has been specifically highlighted with reasons in relevant section of the report.

31. Main upgradation components involve improvement in pavement conditions and geometrics, reconstruction and widening of CD structures, provision of roadside drains, raising of embankment in waterlogged sections, junction/ intersection improvement, safety provisions for road users and wildlife, and provision of road facilities like bus bays/ bus shelters. Environmental enhancement measures like additional plantation and rainwater harvesting are also included in the design.

32. Asphalt pavements emit bitumen fumes. Outgassing occurs during material mixing, pavement laying, and for sometime after the pavement is finished depending on the characteristics of the asphalt and the local climate leading to associated environmental risks. High volatile organic compound materials release dangerous amounts of harmful gases during

processing and curing. These gases are detrimental to the atmosphere and hazardous to people. Well-maintained, asphalt pavement will last 30-40 years which requires regular maintenance including crack filling and sealcoating, which utilizes various resources. Concrete typically has a longer lifespan of 40-50 years. Therefore, in terms of longevity, concrete comes out ahead. Over time, the average asphalt pavement can cost up to three times more.

33. On the other hand, concrete pavement holds up better than asphalt under heavy traffic and heavy truck volumes and is easier to see at night due to its lighter color. Concrete pavement requires little to no maintenance throughout its life. Unlike asphalt, it does not need repeated resurfacing, patching, or spot repairs. However, when concrete pavements get damaged, the cost of repair for each damaged section costs more compared to asphalt since entire spans need to be replaced rathern than patched up as in asphalt pavement. Nevertheless, life cycles analysis reveal that concrete, if installed correctly, has two to four times the lifespan of asphalt and is easier to maintain overall. Concrete is considerably less prone to wear and tear defects like rutting, cracking, stripping loss of texture, and potholes that can occur with flexible pavement surfaces like asphalt.

34. Concrete is more susceptible to unsightly staining than asphalt, whose naturally black exterior masks common contaminants. That said, certain types of stains can be highly destructive for asphalt, particularly oil. If not removed quickly, oil will cause the asphalt binder to become excessively soft, leading to potholing, surface loss, and other problems.

35. In terms of road safety, asphalt may have an advantage over concrete in that it provides better traction and skid resistance, especially when wet. Asphalt also provides a smoother and quieter drive compared to concrete. Coal consumption appears to be larger for the steel-reinforced concrete pavement, whereas the use of natural gas, liquefied natural gas, and liquefied petroleum gas appears to be larger for the asphalt pavement.

36. The greatest environment impact around the use of concrete pavement is with cement production. The process involves firing of kilns to extremely high temperatures using fossil fuels and consumes non-renewable resources such as limestone. It is a pressing concern considering that concrete is one of most utilized material globally and accounts for 7-8% of globaal carbon emissions. However, when compared to asphalt and converted to a common unit, asphalt pavement production for a 1-km section requires about 7 million MJ of energy, and the equivalent concrete pavement design requires roughly 5 million MJ. Use of fly ash as a cement additive will also help offset the upstream carbon emissions. Carbon is also captured as concrete cures, adding futher to the offsetting of carbon emissions.

37. Given all these considerations, rigid pavement is proposed for the sub-project roads over bituminous pavement**.**

38. Design speed has been adopted consistent with codal provisions of IRC: SP: 73-2018 (**Table 4**).

Table 4: Design Speed

Nature of Terrain	Cross Slope of the Ground	Design Speed (km/h)	
		Ruling	Minimum
Plain and rolling	Up to 25 percent	100	80
Mountainous and Stee	More than 25 percent	60	40

39. Design speed is reduced where site conditions are restrictive (intersections, bridge approaches, curves, built-up sections, educational and other sensitive receptors, forest and

potential wildlife crossing sections, etc.) and adequate land width is not available. In built-up sections, it is generally restricted to 30 kph which is further reduced to 20 kph in exceptional cases. Gradual changes will be introduced by providing successive sections of increasing/ decreasing design speeds so that road users become progressively conditioned to such changes. Warning signs have been proposed at all locations with reduced speed limit.

40. The horizontal curves have been eased to the extent feasible considering the ground constraints/ land availability. Horizontal geometry will be based on IRC: 38-1988: Guidelines for Design of Horizontal Curves for Highways (First Revision) and vertical geometry will be based on IRC: SP 23-1993.

41. Only one new major bridge is proposed under the project and 5 other major bridges are proposed for reconstruction. Existing bridges which are recently constructed have been retained, proposed for reconstruction or retained with some repair. Overall, 3 new construction, 33 reconstruction, 20 widening, 29 retentions with repair of minor bridges have been proposed in various sub-projects. In addition, several slab culverts and new pipe culverts are included in the design. Additional culverts are proposed to facilitate wildlife crossings in few sub-projects (refer to Chapter 5 location and other details).

42. Existing roads are largely devoid of side drains. In some urban stretches with drains, these were found to be blocked or choked. Covered lined drains with footpaths have been proposed in all built-up sections. Open unlined earthen drains have been provided to capture surface run off from the main highway for most of the sub-projects. Concrete RCC covered drains are proposed on hillsides in ghat sections of SH-119 (Kapurhol-Bhor-Wai Road) and PCC drains are proposed in the Ghat section of SH-23 (Bari-Ghoti-Sinnar) to protect the road from cutting/ damage to pavement. Slope protection works have been proposed in ghat sections of SH-119 (Kapurhol-Bhor-Wai Road) through construction of Netting for Rockfall Protection. Beside these, retaining walls and toe walls have been proposed at waterways/ CD structures.

43. All major and minor junctions are proposed for improvement as per IRC guidelines, mostly at grade. Bus shelters with few toilet units have been provided at all important junction locations. Bus bays have been designed at locations of bus shelters along sub-projects having adequate land width with additional paved area in order to enable a bus to stop without obstructing the flow of traffic. The EPC contractor may shift these locations, if necessary, in consultation with the local people and Authority Engineers during detailed design. ROBs are mostly not proposed for existing level crossings since Train Vehicle Unit (TVU) is less than warranted except one existing level crossing on MDR-84 between Nila Junction to Mugat Junction (at km 5+900) where Train Vehicle Unit (TVU) is 61926 which warrants the proposed improvement to ROB.

44. Safe crossing facilities for pedestrians are proposed at major intersections and bus bays. These facilities are planned in accordance with relevant provisions in IRC-11,[14] IRC-67,[15] and IRC-103.[16] At intersections, controlled form of crossing is achieved through provision of 3 m wide zebra crossing, accompanied by STOP line.

[14] Recommended Practice for the Design and Layout of Cycle Tracks.
[15] Code of Practice for Road Signs.
[16] Guidelines for Pedestrian Facilities.

45. The project roads have been provided with all safety features as per IRC: 8,[17] IRC:25,[18] IRC:26,[19] IRC:35,[20] IRC:67,[21] IRC:103,[22] and Section 800 of MORTH.[23] Key features include provision of (i) crash barriers in high embankment areas/black spots, (ii) speed breakers/ rumble strips near built-up areas, educational institutes, health centres and active wildlife crossing areas, delineators, road studs, cat's eye, chevrons, object markers, etc. have been included in the design.

46. For construction stage safety, a proper traffic diversion plan shall be prepared as per IRC: SP: 55-201416. Separate traffic diversion plan shall be prepared for structures and CD works. The execution of the project road should be planned such that inconvenience to road users is minimal. The width of temporary diversion should be equal to the width of existing carriageway. Embankment heights are proposed for raising for grade improvement and locations where overtopping was reported either due to local drainage problem or ponding due to overflow of rivers during monsoons. Existing roads' characteristics and proposal for improvement have been summarized in **Table 5**.

Table 5: CECIGM Sub-project Road's Salient Features and Improvement Proposals

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL
1. Siddhatek to Korti (SH-68), EPC-10	
- Length= 23.98 Km - Location: The project road is a part of SH-68 start from Siddhatek at km 103+650 and ends to Rashin at Km 127+200 - Additional approach road for Sidhatek temple Km 00+000 to 00+430. - Habitations are Sidhatek, Deulwadi, Bhambora, Baradgaon Sudrik, Yeswadi and Rashin. - ROW: 15.0 to 38.0m - Configuration: Single-lane intermediate road of bituminous surfacing with 5.5 m to 6.0 m carriageway width. Murrum shoulders exist for almost entire length with width varying from 0.8 to 2.2m. Around 42% of the pavement is good condition. The existing pavement for the entire stretch is of bituminous surface. No submergence area is observed. Roadside drains are present in urban parts but they are either non-functional or partially functioning. - Junction/ Intersections: 3 major and 4 minor - Cross Drains: 4 Major Bridge, 2 minor bridge, 6 Slab/ Box culverts and 44 pipe	- Executable Length:23.980 km - ROW: 15 to 38m. - Configuration Rigid Pavement; Two-lane with paved shoulder of 1.5 m on either side. In built up length two-lane with paved shoulder with 2.0 m Footpath on either side. - 5 Bus shelters on both sides - Junction improvements: 3 Major Junctions and 4 Minor Junctions - Cross Drainage Structures:

Cross Drainage	New	Re construction	Widening	Retain with Repair	Converted	Total
HPC	3	42	-	2	1	**48**
Slab/ Box Culvert	-	4	1	1	-	**6**
Minor Bridge	-	-	-	1		**1**
Major Bridge	-	-	-	4		**4**

- Side Drains:
- Notch type Surface drain = 4420m on Both Side
- Open Unlined Trapezoidal Drain= 42940m on Both Side
- Open lined Trapezoidal Drain= 300m on RHS
- Water harvesting Staructures: 48

[17] Type Design for Highway Kilometer Stones.
[18] Type Design for Boundary Stones.
[19] Type Design for 200-meter Stones.
[20] Code of Practice for Road Markings.
[21] Code of Practice for Road Signs.
[22] Guidelines for Pedestrian Facilities.
[23] Specifications for Traffic Signs and other Safety-Related Works.

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL

culverts
- Terrain and Land use: Plain mainly
- Mainly agricultural, residential and barren

2. Khadki to Bhawani Nagar (MDR-84), EPC-11

- Length= 21.900 km
- Location: The project road is a part of MDR-84 start from Khadki at km 00+000 and ends to Nirgude at Km 21+900 (total length 21.900 km).
- Habitations are Khadki, Parvadi, Shetphalgade and Nirgude.
- ROW: 7.0 to 40.0 m
- Configuration: Single-lane intermediate road of bituminous surfacing with 3.75m to 5.5m carriageway. Pavement for the entire stretch is of bituminous surface. Murrum shoulders for almost entire length of the highway with width varying from to 1.0 m. to 1.5 m. No submergence area is observed. Roadside drains are present in urban parts but they are either non-functional or partially functioning.
- Junction/ Intersections: 1 major and 4 minor Junctions.
- Cross Drains: 0 Major Bridge, 2 minor bridges, 1 Slab culverts and 24 pipe culverts.
- Terrain and Land use: Plain, mainly agricultural, residential and barren land.

- Project Road Length: 21.900 km
- ROW: 7.0 to 40.0 m
- Configuration: 2-lane rigid pavement with paved shoulder of 1.00 m on either side. In built up length two-lane with paved shoulder with 2.0 m footpath on either side.
- 12 Bus shelters on both sides
- 1 Major and 4 Minor Junctions Improvements

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	1	19	-	1	-	**21**
SlabCulvert	-	1	-	-	-	**01**
Minor Bridge	4	1	-	-	-	**05**
Major Bridge	1	-	-	-	-	**01**

- Notch type Surface Drain: 1.250 X 2 = 2.500 km
- Unlined Trapezoidal Drain: 19.246 X 2 = 38.49 km
- Open lined Trapezoidal Drain: 0.75 X 2= 1.5 km
- Rainwater harvesting Structures = 44Nos.

3. Kapurhol-Bhor-Wai Road (SH-119), EPC-12

- Length=45.357 km
- Location: Project Road starts from km 76.000 (PWD km. 76/00) T- Junction with NH-04 (LHS- Satara, RHS – Pune) Near Kapurhol Village, Pune District and Terminates at Km 117.125 (Design Chainage. 117/100), Near Dhawadi Village, Satara District and Approach Road for Connecting to Mandhardev Temple Start from Km. 0.000 with Y Junction SH 119 (LHS – Bhor, RHS – Wai) and Terminate at Km. 4.257 near Mandhardev Temple
- Habitations are Kapurhol, Kasurdi, Bholawade, Sangvi, Bhor, Khanapur, Nere, Gundewadi, Dhawadi Apporach road- Kochalewadi, Mandhardev
- ROW: 8.0 to 30.0m.

- Executable Length: 45.357 km
- Proposed ROW: 8.0 to 30 m.
- Configuration: 45.357 km 2-lane with paved/ earthen shoulder of 1.5/1.0 m on either side
- New road/ Major Realignment: Nil
- RUB/ ROB: Nil
- Junction improvements: All major junctions
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	36	90	-	11	-	**137**
Slab & Arch/ Box Culvert	-	19	-	7	-	**26**
Minor Bridge	1	1	2	-	-	**4**
Major Bridge	-	-	-	4	-	**4**

- RCC covered Drain: 4.090 km
- RCC covered Drain for ghat section: 15.377 km
- Retaining wall 3.456 km
- Toe wall: 1.500 (B/S)
- Netting for Rockfall Protection: 0.3 km

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL

- Rainwater harvesting Structures = 90 Nos.

