

Initial Environmental Examination

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Proposed Loan India: Maharashtra Rural Connectivity Improvement Project—Additional Financing

Prepared by the Maharashtra Rural Road Development Association, State Government of Maharashtra, for the Asian Development Bank.

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Currency Equivalents
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Currency unit	–	Indian Rupee (₹)
₹1.00	=	\$0.014
\$1.00	=	₹73.91

ABBREVIATIONS

ADB	–	Asian Development Bank
DPR	–	detailed project report
GDP	–	gross domestic product
ha	–	hectare
km	–	kilometer
MMGSY	–	Mukhya Mantri Gram Sadak Yojana (Chief Minister's Rural Road Scheme)
MRRDA	–	Maharashtra Rural Road Development Association
PISC	–	project implementation support consultant
PIU	–	project implementation unit
PMGSY	–	Pradhan Mantri Gram Sadak Yojana (Prime Minister's Rural Road Development Program)
PMU	–	project management unit
SPS	–	Safeguard Policy Statement, 2009
TA	–	technical assistance

NOTE

- (i) In this report, "\$" refers to United States dollars.

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I. INTRODUCTION

A. Project Background

1. The state of Maharashtra has the 2nd highest population in India at 116 million in 2018) and 3rd largest inland mass (308,000 square kilometers [km²]), which is 9.4% of the country. The state shares borders with Gujarat, Madhya Pradesh, Chhattisgarh, Andhra Pradesh, Karnataka, Goa and the Union Territory of Dadra and Nagar Haveli. Maharashtra has a well-developed social, physical and industrial infrastructure. The state has 16 airports, 2 major ports and 48 minor ones and good power supply. Infrastructure sector has grown over the several years, with a substantial increase of industrial clusters and public-private partnership (PPP) projects.

2. Maharashtra being the most industrialized state, it contributes 14.11% of India's total gross domestic product (GDP) in 2017–2018.¹ Between 2012–2017, Maharashtra's GDP grew at an average of 7.4% per year, compared to the national average of 6.8% during the same period. Economic growth over the past 5 years is primarily driven by the industrial and service sectors, at an average of 6.1% and 8.8% annual growth rates, respectively. Notwithstanding this, approximately 20 million people still live below the national poverty line of less than \$1.90 per day.² Although the state's rural poverty rate of 24% is marginally better than the national average of 27%, poverty rates are recorded as high as 40% in some districts.

3. The agriculture sector remains central to Maharashtra's economic and political landscape. The sector contributes 15% of the Maharashtra's GDP and accounts for 79% of rural employment. The share of agriculture sector in Maharashtra has been declining in the last three decades, from 21.4% in 1990–1991 down to 12.2 % in 2016–2017. The agriculture sector recorded 2% annual growth during the period, below the national agriculture sector growth rate of 2.6%. This is due to several reasons, including infrastructure gaps in transport which hinder effective links between farms and markets chains. Greater investment in Maharashtra's rural infrastructure is required to boost the agriculture sector and improve the livelihoods and living standards of the state's rural population.

4. Most of the state's population (54.8%) are from the rural areas and are highly dependent on the agriculture sector for employment and income generation. Rural connectivity supports rural development in Maharashtra. The state has a road network of 303,000 km, which 67% are rural roads. Roads are the dominant mode of transportation, utilized by over 80% of passengers and 60% of freight traffic. However, long-term underinvestment has affected all levels of the road network, and the rural road network is in the worst condition. In rural areas, many villages still rely on earthen tracks, which are unsuitable for motorized traffic and can easily become impassable during the rainy season. Poor road infrastructure affects economic growth in rural areas, agricultural productivity, and employment, and has a strong link to poverty. The State Government of Maharashtra recognizes the importance of rural connectivity in vitalizing rural livelihoods and addressing poverty alleviation.

5. The state government has prepared Vision 2030 based on the United Nations Sustainable Development Goals (SDGs).³ Vision 2030 outlines 5 areas for strengthening: (i) agriculture, (ii) infrastructure, (iii) industry, (iv) social sector, and (v) governance. In terms of infrastructure, a goal of Vision 2030 is to develop quality, reliable, sustainable and safe roads that are affordable

¹ <http://statisticstimes.com/economy/gdp-capita-of-indian-states.php>

² World Bank. 2017. <http://documents.worldbank.org/curated/en/806671504171811149/pdf/119254-BRI-P157572-Maharashtra-Poverty.pdf>

³ Government of Maharashtra, Planning Department. 2018. *Vision 2030*. Mumbai

and provide equitable access for all. The plan includes development of major corridors and a rural road network which is expected to support economic development and human wellbeing. The state government hopes to improve the state's road network using its own resources and assistance from international development partners.

6. The state has completed 24,439 km of roads under the Prime Minister's Rural Road Development Program (PMGSY), which connects 8,315 habitations.⁴ The government has initiated the Chief Minister's Rural Road Scheme (MMGSY) program in the state to connect other villages in remote rural areas not yet reached by PMGSY and improve existing roads also not covered under PMGSY. The MMGSY aims to develop 30,000 km of rural roads over four years to improve access in remote areas to public facilities, markets, and goods.

7. Rural Connectivity Improvement Project (RCIP), the ongoing project, is aligned with the government's Vision 2030 and the country partnership strategy for India 2018–2022 of the Asian Development Bank (ADB). The project will improve about 2,100 km of rural roads to all-weather standards. This improvement will support rural populations across 34 districts and help bolster the agriculture sector. RCIP supports the government's agricultural strategy for increasing agricultural productivity by (i) encouraging commercial agriculture and agribusiness development, (ii) increasing employment opportunities for rural poor people, and (iii) reducing the state's poverty incidence. Development of the rural road network is one critical initiative aimed at achieving the state's agriculture growth target of 5% per annum. Other major initiatives include doubling farmers' income, implementing the climate resilient agriculture project funded by the World Bank, and increasing agricultural market access. The project was approved on 7 August 2019 and became effective on 7 November 2019.

8. Development of the rural road network is one critical initiative aimed at achieving the state's agriculture growth target of 5% per annum. Other major initiatives include doubling farmers' income, implementing the climate resilient agriculture project funded by the World Bank,⁵ and increasing agricultural market access.

9. The State of Maharashtra acting through the Maharashtra Rural Road Development Association (MRRDA) will be the executing and implementing agency. A project management unit (PMU) established within MRRDA will support project implementation. The Secretary cum Chief Executive Officer of MRRDA will be responsible for project coordination and monitoring. There will be 34 project implementation units (PIUs) in 34 districts under 6 regions. A project director assisted by two deputy project directors will comprise the PMU. The PMU will be assisted by consultants. The 6 regional offices headed by 6 superintending engineers will supervise the 34 PIUs. Each PIU will be headed by an executive engineer, supported by three deputy engineers, and will be responsible for the day-to-day implementation and monitoring of project activities under the guidance of the PMU. A project implementation support consultant (PISC) will be engaged to primarily guide the PMU on safeguards, procurement, and road safety.

10. The Maharashtra Rural Connectivity Improvement Project—Additional Financing will scale up improvement of rural connectivity with additional climate-resilient all-weather 2,965 km. roads and 236 bridges in 34 districts of the State of Maharashtra. The roads and bridges will connect rural habitations, productive agricultural lands and markets, and economic growth centers across the state. This will enhance employment opportunities and help reduce poverty, especially in rural areas where about 55% of the state's population lives and economic impact of COVID-19 pandemic will be more severe. The project will enhance agricultural productivity and food security,

⁴ A nationwide program in [India](#) to provide good all-weather road connectivity to unconnected villages.

⁵ World Bank. 2017. Maharashtra Project on Climate Resilient Agriculture. Washington.

add value to agricultural produce and value chain, and contribute to increasing the average growth rate of agriculture and allied activities.

11. The additional financing will scale up the current project's outputs by (i) expanding improvement and maintenance of rural roads and adding bridges, (ii) adding further piloting of new technologies such as asphalt blended with plastic waste and pre-cast concrete arch bridges under output 1, and (iii) adding the following under output 2: (a) impact evaluation study and (b) mobile mapping monitoring tool. More descriptions are given below.

- i. **Output 1: Conditions and safety of selected rural roads improved and maintained.** The project will improve the condition of rural roads and bridges—connecting rural communities with productive agricultural areas and socioeconomic centers—to all-weather standards, with climate resilience and safety features. The roads and bridges will incorporate climate resilience measures such as improved cross and side drainage, increased surface elevations, and stronger embankments in the designs. Environmentally friendly alternative sealing options such as asphalt blended with plastic waste will be piloted on selected road segments. Other new technologies such as fiber reinforced concrete and pre-cast concrete arch bridge will also be piloted for further practical application in similar settings. The roads will be covered under contractual maintenance for 5 years following construction.
- ii. **Output 2: Capacity of rural infrastructure agency and awareness among road users in the state enhanced.** Capacity development of rural infrastructure agency will involve training the MRRDA on road safety, road asset management, contract management, climate resilient design and construction, and impact evaluation of the project. A mobile mapping tool will also be introduced to regularly monitor the progress of the works and evaluate the development impacts along the project roads. Capacity development of road users in the state will include (i) improving road users' awareness on road safety and gender-based violence; and (ii) enhancing women workers' road construction and maintenance skills.

B. IEE Objectives

12. The project is a category "B" , for environment, based on ADB's Safeguard Policy Statement (SPS) of 2009. The project is required the conduct of an initial environmental examination (IEE) report and its documentation. The report identifies the environmental issues at project planning and design stage. It 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) is also proposed which includes mitigation measures for significant environmental impacts during implementation of the project, environmental monitoring program, and the responsible entities for mitigation and monitoring.

13. An IEE has four basic objectives: (i) identify the environmental issues that should be considered due to project interventions; (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.

C. Extent of IEE

14. The extent of the IEE was based on all likely Impacts and risks analyzed in the context of the project's area of influence. It encompasses: (i) the primary project site(s) 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.

15. The core zone of impact is taken at the existing road width measured from embankment toe-to-toe as the existing rural roads do not have a defined right-of-way and its immediate vicinity. The assessment also considers the bridges under the scope of the project, areas and activities related to associated facilities viz. quarry operation, borrow areas, construction camp, transportation/haulage routes etc. The study area is considered up to 500 meters (m) on either side of road and bridges for larger analysis of land use and other environmental features. Assessment is carried out for all components of environment covering terrestrial and aquatic ecology, soil, water, noise and socio-economic aspects.

D. Study Approach and Methodology

16. This IEE report has been prepared based on specific road and bridge detailed project reports (DPRs), transect walks, and stakeholder consultations to meet the requirements for environmental assessment process and documentation as per ADB's SPS. The IEE commenced with the preliminary review of legal requirements for the project and followed by gathering technical details, technical meetings, discussions, and consultations at the level of district, panchayat, and stakeholders on each of the project roads.

E. Reconnaissance Survey and Initial Consultations

17. Reconnaissance survey and initial consultations were undertaken as part of the transect walks and helped in identifying data gaps, valued environment components, key stakeholders and key informants who can further substantiate the collected information.

F. Primary Data Collection

18. Environmental resource inventory was prepared of all environmental features to include terrain, land use, waterways/water bodies, roadside vegetation, sensitive receptors, common property resources, utilities, drainage, flooding/water logging, industries, accident prone areas etc. within the area of interest/core zone.

19. The transect walk is an activity done for the target rural roads and bridges to observe and collect information on the characteristic of the project locations. Through the activity, MMRDA engineers, TRTA consultants and affected people have identified the locations where there are sensitive areas such as coastal zones, forest areas and community places and agricultural places. This is a useful survey because affected trees, rivers and man-made structures such as electric poles and borewells are identified and documented.

G. Secondary Data Collection

20. Secondary sources included detail design report, published government reports such as the Maharashtra Pollution Control Board's (MPCB) Water Quality Status of Maharashtra Report (2017-18), environmental impact assessments conducted in the similar region, government websites, recognized institutions and relevant government departments. The IEE report utilized

the result of the wildlife screening from the Integrated Biodiversity Assessment Tool (IBAT). The tool provided the list of endangered species that can be found in the state of Maharashtra.

H. Public Consultations

21. Similar with the ongoing RCIP, meaningful consultations were organized with the government agencies, local people/beneficiary population to know the level of project acceptability, understand their concerns, apprehensions, and overall opinion. Information were gathered about existing baseline environmental condition viz. ambient levels and its effects on health, water resources, flora and fauna, 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 used to integrate it in project design and formulate mitigation measures and environmental management plan.

I. Other Tools, Additional Surveys and Studies

22. Climate risk screening identified flood as major risk which may adversely impact the road components like, pavement, embankment and cross drainage structures during design life. To avoid flood induced impact on road components it is essential to incorporate various measures in design. Details of structures, history of floods, water logging/low lying areas, road stretches and bridge liable to submergence along the project road were collected during field visit and the same was corroborated with information available with design team.

J. Assessment of Potential Impacts

23. 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 whether the project is environmentally-sustainable or not. 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 have been suggested.

K. Preparation of the Environment Management Plan (EMP)

24. The project specific EMP has been formulated with an aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. This includes (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.

L. Structure of IEE Report

25. The improvements of existing rural roads and bridges are not cover by the Environment (Protection) Act 1986 or the EIA Notification 2006 (Amended 2009). The IEE has been prepared based on the requirements of the ADB's SPS as implemented under the various rural connectivity improvement projects. The content covers following chapters, including this introduction chapter.

II. DESCRIPTION OF THE PROJECT

A. Project Location

26. In response to the severe August 2019 floods⁶, the additional financing will scale up the road condition and safety improvement works of rural roads and urgently rehabilitate bridges to enhance flood resilience and climate adaptation. The additional scopes are strongly linked to the ongoing RCIP and can be implemented under the same arrangements. These roads and bridges will enhance Maharashtra's agriculture value chain together with the government's priorities under the Mukhya Mantri Gram Sadak Yojana (MMGSY) program⁷ and ADB's country partnership strategy⁸.

27. Distributed across 34 districts, the project will take a large part of the MMGSY program by (i) improving priority rural roads (Appendix 1) and bridges (Appendix 2) into all-weather standards (climate resilient), gender-inclusive, and high safety features⁹; and (ii) development of the MRRDA's capacity on road asset management. The roads and bridges will be covered under contractual maintenance for 5 years after the date of construction.¹⁰ The manuals for the road maintenance, climate-resilient designs and rural road construction will also be developed under the project.

Roads

28. The rural roads under the financing will cover 6 regions in the state, which are (i) Amaravati, (ii) Aurangabad, (iii) Konkan, (iv) Nagpur, (v) Nashik and (vi) Pune. Located on a hilly upland terrain in the Deccan Traps¹¹. There are 1,100 rural roads, which cover 2,965 km under the project. The project works in Aurangabad has the most number of rural roads and largest coverage among all the regions. These rural roads are located at the districts of Aurangabad, Beed, Hingoli, Jalna, Latur, Nanded, Osmanabad, and Parbhani.

29. On the leeward side of the Westrens Ghats and extends to the eastern part of the Deccan Plateau, the region of Pune follows Aurangabad in terms of the number target rural roads at 219. These roads are located in the districts of (i) Pune, (ii) Sangli, (iii) Satara, (iv) Solapur, and (v) Kolhapur, which covers 490 kms of the region.

30. Famous for growing oranges and cotton, the region of Nashik comes in second after Aurangabad on the total length of rural roads. Under the additional financing, there is a total of 516 kms of proposed rural roads over 5 districts in Nashik. The length of the rural roads ranges from 68 kms to 168 kms, thus an average of 103 kms per district. The target rural roads are located in the districts of (i) Ahmednagar, (ii) Nandurbar, (iii) Dhule, (iv) Jalgaon and (v) Nashik.

⁶ A series of floods that affected over 13 states, due to incessant rains. The states of Karnataka and Maharashtra were the most severely affected by the flooding.

⁷ Government of Maharashtra, Rural Development and Panchayat Raj Department. 2019. Mukhya Mantri Gram Sadak Yojana. Mumbai.

⁸ ADB. 2017. *Country Partnership Strategy: India, 2018 – 2022 – Accelerating Inclusive Economic Transformation*. Manila.

⁹ Road safety measures include cautionary and information signs, guard posts, and speed breakers.

¹⁰ Routine maintenance will be undertaken for 5 years by the same contractors that built the roads. All maintenance will be financed by the government.

¹¹ Large igneous province on the Deccan Plateau of west-central India.

31. The following table shows the summary of the number of roads and the corresponding length in every district.

Table 1. Distribution of the target rural roads for the Maharashtra Rural Connectivity Improvement Project – Additional Financing.

District	ROADs	
	No of Roads	Length (Km)
Akola	37	116.51
Amaravati	24	73.01
Washim	24	58.95
Buldhana	33	61.58
Yavatmal	32	74.90
Amaravati Region	150	384.94
Osmanabad	63	132.26
Nanded	34	68.69
Hingoli	30	79.88
Beed	37	132.00
Latur	32	80.45
Parbhani	40	96.15
Aurangabad	35	107.30
Jalna	34	127.85
Aurangabad Region	305	824.57
Raigad	23	61.61
Palghar	23	57.58
Sindhudurg	24	64.83
Ratnagiri	48	106.20
Thane	10	19.47
Konkan Region	128	309.68
Nagpur	27	115.66
Chandrapur	15	64.11
Wardha	28	90.65
Bhandara	18	76.72
Gadchiroli	2	9.78
Gondia	34	84.58
Nagpur Region	124	441.50
Ahmednagar	66	167.51
Nandurbar	17	68.19
Dhule	20	70.90
Jalgaon	33	107.29
Nashik	39	101.92
Nashik Region	175	515.81
Satara	36	80.90
Kolhapur	32	57.96
Sangli	38	92.93
Solapur	45	124.52
Pune	67	132.28
Pune Region	219	489.60
Maharashtra	1100	2965.07

Bridges

32. The proposed bridges are designed according to the (i) specifications for rural roads (2004), (ii) Indian Road Congress (IRC):SP:20 (2002)¹², (iii) IRC:SP13:2004¹³, (iv) IRC:SP:82:2008¹⁴ and (v) Guidelines for Bridge Designs by the Designs Circle of Public Works Department (PWD), Maharashtra.