4. Adarki-Mirgaon-Phaltan (SH-149), EPC-13

- Length = 21.0 km
- Location: Project Road starts from junction of SH-61 near Adarki Phaltan at Km 0/00 and ends near Wathar Nimbalkar at Km 26.400 of SH-149. 5.400 km will be upgraded by PWD under another scheme so the length under ADB scheme will be 21.0km.
- Configuration: Pavement condition of the project road is good to fair with bituminous type with 2 lane configurations. No submergence area is observed in general except in built-up area due to poor drainage. Roadside drains are present in urban parts but they are either non-functional or partially functioning.
- Junctions: 1 major junction and 12 minor junctions.
- ROB: 1 ROB of 0.8km.
- Habitations are Hanumantwadi, Dasturi, Adarki khurd, Adarki Bk., Kapashi, Ghadgewadi, Malwadi and Mirgaon.
- ROW: 12.0 to 18.0m in rural and 8.0 to 10m in built-up area.
- Terrain and Landuse: Plain and Rolling terrain with predominantly open scrub and agricultural land

- Executable Length: 21.00 km
- Proposed ROW: 12.0 to 18.0 m.
- Configuration: 2-lane rigid pavement of 17.630km and 2-lane flexible pavement of 3.370km for forest area. 2-lane carriageway with 3.5m X 1.5m paved shoulder in rural section. 2-lane carriageway with 3.5m X 1.2m drain are proposed in built-up section.
- New road/ Major Realignment: Nil
- ROB: 1 retained.
- Junction improvements: All major junctions
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	3	39	-	-	-	**42**
Slab/Box Culvert	-	6	-	-	-	**6**
Minor Bridge	-	6	-	1	-	**7**
Major Bridge	-	-	-	-	-	**0**

- Rainwater harvesting Structures = 42 Nos.
- Rectangular covered drain: 2.5 km
- Open Unlined Trapezoidal Drain: 37.612 km
- Open Lined Trapezoidal Drain: 2.688 km
- Metal crush barrier: 2.53 km
- Bus-bay/ Shelter: 6 Nos

5. Kerli-Kotoli-Nanadari (SH-191), EPC-14

- Length = 24.0 km
- Location: Starts from T junction on NH-166 (Kolhapur-Ratnagiri Highway) at Km 128/200 of NH-166 (Km 0/000 of SH-191) near Kerli village and terminates at Km 24/000 on SH-191 near Nandgaon village.
- Configuration: Pavement condition of the project road is poor to fair with bituminous flexible type with 2-lane of 3.250 km (14%), Intermediate-lane of 15.050 km (63%), Single-Lane-5.700 km (24%) configuration. No submergence area is observed in general except in built-up area due to poor drainage. Roadside drains are present in urban parts but they are either non-functional or partially functioning.
- Junctions: 1 major junction and 31 minor junctions.
- Habitations are Kerli, Asurle, Porle T. Thane, Uttur, Udalewadi, Waghave, Kotoli, Nanundre, Ghotavade, Nandgaon.
- ROW: 9.0 to 17.0m in rural and 8.0 to 10m in built-up area.

- Executable Length: 24.00 km
- Proposed ROW: 9.0 to 17.0 m.
- Configuration: 24 km 2-lane with paved/ earthen shoulder of 1.5/1.0 m on either side.
- New road/ Major Realignment: Nil
- RUP/ROB: Nil
- Accident Prone Area - Nil
- Flood Prone Area - Nil
- Junction improvements: All maor junctions
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	-	28	1	3	0	**32**
Pipe	-	25	-	-	-	
Slab Box Culvert	-	3	-	2	-	**5**
Minor Bridge	-	3	3	5	-	**11**
Major Bridge	-	3	-	-	-	**3**

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL
- Terrain and Landuse: Plain and Rolling terrain with predominantly agricultural land.	- Lined Drains: 14.700 km (B/S), Unlined Drains: 33.300 km (B/S) - Toe wall: 500 m, Retaining wall: 100m - Metal crash barrier: 5750m - 1 highmast lighting at 1 major junction (km 0+000) - Bus-bay/ Shelter :9 Nos,Toilets blocks: 07 Nos.

6. Karanja-Bharsingi-Mowad (SH-323), EPC-15A

- Length = 10.500 km
- Location: Starts from km 51+600 on SH-248 with "T" Junction at Jalalkheda and ends at Mowad at km 62+100 on SH -323.
- Configuration: Pavement condition of the project road is poor to fair with bituminous flexible type except at few distresses locations with 2-lane of 2.6 km and Intermediate-lane of 7.9 km configuration. No submergence area is observed in general except in built-up area due to poor drainage.
- Junctions: 1 major junction and 12 minor junctions.
- Habitations are Madna, Thugaon, Khairgaon and Mowad.
- RUP/ROB: 1 level crossing at Mowad Railway Station.
- ROW: 15.0 to 20.0m.
- Terrain and Landuse: Plain and Rolling terrain with predominantly open agricultural land.

- Executable Length: 10.50 km
- Proposed ROW: 15.0 to 20.0 m.
- Configuration: 2-lane Rigid pavement with paved/ earthen shoulder of 1.5/1.0 m on either side in open area for 9.75 km. On the other hand, Rigid pavement with 4-lane divided carriageway in built-up section at Khairgaon for 0.75 km.
- Junction improvements: All major junctions
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
Pipe	14	6	-	-	-	20
Slab/ Box Culvert	3	-	-	-	-	3
Minor Bridge	-	-	-	-	-	0
Major Bridge	-	-	-	-	-	0

- Covered Drains: 1.500 km (B/S)
- Open Drains: 19.500 km (B/S)
- WBM Metal crush barrier: 2191m
- Bus-bay/ Shelter :8 Nos
- Rainwater harvesting Structures = 20 Nos.

7. Kalmeshwar-Ghorad-Mohapa (SH-349), EPC-15B

- Length = 9.250 km
- Location: Starts from km 0+000 on MDR-04 with "T" junction near Khapa, traverse through settlement of Tidangi, Telgaon and Nandakheda and ends at chainage km 9+250.
- Configuration: Pavement condition of the project road is poor to fair with bituminous flexible type except at few distresses locations with Intermediate Lane of 4.5 km and single lane of 4.75 km configuration. No submergence area is observed in general except in built-up area due to poor drainage.
- Junctions: 1 major junction and 7 minor junctions.
- Habitations are Tidangi, Telgaon, Mandvi.
- RUP/ROB: 1 level crossing at Mowad Railway Station.

- Executable Length: 9.250 km
- Proposed ROW: 15.0 to 20.0 m.
- Configuration: Rigid pavement with 2-lane with paved/ earthen shoulder of 1.5/1.0 m on either side in open area for 9.05 km and 2-lane with footpath is proposed in built-up section for 0.02 km.
- New road/ Major Realignment: Nil
- RUP/ROB: Nil
- Junction improvements: All major junctions
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
Pipe	4	8	-	-	-	**12**
Slab & Arch/	8	-	-	-	-	**8**

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL
- ROW: 15.0 to 20.0m. - Terrain and Landuse: Plain and Rolling terrain with predominantly open agricultural land.	Box Culvert | | | | | | | Minor Bridge | - | - | - | 3 | - | **3** | Major Bridge | - | - | - | - | - | **0** | - Side covered Drains: 0.400 km (B/S) - Open Drains: 17.840 km (B/S) - CC open drain: 0.260 km (B/S) - WBM Metal crush barrier: 2941m - Bus-bay/ Shelter :8 Nos - Rainwater harvesting Structures = 18 Nos.

8. Kandil-Bothi-Rameshwar-Tanda-Wadgaon-Girgaon (MDR-10), EPC-16

- Length = 28.672 km
- Location: Starts from starts from T-junction on Hingoli-Nanded road (NH-161) km 0.000 and ends at T-Junction on SHi-259.
- Configuration: Pavement condition of the project road is poor to fair with bituminous flexible type except at few distresses locations with single lane configuration. No submergence or overtopping area is observed in general except in km 12+500 and km 15+400. Roadside drains are present in urban parts but they are either choked or non-functional.
- Junctions: 8 major junction and 15 minor junctions.
- Habitations are Kandil, Bothi, Rameshwar, Tanda, Wadgaon and Girgaon.
- ROW: 17.0 to 24.0m.
- Terrain and Land use: Rolling terrain with predominantly open agricultural land.

- Executable Length: 28.672.250 km
- Proposed ROW: 15.0 to 20.0 m.
- Configuration: Rigid pavement with 2-lane with paved/ earthen shoulder of 1.5/1.0 m on either side in open area and 2-lane with paver block shoulder of 1.5 in either side in built-up section.
- Junction improvements: All major junctions
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
Pipe	4	8	-	-	-	**12**
Slab & Arch/ Box Culvert	8	-	-	-	-	**8**
Minor Bridge	-	-	-	3	-	**3**
Major Bridge	-	-	-	-	-	**0**

- Side covered Drains: 0.950 km (B/S)
- Open Drains: 15.000 km (B/S)
- Toe wall: 6.600 km,
- Retaining wall: 0.268 km
- Bus-bay/ Shelter :28 Nos
- Rainwater harvesting Structures = 40 Nos.

9. Nila Junction to Mugat Junction and Brahmanwada Realignment (MDR-83, Part-1), EPC-17

- Length = 19.920 km
- Location: The section of MDR-83 starts at Nila Junction km 0.000 on the Basmat-Nanded road in Nanded city and terminates at km 14.815 near Mugat Junction in Nanded. The second section is from Chaitanya Nagar Shiv Mandir to Asna Bridge junction km 0.00 to km 3.515. Third section is the Brahmanwada realignment km 0.000 to km 1.590.
- Configuration: Intermediate/ 2-lane road with 5.50m to 7.00m bituminous carriageway with earthen shoulders. Pavement condition of the project road is fair to poor. Rigid pavement consists in few built ups in poor condition. No submergence area is observed in general

- Executable Length: 19.920 km
- Proposed ROW: 18.0 to 30.0 m.
- Configuration: Rigid pavement with 2-lane carriageway with paved/ earthen shoulder of 1.5/1.0 m on either side in open area and 2-lane carriageway with paver block and drain in built-up section.
- New road/ Major Realignment: Brahmanwada realigned length 1.590 km
- RUP/ ROB: Existing level crossing at km 5+900 is proposed to improve to ROB.
- Accident Prone Area - Nil
- Flood Prone Area - Nil
- Junction improvements: All major junctions
- Cross Drainage Structures:

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL

except in built-up area due to poor drainage.
- Existing roads are largely devoid of side drains. Roadside drains are present in urban parts but they are either choked or non-functional.
- Historic/ Archeological Monuments: 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.
- Junctions: 8 major junction and 40 minor junctions.
- Habitations are Nanded, Daregaon, Trikut and Brahmanwada.
- RUP/ ROB: 1 level crossing at km 5+900.
- ROW: 18.0 to 30.0m.
- Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and few built-up areas.

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	13	19	1	1	-	**34**
Slab & Arch/ Box Culvert	3			6	-	**9**
Minor Bridge			1	3	-	**4**
Major Bridge				1	-	**1**
ROB	1				-	**1**

- Line Drains: 13.720 km (B/S)
- Unlined Drains: 23.060 km (B/S)
- Toe wall: 1835 m,
- Metal crush barrier: 2710m
- Street Lighting: 435 nos in habitation areas, 11 nos at bus stop locations, 11 high mast lighting at 11 major junctions.
- Rainwater harvesting structures: 26 Nos.
- Bus-bay/ Shelter :11 Nos
- Toilet block: 11 Nos.

10. Mugat Junction-Khujda Junction- Amdura and Malkota realignment EPC-18

- Length = 25.835 km
- Location: The section of MDR-83 starts at Aamdura Junction at km 14.815 on the Basmat-Nanded road in Nanded City and terminates at km 34.750 near Khujda Junction in Nanded. The second section is Aamdura Realignment km 0.000 to km 3.330. Third section is Aamdura Link Road km 0.000 to km 0.595. The fourth section is Malkautha realignment km 0.000 to km 1.975.
- Configuration: Intermediate/ 2-lane road with 5.50m -7.00m bituminous carriageway with earthen shoulders. Pavement condition of the project road is fair to poor.
- Submergence area is observed in general in built-up area due to poor drainage and at km 15.370km 17.720 and km 28.020 near Godavari and Sati River.
- Two Bhandaras over Godavari River near Km 49.0 & Km 76.32 of the road. Due to back water effect the road get submerged at several locations (km 7.000, km 28.000) especially during monsoon.

- Executable Length: 25.835 km
- Proposed ROW: 18.0 to 30.0 m.
- Configuration: Rigid pavement with paved/ earthen shoulder of 1.5/1.0 m on either side in open area and 2-lane carriageway with paver block and drain in built-up section.
- New road/ Major Realignment: Amdura realignment length 3.330 km and Malkota realignment of 1.975 km.
- Junction improvements: 8 major and 17 minor

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	31	21	9	3	-	**64**
Slab & Arch/ Box Culvert	1	-	-	-	-	**1**
Minor Bridge	2	3	-	2	-	**7**
Major Bridge	-	1	-	-	-	**1**
Causeways	-	1	-	-	-	**1**

- Line Drains: 7.150 km (B/S)
- Unlined Drains: 44.520 km (B/S)
- Toe wall: 2450 m,
- Retaining wall: 1800 m

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL
- Existing roads are largely devoid of side drains. - Junctions: 4 major junction and 13 minor - Habitations are Amdura, Devapur, Kamaj and Malkota. - ROW: 18.0 to 30.0m. - Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and few built-up areas.	- Metal crush barrier: 7125m - Street Lighting: 461 nos in habitation areas, 13 nos at bus stop locations, 8 high mast lighting at 8 major junctions. - Rainwater harvesting structures: 60 Nos. - Bus-bay/ Shelter :7 Nos - Toilet block: 7 Nos.