33. Similar to the roads, the target bridges are located within the 6 regions of the state. The length of these bridges ranges from 80 m to 120m. Aurangabad has the most number at 61 target bridges that are located in 8 districts. These are in (i) Aurangabad, (ii) Beed, (iii) Hingoli, (iv) Jalna, (v) Latur, (vi) Nanded, (vii) Osmanabad, and (viii) Parbhani. While Pune Region has the least number of target bridges at 16 in the districts (i) Pune, (ii) Sangli and (iii) Solapur.

34. The following table shows the summary of the number of roads and the corresponding length in every district.

Table 2. Distribution of the target bridges for the Maharashtra Rural Connectivity Improvement Project – Additional Financing.

District	Bridges	
	No. of Bridges	Length of Bridges (m)
Akola	8	496.00
Amaravati	12	510.00
Washim	8	293.00
Buldhana	3	161.00
Yavatmal	2	66.00
Amaravati Region	33	1526.00
Osmanabad	13	596.00
Nanded	16	558.60
Hingoli	2	99.00
Beed	6	474.26
Latur	7	328.00
Parbhani	4	276.00
Aurangabad	7	443.00
Jalna	6	228.00
Aurangabad Region	61	3002.86
Raigad	5	160.00
Palghar	8	268.90
Sindhudurg	5	184.00
Konkan Region	18	612.90
Nagpur	3	198.00

¹²Indian Road Congress: Rural Roads Manual

¹³Indian Road Congress: Guidelines for the Design of Small Bridges and Culverts

¹⁴ Indian Road Congress: Guidelines for Design of Causeways and Submersible Bridges

Chandrapur	9	455.00
Wardha	19	645.00
Bhandara	9	458.00
Gadchiroli	2	80.00
Gondia	12	548.00
Nagpur Region	54	2384.00
Ahmednagar	7	288.00
Nandurbar	8	594.00
Dhule	12	588.00
Jalgaon	20	793.00
Nashik	8	406.00
Nashik Region	55	2669.00
Sangli	1	55.00
Solapur	12	571.80
Pune	2	119.02
Pune Region	15	745.82
<u>Maharashtra</u>	<u>236</u>	<u>10940.58</u>

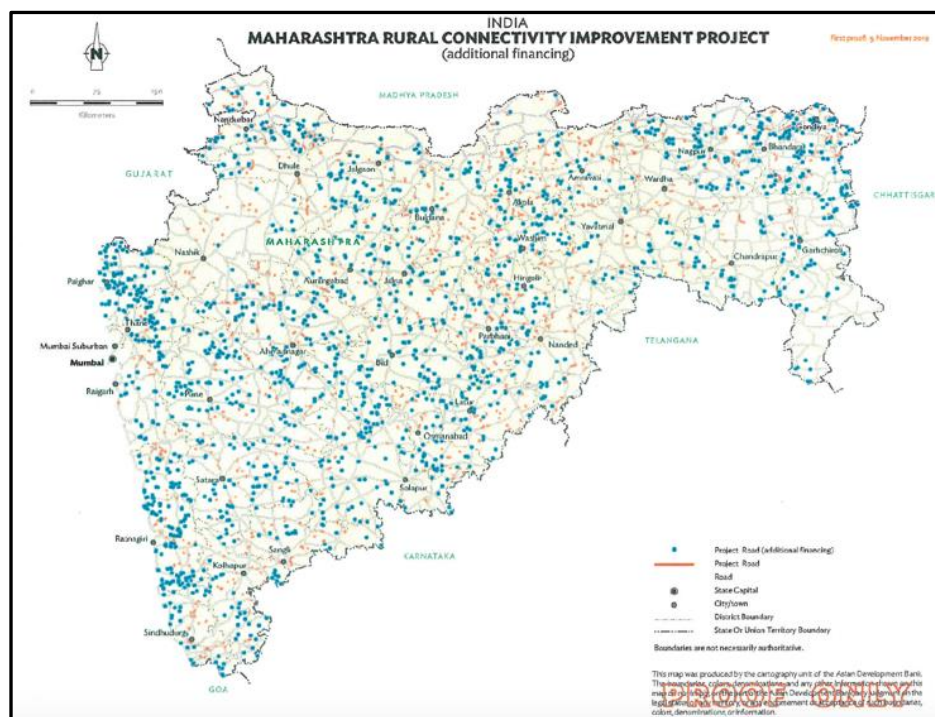


Figure 1: Locations of the proposed rural roads under the Maharashtra Rural Roads Connectivity Project additional financing.

B. Proposed Project

Rural Roads

35. In general, the proposed improvements include (i) provision of flexible pavement in rural areas and rigid pavement in urban areas, (ii) installation of traffic signs, (iii) construction of new drainage system and re-construction of old ones, and (iv) 5-year maintenance of the roads.

36. Construction activities involves the following:

- (i) Site clearance – clearing and grubbing of road land including uprooting of vegetation, grass, brushes, shrubs, samplings, and trees, removal of stump, and disposal of unwanted materials, and selling of serviceable materials. This also includes the dismantling of existing structures like culverts, hume pipes, bridges, and retaining walls and including good disposal practices.
- (ii) Excavation – removal of soil and rocks (ordinary and hard) for roadworks using hydraulic excavators and tippers, including cutting and loading, trimming of bottom and side slopes, grades and cross graded.
- (iii) Embankment – materials recovered from roadway cutting and borrow pits that includes construction of surface drains.
- (iv) Sub-base – involves the construction of the granular sub-base by compacting with smooth wheel roller.
- (v) Sub-grade – road subgrade and earthen shoulder require (i) materials transport, (ii) spreading, (iii) grading to required slope, and (iv) compaction graded gravel in uniform layer and required density;
- (vi) Flexible pavement – water bound macadam (WBM) with crushable screening through (i) laying, spreading and compacting stone aggregates into specification including hand packing, rolling, applying and brooming to fill-up the spaces of the coarse aggregates, (ii) watering and compacting, (iii) coat application with bituminous emulsion distributor; (iv) application of 20 millimeters (mm) open graded premix carpet using bituminous binder; and (v) provision of seal coat.
- (vii) Road Furnitures - installation of (i) cautionary and information signs, (ii) kilometer stones using reinforced concrete, and (iii) granite/quartzite guard stones. This also includes white color washing of roadside trees, metal beam crash barriers, cat's eyes, road markings with thermoplastic compound, and vertical and road delineators.

37. Figure 2 presents a typical cross-section after improvement works. Salient features of the completed rural roads include:

- (i) On the average 10 m road width measured from the bottom drainage canals, paved carriage width of 3.0 m, 1.5 m earthen shoulders;
- (ii) Road embankment side slope of 1:1.50 m and 0.9 x1.50 side drains; and
- (iii) 20 mm carpet and seal coat.

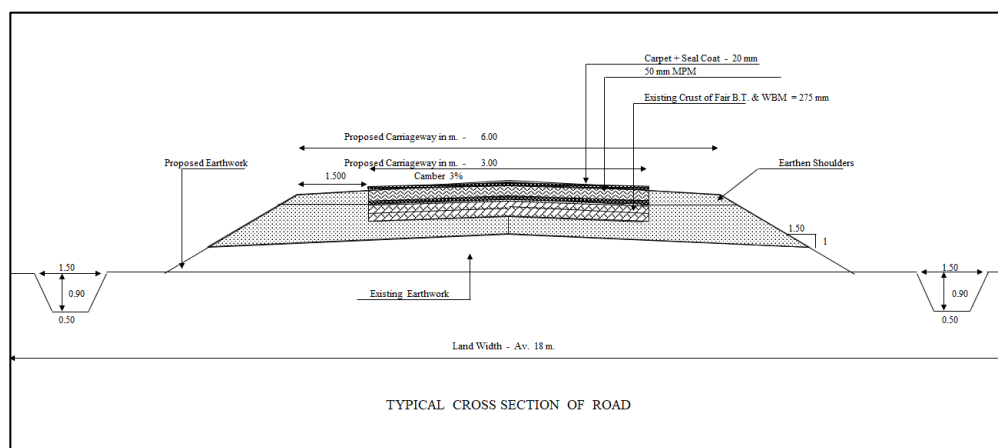


Figure 2: A typical rural road design (cross-section)

38. In addition to the cross-sectional improvements, the following items will be improved:
- Side shoulders at water bound macadam WBM and modified penetration macadam (MPM) level with 15-centimeter (cm) thick murum;
 - Cross drainage structures based on IRC SP20 and Maharashtra Design Circle Guidelines for culverts, minor bridges, and causeways;
 - Road furniture to include km stones, 200m stone, guard/boundary stones, citizens information board, sign boards;
 - At least 50m length on each of the villages; and
 - 5-year maintenance.

Construction Programme													
Sr. No.	Item	1	2	3	4	5	6	7	8	9	10	11	12
1	Site and Lab Establishment	■											
2	Site Clearing	■											
3	Initial Survey	■											
4	Earthwork	■	■										
5	Sub Grade			■	■								
6	GSB				■	■							
7	WBM / WMM					■	■	■					
8	MPM / BM / OPGC								■	■	■		
9	C. C. Drain				■	■	■						
10	C. C. Road				■	■	■						
11	Earthen Shoulders						■	■	■	■	■		
12	Bridge / C. D. Works		■	■	■	■							
13	Protection Works					■	■						
14	Road Furniture										■	■	■

Figure 3: General indication of the construction program for the rural roads.

Bridges

39. Construction activities of the proposed bridges involves the following:
- Excavation – earthworks that includes construction of shoring, removal of stumps and other deleterious materials, dressing of sides and bottom, and backfilling of trenches with suitable excavated materials. The dewatering and diversion of streams, providing cofferdams or bunds maybe necessary for foundation and other parts of the work.

- (iii) Foundation – providing concrete or plain cement in foundations and placing thermo-mechanically treated (TMT) bar reinforcement as per the drawing
- (iv) Substructure – includes laying of cement, placing of TMT bars, sand filling in foundation, provision of pressure relief pipes, laying of filter media (granular aggregates) not less than 600 mm., backfilling of bitumen, and providing weepholes apron with cement concrete as per the drawings and technical specifications
- (v) Superstructure – this involves laying of reinforced cement concrete and fitting of TMT bars (for the solid slab, ballast wall, kerb and wearing coat), fixing railings and expansion joint with 25mm thick bituminous pad
- (vi) Earthwork – excavation for roadwork with excavator machine and construction of embankments
- (vii) Granular Sub-Base (GSB) – providing Grading-II material by spreading in uniform layers with motor grader, mixing in place with rotavator and compacting with vibratory wheel roller
- (viii) Water Bound Macadam (WBM) – laying, spreading and compacting stone aggregates of specific sizes as per the technical specifications.
- (ix) Bitumen works – this stage includes the construction of 50 mm. thick modified penetration macadam over prepared base layer of compacted crushed coarse aggregate, applying tack coat with bitumen emulsion, rolling of open-graded premix carpet of 20mm, seal coat application and masonry works.
- (x) Road furniture –placing of guard stones along approaches; painting of lines, dashes and arrows; road marking with hot applied thermoplastic compound; and fixing MMSGY informatory signboards and mandatory caution-informative signs.
- (xi) Miscellaneous activities – removal of grass and rubbish and scarifying of existing bituminous road surface

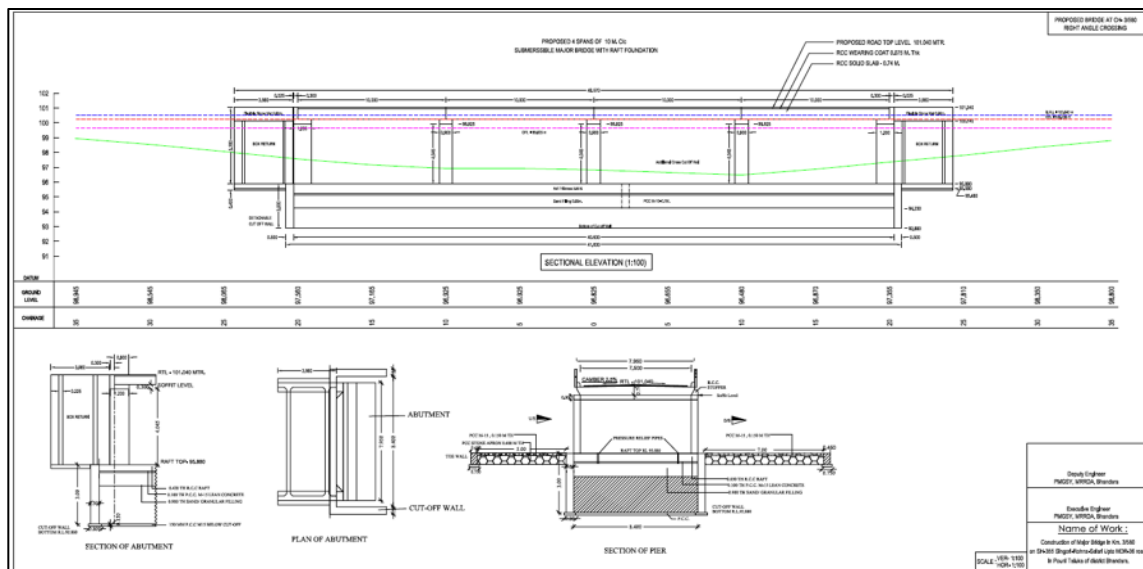


Figure 4. Improvement design (sample) from the Design Project Report (DPR) bridge in Pauni Taluka, Bhandara

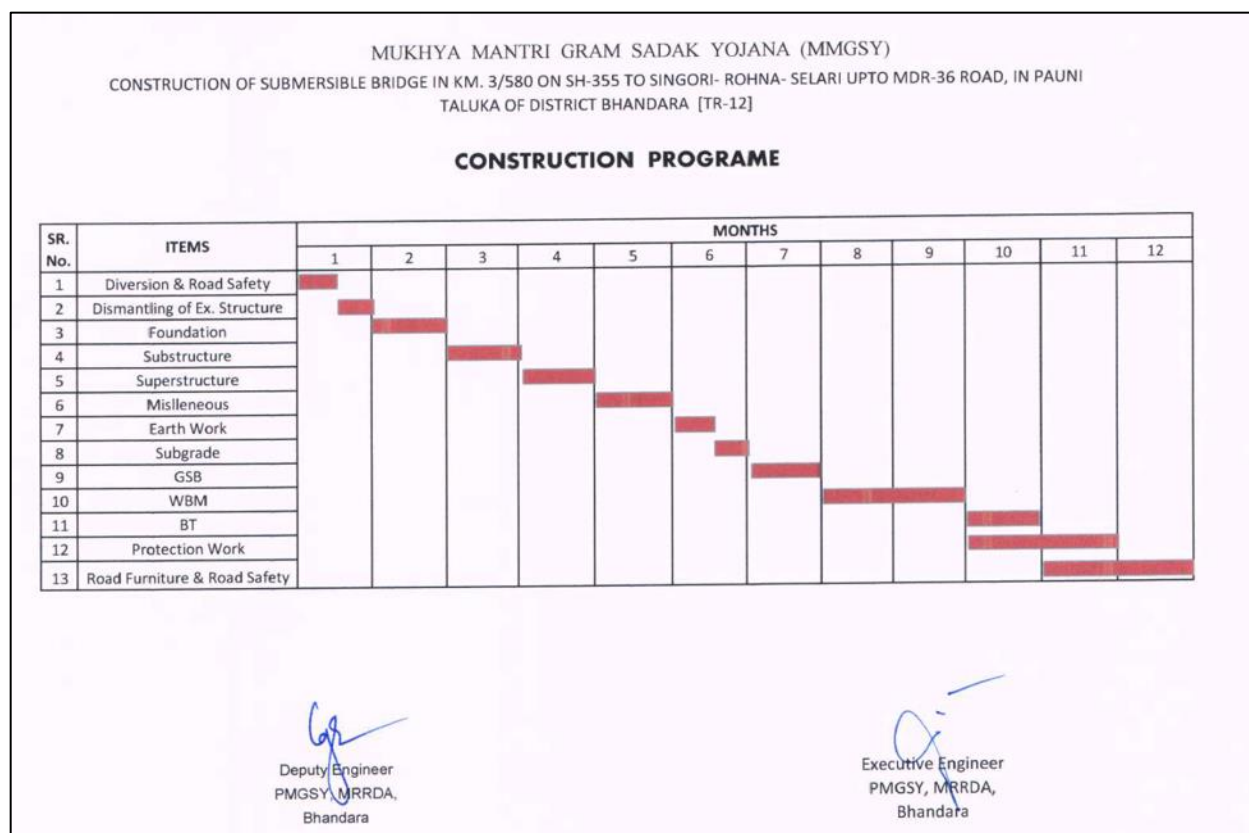


Figure 5. As a sample schedule, construction program for the previous bridge design (Figure 4).