11. Khujda Junction-Karegaon-Phata (MDR-83, Part-3), EPC-19

- Length = 25.650 km
- Location: The section of MDR-83 starts at km 34.750 near Khujda Junction and terminates near Karegaon Phata village at km 60.400 in Nanded.
- Configuration: Intermediate/ 2-lane road with 5.50m -7.00m bituminous carriageway with earthen shoulders. Pavement condition of the project road is fair to poor. Rigid pavement consists in few built ups in poor condition.
- Submergence area is observed in general in built-up area due to poor drainage and at cross drainage structures at km 40.865 and km 51.160 in tributaries of Godavari River.
- Existing roads are largely devoid of side drains. Roadside drains are present in urban parts but they are either choked or non-functional.
- Junctions: 1 major junction and 20 minor junctions.
- Habitations are Hangiranga, Baligaon, Karegaon.
- ROW: 18.0 to 30.0m.
- Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and few built-up areas.

- Executable Length: 25.650 km
- Proposed ROW: 18.0 to 24.0 m.
- Configuration: Rigid pavement with 2-lane carriageway with paved/ earthen shoulder of 1.5/1.0 m on either side in open area and 2-lane carriageway with paver block and drain in built-up section.
- Junction improvements: 1 major and 20 minor
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	25	33	1	1	-	**60**
Slab & Arch/ Box Culvert	-	-	-	-	-	**0**
Minor Bridge	-	2	2	-	-	**4**
Major Bridge	-	-	-	-	-	**0**
Causeways	-	9	-	-	-	**9**

- Line Drains: 3.100 km (B/S)
- Unlined Drains: 48.200 km (B/S)
- Toe wall: 1400 m, Retaining wall: 390 m
- Metal crash barrier: 10948m
- Street Lighting: 62 in habitation, 20 at bus stop locations, 1 high mast lighting at 1 major junctions.
- Rainwater harvesting structures: 60 Nos.
- Bus-bay/ Shelter :10 Nos
- Toilet block: 10 Nos.

12. Karegaon-Phata-State Border Dharmadabad-Balapur IIT-State Border EPC-20

- Length = 27.378 km
- Location: The section of MDR-83 starts at km 60.400 near Karegaon Phata and terminates at Maharashtra Telangana State Border at km 82.065 near Naigaon D. village in Nanded. The second section is Dharmabadad to Balapur IIIT Up to State Border km 0.000 to km 5.715.
- Configuration: Intermediate/ 2-lane road with 5.50m -7.00m bituminous carriageway with earthen shoulders. Pavement condition of the project road is

- Executable Length: 27.378 km
- Proposed ROW: 18.0 to 30.0 m.
- Rigid pavement with 2-lane carriageway with paved/ earthen shoulder of 1.5/1.0 m on either side in open area and 2-lane carriageway with paver block and drain in built-up section.
- Junction improvements: 7 major and 18 minor junctions to be improved
- Cross Drainage Structures:

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL
fair to poor. Rigid pavement consists in few built ups in poor condition. - Submergence area is observed in general in built-up area due to poor drainage and at km 62.470, km 63.255, km 64.655, km 66.650, km 67.505 and km 71.175 at all cross drainages. - Existing roads are largely devoid of side drains. Roadside drains are present in urban parts but they are either choked or non-functional. - Junctions: 7 major junction and 18 minor - Habitations are Karegaon, Haregaon, Belgujari, Saikheda, Jaflapur and Naigaon D, Dharmabad, and Balapur. - ROW: 24.0m. - Plain and Rolling terrain with predominantly agricultural land and few built-up areas.	

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	39	16	-	-	-	**55**
Slab & Arch/ Box Culvert	-	2	-	-	-	**2**
Minor Bridge	-	6	-	-	-	**6**
Major Bridge	-	-	-	-	-	**0**
Causeways	-	2	-	-	-	**2**

- Line Drains: 6.730 km (B/S)
- Unlined Drains: 48.030 km (B/S)
- Toe wall: 8720 m, Retaining wall: 320 m
- Metal crash barrier: 5214m
- Street Lighting: 209 in habitation areas, 26 at bus stops, 7 high mast lighting at 7 major junctions.
- Rainwater harvesting structures: 52 Nos.
- Bus-bay/ Shelter :13 Nos,Toilet block: 13 Nos.

13. Bhokar-Raheti (NH-61), EPC-21

- Length = 22.030 km
- Location: The section of NH-61 starts at end of Bhokar road at km 130.240 and terminates at km 153.220 at Maharastra Telangana State Border in Nanded excluding high level bridge of 0.950 km.
- Configuration: 2-lane road with paved shoulders, 7.00m bituminous carriageway with (2X1.5m) paved shoulders on either side of the carriageway. Pavement condition of the project road is traffic worthy to good.
- Roadside drains are present in urban parts
- Junctions: 1 major junction and 16 minor junctions.
- Habitations are Bhokar, Pomnala, Jamdhari, Pimpaldhav and Rahati.
- ROW: 30.0m.
- Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and few built-up areas.

- Executable Length: 22.030 km
- Proposed ROW: 30.0 m.
- Strengthening with Flexible Pavement with Conventional White Toppings (CWT) Block Floorings and RCC Drains in Built-up area.
- Junction improvements: 1 major and 16 minor

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	-	-	-	24	-	**24**
Slab & Arch/ Box Culvert	-	-	-	7	-	**7**
Minor Bridge	-	-	-	2	-	**2**
Major Bridge	-	-	-	-	-	**0**
Causeways	-	-	-	-	-	**0**

- Line Drains: 3.000 km, Unlined 41.060 km (B/S)
- Metal crush barrier: 925m
- Street Lighting: 42 nos in habitation areas, 1 high mast lighting at 1 major junctions.
- Rainwater harvesting structures: 6 Nos.
- Bus-bay/ Shelter :3 Nos,Toilet block: 3 Nos.

14. Ranjani-Kumbhar-Pimpalgaon-Rajatakali (SH-222), EPC-22

- Length = 37.415 km
- Location: The project road starts at Ranjani at km 0.000 near Ranjani railway station at km 177.400 of SH-222 continues through Devali Patur, Masegaon, Ghonshi, Tanda, Dehegaon Devi, Kumbhar pimpalgaon and finally ends at

- Executable Length: 37.415 km
- Proposed ROW: 15.0 to 24.0 m.
- Configuration: 2-lane with paved shoulder and earthen shoulder (in open terrain), 2-lane with paved shoulder in built-up section (Masegaon and Devidahegaon) and 4-lane in Kumbhar Pimpal gaon village portion.

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL
Rajatakali at km 214.815. - Configuration: Single/ Intermediate Lane with paved shoulder and earthern shoulder configuration. Existing alignment is poor in respect of geometrics and deficient curves. - Overtopping of roads is observed at two locations where FCW & VCW is located but water logging was observed and reported by local residents in built-up area - Existing roads are largely devoid of side drains. Kachha side drains are present in some open areas and functional. - Junctions: 2 major junction and 24 minor junctions. - Habitations are Deoli Partur, Deoli Ambad, Pangra, Masegaon, Ghonsi Tanda, Ghonshi Village, Dahegaon Devi, Bhendala (Bangalewadi), Kumbar Pimplegaon and Raja Takli. - ROW: 15.0 to 24.0m. - Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and few built-up areas.	- Pavement type: Rigid throughout and Polymer Fiber Reinforced Concrete (PFRC) from km 4.860 to km 5.860 (1000 m). - Junction improvements: 2 major and 24 minor junctions to be improved - Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	11	54	-	-	-	**65**
Slab & Box Culvert	-	-	-	-	9	**9**
Minor Bridge	-	1	-	3	4	**8**
Major Bridge	-	-	-	-	-	**0**
Causeways	-	-	-	-	-	**0**

- Line Drains: 3.432 km (B/S)
- Unlined Drains: 67.649 km (B/S)
- Street Lighting: 30 nos in habitation areas.
- Rainwater harvesting structures: 7 Nos.
- Bus Shelter: 8 Nos,Toilet block: 3 Nos at schools.

15. Wangi-Walwa (SH-158, Part-1), EPC-23

- Length = 41.330 km
- Location: The road section starts from km 28.470 at Wangi village in Sangli district and terminates at km 69.460 at bifurcated junction (Ashta, Islampur, Boregaon and city road) in Walwa village, Sangli.
- Configuration: Intermediate/ 2-lane road with 5.50m-7.00m carriageway with earthen shoulders with flexible/ rigid pavement with moderate conditions except at few distress locations. Pavement condition of the project road is fair to poor.
- Existing roads are largely devoid of side drains. Roadside drains are present in urban parts but they are either choked or non-functional.
- Junctions: 11 major junction and 61 minor junctions.
- Habitations are Wangi, Ambak, Deorastre, Kumbhargaon, Kirloskar wadi, Burli, Amnapur, Ankalkhop, Nagthane, Walwa.
- ROW: 8.0 to 30.0m.
- Plain and Rolling terrain with agri- land.

- Executable Length: 41.330 km
- Proposed ROW: 18.0 to 20.0 m.
- 2-lane rigid pavement with paved/ earthen shoulder of 1.5/ 1.0 m on either side.
- RUP/ROB: ROB at km 47.825 under construction.
- Junction improvements: 1 major and 20 minor

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
Drainpipe		1				**1**
HPC	35	33	3	2	-	**73**
Slab/ Box Culvt						
Minor Bridge	-	1	6	2	*	**9**
Major Bridge	-	-	-	1	-	**1**
Causeways	-	-	-	-	-	**-**

- Line Drains: 18.589 km (B/S)
- Unlined Drains: 63.980 km (B/S)
- Toe wall: 13346 m, Retaining wall: 435 m
- Metal crash barrier: 8982m
- Rainwater harvesting structures = 82 Nos.
- Bus-bay/ Shelter :32 Nos

16. Walwa-Wakurde (SH-158, Part-2), EPC-24

- Length = 42.620 km
- Location: The road section starts from bifurcated junction (Ashta, Islampur,

- Executable Length: 42.620 km
- Proposed ROW: 8.0 to 30.0 m.
- 2-lane rigid pavement with paved/ earthen shoulder

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL

Boregaon and city road) in Walwa village, Sangli at km 69.460 and terminates at km 112.645 near Shirashi village, Sangli.
- Configuration: Intermediate/ 2-lane road with 5.50m-7.00m carriageway with earthen shoulders with flexible/ rigid pavement with moderate conditions except at few distress locations. Pavement condition of the project road is fair to poor.
- VUP: Existing VUP at km 96.253
- Existing roads are largely devoid of side drains.
- Junctions: 8 major junction and 38 minor
- Habitations are Walwa, Navekhed, Borgaon, Farnewadi, Hubalwadi, Bahe, Tambave, Dhotrewadi, Kasegaon, Wategaon, Bhairavwadi and Shirash.
- ROW: 8.0 to 30.0m.
- Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land.

of 1.5/ 1.0 m on either side.
- VUP: VUP is retained at km 96.253.
- Junction improvements: 8 major and 38 minor

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
Pipe Culvert	34	53	5	2	-	**94**
Slab & Box Culvert	-	-	-	-	-	**0**
Minor Bridge	-	1	6	2	-	**9**
Major Bridge	-	-	-	-	-	**0**
VUP	-	-	-	1	-	**1**

- Line Drains: 9.533 km,Unlined: 19.066 km (B/S)
- Toe wall: 6518 m, Retaining wall: 2510 m
- Metal crash barrier: 7617m
- Rainwater harvesting structures = 84 Nos.
- Bus-bay/ Shelter :32 Nos

17. Bhigwan-Baramati (SH-54), EPC-25

- Length = 28.200 km
- Location: The road section starts from Diksal at km 145+000 and ends to Baramati MIDC at km 173+200.
- Configuration: Intermediate/ 2-lane road with 5.50m-7.00m carriageway. Murrum shoulders exist for almost entire length of the highway with width varying from 1.0 to - 1.5 m. around 30% of the pavement is in good condition.
- Around 10.40 km of the stretch passes through black cotton soil (BCS).
- No submergence area is observed in general except in built-up area due to poor drainage. Existing roads are largely devoid of side drains. Roadside drains are present in urban parts but they are either choked or non-functional.
- Junctions: 3 major junction and 13 minor junctions.
- Habitations are Diksal, Bhigwan, Madanwadi, Shetphalgade, Jainakwadi, Lamjewadi, Vanjarwadi, Baramati.
- ROW: 17.70 to 39.18 m.
- Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and barren land.