C. Project's environmental category

40. Separate from the government process, the Rapid Environmental Assessment (REA) Checklist is prepared for the categorization requirement of ADB. The additional financing is classified as environment category "B" according to ADB Safeguard Policy Statement (SPS) of 2009 classification system.

41. The project will improve the existing roads and bridges, with no changes on the alignment, no by-passes, and will involve no land acquisition. The proposed works conform with the Pradhan Mantri Gram Sadak Yojana (PMGSY) and MMGSY safety guidelines. None of the target 2,965 kms of rural roads and 236 bridges under the project are located or near cultural heritage, protected areas including buffer zones, or special area for protecting biodiversity. Furthermore, no historical places or religious structures will be affected by the project. All anticipated impacts are site-specific and mitigation measures are readily designed and easily implemented.

42. Anticipated environmental impacts are typical to road and bridge maintenance such as the (i) generation of dust, noise, exhausts from haul trucks and mix plants; (ii) wastes from construction and worker camps; and (ii) occupational health and safety hazards. A number of roads are located near irrigation canals and there is also the risk water quality deterioration during particularly during construction phase.

D. Characteristics of Existing Roads and Bridges

43. In general, the rural roads and bridges suffer from poor pavement condition with many potholes, edge failures, and depressions. Rain cuts and erosion has encroached on the carriageway, which needs urgent repairs. The roads' sections with irrigation canals and water channels manifest embankment side slope erosions. The drainage facilities are damaged, clogged and needs cleaning, while other roads require additional balancing culverts to allow flood waters to cross the road without causing infrastructure damages. The roadside drains particularly in urban stretches and bazaars are mostly choked with rubbish and silt, that renders these structures non-functional. Overtopping and waterlogging are common to the rural roads and bridges. Most of the roads and bridges have inadequate safety provisions. Horizontal and vertical profiles are incoherent to applicable code provisions and horizontal curve is mostly insufficient in built-up areas.

44. The roads' right of way are generally 10-12 m in most cases with reduced width in settlements varying from 3 m to 4 m. Major part is 2-lane with earthen shoulders. Riding condition is mostly poor to fair. Roadside drains are present in some urban stretches but mostly choked and non-functional.



Figure 6. Condition of rural road (SH-51 to Gotra Bhiwapur MDR-45).

E. Climate Resilient Rural Road Improvement

45. According to the World Bank, India is experiencing accelerated change in climate over the past century, with increase in mean annual and maximum temperatures, and decrease in seasonal rainfall but with more frequent extreme rainfall events. The Department of Environment, State Government of Maharashtra projects temperature and rainfall to increase all over the state in the year 2030s. Amravati and Aurangabad divisions will have greater rise in annual mean

temperature than other parts of the state, while increase in monsoon is projected in Amravati and Nashik divisions.

46. Current practices in the structural design and the location of the rural roads and bridges make them more sensitive to impacts of extreme climate events. Similar to the current RCIP, the additional financing will invest on the road's construction of new cross drains/culverts, increasing the capacity of cross drains and creating new ones, building new retaining walls, and increasing the road elevation to address the potential impacts from climate change. To cope with the impacts of climate change like the increase in temperature, the contractors will be responsible for the rural roads and bridges maintenance for 5 years after the completion of the civil works. The cost of the 5-year maintenance is estimated at INR ₹13,170.10 (lakh).

47. The project will initiate the capacity building of MRRDA in climate screening, decision support systems to include knowledge products on climate resilient technologies and practices, design of information support systems to analyze climate data, and post-disaster risk and recovery among others.

F. Use of Innovative Technologies

48. Similar to the current RCIP, the additional financing will promote the use of waste plastic as additive to hot aggregate to form a fine coat of over the aggregate providing higher strength, higher resistance to water, and better performance over time and reduce municipal wastes.¹⁵ From the total of 2,965 km of project roads, about 20% will adopt this technology.

¹⁵ NRRDA (undated). "Guidelines for the use of Plastic Waste in Rural Roads Construction." <http://pmgsy.nic.in/circulars/gpw.htm>

III. POLICY AND LEGAL FRAMEWORK

A. Regulatory Requirements for the Rural Road Upgrading

49. Under the Schedule of Environmental Impact Assessment Notification 2006, the improvements of small roads like rural roads and bridges are not required to conduct environmental assessments and secure environmental clearances from Central Government of India and State Level Environment. The proposed improvement of small roads and bridges under the additional financing may need to secure, depending on the construction activities and location, sectoral environmental laws such as diversion of forest land, tree cutting, opening of new quarry areas, establishment of temporary workshops, construction camps, hot mix plants establishment and operation, and use of vehicles for construction.

50. The legislation relative to the project's roads and bridges are shown in the following table.

Table 3. Pertinent Environmental Laws that are applicable for the project works

Sl. No.	Legislation	Objective	Applicability
1.	Environment (Protection) Act 1986- Environmental Impact Assessment Notification 2006 (Amended 2009)	Protection and improvement the overall environment	Not applicable to the rural roads and bridges. It is applicable only to highways.
2.	Forests (Conservation) Act 1980 (Amended 1988), and Forest (Conservation) Rules, 1981, (Amended 2003)	Protection and management of forest	As per above Act/Rules <i>Forest Clearance</i> from Department of Forests/Ministry of Environment and Forests Govt. of India is required for diversion of forest land (if any) for non-forest purpose. Prior permission is required from forests department to carry out any work within the forest areas and felling of roadside trees. Cutting of trees need to be compensated by compensatory afforestation as per permission condition.
3.	The Wildlife (Protection) Act, 1972 (Amended 1993); Not applicable in this case. Since No roads will be selected passing through protected areas or sanctuaries	Protection of animals through the creation of National Parks and Sanctuaries	Not Applicable, since no road and bridges are selected within wildlife protection zones.
4.	The Water (Prevention and Control of Pollution) Act	Prevention and control of water pollution and	Placement of hot-mix plants, quarrying and crushers, batch

Sl. No.	Legislation	Objective	Applicability
	1972 (Amended 1988), and the Water (Prevention and Control of Pollution) Rules, 1974	maintaining or restoring of quality of water	mixing plants, discharge of sewage from construction camps requires <i>No Objection Certificate (Consent to Establish and Consent to Operate)</i> from State Pollution Control Board prior to start of construction or setting up specific facility. <i>Authorization</i> will also be required for disposal of Hazardous Waste like waste oil etc. from State Pollution Control Board Permission from Central Ground Water Authority (CGWA) is required for extracting ground water for construction purposes.
5.	The Air (Prevention and Control of Pollution) Act, 1981, (Amended 1987) and the Air (Prevention and Control of Pollution) Rules, 1982	Prevention, control and abatement of air pollution	
6.	The Noise Pollution (Regulation and Control) Rules, 2000 (Amended 2002)	Regulation and control of noise producing and generating sources	
7.	The Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008 (Amended 2009), and the Batteries (Management and Handling) Rule, 2001	Control, and proper handling and disposal of hazardous wastes	
8.	Guidelines for Ground Water Extraction Prescribed by Central Ground Water Authority under the power granted under Environment Protection Act 1986	Protection and regulation of ground water use	

Source: India RCIP (2017).

B. Environment Codes of Practices

51. Both the World Bank and the ADB have developed their separate but similar environmental requirements. The World Bank developed environmental codes of practices (ECOPs)¹⁶ for PMGSY roads funded by them. The ECOPs covered a wide range of road construction activities and recommended mitigation and enhancement measures. A total of 20 codes were formulated, and these are:

- (i) ECOP-1.0 Project Planning and Design
- (ii) ECOP-2.0 Site Preparation
- (iii) ECOP-3.0 Construction Camps
- (iv) ECOP-4.0 Alternate Materials for Construction
- (v) ECOP-5.0 Borrow Areas
- (vi) ECOP-6.0 Topsoil Salvage, Storage and Replacement

¹⁶ Government of India, Prime Minister's Rural Road Development Program (PMGSY). 2018. *Environmental Codes of Practice*. <http://documents.worldbank.org/curated/en/644691525177252475/pdf/PMGSY-AF-Environmental-Codes-of-Practice-April-2018.pdf>

- (vii) ECOP-7.0 Quarry Management
- (viii) ECOP-8.0 Water for Construction
- (ix) ECOP-9.0 Slope Stability and Erosion Control
- (x) Ecop-9a. Bio-Engineering
- (xi) ECOP-10.0 Waste Management
- (xii) ECOP-11.0 Water Bodies
- (xiii) ECOP-12.0 Drainage
- (xiv) ECOP-13.0 Construction Plant and Equipment Management
- (xv) ECOP-14.0 Public and Worker's Health And Safety
- (xvi) ECOP-15.0 Cultural Properties
- (xvii) ECOP-16.0 Tree Plantation
- (xviii) ECOP-17.0 Managing Induced Development
- (xix) ECOP-18.0 Environment Audit
- (xx) ECOP-19.0 Natural Habitat
- (xxi) ECOP-20.0 Consultation for Environment Aspect

52. The additional financing will require agencies to implement good environmental practices in constructing and upgrading rural roads. As mentioned, these good practices are developed by the World Bank for India's PMGSY or Prime Ministers Rural Road Program, which "details the factors to be considered during project preparation to avoid/address environmental concerns through modifications in project design and incorporation of mitigation measures."¹⁷ These practices are to be implemented in conjunction with applicable road construction standards.

53. Good practice covers the entire range of rural road construction activities:

- (i) project planning and design;
- (ii) site preparation;
- (iii) construction camps;
- (iv) alternate materials for construction;
- (v) borrow areas;
- (vi) topsoil salvage, storage and replacement;
- (vii) quarry management; (viii) water for construction;
- (viii) slope stability and erosion control;
- (ix) waste management;
- (x) water bodies;
- (xi) drainage;
- (xii) construction plant and equipment management;
- (xiii) public and worker's safety and health;
- (xiv) cultural properties;
- (xv) tree plantation;
- (xvi) managing induced development;
- (xvii) natural habitat and biodiversity; and
- (xviii) consultation for environmental aspects.

54. In 2012, ADB adopted some of the ECOP elements in the Rural Connectivity Investment Program (40423-013)¹⁸ and developed an environmental assessment and review framework

¹⁷ Government of India, Prime Minister's Rural Road Development Program (PMGSY). 2010. *Environmental Codes of Practice*. <http://documents.worldbank.org/curated/en/854951468044369026/pdf/E25790V30EA0Re1actice010August02010.pdf>

¹⁸ ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranchise Financing Facility, Technical Assistance, and Administration of Technical Assistance to India for Rural Connectivity Investment Program*. Manila. (40423-013).

(EARF) to ensure that sound environmental management are incorporated in the contractor's responsibilities. The 40423-013 EARF developed their own environment checklists, general environmental management and monitoring plans which to a certain extent refines the WB ECOPs.

C. ADB Safeguard Policy Statement (SPS) of 2009

55. The ADB SPS requires addressing environmental concerns, if any, of a proposed activity in the early stages of project preparation. For this to address potential impacts, the SPS categorizes proposed project components into categories A, B, C or FI to determine the level of environmental assessment required. All the safeguard categorizations involve a structured process of impact assessment, planning, and mitigation of projects throughout the project cycle.

56. The safeguard policies require the following:

- (i) Impacts are identified and assessed early in the project cycle;
- (ii) Plans to avoid, minimize, mitigate, or compensate for potential adverse impacts are developed and implemented; and
- (iii) Affected people are informed and consulted during project preparation and implementation.

57. The SPS applies to all ADB-financed projects, including private sector operations, and to all project components. The internal procedural requirements are detailed in the Operations manual sections and involve similar implementation processes as follows:

- (i) Screening and scoping of the main issues start as soon as potential projects for ADB financing are identified and continue throughout the project cycle;
- (ii) The impacts are assessed; environmental plans summarizing the mitigation measures, monitoring program, and institutional arrangements are prepared; and arrangements are made to integrate safeguards into project design and implementation;
- (iii) Affected peoples are consulted during project preparation and implementation, and information is disclosed in the form, manner, and language accessible to them, and;
- (iv) Safeguard plans are disclosed to the general public and the information is updated at various stages in the project cycle, if necessary.

Table 4: Summary of the ADB's environmental safeguard categorization

Category	Category A	Category B	Category C	Category FI
Description	The project is likely to have significant Adverse Environmental Impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.	The project has potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats - are less adverse than those of Category A projects. These impacts are	The project is likely to have minimal or no adverse Environmental impacts	A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediaries.

		site-specific; few if any of them are irreversible; and in most cases mitigating measures can be designed more readily than for Category A projects.		
EA requirements	For a Category A project, the project sponsor is responsible for preparing a report, normally an environmental impact assessment	EA is narrower than that of Category A EA. Like a Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.	Beyond screening, no further EA action is required for a Category C project.	For FI category subproject sponsors requires to carry out appropriate EA for each subproject`

D. Safeguards Provisions in the Bidding Documents

58. Moreover, environmental safeguard requirements are incorporated in the bidding documents. These are:

- (i) Sec 19. Safety: "The Contractor shall be responsible for the safety of all activities on the Site and for ensuring safety of all road users;
- (ii) Section 20. Discoveries: "Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them;"
- (iii) Clause F, paras. 56–57, Labor Law Compliance:
 - (a) The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labor, local or other, and for their payment, housing, feeding and transport.
 - (b) The Contractor shall comply with all relevant labor laws and regulations applicable to the Contractors personnel, including staff, consultants, Contractors, and agents; and workplace health and safety laws.
 - (c) The Contractor shall provide equal wages and benefits to men and women for work of equal value or type.
 - (d) The Contractor shall not employ "forced or compulsory labor" in any form. "Forced or compulsory labor" consists of all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.
 - (e) The Contractor shall not employ any child to perform any work, including work that is economically exploitative, or is likely to be hazardous to, or to interfere with,

the child' education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. "Child" means a child below the statutory minimum age of 14, as specified under applicable national, provincial, or local law of the relevant State of India.

(f) During continuance of the Contract, the Contractor and his Sub-Contractors shall abide at all times by all existing labor enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labor law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labor law in future either by the State or the Central Government or the local authority.

(g) The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

(h) Normal working hours are indicated in the Contract Data;

(iv) Clause 61, Health and Safety: The Contractor shall:

(a) conduct health and safety programs for workers employed under the project and shall include information on the trafficking of women and the risk of sexually Transmitted diseases, including HIV/AIDS in such programs. The Contractors shall carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually Transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction and maintenance.

(b) cooperate with the Engineer who will coordinate with State AIDS Control Society and other public health agencies to carry out HIV/AIDS awareness programs for labor and dissemination of information at worksites on risks of sexually Transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction.

(c) follow legally mandated provisions on health, safety, welfare, sanitation and working conditions and appropriate working campsites during the construction period.

(d) at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel and to provide a safe work environment; provide fencing, lighting, guarding and watching of the Works until completion and taking over by the Employer;

(e) provide any Temporary Works (including roadways, footpaths, guards and fences) which may be necessary, because of the executing of the Works, for the use and protection of the public and owners and occupiers of adjacent land;

(f) the Contractor shall at all times take all reasonable precautions to maintain the health and safety of Contractor's Personnel and to provide a safe work environment. In collaboration with local health authorities, the Contractor shall ensure availability of first aid facilities, medical staff, sick bay ambulance service to Personnel;

(g) the Contractor shall make suitable arrangements for all necessary welfare and hygiene requirements and for the prevention of epidemics to include: provision of a sufficient supply of suitable food, adequate supply of drinking water and other water for the use of the Contractor's Personnel, and protection from insect and pest nuisance; and

(h) maximize employment of females and local poor and disadvantaged persons for construction and routine maintenance purposes provided that the requirements for efficiency are adequately met.

(i) The Contractor shall submit quarterly reports on the carrying out of such measures to the Employer;

(v) Clause 63 – Social:

(a) The Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Employer's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

(b) The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

(c) The Contractor shall send, to the Engineer details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.

(d) HIV-AIDS Prevention. The Contractor shall conduct an HIV-AIDS awareness programs through an approved service provider and shall undertake such other measures as are specified in this Contract to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.

(e) The Contractor shall throughout the Contract (including the Defects Liability Period): conduct Information, Education and Communication (IEC) campaigns, at least every other month, addressed to all the Site staff and labor (including all the Contractor's employees, all Sub-Contractors and any other Contractor's or Employer's personnel employees, and all truck drivers and crew making deliveries to site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behavior with respect to, sexually transmitted diseases (STD) or sexually transmitted infections (STI) in general and HIV/AIDS in particular; (2) provide male or female condoms for all Site staff and labor as appropriate; and (3) provide for STI and HIV/AIDS screening, diagnosis, counseling and referral to a dedicated national STI and HIV/AIDS program, of all Site staff and labor.

(f) The Contractor shall include in the program to be submitted for the execution of the Works an alleviation program for Site staff and labor and their families in respect of STI and STD including HIV/AIDS. The STI, STD and HIV/AIDS alleviation program shall indicate when, how and at what cost the Contractor plans to satisfy the requirements. For each component the program shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation of this program shall not exceed the Provisional Sum dedicated for this purpose.

(g) The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental spiritual, moral or social development. Where the relevant labor laws of the Country have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

(h) The Contractor shall submit, to the Engineer, records showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment

on site. Details shall be submitted each calendar month, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the Completion Date stage.

E. International Conventions and Treaties

59. **Ramsar Convention on Wetlands.** In 1971, the Convention on Wetlands was signed in Ramsar, Iran. It 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. Which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Out of the designated wetlands of international importance in India, none of them is located near the rural roads and bridges.