- Executable Length: 28.200 km
- Proposed ROW: 17.70 to 39.18 m.
- Configuration: Rigid pavement with 2-lane carriageway with paved/ earthen shoulder of 1.5/ 1.0 m on either side in open section and 2-lane carriageway with paved shoulder and 2m footpath on either side in built-up section.
- Junction improvements: 8 major and 38 minor junctions to be improved
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
Pipe Culvert	15	37	-	-	-	**52**
Slab & Box Culvert	1	15	-	1	-	**17**
Minor Bridge	2	4	-	1	-	**7**
Major Bridge	-	-	-	2	-	**2**

- Rectangular Line Drains: 4.300 km (B/S)
- Open Unlined Drains: 46.904 km (B/S)
- Notch type surface drain: 2.5 km
- Retaining wall: 330 m
- Metal crash barrier: 2232m
- Rainwater harvesting structures:56 Nos.
- Bus-bay/ Shelter :12 Nos

EXISTING ROAD'S SALIENT FEATURES	IMPROVEMENT PROPOSAL

18. Bari-Ghoti-Sinnar (SH-23), EPC-26

- Length = 13.400 km
- Location: The road section starts at a T-junction of Ghoti Sinnar State Highway MSH-12 and ends at Nashik Ahmednagar district border in Nashik.
- Configuration: Single-lane with 3.75m bituminous carriageway with earthen shoulder width varying from 1.0 to - 1.5 m. Around 30% of the pavement is in good condition. Pavement condition of the project road is poor to very poor.
- No submergence area is observed in general except in built-up area due to poor drainage. Existing roads are largely devoid of side drains. Roadside drains are present in urban parts but they are either choked or non-functional.
- Junctions: 1 major junction and 9 minor junctions.
- Habitations are Pimpalgaon, Dhamenchwadi, Khed.
- ROW: 15.0 to 20.0 m.
- Terrain and Land use: Plain and Rolling terrain with predominantly agricultural land and barren land with few built-up areas.

- Executable Length: 13.400 km
- Proposed ROW: 15.0 to 20.0 m.
- Rigid pavement with paved/earthen shoulder of 1.5/1.0 m in open section and 2-lane with paver block f and drain in built-up sections.
- Junction improvements: 1 major and 9 minor junctions to be improved
- Cross Drainage Structures:

Cross Drainage	New	Re-construction	Widening	Retain with Repair	Converted	Total
HPC	4	27	-	1	-	**32**
Pipe	-	3	-	-	-	**3**
Slab & Box Culvert	-	3	-	-	-	**3**
Minor Bridge	-	4	-	-	-	**4**
Major Bridge	-	-	-	-	-	**0**

- Rainwater harvesting Structures = 26 Nos.
- Rectangular Line Drains: 0.820 km (B/S)
- Open Unlined Drains: 25.82 km (B/S)
- PCC drain in ghat section: 1.150 km (RHS)
- Toe wall: 455 m, Retaining wall: 800 m
- Wire netting: 170m,Metal crush barrier: 4790m
- Bus Shelter with solar lamps :6 Toilet block: 1 No.

F. Construction Material (Quantity and Sourcing)

47. Due to favorable geological conditions, aggregates for the project are available in abundance in most of the project districts with lead distance range of 05–24 km. The soil characteristics seem to be non-uniform along the project alignments and vary from red soil laterite soil, morrum, alluvial but predominantly black cotton soil. Such variation in soil characteristics imply substantial variation in embankment/ subgrade design. Good earth for embankment is generally available within 0–20 km lead distance other than those dominated by black cotton soil where soil needs to be borrowed from comparatively far distances. Sand is also available in all project districts or nearby districts. Water requirement for construction will be met through combination of groundwater and surface water. Most of the sub-project roads lie within 300 km distance from operational thermal power plants and hence fly-ash utilization is mandatory as per Fly-Ash Notification 2021. Quantity and lead of construction materials are summarized in **Table 6.**

Table 6: Quantity of Construction Material

Road Sections	Quantity and Lead in (km.)					
	Earth (Cum)	Sand (Cum)	Cement (MT)	Aggregates (Cum)	Bitumen (MT)	Water (KLD)
SH-68	210755 (2)	188840 (14)	40336 (0)	333433 (14)	- (273)	-
MDR-84	218414 (2)	155635 (7)	24112 (0)	260025 (7)	5.35 (225)	368.590
SH-119	1921 (-)	77973 (-)	51982 (0)	155946 (-)	-	25.991
SH-149	46812 (0)	34125 (15)	26250 (20)	68247 (15)	469 (250)	-
SH-191	203832 (5-18)	43908 (5-18)	73531 (0)	58984 (5-18)	7.77 (420)	26.78
SH-323	55934 (5)	17771 (7)	18295 (10)	34330 (24)	-	-
SH-349	64382 (5)	14199 (26)	15684 (16)	27430 (12)	-	-
MDR-10	251809 (8)	45371 (40)	21778 (0)	90742 (11)	-	-
MDR-83 (Part-1)	358074 (10)	54732 (20)	21892 (0)	87568 (15)	-	23.92
MDR-83 (Part-2)	558200 (10)	72570 (20)	28393 (0)	113571 (15)	-	31.02
MDR-83 (Part-3)	789505 (10)	71380 (20)	28552 (0)	114209 (15)	-	31.19
MDR-83 (Part-4)	803141 (10)	76195 (20)	30478 (0)	121911 (15)	-	60.54
NH-61 (222)	52795 (10)	72570 (20)	28393 (0)	113571 (15)	-	56.40
SH-222	280677 (5)	52025 (10)	102519 (0)	104947 (10)	-	115.36 (5)
SH-158 (Part-1)	90995 (7-14)	73052 (7-14)	73539 (0)	146104 (7-14)	-	36.769
SH-158 (Part-2)	97958 (10-20)	97958 (10-20)	78633 (0)	156225 (10-20)	-	39.317
SH-54	109055 (1-2)	87949 (5)	34754 (-)	169794 (5)	60 (225)	236.645
SH-23	88544 (3)	20220 (20)	13047 (-)	41452 (20)	-	142.5

Note: the above sources are tentative. EPC contractor is free to select the sources after compliance to legislations/permits and consent from panchayat and concurrence of landowners.

G. Cost and Implementation Schedule

48. Project construction period will be 24 months for sub-project roads followed by 5-year performance-based maintenance. Estimated total civil works cost is approximately ₹3,044 Cr.

III. POLICY AND LEGAL FRAMEWORK

49. This chapter presents a review of the international agreements and commitments, existing institutions and legislations relevant to the project at the National and State level. The environmental assessment process needs to adopt environmental regulations and guidelines of Government of India (GoI) and ADB's safeguard requirements.

A. International Agreements and Commitments

50. India is party to various international agreements/conventions/treaties for conservation of environment at global level. Those that are applicable have been briefly described and analyzed vis- a- vis the project development.

51. **Ramsar Convention on Wetlands, 1971**: The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an inter-governmental treaty, for the conservation and sustainable utilization of wetlands i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value. It provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Out of 25 designated wetlands of international importance in India, none of them is located in project influence area. Activities undertaken in the proximity of these wetlands should follow the guidelines of the convention.

52. **Convention on Protection of the World Cultural and Natural Heritage, 1972**: The United Nations Educational, Scientific and Cultural Organization (UNESCO), which seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity has embodied these objectives in an international treaty called the Convention concerning the Protection of the World Cultural and Natural Heritage in 1972. There are twenty-six world cultural heritage and natural sites in India. None of them is located in project influence area.

53. **Vienna Convention for Protection of the Ozone layer, 1985 and Montreal Protocol on Substances Depleting the Ozone layer, 1987**: The Vienna Convention outlines states responsibilities for protecting human health and the environment against the adverse effects of ozone depletion, and established the framework under which the Montreal Protocol was negotiated. The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere (e.g., chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform) are to be phased out by 2010. The project does not envisage production and consumption of these substances.

54. **United Nations Framework Convention on Climate Change (UNFCCC), 1994**: The UNFCCC is an international environmental treaty with an objective to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. It was adopted on 9 May 1992 and opened for signature at the Earth Summit in Rio de Janeiro in June 1992. It then entered into force on 21 March 1994. India has ratified the second commitment period of the Kyoto Protocol that commits countries to contain the emission of greenhouse gases, reaffirming its stand on climate action. It is the 80th country to do so. The Doha Amendment to the Kyoto Protocol was adopted in Qatar in December 2012. The amendment includes new commitments for parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from January 2013 to December 2020

and a revised list of greenhouse gases to be reported on by Parties in the second commitment period. During the Paris Agreement India emphasized and committed that forest landscapes are at the heart of the country's commitments. It plans to create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through forest and tree cover; to increase forest cover from 25% at present to 33%; and to restore 26 million hectares of land by 2030. At 26th UN Climate Change Conference of Parties (COP 26) summit, India has pledged to cut India's emission by 1 billion tonnes by 2030, reduce carbon intensity of the nation's economy by less than 45% by end of the decade and net-zero carbon emission by 2070.

55. **Convention on Biological Diversity (CBD) 1992**: The Convention on Biological Diversity (CBD) is dedicated to promoting sustainable development and came into force in 1992 Rio Earth Summit. India signed the CBD in 1994. Member Parties have committed themselves to achieve by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.

B. Country Legal Framework and Regulatory Requirements

56. The implementation of the CECIGM will comply with the environmental acts, policies, rules, and regulations of the Government of India which has a comprehensive coverage of environmental issues and requirements. This environmental legal framework imposes command and controls on certain activities deemed detrimental to the environmental integrity and encompass the conservation of various components of the biological and physical environment and environmental assessment procedures and requirements for public consultation. The policies and requirements which are most relevant in the context of this project are provided in **Table 7** below.

Table 7: Summary of Environmental Legislation Applicable to the Proposed Project

S. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
1.	Environment Protection Act-1986	To protect and improve overall environment	Yes	Umbrella legislation and notifications, rules and schedules are promulgated under this act.	MOEFCC GoI; State Govt., MPCB
2.	Environmental Impact Assessment Notification,14th Sep-2006 [24]	To accord environmental clearance to new project/ activities listed in schedule of EIA notification.	Yes	EPC-10 (SH-68) fall within ESZ boundary of Great Indian Bustard (GIB) Sanctuary and hence trigger Environmental Clearance.	MOEFCC.
3.	Wildlife Protection Act, 1972 (as	To protect the wildlife due to project development and operation	Yes	EPC-10 (SH-68) fall within ESZ boundary of Great Indian Bustard (GIB) Sanctuary and hence trigger Wildlife Clearance.	MoEFCC/NBWL

[24] All New State Highways; and State Highway expansion projects located in hilly terrain (above 1,000 m mean sea level) and or ecologically sensitive areas.General Conditions Shall Apply: General Conditions: Any project specified in Category 'B' will be treated as Category A, if located in whole or in part within 5 km from the boundary of: (i) Protected Areas notified under the Wildlife (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board, (iii) Notified Eco-sensitive areas, (iv) inter-State and international boundaries.
Note: Since the general conditions will be applicable, EPC-10 sub-projects will be categorised as A and hence to be appraised by MOEFCC.

S. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
	amended)[25]				
4.	Fly Ash Notification, as amended 22nd April 2021:	Reuse fly ash to minimize land requirement for disposal and soil contamination	Yes	Most of the sub-projects are located within 300 km from TPP.	MOEFCC
5.	National Environment Appellate Authority Act (NEAA) 1997	Address Grievance regarding the process of environmental clearance.	Yes	Grievances if any will be dealt with, within this act.	NEAA
6.	The Forest (Conservation) Act 1980 and its amendments	To check deforestation by restricting conversion of forested areas into non-forested areas	Yes	Forest diversion is required for 9 roads; MDR-84 (1.02 Ha), SH-119 (6.56 Ha), SH-149 (4.6051 Ha), SH-191 (0.8 Ha), MDR-10 (3.876 Ha), MDR-83 (2.664 Ha), NH-61 (0.9 Ha), SH-54 (1.25 Ha) and SH-23 (1.97 Ha)	State Forest and MOEFCC RO
7.	The Maharashtra Felling of Trees (Regulation) Act, 1964	To restore tree, cover equal to or more for trees likely to be cut	Yes	7,679 trees (all sub-projects put together) likely to be felled for the project.	RFOs/DCs
8.	Air (Prevention and Control of Pollution) Act, 1981	To monitor air pollution due to equipment and machineries potential to emit air pollutants from hot mix plant, crushers, DG set and vehicles.	Yes	Consent for Establishment (CTE) and Consent for Operation (CTO) from MPCB; for establishment of hot mix plant, crushers, workers/ construction camp,	MPCB
9.	Water Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	This act will be applicable during construction for (establishments of hot mix plant, construction camp, workers' camp, etc.	MPCB
10.	Permission of Abstraction of Groundwater	To conserve and augment the groundwater resources	Yes	All infrastructure projects abstracting ground water requires prior permission	CGWA
11.	Noise Pollution (Regulation and Control Act) 1990	The standards for noise for day and night have been promulgated by the MOEFCC for various land uses.	Yes	This act will be applicable as vehicular noise on project routes required to assess for future years and necessary protection measure need to be included in design.	MPCB
12.	Explosive Act 1984	Safe transportation, storage and use of explosive material	Yes	In case of opening new Quarries	Chief Controller Explosives

[25] As per MoEF&CC OM F.No. 22-43/2018-IA.III dated August 08, 2019, Proposals involving developmental activity/project located within the notified Eco-Sensitive Zones (ESZ) shall be regulated and governed by the concerned ESZ notification. However, for the developmental project/activity located within the notified ESZ and covered under the schedule of the EIA Notification 2006, prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) is mandatory

S. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
13.	Maharashtra Minor Mineral Extraction (Development and Regulation) Rules, 2013	To regulate excavation, production, storage, collection, distribution, transportation, manufacturing, possession, purchase and sale of any minor mineral including soil	Yes	Project requires sand, aggregates, soil and other minor minerals in large quantity.	District Collector and State Mines Dept.
14.	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	To check vehicular air and noise pollution.	Yes	These rules will be applicable to road users and construction Machinery.	Motor Vehicle Department
15.	National Forest Policy1952 National Forest Policy (Revised) 1988	To maintain ecological stability through conservation and restoration of biological diversity.	Yes	This policy will be applicable as project intervention requires forest land to be acquired.	Forest Dept. GoI and GoB
16.	The Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996	To regulate the employment and conditions of construction workers and to provide for their safety, health and welfare measure and for other matter incidental thereto	Yes	A large number of construction workers skilled, semiskilled or unskilled will be employed temporarily during Construction Phase of the project	Ministry of Labor and Employment Government of India
17.	Bonded Labor (Abolition) Act, 1976 and Rules, 1976	Abolition of bonded labor.	Yes	Construction workers skilled, semiskilled or unskilled will be employed temporarily during Construction Phase	Ministry of Labor and Employment GOI
18.	Contract Labor (Regulation and Abolition) Act1970 and rules, 1971	Prevent exploitation of contract labor and introduce better work conditions	Yes	- Do-	- Do-
19.	Employees Provident Funds Miscellaneous Provisions Act1952	secure well-being of the employees when contractors employ more than 20 persons	Yes	- Do-	- Do-
20.	Minimum Wages Act 1948 along with Central Rules1950	Ensure that workers get at least minimum wages as fixed by the state/central Govt. whichever is higher	Yes	- Do-	- Do-
21.	Public Liability and Insurance Act 1991	Protection from hazardous materials and accidents.	Yes	Contractor need to stock hazardous material like diesel, Bitumen, Emulsions	- Do-
22.	Solid waste Management Rules 2016	Utilization of Solid waste to Reduce, Reuse and Recycle.	Yes	Manage domestic solid waste generating from labour colonies.	Central Public Health and Environmental Engineering Organization (CPHEEO)
23.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.	Scientific disposal of hazardous waste through collection, storage, packaging, transportation and treatment, in an environmentally sound manner minimises the adverse impact on human health and on the environment.	Yes	Use of hazardous substances viz; bitumen/tar, emulsions, oil etc	CPCB

S. No	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
24.	The Maharashtra Ancient Monuments and Archaeological Sites and Remains Rules, 1962	Act for the preservation of ancient and historical monuments and records and archaeological sites and remains (other than those declared to be of national importance) in the State of Maharashtra.	Yes	Provides procedure for moving antiquities	ASI
25.	E-Waste (Management) Rules, 2016	Recovery and/ or reuse of useful material from e-waste, thereby reducing the hazardous wastes destined for disposal and to ensure the environmentally sound management of all types of waste of electrical and electronic equipment.	Yes	Use of electric bulbs, lamps, batteries, computers parts etc	MPCB
26.	Construction and Demolition Waste Management Rules, 2016	Recover, recycle and reuse the waste generated through construction and demolition.	Yes	Dismantling of existing structures	(CPHEEO)

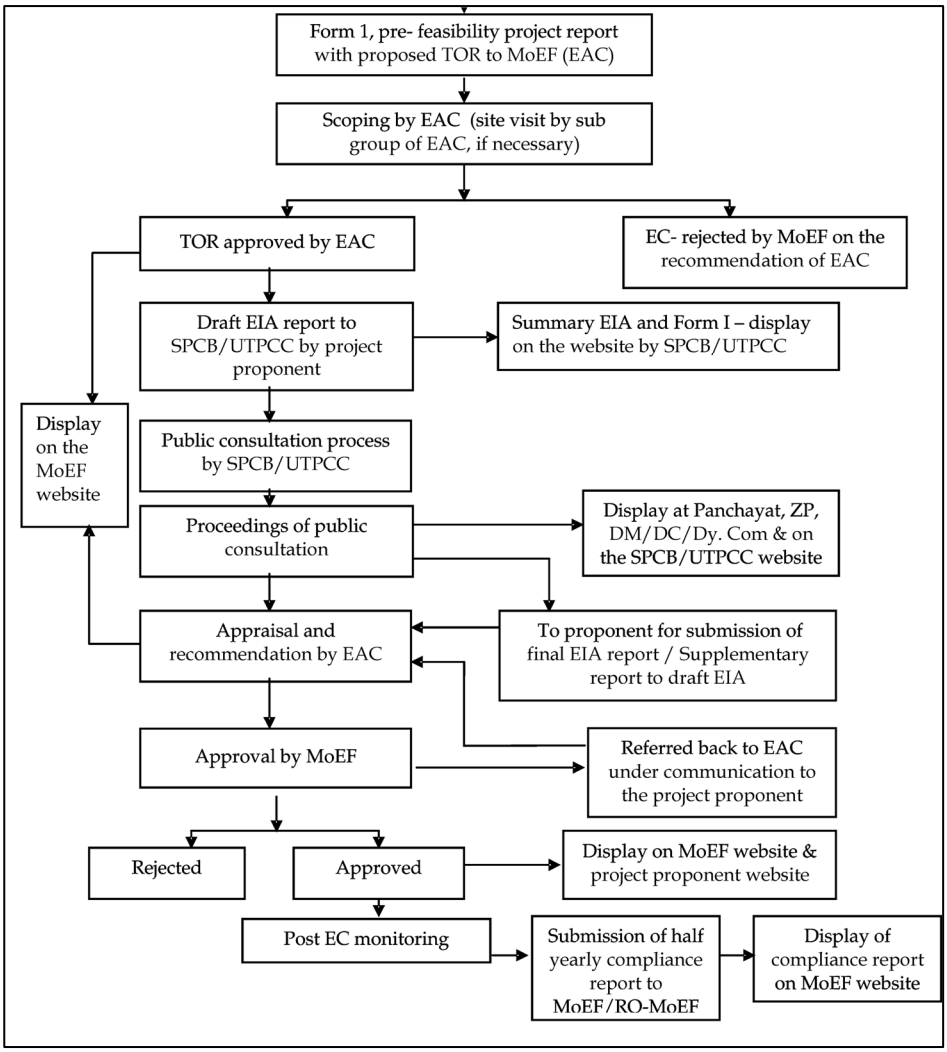
C. Procedure for Obtaining Key Clearances/Permits

57. **Environmental Clearance:** The environmental clearance process to be followed for Category A projects will comprise following stages described sequentially in following paras.:

i. **Scoping:** It refers to the process by which the Expert Appraisal Committee (EAC) determine detailed TOR for the preparation of an EIA. The EAC shall determine the TOR on the basis of information furnished in the prescribed Form 1 and pre-feasibility report including TOR proposed by the applicant. A site visit by a sub-group of EAC may be conducted only if considered necessary by the EAC.

ii. **Public consultation** refers to the process by which the concerns and views of affected/local persons and other stakeholders are ascertained. It is exempted in case this case since land acquisition is not involved in both sub-projects.

iii. **Appraisal:** scrutiny of final EIA and outcome of the public consultations if applicable. Flow-chart depicting clearance process for category A project is illustrated below.



58. **Forest Clearance:** MOEF&CC has initiated online submission and disposal of forest clearance cases. The stepwise procedure and workflow with timeline for securing forest clearance is summarized below in **Table 8**.

Table 8: Workflow with Timeline for Forest Clearance

Step	Activity	Timeline
1	✓User Agency has to register on 'http://www.parivesh.nic.in' to get login credentials. ✓User agency has to authorize an official for making application on behalf of UA ✓Form- A (Part-I) has to be uploaded along with all enclosure. ✓Prior to online application, the User Agency has to arrange key data such as alignment marked on Survey of India Toposheet, Kml file, Geo-referenced map, Land schedule of Forest Land, Project summary etc. for uploading application. ✓Application is forwarded online to the Nodal Officer (FC). After submission, automatically an acknowledgement letter would be sent (by System) to email-id of (Applicant) User Agency, comprising single window proposal number. This unique proposal number should be referred for all future references.	NA

Step	Activity	Timeline
2	✓Nodal Officer scrutinizes the proposal (within 10 days) and sends an acceptance letter to User Agency, if the proposal is complete in all respect, an acceptance letter would be sent (by System) to email-id of User Agency, parallelly the details of proposal in online mode are forwarded to concerned DFOs and DCs for action. ✓In case of any shortcomings or any other information is needed, Nodal Officer will raise Essential Details Sought (EDS). EDS letter would be sent (by System) to email ID of User Agency. User Agency to upload that missing information. ✓Timeline of processing of proposal will start only if Nodal officer accepts the proposal subject to its completeness	10 Days
3	✓User Agency has to submit hard copies of Forest Diversion Proposal to DFO concerned and District Collector and upload scanned copy of the receipt copy for submission of hard copies of the proposal. After uploading receipt of hard copy online proposal will be automatically redirected to DFOs concerned. ✓As a parallel activity, user agency may apply to the District Collector for certificate under 'Forest Right Act, 2006'.	NA
4	✓DFO reviews the proposal, conducts joint site inspection with user agency & process Part-II / Form-A of the Forest Diversion Proposal. DFOs have to upload Compensatory Afforestation Scheme, Recommendation/Site Inspection report in Part-II / Form(A), If FRA certificate is available same may be uploaded by DFO. ✓As a parallel activity District Collector (DC) can view the proposal after logging in to portal. DC may also upload FRA Certificate. ✓When, DFO uploads the recommendation and Site Inspection Reports, proposal details are forwarded automatically to CF/CCF for the necessary action.	30 days up to 40 ha, 45 days for 40-100 ha & 60 days for more than 100 ha
5	✓CF/CCF reviews the proposal and recommendation of DFO after logging in to portal. Site inspection of CF/CCF is mandatory for area above 40 hectares. For proposals less than 40 ha area it is CFs discretion to undertake site visit or not. ✓CF/ CCF, uploads the part-III / Form-A on the portal along with specific recommendation (if any) and Site Inspection report (if site inspection done). ✓Once, CF/CCF uploads recommendation and Site Inspection Reports on the online portal, proposal is forwarded automatically to Nodal Officer	10 Days up to 40 ha & 30 days for more than 40 ha area.
6	✓Nodal Officer reviews the proposal and recommendations of DFO and CF/CCF and check enclosures of the proposal and then process it. Nodal Officer uploads the part-IV/Form-A on the portal along with recommendation and site inspection report. Nodal Officer's (State Govt level), site visit is not mandatory. ✓When, Nodal Officer uploads recommendation and site inspection reports, proposal is forwarded automatically to Secretary, Environment & Forest, State Government for forwarding proposal to the Regional Office, MoEF&CC.	10 days for 0-5 ha, 20 for 5-40 ha, 25 for 40-100 ha & 30 days for > 100 ha
7	✓Secretary, Environment & Forest of State Government reviews the proposal and recommendations of DFO, CF/CCF and Nodal Officer and then processes it. Then he uploads Part-V/Form-A along with his recommendation. ✓Once, State Secretary uploads recommendation on the portal, the Forest Proposal are forwarded automatically to concerned Regional Office of MoEF&CC.	30 days irrespective of the area involved.
Total Time required for processing of Forest Diversion Proposal up to State Government Level. - 110 days for 0-5 ha, 120 days for 5-40 ha, 150 days for 40-100 ha, & 180 days for area above 100 ha.		
Timeline for processing of Forest Diversion Proposal in MoEF&CC at Central Government level.		
1	Regional Office of the MoEF&CC, examine completeness of the proposal & recommendation of State Govt. In case of any shortcomings, RO/MoEF&CC may raise Essential Details Sought (EDS) to State Government. If the proposal is complete in all respect, it is eligible to be processed for Stage-I Forest Clearance.	5 days for 0-40 ha, & 10 days for > 40 ha.

Step	Activity	Timeline
2	✓The cases of In-Principle approvals (Stage-I Forest Clearance) for diversion of forest land up to 5 ha is accorded at Regional Office without appraising the proposal in meeting of Regional Empowered Committee (REC) Meeting. ✓The proposals of more than 5 ha area are proposed, has to be discussed in the meeting of Regional Empowered Committee (REC) at RO/MoEF&CC. ✓After considering case in REC meeting, formal Stage-I Forest Clearance will be issued to Secretary, Forest & Environment Department / Nodal Officer	30 days
Total Time required for processing of Forest Diversion Proposal at Regional Office, MoEF&CC- 35 days for 0-40 ha & 40 days for proposals above 40 ha are		
Deposition of Payment for Net Present Value / Compensatory Afforestation, etc.		
1	Secretary, Forest & Environment Department / Nodal Officer (FC) of State Government shall communicate Stage-I Forest Clearance letter to the concerned user agency along with demand note for payment of Net Present Value.	1-7 days.
2	DFO issue demand note for payment of Compensatory Afforestation and other cost	1-7 days.
3	After obtaining demand note of NPV / CA, user agency uploads the demand on online portal for approval of the Nodal Officer (FC).	1 day.
4	Nodal Officer (FC) review the demand note and approve same.	1-3 days.
5	After approval of demand note, user agency generates 'online bank challan' for deposition of NPV / CA cost. Thereafter, payment has to be made within 10 days. Failing which fresh 'online bank challan' needs to be generated.	1 day.
6	User agency make payment	NA
Working Permission and Tree Felling Permission at DFO level.		
1	User agency submit point wise compliance report (of the conditions stipulated in the Stage-I Forest Clearance letter) to the DFOs concerned with a request to issue Working Permission and Tree Felling Permission.	NA
2	DFOs concerned review the compliance report / payment of NPV & CA and issues Working Permission and Tree Felling Permission.	1-7 days.
Stage-II Forest Clearance (Final Approval)		
1	DFO send compliance report (of the conditions stipulated in the Stage-I Forest Clearance letter) to the Nodal Officer (FC)	1-10 days
2	Nodal Officer reviews compliance and forward to the Regional Office of MoEF&CC.	1-10 days
3	Regional Office, MoEF&CC review compliance of conditions stipulated in Stage-I Clearance and issues Stage-II Forest Clearance (Final Approval) to State Govt.	30 days.
4	State Govt communicates Stage-II Forest Clearance letter to the user agency.	1-10 days.
Diversion of Forest Land in favour of user agency at State Government level.		
1.	File pertaining to diversion of Forest in favour of user agency is processed at State Government level and after approval of Secretary, Environment & Forest Department, the land is diverted in favour of user agency by a notification	1-2 months.

59. Wildlife Clearance: As per MoEF&CC OM F.No. 22-43/2018-IA.III dated August 08, 2019, Proposals involving developmental activity/project located within the notified Eco-Sensitive Zones (ESZ) shall be regulated and governed by the concerned ESZ notification. However, for the developmental project/activity located within the notified ESZ and covered under the schedule of the EIA Notification 2006, prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) is mandatory. The stepwise procedure and workflow with timeline for securing forest clearance is summarized below in **Table 9.**

Table 9: Work Flow with Timeline for Wildlife Clearance

Step	Activity	Timeline
1	✓ The User Agency/Project Proponent is required to file the application online as provided in the User Manual of Online Submission and Monitoring of Environmental, Forests and Wild Life Clearance – a Single Window Clearance System, attached herewith. (User manual has been uploaded on the website. http://www.moef.nic.in/division/orders-and-releases) ✓ The user agency can also track the movement of the proposal through different stages of processing through the online clearance system. Following timelines will be adhered by all the officials responsible for the activities indicated.	N/A
2	**DFO/Wildlife Warden** ✓ i. Initial scrutiny in 5 days of receipt of the proposal ✓ ii. 30 days after receipt of complete proposal for site inspection, consultation with Conservator of Forests/Chief Conservator of Forests/Addl. Principal Chief Conservator of Forests and forwarding to the Chief Wildlife Warden	35 Days
3	**Chief Wildlife Warden** ✓ Receipt of proposal for scrutiny and recommendation to the State Government for placing before the State Board for Wildlife.	20 Days
4	**Consultation with State Board for Wildlife and recommendation of State Government** ✓ The activity involves decision of the State Government, consultation with State Board for Wildlife and thereafter, recommendation of State Government to Ministry of Environment, Forest and Climate Change enclosing the copy of the minutes of the State Board for Wildlife. ✓ State Board for Wildlife is chaired by Hon'ble Chief Minister.	90 Days
5	**MoEF&CC** ✓ Initial scrutiny in 5 days of receipt of the proposal ✓ 30 days after receipt of complete proposal for Standing Committee of National Board for Wildlife.	35 Days
6	**Consultation with Standing Committee of National Board for Wildlife** ✓ Meetings of Standing Committee of National Board for Wildlife	90 Days

60. **Tree Cutting Permission:** In the State of Maharashtra tree felling permission (i.e., excluding urban areas) is issued by the tree authority i.e., Range Forest Officer under the Maharashtra Felling of Trees (Regulation) Act, 1964. The tree felling permission is required only in case of tree species mentioned in the schedule in the Act. The number of species for which felling permission is required is 15 species. All issues relating to felling of trees and transit permission situated in lands that are private and not notified as Reserve Forest, Protected Forest or unclassed forest, identified forest, Mangrove Forest, Zudpi Jungle, etc. in Government records shall follow the guidelines issued on 24 April 2017, namely, Ease of Doing Business – Guidelines for Tree Felling and Transit Permission. Timeline for obtaining tree cutting permission is summarised in **Table 10.**

Table 10: Key Activities with Timeline for Obtaining Tree Cutting Permission

S.No.	Particulars	Timeline
1	Issuing Acknowledgement to the Applicant after submission of application: Verification of application and accompanying documents to ascertain completeness of the application as indicated at the Website and major issues	7 days
2	Tree Officer will arrange for forest survey when the applicant's land is adjoining to Govt. Forest land for verification of boundary through TILR map. He will also arrange for joint survey (forest surveyor and TILR).	15 days
3	Tree officer will send all the case papers to concerned Round Officer for document verification and field inspection. The Round Officer shall – check 7/12 extract, boundary of the survey number, Verify the list of trees species-wise, girth-class wise, permission from DC, (felling of trees within 30 meters of extreme edge of the bank of any watercourse), NOC from adjoining owners, Drawing Panchnama etc.	8 days
4	Submission of report by Round Officer to the Tree Officer	2 days
5	Based on the observations/recommendations of Round Officer, the Tree Officer will call objections from public if any, by way of issuing Advertisement (Jahirnama) in Gram Panchayats. Enquire into the objections received and process the application	15 days
6	Field inspection and related enquiries by Tree Officer. (a) enquiry will ensure that the trees to be felled belong to occupant (b) decide the species-wise number of trees permitted to be felled after inspecting status of trees (c) decide the number of trees to be planted by the applicant, if necessary, in the ensuing rainy season	10 days
Total Time Required		**60 days**

61. **Permission for Groundwater Abstraction:** The Honorable National Green Tribunal (NGT), in its judgment dated 1 November 2016 issued directions to ensure that all existing, new and expansion industries/projects including infrastructure projects extracting ground water should obtain permission from Central Ground Water Authority. It is applicable irrespective of Quantity and Categories (safe, semi-critical, critical and overexploited) based on the ground water resources estimation 2009 by Central Ground Water Board. Steps for filing application form for obtaining NOC/permission is available on Central Ground Water Authority (CGWA) website: (http://cgwa-oc.gov.in/LandingPage/GuidelinesonlineFilling/steps_for_online_filling_of_application-08Aug2019.pdf#ZOOM=100).

D. Relevant Indian Road Congress (IRC) Codes to the Project Road

62. Key IRC guidelines have been summarized in **Table 11** that has a direct/ indirect bearing on the environmental management during design and construction stages.

Table 11: Applicable Indian Road Congress (IRC) Codes

Sr. N.	IRC code Theme	IRC code
1	Recommended practice for borrow pits for Rural Road embankments	IRC: 10 1961
2	Guidelines for Pedestrian Facilities	IRC: 103 -1988
3	Guidelines for EIA of Highway projects	IRC:104-1988
4	Ribbon developments on highways and its prevention	IRC: SP: 1996
5	Manual on Landscaping of road	IRC: SP: 21-1979
6	Report on recommendations of IRC Regional workshops on highway safety	IRC: SP: 27-1984

Sr. N.	IRC code Theme	IRC code
7	Road safety for Children (5-12 years old)	IRC: SP: 32-1988
8	Guidelines on road drainage	IRC: SP: 42-1994
9	Highway safety code	IRC: SP: 44-1994
10.	Guidelines for safety in construction zones	IRC: SP: 55-2001

E. ADB Safeguard Requirements

63. The Asian Development Bank has defined its environmental safeguard requirements under its Safeguard Policy Statement, 2009 (SPS 2009). The SPS 2009 key requirements include screening for significant impacts and categorization, consultation, and disclosure. Proposed projects are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts. Projects are classified into the following categories:

a. **Category A**. The proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA) including an environmental management plan (EMP), is required.
b. **Category B**. The proposed project's potential environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, is required.
c. **Category C**. The proposed project is likely to have minimal or no adverse environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.
d. **Category FI**. The proposed project involves the investment of ADB funds to, or through, a financial intermediary.

64. Project categorization has been done using REA checklist following the guidance provided above and the project is categorized as B. As per SPS 2009, **Category B** projects warrant preparation of an IEE. The SPS includes 11 policy principles on environment safeguards on screening, conduct of environmental assessment, alternative analysis, mitigation hierarchy, need for meaningful consultation, public disclosure, environmental management planning, biodiversity protection and conservation, pollution prevention, occupational health and safety, and conservation of physical cultural resources.

IV. DESCRIPTION OF EXISTING ENVIRONMENT

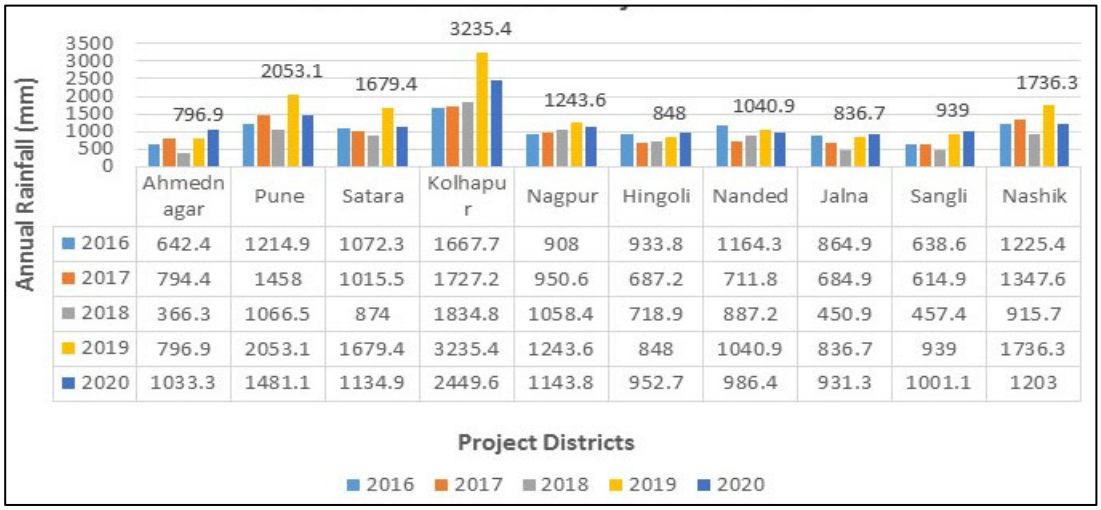
A. Physical Environment

1. Climate

65. **Seasons:** The State experiences four seasons during a year with four meteorological sub-regions namely Konkan, Madhya Maharashtra, Marathwada, and Vidarbha. Maharashtra has tropical monsoon climate, with hot, rainy and cold weather seasons. Tropical conditions prevail all over the state, and even the hill stations are not that cold. However, dew, frost and hail also occur sometimes, depending upon the seasonal weather. The winter in January and February is followed by the hot scorching summer from March onwards. Summer is followed by rainy monsoon in early June to September. The important factor which influences the climate is the towering presence of the Western Ghats which block the monsoon bearing winds from the Arabian Sea and cause good rainfall in the Konkan region and the peaks of the Sahyadris.

66. **Rainfall:** Rainfall is the sole source of natural recharge to the ground water regime. There are large variations in the quantity of rainfall within different parts of the state. Ghat and coastal districts receive an average annual rainfall of 2000 mm but a large part of the state lies in the rain shadow belt of the Ghat with an average rainfall of 600 to 700 mm. The rainfall variations from 500 to 5000 mm have been recorded with an average rainfall of 1000 mm distributed over 60-70 days in a year. Among the project districts, highest rainfall over the last 5 years from 2016 to 2020 is recorded in Kolhapur district with annual rainfall of 3235 mm in the year 2019 and lowest recorded annual rainfall is 366 mm in 2018 in Ahmednagar district. The average annual rainfall in the project districts of Ahmednagar, Pune, Satara, Kolhapur, Nagpur, Hingoli, Nanded, Jalna, Sangli and Nashik is less than 1200 mm rainfall every year. About 85% rainfall is from the southwest and occurs during June-September. Annual rainfall (mm) during 2016-2020 in the project districts is shown in **Figure 2.**

Figure 2: Average Annual Rainfall in the State and Project Districts



	Ahmednagar	Pune	Satara	Kolhapur	Nagpur	Hingoli	Nanded	Jalna	Sangli	Nashik
2016	642.4	1214.9	1072.3	1667.7	908	933.8	1164.3	864.9	638.6	1225.4
2017	794.4	1458	1015.5	1727.2	950.6	687.2	711.8	684.9	614.9	1347.6
2018	366.3	1066.5	874	1834.8	1058.4	718.9	887.2	450.9	457.4	915.7
2019	796.9	2053.1	1679.4	3235.4	1243.6	848	1040.9	836.7	939	1736.3
2020	1033.3	1481.1	1134.9	2449.6	1143.8	952.7	986.4	931.3	1001.1	1203

67. **Temperature:** Temperature varies between 22°C-45°C during summer and 12°C-34°C during winter season. The spatial changes in minimum temperatures are decreasing in most parts of Western Ghats. Pre-monsoon maximum temperatures have increased significantly over the west coast. Average summer temperatures reach to 38–41°C, and winter temperatures

average about 21–23 °C in the non-coastal areas.