60. **Convention on Protection of the World Cultural and Natural Heritage.** 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 18 international treaty called the Convention concerning the Protection of the World Cultural and Natural Heritage in 1972. No rural roads and bridges are near heritage areas.

61. **Vienna Convention for Protection of the Ozone layer and Montreal Protocol on Substances Depleting the Ozone layer.** The Vienna Convention (1985) 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 (1987) was negotiated. The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform) are to be phased out by 2010. The project will not produce and consume ozone depleting substances.

62. **United Nations Framework Convention on Climate Change (UNFCCC).** As per the convention the reduction/limitation requirements of Green House Gases (GHG) apply only to developed countries. The only reporting obligation for developing countries relates to the construction of a GHG inventory (GHG sources and sinks, potential vulnerability to climate change, adaptation measures and other steps being taken to address climate change).

63. **Convention on Biological Diversity (CBD).** The convention 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.

64. **The Convention on the Conservation of Migratory Species of Wild Animals (CMS, 1983).** It is an intergovernmental treaty, concluded under the aegis of the United Nations Environmental Programme (UNEP), concerned with the conservation of wildlife and habitats on a global scale and in particular terrestrial, aquatic and avian migratory species throughout their range.

IV. ENVIRONMENTAL BASELINE

A. Geography and Project Administrative Boundary

65. The State of Maharashtra is at the western sea coastline of India. This is surrounded by Goa, Telangana and Karnataka states (south), Andhra Pradesh (southeast), Gujarat and Madhya Pradesh (north), Chhattisgarh (east), and the Arabian Sea (west). In terms of land area and population, Maharashtra is the third-largest state of India. The coastline is 530 km long along the Arabian Sea.

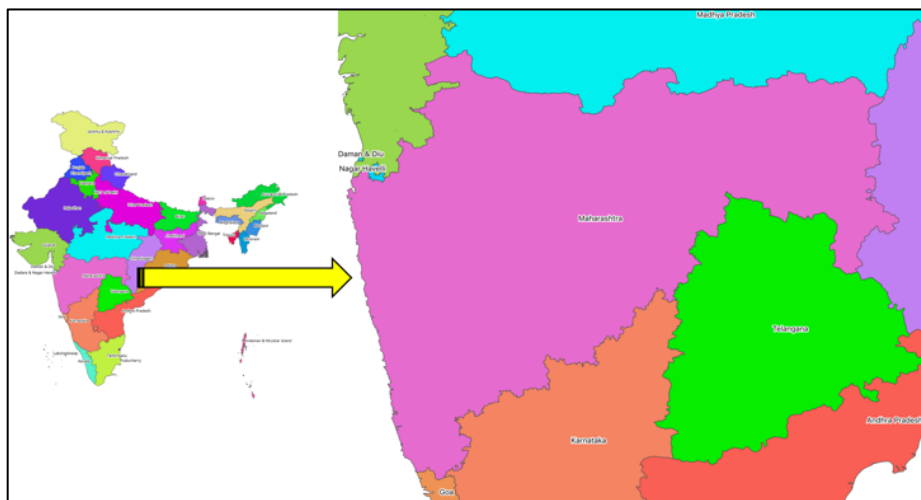


Figure 7. Administrative location of Maharashtra along with the other states of India.

66. Maharashtra is divided into 5 geographic regions (geographically, historically, politically, and according to cultural sentiments). The location of *Konkan* is at the western coastal region that is between the Western Ghats and the Arabian Sea. Its major cities include Mumbai, Thane, Ulhasnagar, Bhiwandi, Ratnagiri and Chiplun. *Kandesh* is the northwestern region and lying in the valley of Tapti River. Jalgaon, Dhulia and Bhusawal are the major cities of Kandesh. *Desh* is at the center of the state, while *Marathwada* is at the southeastern part. *Vidarbha* is the easternmost region of Maharashtra, formerly part of Central Provinces and Berar. Nagpur is the main city of Vidarbha.

67. Physical features of Maharashtra is divided into *Deccan plateau*, which is separated from the Konkan coastline by “Ghats”. The *Ghats* are a succession of steep hills, periodically bisected by narrow roads. Most of the famous hill stations of the state are at the Ghats. *Sahyadri* range with an elevation of 1,000 meters is known for its crowning plateaus. Lying between the Arabian Sea and the Sahyadri Range, *Konkan* is narrow coastal lowland, just 50 km wide and with an elevation below 200 meters. The third important region is the *Satpura* hills along the northern border, and the Bhamragad-Chiroli-Gaikhuri ranges on the eastern border form physical barriers preventing easy movement. These ranges also serve as natural limits to the state.

68. Forest cover comprise 17% of the total area of the state. Majority of the forests are in the eastern and Sahyadri regions of the state. Main Rivers of the state are Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga.

69. The proposed rural roads and bridges are located in 6 regions (34 districts) as the administrative boundaries of the project. Appendix 1 and 2 shows the detailed distribution of rural

roads and bridges within the various districts of the state. Table below shows the general information of the administrative boundaries and corresponding number of rural roads and bridges.

Table 5: Distribution of the districts in different divisions of the State Maharashtra and corresponding target quantity of rural roads and bridges.

Region	Districts	Land Area (km ²)	No. of rural roads	No. of bridges
Amravati	Akola, Amravati, Buldana, Yavatmal, Washim	46,090	150	32
Aurangabad	Aurangabad, Beed, Jalna, Osmanabad, Nanded, Latur, Parbhani, Hingoli	64,590	306	57
Konkan	Thane, Palghar, Raigad, Ratnagiri, Sindhudurg	30,746	145	18
Nagpur	Bhandara, Chandrapur, Gadchiroli, Gondia, Nagpur, Wardha	51,336	124	54
Nashik	Ahmednagar, Dhule, Jalgaon, Nandurbar, Nashik	57,268	175	55
Pune	Kolhapur, Pune, Sangli, Satara, Solapur	58,268	219	15

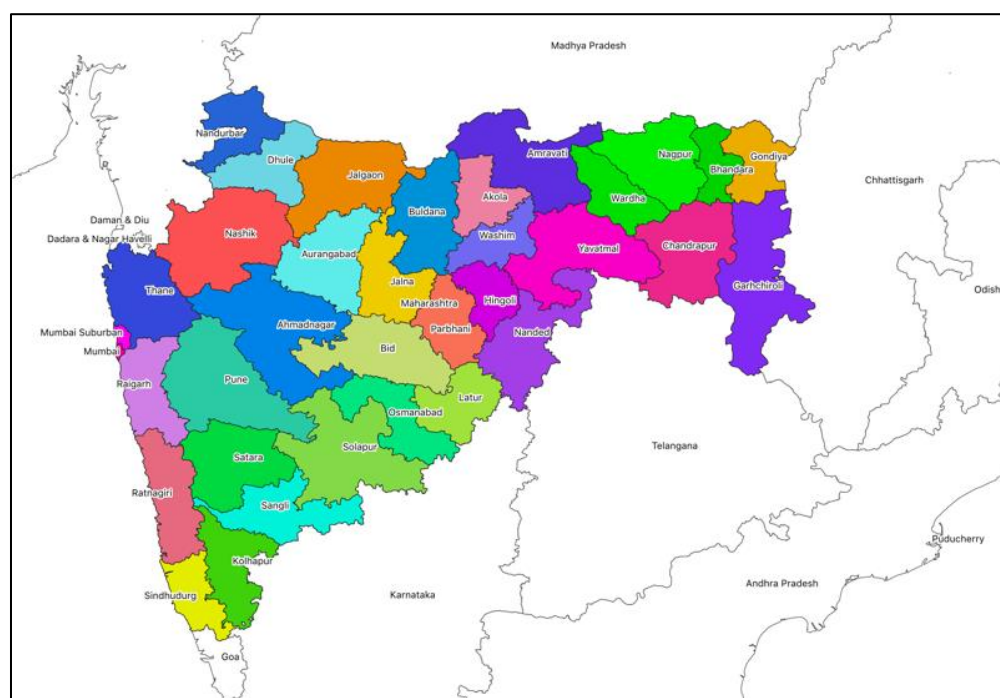


Figure 8: Map of the districts of Maharashtra.

B. Physical Environment

1. Climate and Meteorology

70. The climate in Maharashtra is generally semi-arid. There is wide variation of rainfall distribution across the state, where the coastal area receives more than 2,000 mm/year while the drought-prone and arid Marathwada Region which receives less than 600mm/year. The presence of Western Ghats influences the state's climate by blocking the monsoon bearing winds coming from the Arabian Sea and cause rainfall. In general, the annual rainfall of the state varies from 400 mm to 6000 mm within 3 - 4 months annually.

71. The average annual temperature of Maharashtra is 25°C - 27°C in most regions. The months of March, April and May, experience very high temperatures and accompanied by thunderstorms. During this hot season, there is minor variation in temperature that ranges from 34°C–40°C. However, temperature gradient occurs in the period of pre-monsoon when the Western Ghats experience lower temperature compared to the rest of the state.

72. With the exception of the coastal zone, the state is generally drought-prone with 73% of the territory regularly experiences extreme water shortage and accounting for almost 25% of the country's total. The drought-prone districts are Ahmednagar, Solapur, Nashik, Pune, Sangli, Satara, Aurangabad, Beed, Osmanabad, Dhule, Jalgaon, and Buldhana. Maharashtra experienced severe and successive years of drought in 1970–1974 and 2000–2004.

73. The onset of the monsoons in the early June provides relief to the scorching summers of March and conditions become cold from October till end of the year. Most of the rainfall is received by the Konkan and Sahyadrian parts of the state. In some years the frequency of the rainfall varies along with harsh climatic conditions in summer months.

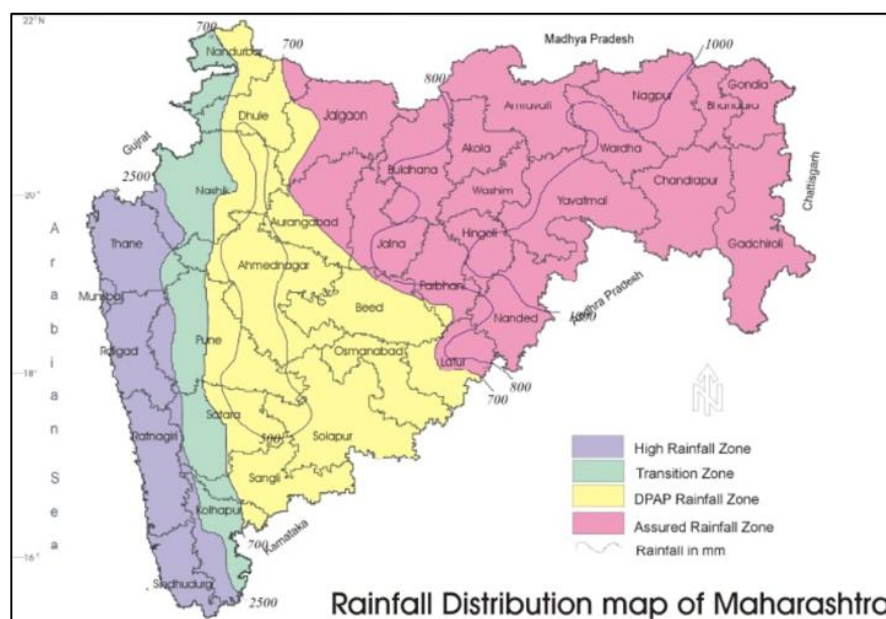


Figure 9: Map showing varying amount of rainfall annually in different parts of Maharashtra.¹⁹

¹⁹ Vikas Kharage, Water Supply and Sanitation Department, State of Maharashtra: From Survey to Sustainability – Groundwater Experiences of Maharashtra.

74. In summary, the seasons are described below:

Summer: March, April and May are the hottest months. During April and May thunderstorms are common all over the state. Temperature varies between 22°C-39°C during this season.

Rainy: Rainfall starts normally in the first week of June and July is the wettest month in Maharashtra, while August gets substantial rain. Monsoon ends on September.

Winter: Cool dry spell prevails from November to February. But the eastern part of Maharashtra sometimes receives some rainfall. The temperature varies between 12°C-34°C.

2. Physical and Geography

75. The state is geologically considered part of the “Peninsular Shield” underlain with ancient rocks dating from the Precambrian era which have undergone metamorphism. The formation is characterized by stable clock and unaffected by mountain building movements over the ancient rocks from Precambrian and Proterozoic eras. These rocks are extensively covered by horizontally bedded lava flows comprising the Deccan trap. The Vidarbha Region is underlain with important limestone and coalfields. The Western coast was formed by faulting from Ratnagiri, Mumbai, and Thane district, where several hot springs along a linear orientation and suggesting these are located on a line of fracture. Further, the Western Ghats is comprised of Deccan trap lava flow.

3. Soils

76. A variety of soils types cover the State of Maharashtra. On the Decan plateau, Narmada, Krishna, Godavari, Wardha, and Tapi rivers has carved the highlands and depositing mostly black basalt soil that is clayey, commonly called “black cotton soil”. This type of is not suitable for road construction but is preferred by cotton and rabi crop production.



Figure 10. Soil map Maharashtra²⁰

²⁰ Source: National Bureau of Soil and Land Use Planning, ICAR, Nagpur

77. In Wardha, soils are formed from old crystalline rocks, which contains high salinity and rendering this soil useless for agricultural purposes. Along the hilly terrain has reddish brown soil usually under forest cover and very suitable for rainfed crops like rice, gram, sugarcane, and perennials like mango, cashew, and jackfruit.

78. The Western Ghats, runs parallel along the coast, has reddish brown to black soils that are rich with nitrogen. As the hills starts to flatten or called tableland transition (Mawat), soil in these areas are suitable for agriculture and cash crops like potato, onion, chilies, brinjal, and tomatoes dominate.

79. Along the plain lands of the state, the soil is grayish black with moderate alkalinity and suitable for jowar, wheat, and groundnuts. Along the Konkan coast measuring almost 50 km from the sea and the Western Ghats is planted mostly with rice, mango, and coconut.

4. Seismic Hazard

80. Based on the seismic classification of the Bureau of Indian Standards, the central and eastern sections of the state that covers the districts of Beed, Osmanabad, Latur Ahmednagar, Pune, Satara and Sangli districts are in Zone II. The districts of Raigad and Ratnagiri are the only districts to lie in Zone IV, where the maximum expected intensity is Medvedev–Sponheuer–Karnik (MSK) VIII. MSK VIII earthquake will be damaging with “many people find it difficult to stand, even outdoors, furniture may be overturned and waves may be seen on very soft ground. Older structures partially collapse or sustain considerable damage. Large cracks and fissures opening up, rockfalls”.

81. The remaining western and north-western districts all lie in Zone III. Areas under Zone II is liable to MSK VI or less and is classified as the Low Damage Risk Zone. The IS code assigns zone factor of 0.10 (maximum horizontal acceleration that can be experienced by a structure in this zone is 10% of gravitational acceleration). For Zone 3 or Moderate Damage Risk Zone, is liable to MSK VII. Finally, Zone IV is called the High Damage Risk Zone and covers areas liable to MSK VIII.

82. On December 10 December 1967 the strongest earthquake ever recorded in Maharashtra took place in the Koyna area at around 06:48:25 coordinated universal time (UTC) killing 200 people in the Koynanagar area. The Koyna Dam suffered some structural damage and tremors were felt strongly in many towns and cities in western Maharashtra, including, Mumbai and Pune. Also felt in Goa and other parts of western and southern India.

5. Land Use Pattern

83. As of 2011, the total land area was 30.771 million hectares (ha) of which 16.95% was forest followed by barren lands accounting for 10.24%. The land use pattern is presented in the figure below.

Table 6. Land Use in Maharashtra as of 2018.²¹

²¹ Source: Data.gov.in (2018)

Land Use	Area (in thousands, ha.)	Percentage (%)
Total geographical area	30,771	-
Reporting area for land utilization	30,758	100.00
Forests	5,213	16.95
Not available for cultivation	3,151	10.24
Permanent pastures and other grazing lands	1,246	4.05
land under misc. tree crops and groves	248	0.81
Culturable wasteland	917	2.98
Fallow lands other than current fallows	1,187	3.86
Current fallows	1,370	4.45
Net area sown	17,426	56.66

6. Surface and Ground Water Quality

84. As the state's nodal agency and under the Central Pollution Control Board (CPCB), the Maharashtra Pollution Control Board (MPCB) is monitoring the water quality over 294 Water Quality Monitoring Stations (WQMS) for both surface and ground water. The IEE utilized the Water Quality Status of Maharashtra Report (2017-18)²² as the baseline information of the quality of water resources in the state. The water quality status report by the MPCB is a compilation of statistically analyzed data for the year 2017-18, which represents the performance of surface and ground water quality in Maharashtra.

85. For easy understanding, MPCB used the Water Quality Index (WQI) into the report to simplify the complex water quality parametric data for comprehensive information. The MPCB water quality report used the WQI for surface water within the basins of (i) *Tapi*, (ii) *Godavari*, (iii) *Krishna*, and (iv) *West Flowing rivers*, as well as for the (v) *ground water*.

86. After assessing the water parameters, the WQI provides a single entity (number) which expresses the overall water quality at a particular period for different water quality parameters (DO, BOD, pH, etc). WQI is similar to a numerical grade that shows the overall quality of water resources at a particular location and time. Also, WQI provides a general idea on the possible problems with the water in the region. The following sections show the summary of the Water Quality Status of Maharashtra Report (2017-18).