2. Topography/ Landforms and Drainage:

68. **Topography/ Landforms**: The topography of Maharashtra is characterized by a narrow coastal plain that separates the Arabian Sea from the Western Ghat Mountains. On the eastern side of the mountains the climate is drier, and the topography is characterized by a large plateau formed by a series of tablelands that occupy most of the central part of the state. The State is divided into nine agro-climatic zones differentiated mostly by rainfall, soil and cropping patterns. The western coastal plains have high rainfall, followed eastward by the ghat mountain zone, the transition zone, and the drought prone zones. The eastern zones are again characterized by moderate to high rainfall patterns. District wise topography is summarized in **Table 12.**

Table 12: Topography of Project Districts

Ahmednagar
Largest district with geographical area of 17,418 sq. km. Topographically divided into two natural regions viz., the western region comprising of the hilly area and the eastern low-lying region. The Sahyadri Mountain ranges pass through the Akola tehsil. It lies between 18°2' to 19° 9' N latitude and 73° 9' to 75° 5' E longitude with covering 14 tehsils. The elevation of the district is 649m (amsl).
Pune
Pune is the largest district of the State with geographical area of 15,642 sq. km. The landscape of Pune district is distributed triangularly in western Maharashtra at the foothills of the Sahyadri Mountains and is divided into three parts viz; Ghatmathall, Mavalll and Desh. It lies between 17°5' to 19° 2' N latitude and 73° 2' to 75° 1' E longitude with covering 14 tehsils. The elevation of the district is 562 m (amsl).
Satara
The district shows a contrast of immense dimensions and reveals a variety of landscapes influenced by relief, climate and vegetation. The variation in relief ranges from the pinnacles and high plateaus of main Sahyadrians range having height over 4500 feet above mean sea level to the subdued basin of the Nira River with the average height of about 1700 feet above mean sea level.
Kolhapur
Kolhapur district extends from15°43' to 17°10' North latitude and 73° 40' to 74° 42' East longitude with area of 7658 sq.km. Kolhapur is situated in the western ghat having steep slope towards the western side and gentle slope towards the eastern side characterized by ridges and valleys and form a part of Deccan plateau which made of lava material.
Nagpur
The location of Nagpur is 79°7' East and 21°7' North. Nagpur is situated at a height of 312.42 m above sea level. The underlying rock is mainly Deccan Trap. The lava flows here gave rise to flat topped and terraced features. Crystalline Metamorphic Rock such as granites, schist and gneiss cover the Eastern halves. The yellowish sand stones and clays of the lower Gondwana can be found in the Northern Part.
Hingoli
The district lies between 19.05° to 20.05° North and 76.30° to 77.30° East. It lies on the Deccan plateau, with slope towards southwest and southeast and has a varied topography consisting of hills, plains and undulating topography near river-banks. It is at elevation of about 500 m above sea level.
Nanded
Nanded lies between 18º 15' to 19º 55' North and 77º to 78º 25' East. The entire district forms a part of the Deccan plateau having plain terrain with undulations. The Southern part has light and barren land. The North - Eastern part is mountainous and largely barren. The remaining part of the district is mostly flat and has fertile black soil. There are three distinct traces of elevation ranging from 350 to 570m, 570 to 600m, and above 600 m (amsl).
Jalna
Jalna lies between 19.01º N to 21.03º N and from 75.04º E to 76.04º E with gently to moderately sloping topography. The Northern part is occupied by the Ajanta and Satmala hill ranges. Ground slope in the district is towards east and south-east. Elevations of the hilly regions range from 600 to 900m (amsl) and of the plains from 450 to 600 m (amsl).
Sangli
Located between 16º45’ N and 17º33’ N and 73º41’ East and 75º41’ East. The hill ranges are flanked by relatively lower elevation foothill zones, characterized by sloping rolling topography, gradually merging into the plains, extending along the river valleys. The ground elevation in the foothills generally vary from 550m to 600m (amsl).
Nashik

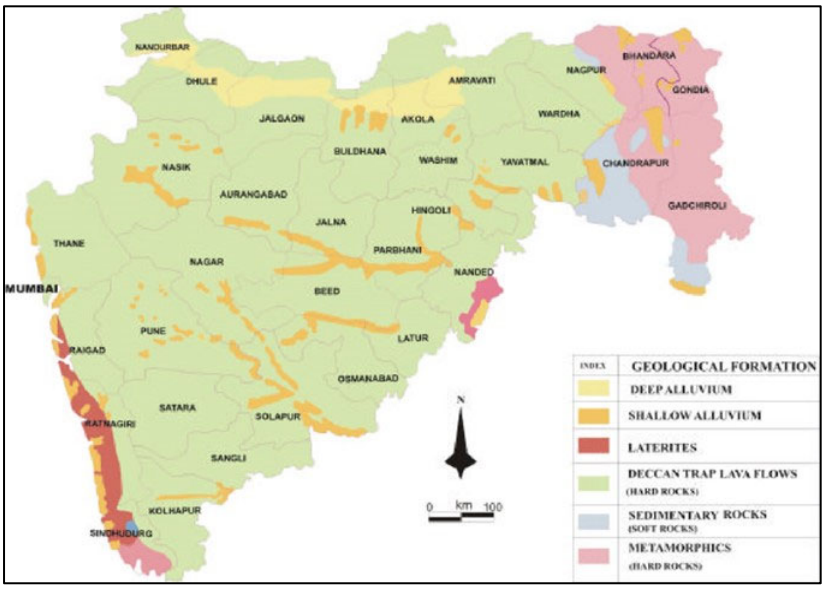
Nashik lies between 18.33 º North and 20.53 º North and between 73.16 º East and 75.16 º East at Northwest part of the Maharashtra state and at elevation of 565 meters above mean sea level. Western Ghats or Sahyadri range stretches from north to south across the western portion of the district.

69. **Drainage:** Project districts are drained by a number of major rivers and tributaries. The important rivers flowing through Ahmednagar district are Godavari, Bhima, Sina and Dhora river and Pravara, Mula, Mahalungi and Adhale are few tributaries. The major rivers flowing in the Pune district are the Nira and Karha rivers. The major rivers flowing in the Satara district are Man River in the south-east and the Kishna River in the south with Kudal, Vena, Urmodi, Tarli, Koyna, Vasna and Verla as the main tributaries of Krishna River. The major tributary flowing in the Kolhapur district is Panchaganaga tributary of Krishna River. The major rivers flowing in the Hingoli district are Penganga and Kayadu rivers. The principal rivers of Nanded district are Godavari, the Penganga, the Manjara and the Mansar. Godavari river has three tributaries Asna, Sita, and Siddha. Similarly, Manjara river has Mannar and Lendi as tributaries.

3. Geology and Soil

70. **Geology:** The entire State forms a part of the “Peninsular Shield” that is composed of rocks commencing from the most ancient rocks of diverse origins, which have undergone considerable metamorphism. Over these ancient rocks of Precambrian era lie a few basins of Proterozoic era and permo-carboniferous periods which are covered by extensive sheets of horizontally bedded lava flows comprising the Deccan trap. More than 80% of the State is covered by these Deccan trap, which have concealed geologically older formations. Important economic minerals such as coal, iron and manganese ore, limestone, etc. are found in the geologically older formations. Geological map of Maharashtra is shown in **Figure 3**.

Figure 3: Geology and Mineral Map of Maharashtra



71. The major geological formations of the project districts are summarized in the **Table 13.**

Table 13: Major Geological Formation of Project Districts

Ahmednagar
Recent Alluvium (Sand and gravel) and Deccan Trap Basalts. Water Bearing Formation are Hard Rock Deccan Traps/ Weathered/ Fractured/ Jointed massive or vesicular Soft Rock.

Pune
Underlain by the basaltic lava flows of upper Cretaceous to lower Eocene age which occupies more than 95% of the area. The shallow alluvials of recent age occurs along the major rivers like Bhima, Ghod, Mula, Mutha and tributaries.
Satara
Underlain by Deccan trap basaltic lava flow of Upper Cretaceous to Lower Eocene age. The shallow alluvial formation of recent age also occurs as narrow stretch along the major rivers flowing in the district however, they have limited areal extension.
Kolhapur
The major portion of district is covered by Basaltic lava flows of upper Cretaceous to lower Eocene age. These flows are part of the plateau Basalt of the Peninsular India, and believed to have been extruded by fissure type of Volcanoes
Nagpur
Archeans and the Deccan trap basalts are the two consolidated formations which form the Hard rock aquifers. Archeans are the crystalline rocks comprising of gneiss, schist, pegmatite and quartzite occurring in northeastern and southeastern parts of the district.
Hingoli
Underlain by basaltic lava flows and alluvium only. The basaltic lava flows belonging to the Deccan Traps occupy about 98% of the area. Alluvium occurs as small patches along banks, flood plains and meanders of main rivers.
Nanded
Recent Alluvium (Sand and gravel) and and Deccan Basalt of upper Cretaceous to lower Eocene age. Vindhyan (Sandstone and Limestone) of Precambrian and Peninsular Granite Gneisses Complex, Intrusive Granite, Dolerite Quartz vain, BHQ of Archean.
Jalna
Recent Alluvium (Sand and gravel) and Deccan Trap Basalt geological formation of upper Cretaceous to lower Eocene age.
Sangli
Mainly district is underlain by Deccan lava flows of Upper Cretaceous to Eocene Age, where in alluvium is restricted along riverbanks. Deccan Traps are horizontally disposed thick piles of basaltic lava flows, which are apparently more or less uniform in composition.
Nashik
Entire district is underlain by the basaltic lava flows of upper Cretaceous to lower Eocene age. The shallow alluvial formation of Recent age also occurs as narrow stretch along the banks of Godavari and Girna Rivers. Basaltic lava flow occupies about 90% of the area

Source: District Groundwater Brochures, CGWB.

72. **Soil**: The soil of Maharashtra is residual, derived from the underlying basalts. In the semi-dry plateau, the soil is clayey, rich in iron and moisture-retentive, though poor in nitrogen and organic matter. When re-deposited along the river valleys, soils are deeper and heavier, better suited for Rabi crops. Farther away, with a better mixture of lime, the morand soils form the ideal Kharif zone. The higher plateau areas have pather soils, which contain more gravel. The soil in the Deccan plateau is made up of black basalt soil. This type of soil is rich in humus. The soil is commonly known as the black cotton soil because it is best suited for the cultivation of cotton. Waliganga river valley has saline soils which are infertile. The soil type varies from district to district in the state of Maharashtra. The soil of project districts is summarized in the **Table 14.**

Table 14: Soil Formation of Project Districts

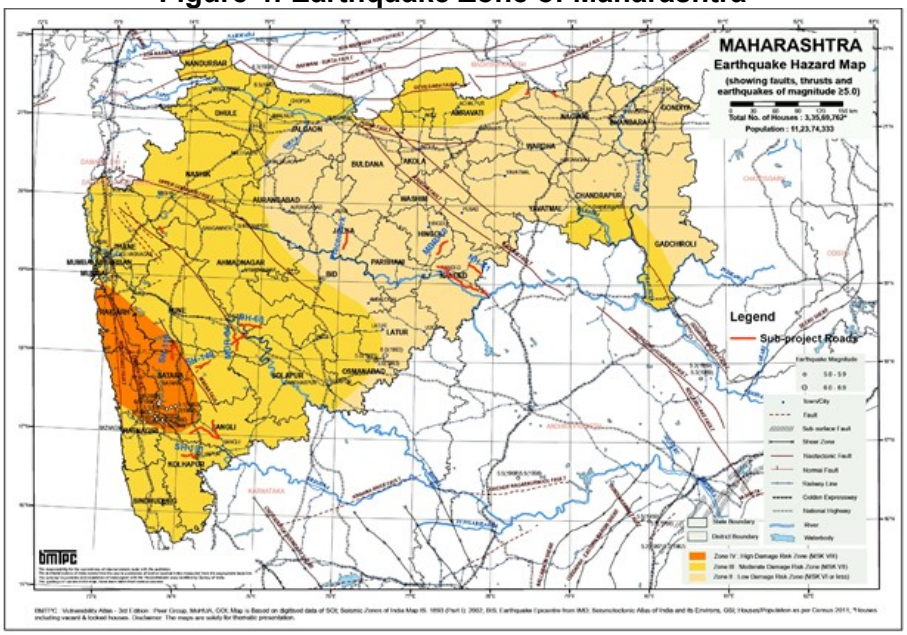
Ahmednagar
Ahmednagar district can broadly be classified into three groups' viz., black, red or tambat and laterite and the gray of inferior quality locally known as barad. Shallow grey soil (65.39%); Medium Deep Black soil (23.96%) and Deep Black soil (10.65%) constitute the area of the district.
Pune
A variety of soils are found ranging from deep black soils of plain & scarcity zone to shallow, red or reddish-brown soils of sub mountain & western ghat zone. Soils of Pune district are categorized in to 5 types viz., Black (45%), Red (5%), Alluvial (8%), Sandy (12%) and Sandy loams (30%) constitute the area of the district.
Satara

A variety of soils are found in Satara district ranging from deep black soils of plain & scarcity zone to shallow, red or reddish-brown soils of sub mountain & western ghat zone. Soils of Satara district are categorized in to 5 types viz., Black (45%), Red (5%), Alluvial (8%), Sandy (12%) and Sandy loams (30%) .
Kolhapur
Kolhapur district can be divided into three broad soil zones: (*a*) the western part, with heavy rainfall (is mountainous and woody and is covered with lateritic soils); (*b*) the fertile central part, with brownish well-drained soils of neutral reaction; and (*c*) the dry eastern zone, with precarious rainfall and covered with medium black soil of varying depth.
Nagpur
The soils of the district are either true black cotton soil or else formed from a basis of cotton soil modified by intermixture with soils derived from the gneissic formation which surrounds it. Medium to deep clayey (13.8%), black cotton soils (43.4%); medium, loamy alluvial soils; shallow sandy, clayey red soils (42.7%) constitute the area
Hingoli
Soils are derived from the basaltic flows. Thickness of the soil is less in northern and western parts where elevations are higher and soil regur, gravels, murum are transported down to lower regions through gravity, water or winds. Deep Black soil (36.34%); Medium Deep Black soil (7.95%) and Shallow Black soil (55.7%) constitutes the area
Nanded
Soil is mostly formed from igneous rocks and are black, medium black, shallow and calcareous types having different depths and profiles. The soil of the district is black and fertile. Deep Black soil (36.81%); Medium Deep Black soil (9.43%) and Shallow Black soil (53.75%) constitutes the area of the district.
Jalna
Soils derived from the basaltic flows. Thickness of the soil cover is less in northern and western region where ground elevations are higher and soil regur, gravels, murum are transported down to lower regions through gravity, water or winds. Deep Black soil (13.37%); Medium Deep soil (21.36%) and Shallow soil (65.27%) constitutes the area
Sangli
The soils of the region derived from the Deccan trap. The characteristic and distribution of soils in the region are influenced essentially by nature and intensity of weathering, mode and rapidity of fluvial transport. Coarse shallow soils (25%), Medium black soils (53%) and Deep black soils (20%) constitutes the area of the district.
Nashik
The soils of the district are the weathering products of Basalt and have various shades from gray to black, red and pink color. Soils of Nashik district are categorized into 4 types viz., Lateritic black soil (Kali), Reddish brown soil (Mal), Coarse shallow reddish black soil (Koral) and Medium light brownish black soil (Barad).