Surface Water – Tapi Basin

87. Situated in the northern part of the Deccan plateau, Tapi Basin extends over other states of Madhya Pradesh, Maharashtra and Gujarat and covering 65,145 sq. km. Almost 80% of the basin is within the state of Maharashtra, then followed by Madhya Pradesh and Gujarat at 15% and 6%, respectively. The major tributaries of Tapi river system are rivers of Purna, Girna, Gomai, Panzara, Pedhi and Arna. The basin covers the districts of Akola, Amravati, Dhule, Jalgaon, Nandurbar and Nashik, which are also locations of the RCIP additional financing.

²² Water Quality Status of Maharashtra 2017-18 (Compilation of Water Quality Data Recorded by MPCB) January 2019.

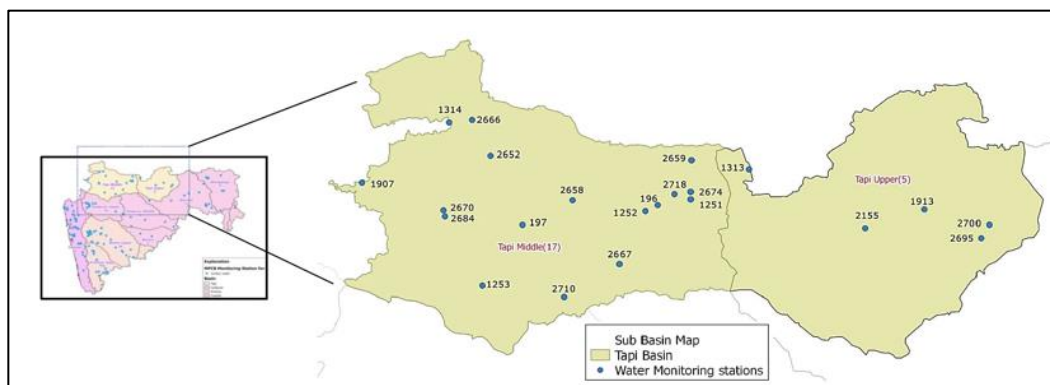


Figure 11. Network of surface water quality monitoring stations in Tapi Basin²³

88. The water quality performance of Tapi basin over the 6 districts of the state is shown in Figure 12. According to the report of MPCB, the annual average WQI of Akola, Amravati and Jalgaon has “Medium to Good” category, but compared to 2016-17, WQI showed a decreasing pattern, which indicated deterioration of water quality in these stations (though in “Medium to Good Category”). The WQI of Dhule increased from nearly 56 to 62 in 2017-18 indicating improvement in water quality in Dhule monitoring areas.

89. The WQI of Nandurbar and Nashik district registered to be in “Good to Excellent” in 2017-18. However compared to previous year’s index value, both the districts registered decrease in pattern from nearly 71 (2016-17) to 69 (2017-18) and 76 (2016-17) to 66 (2017-18), respectively.

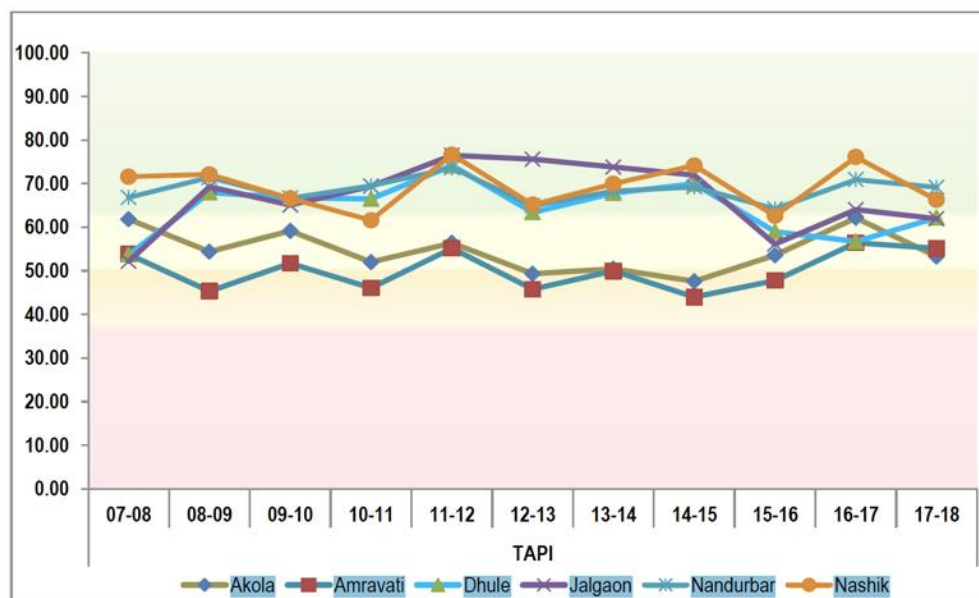


Figure 12. Historical WQI (2007 to 2018) of 6 districts in Tapi Basin²⁴
Surface Water – Godavari Basin

²³ Map no. 3, Page 31, Water Quality Status of Maharashtra 2017-18

²⁴ Figure No.5, Page 32, Water Quality Status of Maharashtra 2017-18

90. Nearly 10% of the total geographical area of India, Godavari Basin covers 6 states, which are Maharashtra (48.65%), Andhra Pradesh (23.40%), Chhattisgarh (12.49%), Madhya Pradesh (8.63%), Orissa (5.67%) and Karnataka (1.41%). As second longest river in the country, the total length of the river system of Godavari is around 1,465 km from Trimbakeshwar, Nashik to its outfall into the Bengal Bay. In Maharashtra, the Godavari Basin could be divided into sub-basins:

- (i) Godavari Upper (Godavari 1 Basin)
- (ii) Godavari Middle (Godavari 1 Basin)
- (iii) Manjra (Godavari 1 Basin)
- (iv) Wardha (Godavari 2 Basin)
- (v) Weinganga (Godavari 2 Basin)
- (vi) Indravati (Godavari 2 Basin)
- (vii) Pranhita (Godavari 2 Basin)

91. For the purpose of monitoring and analysis, these sub-basins have been grouped by MPCB into 2 clusters, Godavari 1 Basin comprising of (i) Godavari Upper, (ii) Godavari Middle and (iii) Manjra sub-basin (Figure 13), Godavari 1 Basin records the annual average WQI for the districts of Aurnagabad, Beed, Jalna, Latur, Nanded, Nashik, Osmanabad and Parbhani.

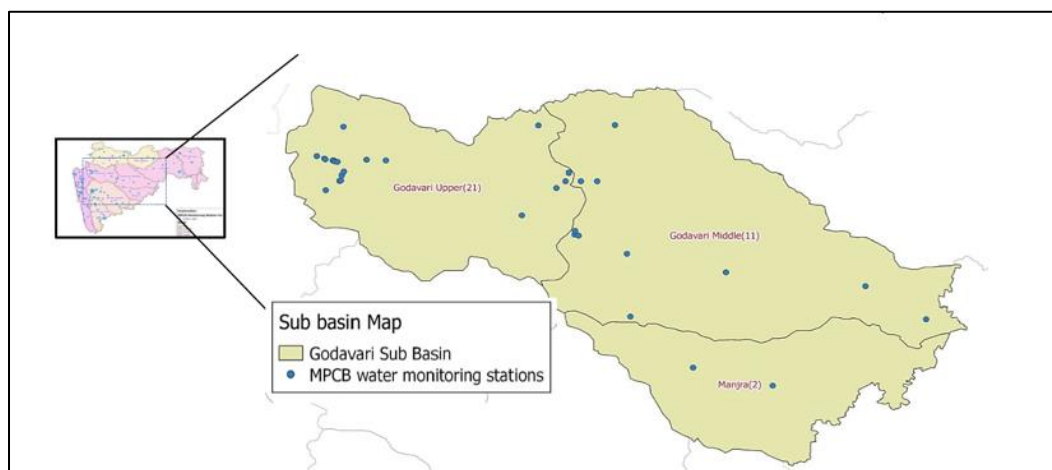


Figure13. Network of surface water quality monitoring stations in Godavari Basin ¹²⁵

92. As shown in Figure 14, MPCB grouped sub-basins of (i) Wardha, (ii) Weinganga, (iii) Indravati and (iv) Pranhita for monitoring of Godavari 2. The Godavari 2 Basin covers districts, which are also locations of the additional financing's rural roads and bridges, which are Akola, Bhandara, Buldhana, Chandrapur, Nagpur, Wardha, Yavatmal.

²⁵ Map no. 4, Page 43, Water Quality Status of Maharashtra 2017-18

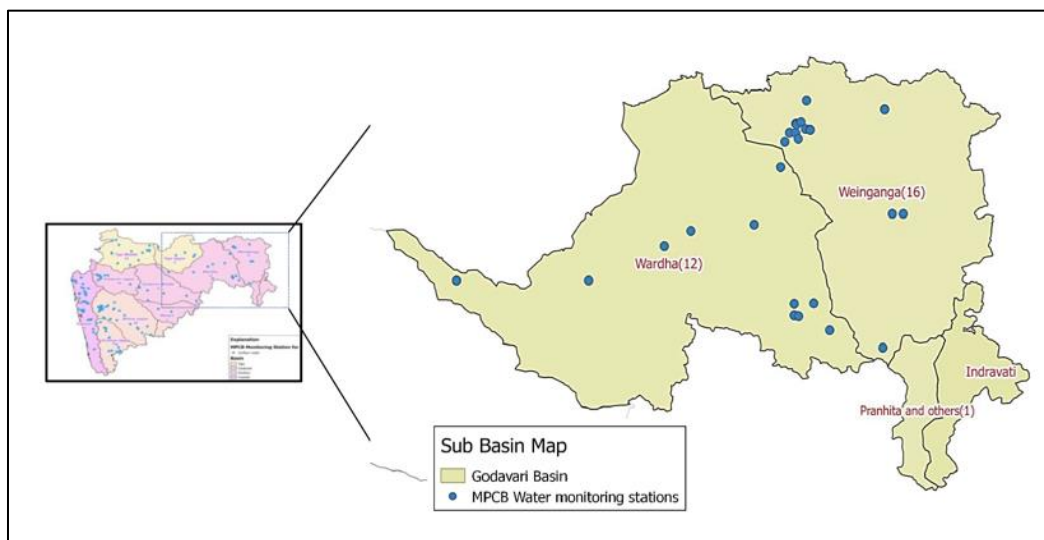


Figure 14. Network of surface water quality monitoring stations in Godavari Basin²⁶

93. Except for Aurangabad, the WQI for 7 districts were “Good to Excellent” category. The WQI of Aurangabad was found slightly lower at Good to Medium category. However, a small decrease was observed during 2017-2018 reporting period, which an indication of a slight deterioration in the water quality (Figure 15).

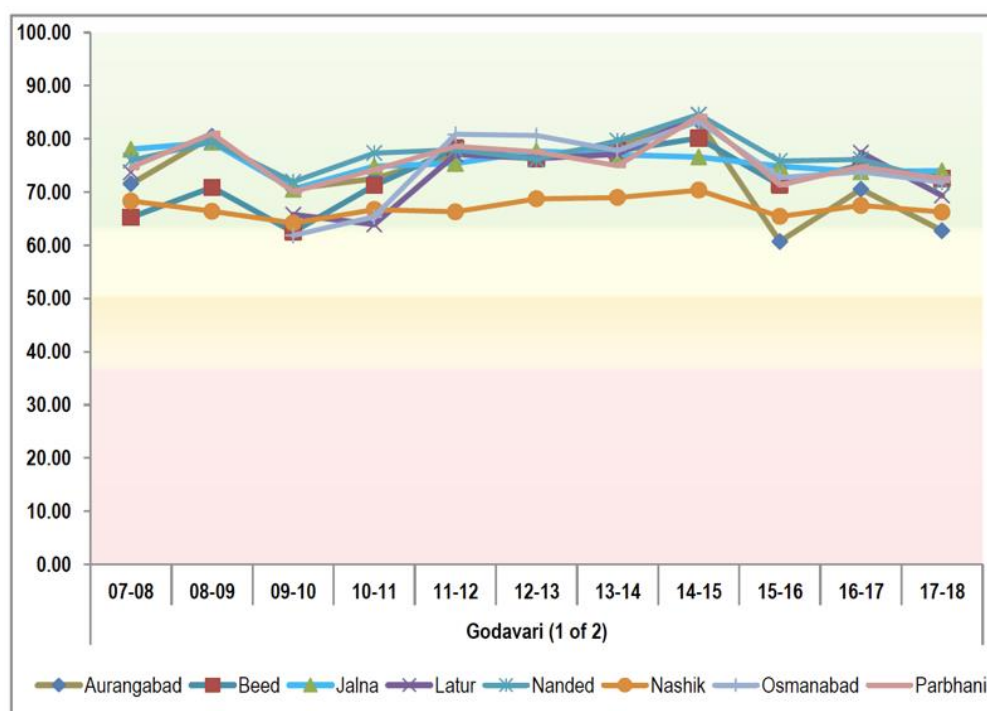


Figure 15. Trend of annual WQI across districts of Godavari Basin²⁷

²⁶ Map no. 5, Page 57, Water Quality Status of Maharashtra 2017-18

²⁷ Figure No.11, Page 44, Water Quality Status of Maharashtra 2017-18

94. The historical WQI of Godavari basin 2 is below. For the year 2017-18, the annual average WQI was “Medium to Good” classification except for District of Nagpur. The WQI of Nagpur is classified as “Bad” category (2017-18) compared to the previous year’s “Medium to Good”. This indicates the decrease in water quality due to pollution in Nagpur District according to the MPCB. On the other hand, WQI of Bhandara, Chandrapur and Yavatmal improved during the reporting period, which indicates improvement in water quality. However, the districts of Akola, Buldhana and Wardha decreased the WQI (2017-18).

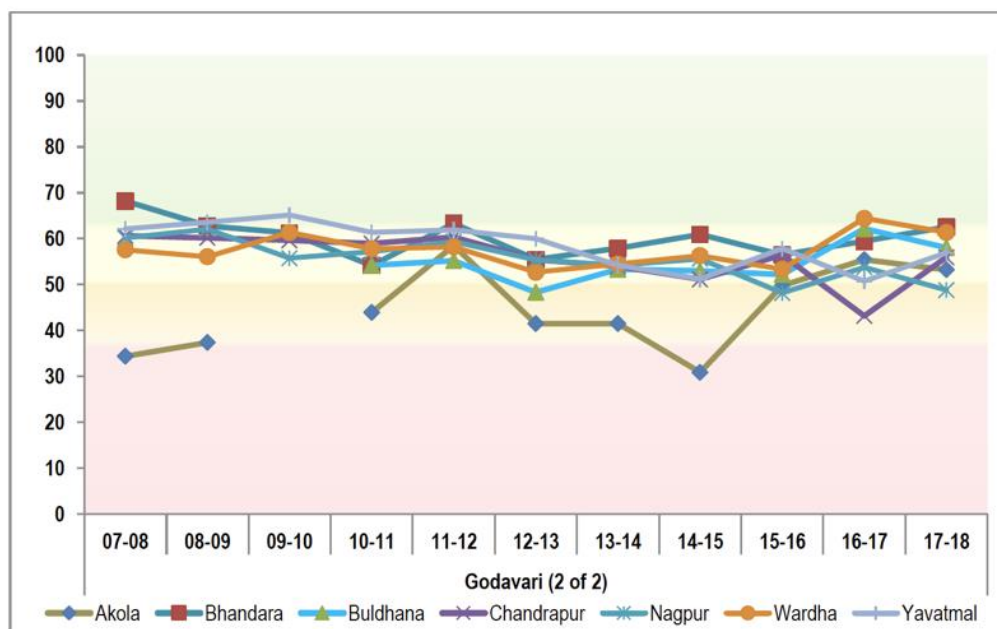


Figure16. Trend of annual WQI across districts of Godavari Basin²⁸

Surface Water – Krishna Basin

95. Krishna River Basin has a total area of 258,948 sq. km. The basin extends over the states of Andhra Pradesh, Maharashtra and Karnataka. Based on the MPCB's report, the river is 1,400 km, which drains the Deccan plateau into the Bay of Bengal. The major tributaries of Krishna River Basin are the (i) Ghataprabha, (ii) Malaprabha, (iii) Bhima, (iv) Tungbhadra, (v) Munneru and (vi) Musi River. The Krishna basin is divided into smaller sub-basin, these are Krishna Upper (21 stations) and Bhima Upper (37 stations) for analysis of the water quality status report.

96. The yearly results of the surface water quality monitoring of the Krishna Basin is monitored in the districts of (i) Ahmednagar, (ii) Kolhapur, (iii) Pune, (iv) Sangli, (v) Satara and (vi) Solapur districts (Figure 17). Of all districts in the basin, Sangli's annual average has improved significantly from “Bad” category to “Good and Excellent”. Improvement is also recorded in Kolhapur District, wherein the WQI is “Good to excellent” in 2017-18 report from previous “Medium to Good” category. This indicates that Kolhapur District has significant improvement in water quality. MPCB also reported Pune's WQI improvement in annual average from “Bad” (2016-17) to “Medium to Good” in 2017-18.