4. Natural Hazard

73. **Earthquake:** As per the seismic zone classification of India, Maharashtra lies majorly in Zone II (least active) and III (Moderate), and partially in zone IV (High). As per the BIS classification, out of 10 project districts, Satara lies in Zone IV (High damage risk zone), Small portion of Pune and Kolhapur falls in Zone IV (High damage risk zone) and majorly in Zone III (moderate damage risk zone) and rest all districts are either in Zone III (moderate damage risk zone) or in Zone II (Low Damage Risk Zone). **Figure 4** showing earthquake zone of the state**.**

Figure 4: Earthquake Zone of Maharashtra



74. **Drought:** Maharashtra has traditionally remained a drought-prone state. Almost 70 percent of the State's geographical area lies in semi-arid region rendering it vulnerable to water scarcity. Out of 36 districts 26 districts are normally drought hit districts. Among the project districts Ahmednagar, Pune, Hingoli, Jalna, Nanded, Nagpur, Sangli, Satara and Nashik divisions experience drought frequently. The evaporation rate is high, and precipitation exceeds evaporation only in September. In many parts, hard basalt rock in the region does not allow filter or storage of water. Therefore, when there is scanty rainfall, the scarcity of water both for drinking and cultivation is acute. All project districts except Kolhapur fall within drought prone areas.

75. **Flood**: The state of Maharashtra is largely vulnerable to floods. There are many man-made reasons for the occurrence of floods and most floods in the state are flash floods due to nallah-overflows and poor drainage systems. Very few floods, like the one in Konkan in 1983, are due to heavy rains in the region. The floods of 2005 and 2006 have shown that almost all the districts in the state are vulnerable to floods. Almost all the districts of the sub-projects experience flood frequently. Thus, except Ahmednagar, Nagpur, Sangli all other project districts (Pune, Satara, Hingoli, Jalna, Nanded, Kolhapur and Nashik) are vulnerable to flood (**Figure 5).**

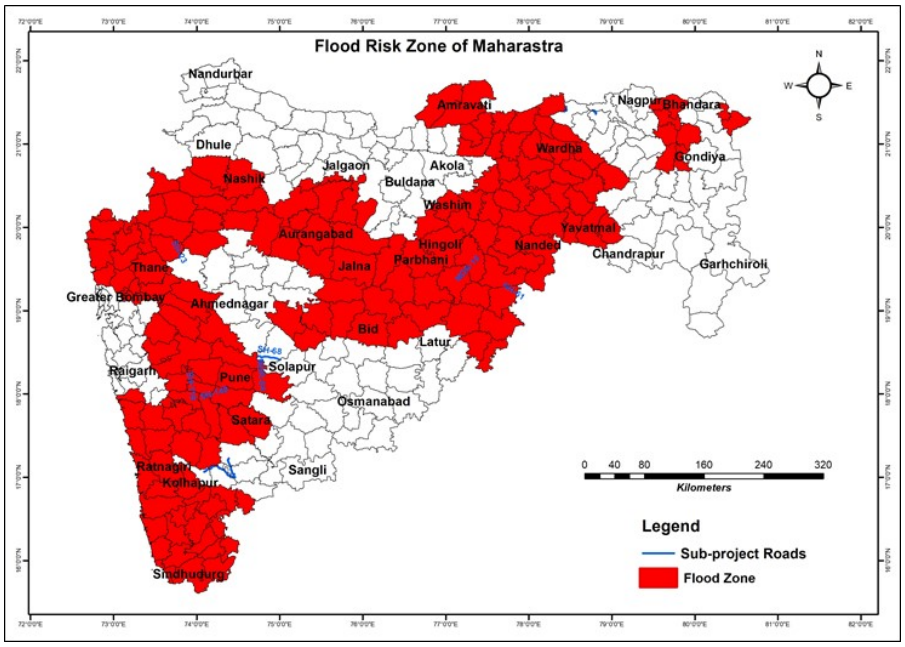
76. Most of the sub-projects excluding EPC 12, EPC-13, and EPC-15A and EPC15 B are susceptible to flooding. Overtopping was reported through local enquiries and also assessed by detailed design team in some sections/locations along the project, same is given in **Table 15**.

Table 15: Flood-prone/Overtopping Sections

EPC No.	Flood Prone/Overtopped Sections and Reasons
EPC -10	• Km 103+890 to Km 104+160 near Sidhatek due to Bhim River obverflow. Also, few isolated sections due to drainage congestions.
EPC-11	• Km 0+600 to Km 0+700 near Khadki Village • Km 8+450 to Km 8+Near Parawadi Village • Km 12+550 to Km 12+750 near Shetphalgade • Km 23+550 to Km 23+650 near Lakdi

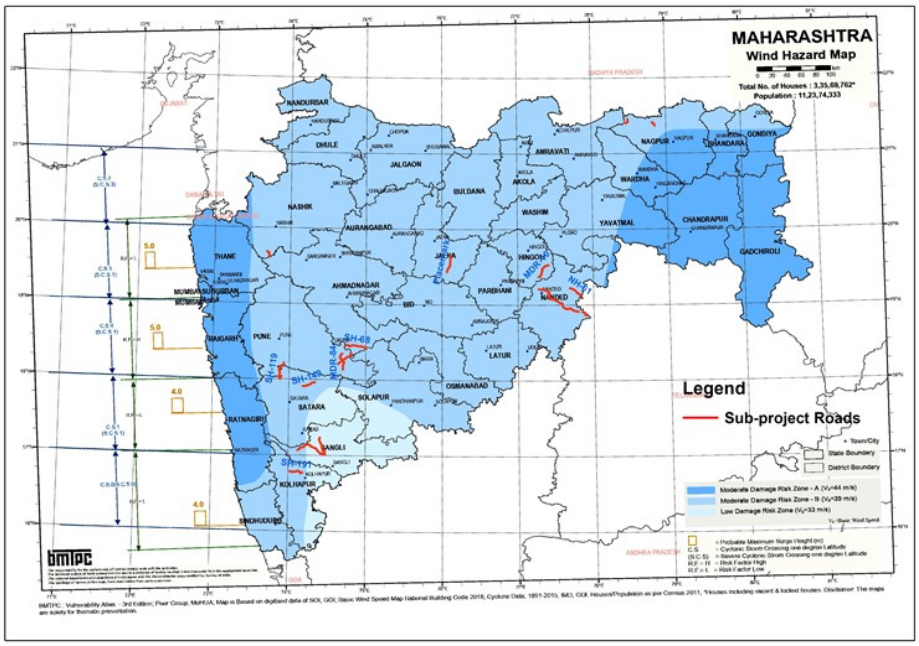
	• 28+000 to 28+200 Near Nimbodi
EPC-14	• Ch. 11+350 Locals reported water around 2-3' above the road. Mainly due to river Kasara which flows parallel to the LHS of the road at an approx. distance of 500 m
EPC-16	• Overtopping near Km 12+500 and Km 15+400 and other causeways due to reduced capacity over time and in proximity to a Dam's backwater
EPC 18	• Sub-project road mostly flows parallel to Godavari River (within 1km distance) for almost entire length. • Km 15.370, Km 7.720 and Km 28.020 sumbmersible CD structure presently over tributary crossing • Km 21.265 at causeway locations water overtops and disrupts traffic for 15-20 days during monsoon season
EPC-19	• Sub-project road mostly parallel to Godavari River (within 1km distance) for almost entire length. Overtopping reported at crossing with tributary of Godavari River at km 40.865 and km 51.160
EPC-20	• Sub-project road mostly flows parallel to Godavari River (within 1km distance) for almost entire length and water overtops the road mostly all locations whre being crossed by tributary of Godavari River at km 62.470, km 63.255, km 64.655, km 66.650, km 67.505 and km 71.175
EPC 22	• Km 186+850 (Jirad) and Km 186+856 (near Masegaon) due to overflow of nala during monsoon
EPC 23	• Approx.15 km section flows parallel to Krishna River and the incidence of overtopping is very common. The adjoining area gets flooded when Koyna dam (upstream) releases water but that is further not released through Almitti dam downstream.
EPC 24	• Overtopping section from km 70.00 to km 95.000 • River Krishna flows very close to and along the road from Ch. 84 + 300 to 92+400 causing inundation and overtops the road from Ch. 70 + 000 to 95+000.
EPC 26	• Overtopping recorded between km 199.810 to Km 200.470 near the 2 stream crossings

Figure 5: Flood Risk Map of Maharashtra



77. **Cyclone:** Due to its proximity to the western coast, Maharashtra is moderately vulnerable to cyclone. Severe cyclonic storms have been recorded in the Arabian Sea, which have affected the Maharashtra-Goa coast. The most recent to hit the State was cyclone Tauktae in 2021 which affected the coastal districts. Of the project districts, some portion of Nagpur and Western parts of Nashik, Pune Satara and Kolhapur are under moderate risk zone-A, and remaining districts are in moderate risk zone-B. **Figure 6.**

Figure 6: Cyclone Map of Maharshtra



5. **Land Use/ Land Cover**:

78. **State:** Most of the geographical area of the state is available for utilization. Major portion of the land use is under agriculture. Total cultivable land is 209,012.72 Sq.m. (67.93%), 56,896.54 km^2 (22.67%) is under different type of forest, barren land comprises 24,687.23 km^2 (8.02%), 10,807.37 km^2 (3.51%) is under wetland/ water bodies/reservoir/ lakes/pond, and the remaining 2.34% (7,199.42 km^2) is under built-up area.

Figure 7: Land Use/ Land Cover of Maharshtra

LULC Class	Area (Sq.Km)	LULC Class	Area (Sq.Km)
Builtup,Urban	3767.77	Builtup,Rural	3084.27
Builtup,Mining	347.38	Agriculture,Crop land	188314.38
Agriculture,Plantation	6073.31	Agriculture,Fallow	14625.03
Forest,Evergreen/ Semi evergreen	7186.38	Forest,Deciduous	40060.08
Forest,Forest Plantation	347.24	Forest,Scrub Forest	9045.16
Forest,Swamp/ Mangroves	255.92	Grass/Grazing	1.76
Barren/unculturable/ Wastelands, Salt Affected land	8.12	Barren/unculturable/ Wastelands, Gullied/Ravinous Land	485.92
Barren/unculturable/ Wastelands, Scrub land	22175.08	Barren/unculturable/ Wastelands, Sandy area	0.97
Barren/unculturable/ Wastelands, Barren rocky	1103.87	Wetlands/Water Bodies, Inland Wetland	2.28
Wetlands/Water Bodies, CoastalWetland	910.99	Wetlands/Water Bodies, River/Stream/canals	3896.22
Wetlands/Water Bodies, Reservoir/Lakes/Ponds	5997.88		
Total			307690

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Wetlands/Water Bodies, Reservoir/Lakes/Ponds	5997.88		
Total			307690

79. **Study Area:** Satellite imagery-based land use mapping was done to have an overview of environmental setting for a wider area beyond the corridor of impact. During the design stage, it can be used as an efficient tool for decision makers for making the proposed development environmentally more sustainable, technically sound and socially acceptable. Consolidated with different surface features like drainage/hydrology, vegetation, population distribution, availability of social and physical infrastructure etc., it is very useful in road design and in deciding alignment

alternatives.

80. Land use maps prepared during planning stage can be used as a performance indicator tool to assess the impact of proposed development after implementation how the road improvements with efficient transportation to rural areas helps in spreading the agricultural activities to fallow land and cultivable wasteland, marketing of agricultural products, growth in rural industries, with the expanded market network and social transformation through greater accessibility to basic amenities.

81. Land use of the study area of all sub-projects largely replicates the state's profile with minor variations. All the sub-projects land use/land cover is significantly open agricultural spotted with a few built-up portions except few under hills/ghat influence in EPC-26-SH-23 Bari-Ghoti Sinnar, EPC-21- NH-61- Bhokar Rahati Road and EPC-24-SH-158- Pusesavali-Vangi-Walwa-Wakurde. Majority portion of the land use in 10 km radius of project roads falls under agriculture category followed by uncultivable category. Agriculture/ fallow category ranging between 51.82% (EPC-12, SH-119 – Kapurhol-Bhor-Wai) to 97% (EPC-21- NH-61- Bhokar Rahati Road). Barren/Uncultivable/Wasteland category ranges between 1.34% (EPC-20-MDR-83- Nila-Balapur) to 35% (EPC-12- SH-119- Kapurhol-Bhor-Wai). Forest/Plantation category ranges between 0.67% (EPC-10- SH-68- Siddhatek-Korti) to 30.08% (EPC-14-SH-191-Kerli Kotoli-Nanadari). Built-up/Settlement's category ranges between 0.45% (EPC-10- SH-68- Siddhatek-Korti) to 3.88% (EPC-14-SH-191-Kerli-Kotoli-Nanadari). Land use/land cover map of 10 km buffer (study area) for each sub-project sections is shown in **Figure 8 to Figure 25.**