²⁸ Figure No.17, Page 58, Water Quality Status of Maharashtra 2017-18

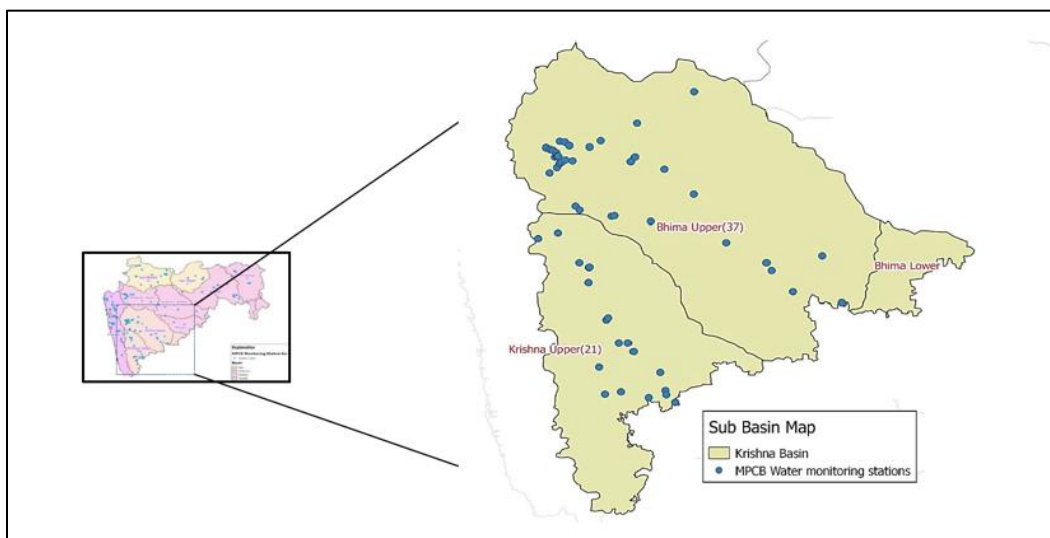


Figure17. Network of surface water quality monitoring stations in Krishna Basin²⁹

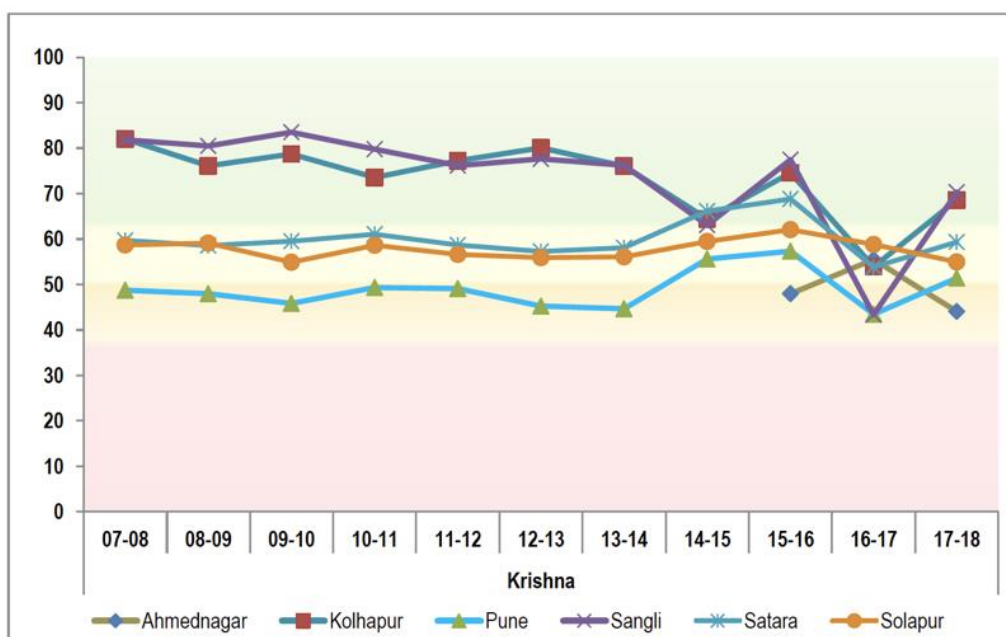


Figure 18. Trend of annual WQI across districts of Krishna Basin³⁰

²⁹ Map no. 6, Page 71, Water Quality Status of Maharashtra 2017-18

³⁰ Figure No.23, Page 72, Water Quality Status of Maharashtra 2017-18

Surface Water – Godavari Basin

97. There are many rivers flowing westwards, originating from Western Ghats and discharging to the Arabian Sea. The West flowing rivers of Peninsular India are fewer and smaller. Unlike flowing rivers in the eastern part of the state, these rivers are smaller and do not form deltas, but only estuaries. The following rivers are important sources of drinking water, agricultural and industrial applications.

98. The geographical area covered by the West Flowing Rivers in Maharashtra is 3.16 Mha (Million hectares), which is 10.7% of the state. MPCB has installed total 41 water quality monitoring stations along these rivers to monitor the overall status of the river system. West flowing rivers from Maharashtra are (i) Damanganga, (ii) Vaitarna, (iii) Ulhas, (iv) Savitri, (v) Vashishti, (vi) Kundalika, (vii) Shastri, (viii) Karli, (ix) Mithi, (x) Terekhol and (xi) Surya.

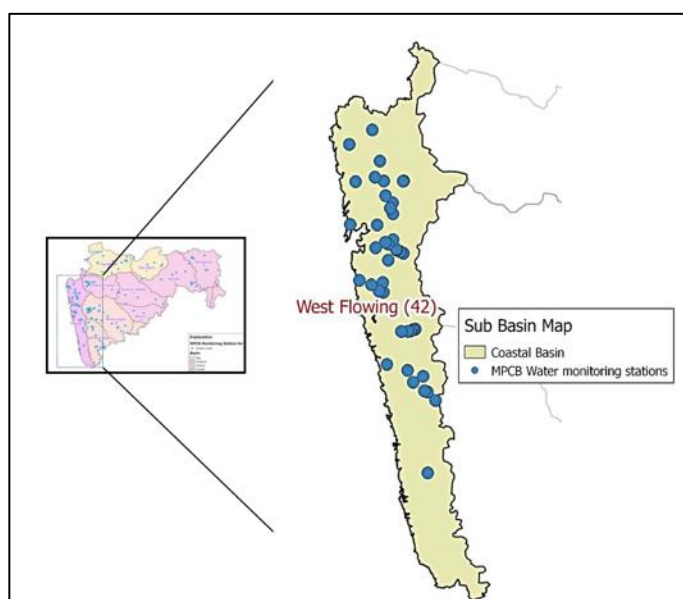


Figure19. Network of surface water quality monitoring stations in West flowing rivers³¹

99. In figure 20, MPCB reported that the 5 districts have slight improvement in the annual average WQI. However, Mumbai is consistently classified as poor WQI and became “Bad to Very Bad” category, which indicates water quality deterioration. WQI results in Raigad, Thane and Palghar were in “Good to Excellent” category and have shown improvement than to the previous monitoring year (2016-17).

³¹ Map no. 7, Page 95, Water Quality Status of Maharashtra 2017-18

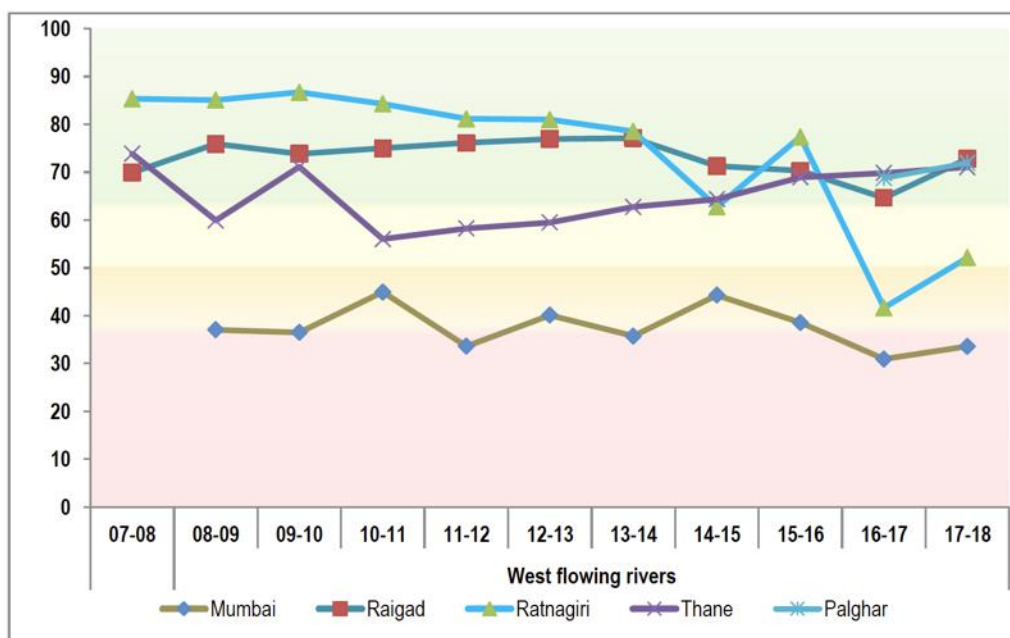


Figure 20. Trend of annual WQI across districts of West Flowing Basins³²

Groundwater

100. From the report of the MPCB, the WQMS in stations 2819 (Malegaon, Pune) and 2822 (Chincholi, Solapur) recorded as “Water Unsuitable for Drinking”. The stations have recorded high levels of TDS, hardness, calcium and chloride in the water. The pH levels for all ground WQMS were observed in the range of 6.5-9. However, there are WQMS at well water stations 215 (Turbhe store), bore well station 2825 (Wahegaon, Aurangabad), private dug well station 2819 and bore well station 2822 (near Chincholi) have records of very high levels of Hardness and Calcium (CaCo₃) of about 7400 mg/l, 1210 mg/l, 1380 mg/l and 1710 mg/l, respectively. The private well station recorded highest Nitrate value of 21.0 mg/l. The fluoride, levels are found to be well within the limits (1.5mg/l).

101. According to the MPCP’s report, stations 220, 2202, 2832, 2833 and 2835 of Kolhapur district recorded “Excellent” WQI throughout the reporting period of 2017-2018. There is 23% and 35% of the total ground WQMS under “Good water” and “Poor Water”, respectively. However, the stations 2825, 2008 and 1985 in Aurangabad, Kolhapur and Thane district respectively recorded “Very Very Poor Water”. The stations 2819 and 2822 in Pune district recorded WQI as “Water Unsuitable for drinking”, which shows high level of water quality deterioration due to pollution.

³² Figure No.237, Page 96, Water Quality Status of Maharashtra 2017-18

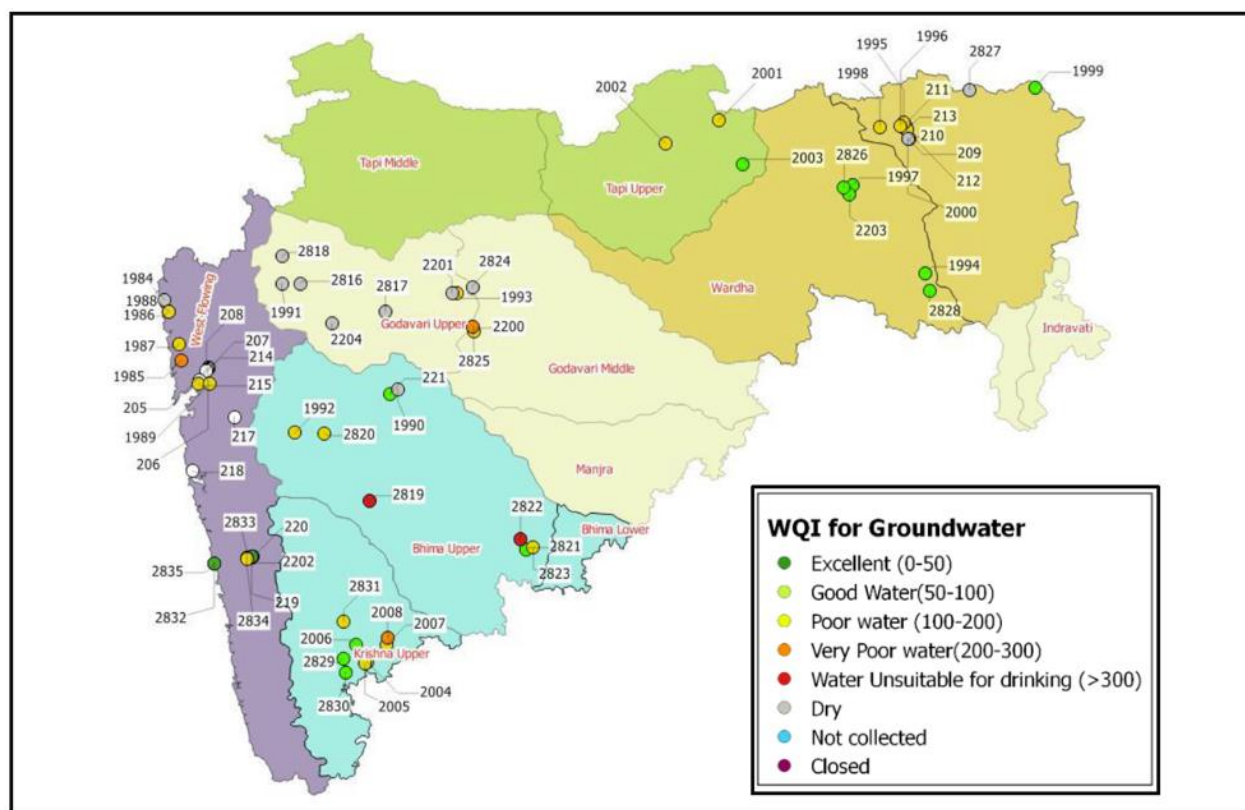


Figure 21. Spatial representation for average groundwater WQI³³

C. Flora and Fauna

1. Forest

102. As of 2011, 5.046 million ha of the state's territory have forest cover accounting for more than 16% of the total land area. By forest cover type: open, moderate dense, and very dense accounts for 2.11 ha, 2.08 ha, and 0.87 ha, respectively. Geographically, these forests are found along the Konka coast, and districts sharing boarder with Chhatisgarh. Most of dense forest cover are found in the districts of Gadchiroli with 473,000 ha, Chandrapur with 134,000 ha, and Gondia with 88,000 ha, aggregately accounting for almost 805 of the total dense forest cover of the state.

³³ Map no. 2, Page 10, Water Quality Status of Maharashtra 2017-18

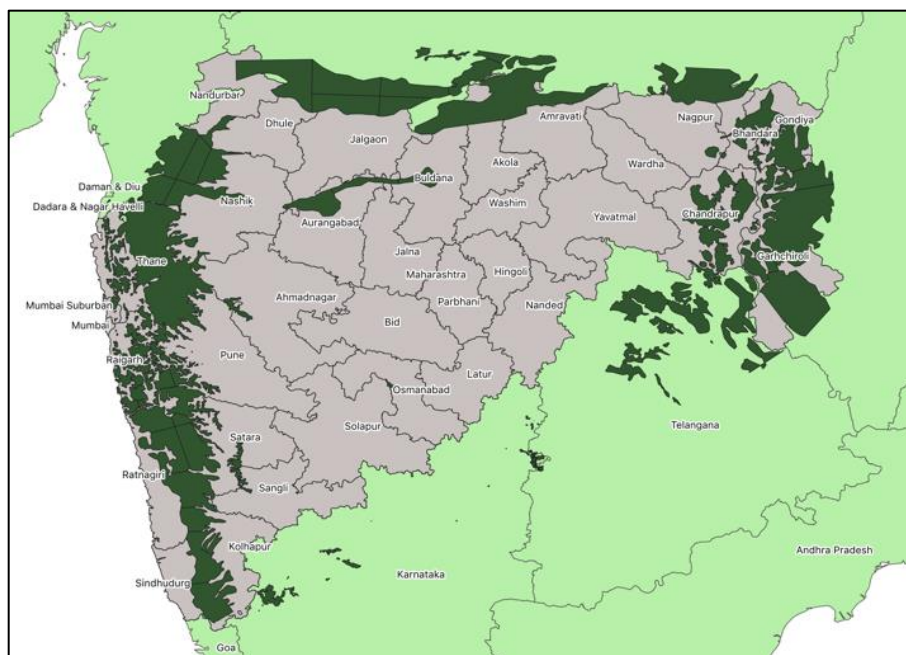


Figure 22: Distribution forest cover across the State of Maharashtra.

District	Geographical Area	2011 Assessment - Very Dense Forest	2011 Assessment - Mod. Dense Forest	2011 Assessment - Open Forest	2011 Assessment - Total	Percent of GA	Change	Scrub
Ahmadnagar ^T	17048	0	69	217	286	1.68	0	555
Akola	5390	11	96	215	322	5.97	0	8
Amravati ^T	12210	655	1455	1077	3187	26.10	0	116
Aurangabad	10107	19	101	437	557	5.51	0	193
Bhandara	3588	130	544	215	889	24.78	-2	21
Bid	10693	0	13	162	175	1.64	0	357
Buldana	9661	23	137	430	590	6.11	1	163
Chandrapur ^T	11443	1340	1588	1150	4078	35.64	4	56
Dhule ^T	7189	0	70	251	321	4.47	0	103
Gadchiroli ^T	14412	4733	3392	1969	10094	70.04	-1	20
Gondia	5733	884	824	303	2011	35.08	0	37
Hingoli	4686	0	10	104	114	2.43	0	47
Jalgaon ^T	11765	52	363	770	1185	10.07	0	69
Jalna	7718	1	16	48	65	0.84	0	55
Kolhapur ^H	7685	65	1038	672	1775	23.10	0	88
Latur	7157	0	0	5	5	0.07	0	25
Mumbai city	157	0	0	2	2	1.27	0	0
Mumbai Suburban	446	0	62	58	120	26.91	0	0
Nagpur ^T	9892	372	953	698	2023	20.45	0	77
Nanded	10528	60	434	420	914	8.68	0	128
Nandurbar	5961	0	418	796	1214	20.37	0	30
Nashik TH	15530	0	351	738	1089	7.01	0	319
Osmanabad	7569	0	3	40	43	0.57	0	49
Parbhani	6355	0	4	46	50	0.79	0	49
Pune TH	15643	0	757	975	1732	11.07	0	493
Raigarh ^H	7152	13	1248	1603	2864	40.04	0	70
Ratnagiri ^H	8208	33	1910	2255	4198	51.15	-1	2
Sangli	8572	0	95	49	144	1.68	0	156
Satara ^H	10480	119	569	588	1276	12.18	0	365
Sholapur	14895	0	8	39	47	0.32	0	50
Sindhudurg ^H	5207	88	1364	1116	2568	49.32	-5	47
Thane ^T	9558	0	1281	1631	2912	30.47	0	222
Wardha	6309	10	419	430	859	13.62	0	62
Washim	5184	5	113	214	332	6.40	0	28
Yavatmai ^T	13582	123	1110	1372	2605	19.18	0	97
Grand Total	307713	8736	20815	21095	50646	16.46	-4	4157

Figure 23. District-Wise Forest Cover of Maharashtra (2013)³⁴

³⁴ Source: Data.gov.in (2018)

2. Protected Areas

103. According to ENVIS Centre on Wildlife & Protected Areas that is sponsored by the Ministry of Environment, Forests and Climate Change, Government of India, the state has 6 national parks and 36 wildlife sanctuaries. None of the proposed rural roads and bridges are located in the following protected areas including their buffer zones. This is to avoid potential risks and impacts to wildlife and biodiversity during project implementation.

Table 7. Summary of protected areas in Maharashtra

Name	Area (sq. kms)	Location/District	Distinct Features
Chandoli NP	317.67	Sangli, Kolhapur, Satara, Ratnagiri	Ecological, faunal, and floral significance
Gugamal NP	361.28	Amravati	Part of tiger reserve
Nawegaon NP	133.88	Gondia	Deer park, bird sanctuary, leopards, sloth bears, gaurs, sambars, chitals and langoors.
Pench NP	257.26	Boundary of Madhya Pradesh	Tiger Reserve
Sanjay Gandhi (Borivali) NP	86.96	Near Mumbai	Kanheri caves, religious.
Tadoba NP	116.55	Chandrapur	Religious, Tadoba Lake, Crocodiles and Tiger Reserve
Amba Barwa WLS	127.11	Amravati	Tiger reserve, leopard, Sambar, Barking deer and Chausinga. Tropical dry deciduous trees like Teak, Salai and Dhawada
Andhari WLS	509.27	Chandrapur	Tiger reserve. Indian leopards, sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats, sambar, barking deer, chital, chausingha and honey badger. Tadoba Lake sustains the marsh crocodile, which was once common all over Maharashtra.
Aner Dam WLS	82.94	Dhule	Migratory birds Brahminy Ducks, cranes, stokes and waders.
Bhamragarh WLS	104.38	Chandrapur	Tiger and Leopard Sambhar, Chital, Blackbuck and Blue bull continue to provide broad prey base. Wild dogs, wild boars Languor's and mongoose are also common in the area.

Name	Area (sq. kms)	Location/District	Distinct Features
Bhimashragarh WLS	130.78	Pune, part of Western Ghats	Endemic a flora and fauna. Home to the state animal of Maharashtra- <i>Ratufa indica elphistonii</i> , sub species of the Indian Giant squirrel that is one of three threatened Indo-Malayan squirrel species. Important mammals are Leopard (<i>Panthera pardus</i>), Striped Hyena (<i>Hyaena hyaena</i>) and Golden Jackal (<i>Canis aureus</i>), Sambar (<i>Cervus unicolor</i>), Barking Deer (<i>Muntiacus muntjac</i>), Wildboar (<i>Sus scrofa</i>), Common Langur (<i>Semnopithecus entellus</i>), Rhesus Macaque (<i>Macaca mulatta</i>) and the Mouse Deer (<i>Moschiola meminna</i>). The Indian Pangolin (<i>Manis crassicaudata</i>) are also reported.
Bor WLS	61.10	Wardha, Bor Dam	Tiger reserve
Deolgain-Rehkuri WLS	2.17	Ahmednagar	Blackbuck sanctuary
Dhyangaga WLS	205.23	Buldana	Leopards, sloth bears, barking deer, blue bulls, spotted deer, hyenas, jungle cats and jackals along with tigers
Gautala WLS	260.61	Aurangabad and Jalgaon, along western ghat	Forest reserve. Including chinkara (<i>Gazella bennettii</i>), nilgai (antelope) (<i>Boselaphus tragocamelus</i>), sloth bears (<i>Melursus ursinus</i>), jungle cat (<i>Felis chaus</i>), Wanderoo (<i>Macaca muntjac</i>), Leopard Cat (<i>Prionailurus bengalensis</i>), Brown Palm civet (<i>Paradoxurus jerdoni</i>), Barking deer (<i>Muntiacus muntjac</i>), Hare (<i>Lepus nigricollis</i>), Leopard, Fox, Jackal, bats, wild boar, Gray Langur (<i>Semnopithecus entellus</i>), Wolf (<i>Canis lupus pallipes</i>) and Dhole

Name	Area (sq. kms)	Location/District	Distinct Features
			(wild dog) (<i>Cuon alpinus</i>). 240 bird species have been observed in and around the sanctuary, among them are cranes, spoonbills, storks, ibis, pochards, peafowl, quail, partridges, and various species of wading birds. Snakes include the Cobra (<i>Naja naja</i>), Common Krait (<i>Bungarus caeruleus</i>), and Rat Snake (<i>Ptyas mucosus</i>).
Great Indian Bustard WLS	8,496.44	Solapur	wildlife sanctuary for the great Indian Bustard (<i>Ardeotis nigriceps</i>)
Jaikwadi WLS	341.05	Aurangabad	Almost 200 species of birds can be found in this region, which includes more than 70 species of migratory birds. Out of these, 45 chief species are of international migration. Notable amongst migratory birds are cranes, flamingos, pintails, wigeons, shovellers, brahminy ducks, pochards, teals, godwits, shauces and glossy ibises.
Kalsubai WLS	361.71	Nashik, Ahmednagar	Highest peak in Western Ghat. Forest for trekking.
Karaja Sohol Blackbuck WLS	73.63	Washim	Blackbuck
Karnala WLS	4.48	Raigad	Bird Sanctuary, Important Bird Area (IBA). Over 222 species birds of which 161 are resident species, 46 are winter migrant species, three are breeding migrants, seven species are passage migrants and five species are vagrant. Endemic to Western Ghats are Grey-fronted Green-pigeon (<i>Treron affinis</i>), Nilgiri Woodpigeon (<i>Columba elphinstonii</i>), Malabar (Blue-winged) Parakeet (<i>Psittacula</i>

Name	Area (sq. kms)	Location/District	Distinct Features
			<i>columboides</i>), Malabar Grey Hornbill (<i>Ocyrceros griseus</i>), White-cheeked Barbet (<i>Megalaima viridis</i>), Malabar Lark (<i>Galerida malabarica</i>), Small Sunbird (<i>Leptocoma minima</i>) and Vigor's Sunbird (<i>Aethopyga vigorsii</i>). Five rare birds, the Ashy Minivet, Three-toed Kingfisher, Malabar Trogon, Slaty-legged Crane (<i>Rallina eurizonoides</i>), and Rufous-bellied Eagle.
Katerpurna WLS	73.63	Akola	four-horned antelope and barking deer
Koyna WLS	423.55	Satara	Dense rain forest, Some of the threatened species of trees found in the sanctuary are dhup (<i>Indian frankincense</i>), longan, and Elaeocarpus spp. Bengal tigers, Indian leopards, Indian gaur, sloth bears, sambar deer, barking deer and mouse deer, common gray langurs, smooth-coated otters and Indian giant squirrels are common.
Lonar WLS	1.17	Buldhana	Lonar crater lake
Marine (Malvan) WLS	29.12	Sindhudurg	Scuba diving and snorkeling
Mayureswar Supe WLS	5.15	Pune	Dry deciduous scrub forest of Khair (<i>Acacia catechu</i>), Acacia sp. (Hivar), Sisoo (<i>Dalbergia latifolia</i>), <i>Ziziphus mauritiana</i> (Ber), Karwand (<i>Carissa opaca</i>), <i>Alysicarpus bupleurifolius</i> , <i>Cyathocline purpurea</i> , <i>Eriocaulon diane</i> , <i>Merremia emarginata</i> , <i>Cucumis melo</i> , <i>Cyperus kyllingia</i> , <i>Striga densiflora</i> , <i>Mareilea minuta</i> trees and interspersed grasslands. Flora of constitutes a total of 994 taxa belonging to 938 species with 42 varieties and 14

Name	Area (sq. kms)	Location/District	Distinct Features
			sub-species, 577 genera and 136 families of flowering plants recorded and described. Variety of birds including: Indian roller, black-winged kite, grey hornbill, grey partridge, Eurasian collared dove, white-throated kingfisher, ashy-crowned sparrow lark, shrike, laughing dove, blue-cheeked bee-eater, Indian silverbill, Gray Francolin, Red-wattled Lapwing, Yellow-wattled Lapwing, Common Hawk-Cuckoo, Short-Toed Snake Eagle, Bonelli's Eagle, Rufous-fronted Prinia, Indian Bush-Lark, Bay-backed Shrike, Southern Gray Shrike. Migratory species like European Roller and Montagu's harrier.
Melghat WLS	778.75	Amravati	Tiger Reserve
Nagzira WLS	152.81	Bhandara ad Gondia	Green Oasis considered as the Green Lung of adjoining huan settlements. Proposed to be Tiger Reserve.
Naigaon Mayur WLS	29.89	Beed	Bird sanctuary. Scarlet Minivet, kingfisher, fly catcher. Blackbuck.
Nandur Madhmeshwar WLS	100.12	Nashik	Bird sanctuary. Ducks (Ruddy-shell ducks, Shovelers, Northern Pintails, Spot-billed Ducks, Comb Ducks, Common Coots, Eurasian Wigeons). Doves (Common Stonechats, Pied Bush-chat, Black Drongo's, Wire-Tailed Swallows, Large Gray Babblers, Paddy-field Pipits, Rufous-tailed lark).
Narnala WLS	12.35	Akola	Historical Fort protected by the Archeological Society of India. Also bird sanctuary.

Name	Area (sq. kms)	Location/District	Distinct Features
Painganga WLS	324.62	Yavatmal	Bird sanctuary. Kite, the Cuckoo, the Kingfisher, the Dove, the Bulbul, the Vulture.
Phansad WLS	69.79	Raigad	Vulture
Radhanagari WLS	351.16	Kolhapur	Bison sanctuary. Man-made forest
Sagareshwar WLS	304.81	Sangli	Man-made forest, most of the wildlife are artificially introduced.
Tansa WLS	304.81	Thane	Tansa Lake. Bird sanctuary.
Thane Creek Flamingo WLS	690	Thane	IBA for flamingos and several other migratory and wading birds, and considered as marine sanctuary.
Tipeshwar WLS	148.81	Yavatmal	Bird sanctuary
Tungareshwar WLS	85	Palghar	Dry Deciduous, Moist Deciduous and Semi Evergreen. Leopard, Wild Boar, Barking Deer, Langur, Bonnet and Rhesus Macaque, and Black-naped Hare, as well as a multitude of birds, including the Crested Serpent-eagle, Jungle Owlet, White-eyed Buzzard, Oriental Honey-buzzard, Emerald Dove and Heart-spotted Woodpecker.
Wan WLS	211.00	Akola, Amravati and Buldhana district	tiger, leopard
Yawal WLS	177.52	Jalgaon	Dense forest. Tiger, Leopard, Sambar deer, Chinkara, Nilgai, Sloth bear, Hyena, Jackal, Fox, Wolf, Wild boar, Barking deer, Jungle cat, Palm civet, Wild dog, Flying Squirrel.
Yedsi Ramlinghat WLS	22.38	Osmanabad	South Deccan Plateau dry deciduous forests in which the trees have stunted growth. Thorny species are common in the sanctuary. Some of the are Acacia catechu, Albizia amara, Terminalia tomentosa ,

Name	Area (sq. kms)	Location/District	Distinct Features
			Boswellia serrata, Cassia fistula, Chloroxylon swietenia, Dalbergia latifolia, Diospyros montana, Hardwickia binata, Pterocarpus marsupium, Shorea talura, Sterospermum personatum, Terminalia belirica, Terminalia paniculata and Anogeissus latifolia.

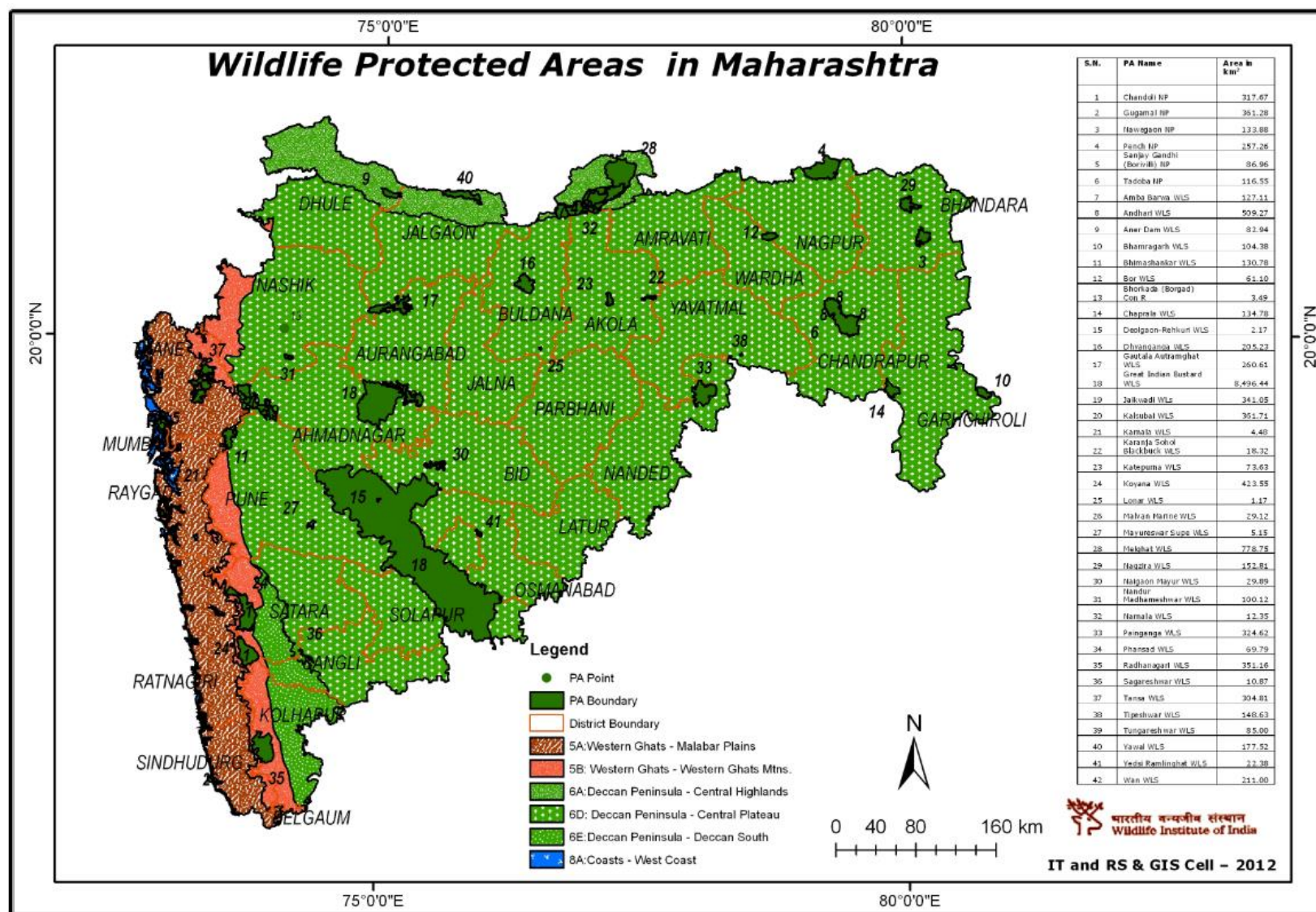


Figure 24: Map of Wildlife Protected areas in Maharashtra (Source: ENVIS Centre on Wildlife & Protected Areas, 2019)

Wildlife

104. The Integrated Biodiversity Assessment Tool (IBAT) was used to determine the different wildlife present in the state of Maharashtra and the classification of each species according to the International Union for Conservation of Nature (IUCN). This is a web-based platform tool, which provide a basic information on the different wildlife and classifications by plotting the boundaries of the target area, which is the entire state. The tool draw together information on globally recognized biodiversity information from a number of IUCN Knowledge Products such as (i) IUCN Red List of Threatened Species, (ii) Key Biodiversity Areas and (iii) Protected Planet/The World Database on Protected Areas. Through its interactive mapping tool, the IEE report used the up-to-date information to identify biodiversity risks and opportunities within the state.

105. According to the report generated from IBAT for the IEE, there are 19 taxonomic groups recorded in the state. Table 8 shows the summary of species-classification from the IBAT report. Among the taxonomic groups, Chondrichthyes has the most number of CR and EN. This are species of cartilaginous fish such as sharks, skates and rays and make up the Chondrichthyes, however, this group is regarded not at risk due to the locations of the project components. There are no rural roads and bridges to be improved within the area of the coastal zones. Hence, only those taxonomic groups potentially affected are discussed on the following sections.

Table 8. Summary of the number of taxonomic groups reported from IBAT.

Taxonomic Group	CR	EN	VU	NT	LC	DD
Reptilia	1	1	9	3	72	10
Chondrichthyes	16	14	19	26	9	12
Amphibia	2	3	7	4	26	8
Actinopterygii	1	9	13	10	643	43
Liliopsida	5	4	2	1	178	6
Aves	5	8	17	28	457	0
Mammalia	0	8	13	5	108	7
Gastropoda	0	1	1	0	90	7
Magnoliopsida	0	3	7	2	115	2
Holothuroidea	0	4	4	0	15	7
Arachnida	0	0	1	1	5	0
Anthozoa	0	0	5	30	37	1
Bivalvia	0	0	1	0	18	6
Insecta	0	0	0	1	75	7
Polypodiopsida	0	0	0	1	17	0
Hydrozoa	0	0	0	0	2	0
Malacostraca	0	0	0	0	42	14
Agaricomycetes	0	0	0	0	1	0
Charophyceae	0	0	0	0	0	1

CR: critically endangered, extremely critical state, **EN:** endangered, very high risk of extinction in the wild, **VU:** vulnerable, high risk of human activities, **NT:** near threatened, close to being at high risk of extinction in the near future, **LC:** least concerned, unlikely to become extinct in the near future and **DD:** data deficient.

106. From the IBAT report, the IEE has documented the wildlife that are found within the districts included in the additional financing and corresponding IUCN classification of the

species (CR and ER only). For further reviews and understanding of the species, the information from website of the IUCN Red List of Threatened Species are used to determine the wildlife geographic locations, habitat and threats. Species under the taxonomic group of (i) Amphibia, (ii) Liliopsida, (iii) Mamalia, (iv) Actinopterygii, (v) Reptilia, (vi) Gastropoda, (vii) Magnoliopsida and (viii) Aves are found within the administrative districts of the proposed rural roads and bridges.

Amphibia (Animalia)

107. The species under the Amphibia taxonomic group are small vertebrates that includes frogs, toads, salamanders, and newts. These species are ectothermic³⁵, which unable to regulate their own body heat, hence, they depend on sunlight for warmth. These species nourish, reproduce and spend part of their lives in water and on land. To survive, Amphibians need water and moist environment.

108. According to the IBAT, there are 5 species under the classification of CR and EN. These species are found in the forested areas in the district of Sawantadi and Amboli and the Western Ghats. *Pseudophilautus amboli* and *Xanthophryne tigerina* are classified as CR, while *Pedostibes tuberculosus*, *Xanthophryne koynayensis* and *Uperodon marmorata* are EN species. The information from the IUCN reveals the primary threat to these species are the conversion of forest areas to agricultural land, recreational areas and urbanization. Table 9 shows the CR and EN amphibian species found in different parts of the state such as in Sawantwadi, Western Ghats and Amboli. The additional financing will not have threat to this species because there will be no rural roads and bridges that will be improved within the forest areas.

Table 9. List of species under the Amphibia group that are CR and EN according to the IUCN records.

Kingdom	CN	SN	IUCN Category	Geographic locations in Maharashtra
Animalia	-	<i>Pseudophilautus amboli</i>	CR	Sawantwadi
Animalia	Malabat Tree Toad	<i>Pedostibes tuberculosus</i>	EN	Western Ghats of India
Animalia	Humbali Village Toad	<i>Xanthophryne koynayensis</i>	EN	Amboli
Animalia	Indian Dot Frog	<i>Uperodon marmorata</i>	EN	Amboli
Animalia	-	<i>Xanthophryne tigerina</i>	CR	Amboli

Liliopsida (Plantae)

109. The taxonomic group of Liliopsida ranges from small floating plants, common herbs and epiphytes and large rosette trees. But for the type of species recorded by the IBAT, Liliopsida in Maharashtra are small plants and commonly found along the streams in the highlands or plateau. There are 5 species under the classification of CR and 8 classified as EN (Table 10). These plants are found in the districts of (i) Nasik, (ii) Ratnagiri, (iii) Aurangabad, (iv) Pune, (vi) Satara and (vii) Sindhurug.

³⁵ organism in which internal physiological sources of heat are of relatively small or quite negligible importance in controlling body temperature. Such organisms rely on environmental heat sources

110. According to the IUCN Red List of Threatened Species, the plants are at risk due to (i) residential and commercial development, (ii) land conversion for urbanization, (iii) recreation, and (iv) solid waste proliferation along the rivers. The conversion of the natural habitats and deficiency of water supply for nourishment play key risks to the population of the species in the state. Table below shows the CR and EN Liliopsida species found in the state of Maharashtra based on the IUCN information. These species are found only in forest areas or places with natural settings, and not in agricultural zones.

Table 10. List of species under the Liliopsida group that are CR and EN according to the IUCN records.

Kingdom	CN	SN	IUCN Category	Geographic locations in Maharashtra
Plantae	-	<i>Eriocaulon rouxianum</i>	CR	Nasik
Plantae	-	<i>Isachne meeboldii</i>	CR	Aurangabad
Plantae	-	<i>Eriocaulon santapau</i>	CR	Pune
Plantae	-	<i>Eriocaulon bolei</i>	CR	Satara
Plantae	-	<i>Eriocaulon sharmae</i>	CR	Sindhudurg
Plantae	-	<i>Cryptocoryne cognata</i>	EN	Sindhudurg and Ratnagiri
Plantae	-	<i>Dimeria hohenackeri</i>	EN	Western coast and Western Ghats of Maharashtra
Plantae	-	<i>Eriocaulon anshiense</i>	EN	Western Ghats of India
Plantae	-	<i>Isachne swaminathanii</i>	EN	Pune, Ratnagiri, Satara and Thane

Mamalia (Animalia)

111. Species under the Mamalia group are vertebrate animals and characterized by the (i) presence of mammary glands, which females produce milk for feeding their young, (ii) a neocortex (a region of the brain), (iii) fur and hair at least at some point of the life cycle, and three middle ear bones. These characteristics distinguish them from reptiles and avian species.

112. The Maharashtra's State Forest Department has notified the Kolamarka forest area as a conservation reserve for the Wild Water Buffalo (*Bubalus arnee*). This forest area is spread over 180 sq. kms and adjacent to the Indravati Tiger Reserve in Chhattisgarh. The Wild Water Buffalo is the only CR among the mammalian species in the state according to the IUCN records.



Figure 25. A photograph of the Wild Water Buffalo (*Bubalus arnee*)³⁶

³⁶ <http://animalia.bio/asian-wild-water-buffalo>

113. Species classified as EN are (i) Dhole, (ii) Asian Elephant, (iii) Indian Pangolin, (iv) Kondana Rat and (v) Tiger. These animals are found in the Western Ghats and mountainous areas of the state. The immediate threat of these species are conversion of forest areas, poaching and expansion urban areas. According IBAT, the CR and EN mammals in the Maharashtra are shown in Table 11. These species are not found within the project locations, instead these mammals are in natural habitats and protected areas of the state.

Table 11. List of species under the Mamalia group that are CR and EN according to the IUCN records.

Kingdom	CN	SN	IUCN Category	Geographic locations in Maharastra
Animalia	Wild Water Buffalo	<i>Bubalus arnee</i>	CR	Central India
Animalia	Dhole	<i>Cuon alpinus</i>	EN	Western Ghats and central Indian forests
Animalia	Asian Elephant	<i>Elephas maximus</i>	EN	Western Ghats and central Indian forests
Animalia	Indian Pangolin	<i>Manis crassicaudata</i>	EN	Statewide
Animalia	Kondana Rat	<i>Millardia kondana</i>	EN	Torana plateau; the Rajgad plateau; and Rareshwar
Animalia	Tiger	<i>Panthera tigris</i>	EN	Reserve areas in Amravati, Chandrapur and Nagpur

Actinopterygia – Animalia

114. Actinopterygia group are ray-finned fishes and bony fishes. These aquatic species are so called ray-finned because the fins are webs of skin supported by bony spines. There are 9 species under the classification of EN and most of these fishes are documented in the Western Ghats. Only Nukta and Black Masheer are reported to be found in Sangli and Central India according to the IUCN. The population of the species are at risk due to industrialization, organic and inorganic pollution of rivers, siltation from deforestation and damming of water during lean seasons. The EN fish species (Actinopterygia) listed below are found in the state, but no habitats nor population of such species will be at risk due to the additional financing.

Table 12. List of species under the Actinopterygia group that are EN.

Kingdom	CN	SN	IUCN Category	Geographic locations in Maharastra
Animalia	Pattharchata	<i>Glyptothorax poonaensis</i>	EN	Western Ghats of India
Animalia	Nukta	<i>Schismatorhynchus nukta</i>	EN	Sangli
Animalia	Black Masheer	<i>Tor khudree</i>	EN	Central India
Animalia	Deccan Labeo	<i>Labeo potail</i>	EN	Western Ghats of India
Animalia	-	<i>Silonia childreni</i>	EN	Western Ghats of India
Animalia	-	<i>Hypselobarbus mussullah</i>	EN	Western Ghats of India
Animalia	-	<i>Puntius crescentus</i>	EN	Western Ghats of India
Animalia	Malabar Silurus	<i>Pterocryptis wynaadensis</i>	EN	Western Ghats of India
Animalia	-	<i>Parapsilorhynchus elongatus</i>	EN	Western Ghats of India

Reptilia (Animalia)

115. The IBAT report has documented 2 reptilian species under EN classification in the state, which are Poona Skink (*Eurylepis poonaensis*) and Hawksbill Turtle (*Eretmochelys imbricata*). The Hawksbill Turtle's habitat is within the coastal zones and project area of influence does not include coastlines, hence, the turtle species is not included in the IEE documentation. On the other hand based on the IUCN records, Poona Skink are found in grasslands and scrub forest in the hill ranges of Pune and nearby Poona and Satara districts. The species is under heavy pressure due to rapid urbanization, tourism related developmental activities and quarrying of the districts.

Gastropoda (Animalia)

116. Gastropoda species are more commonly known as snails and slugs from saltwater, freshwater and on the land. The representative of the taxonomic group in Maharashtra is called *Cremnoconchus carinatus*. According to the IUCN, this is an EN species and has documentation only in the locality of Mahabaleshwar (including the surrounding areas) and Tarna Hills (near Pune). Both of these areas are in Maharashtra, India as shown on the figure below. The species is a "very habitat specific" living in the spray zones of waterfalls. Currently, the known area of occupancy is less than 500 km² and extent of occurrence is less than 1,000 km². The major threat to this species is the decline in water flow due to water abstraction and diversion which is impacting its specialized habitat.



Figure 26. Geographic range of *Cremnoconchus carinatus*³⁷

Magnoliopsida (Animalia)

117. Another taxonomic group under the Kingdom Plantae is the Magnoliopsida. The *Ammannia nagpurensis* and *Rotala ritchiei* are found in Nagpur and the Northern Western Ghats, respectively. The *Ammannia nagpurensis* is an annual herb, which grows in paddy fields, river banks and other moist places, while *Rotala ritchiei*'s habitat is within wetland ecosystems. Both plant species are EN classification. Information of the locations of these plants are shown in the table below.

³⁷ <https://www.iucnredlist.org/species/175097/7096427>

Table 13. List of species under the Magnoliopsida group that are EN according to the IUCN records.

Kingdom	CN	SN	IUCN Category	Geographic locations in Maharashtra
Plantae	-	<i>Ammannia nagpurensis</i>	EN	Nagpur
Plantae	-	<i>Rotala ritchiei</i>	EN	Northern Western Ghats

Aves (Animalia)

118. Aves (birds) taxonomic group is warm-blooded vertebrates, characterized by feathers, toothless beaked jaws, laying of hard-shelled eggs, and a strong yet lightweight skeleton. The animals under the group have wings, thus, enabled these species to have wide geographic coverage. In the list of birds provided by IBAT, majority of the CR and EN bird species covers the entire state according to the IUCN. However, only the Forest Owlet (*Heteroglaux blewitti*) has a limited location, which is in the Satoura Range. The threats of these species are (i) hunting during migration; (ii) forest encroachment and degradation due cultivation, grazing and settlements; (iii) felling of nest-trees, and drainage, conversion, pollution and over-exploitation of wetlands; and (iv) for vultures – consumption of livestock remains that are treated with anti-inflammatory drug diclofenac. As shown in Table 14, the coverage of the CR and EN species of the Aves group covers the state. However, the project will not affect their population because their habitats are characterized by natural habitat settings, which the additional financing does not cover.

Table 14. List of species under the Aves group that are CR and EN according to the IUCN records.

Kingdom	CN	SN	IUCN Category	Geographic locations in Maharashtra
Animalia	Great Indian Bustard	<i>Ardeotis nigriceps</i>	CR	Statewide
Animalia	Sociable Lapwing	<i>Vanellus gregarius</i>	CR	Statewide
Animalia	White-rumped Vulture	<i>Gyps bengalensis</i>	CR	Statewide
Animalia	Red-headed Vulture	<i>Sarcogyps calvus</i>	CR	Statewide
Animalia	Indian Vulture	<i>Gyps indicus</i>	CR	Statewide
Animalia	Forest Owlet	<i>Heteroglaux blewitti</i>	EN	Satpura Range
Animalia	Lesser Florican	<i>Sypheotides indicus</i>	EN	Statewide
Animalia	Black-bellied Tern	<i>Sterna acuticauda</i>	EN	Statewide
Animalia	Pallas' Fish Eagle	<i>Haliaeetus leucoryphus</i>	EN	Statewide
Animalia	Egyptian Vulture	<i>Neophron percnopterus</i>	EN	Statewide
Animalia	Steppe Eagle	<i>Aquila nipalensis</i>	EN	Statewide
Animalia	Saker Falcon	<i>Falco cherrug</i>	EN	Statewide
Animalia	Greater Adjutant	<i>Leptoptilos dubius</i>	EN	Statewide

119. The following table is the summary of the documented threats for each species having CR and EN classification. The information is taken from the IUCN Red list website.

Table 15. Summary of the different threats to EN and CR species found in the state of Maharashtra.

SN	Habitat	Threats
<i>Pseudophilautus amboli</i>	Plantations and forests areas	Habitat loss and fragmentation due to urbanization and tourism development.
<i>Eriocaulon rouxianum</i>	Permanent freshwater marshes or pool	Residential and commercial development
<i>Isachne meeboldii</i>	Pastures of open grasslands	Land conversion for urbanization
<i>Eriocaulon santapau</i>	Along the streams at an altitude of 1,550 m	Recreational activities
<i>Eriocaulon bolei</i>	Permanent rivers or creeks (includes waterfalls)	Residential and commercial development
<i>Eriocaulon sharmae</i>	Near ephemeral ponds, puddles and along the margins of streams on highland lateritic plateau	Solid waste issues, and tourism and recreation areas
<i>Xanthophryne tigerina</i>	Forest and wetlands	Tourism and recreational development, and logging and wood harvesting
<i>Bubalus arnee</i>	Forests, savannah, grasslands and wetlands	Agriculture, and transportation and service corridors
<i>Cuon alpinus</i>	Forests, savannah and grasslands	Housing and urban areas, and hunting and trapping terrestrial animals
<i>Elephas maximus</i>	Forests, savannah, grasslands and artificial habitats	Annual and perennial non-timber crops, wood and pulp plantations, and livestock farming and ranching
<i>Manis crassicaudata</i>	Forests, savannah, grasslands, shrublands and plantations	Annual and perennial non-timber crops, wood and pulp plantations, and livestock farming and ranching
<i>Millardia kondana</i>	Forest, shrub and rocky areas	Overgrazing of vegetation and disturbances due to tourism
<i>Panthera tigris</i>	Forests of tropical Asia	Poaching for illegal trade in high-value tiger products including skins, bones, meat and tonics.
<i>Pedostibes tuberculosus</i>	Montane moist evergreen forest	Conversion of habitat to non-timber plantations (including coffee and tea), the collection of timber and wood for subsistence use by local people, and the construction of roads and dams
<i>Xanthophryne koynayensis</i>	Wet evergreen forest, and dry riparian grassland	Habitat loss due to agriculture and clear cutting of forests
<i>Uperodon marmorata</i>	Tropical moist evergreen and deciduous forests, and can be found in disturbed secondary forest	Conversion to agricultural land and infrastructure development

<i>Glyptothorax poonaensis</i>	Flowing hill stream habitats	Dams, urbanization leading to organic pollution and heavy harvest
<i>Schismatorhynchus nukta</i>	Rapid streams and rivers with sand and boulder bed	Urbanization, industrialization, organic and inorganic pollution, and deforestation
<i>Cryptocoryne cognata</i>	Perennial aquatic plant that grows in sand or gravel in shady streams	Industrial development, power plants and mining
<i>Tor khudree</i>	Cool, fast-flowing, rocky streams	Natural system modifications, and dams and water management/use
<i>Labeo potail</i>	Rivers and streams in the upper reaches	Organic and inorganic pollution, harvesting of the fish and competition with introduced Gangetic carps
<i>Silonia childreni</i>	Reservoir and the adjoining river.	Drought resulting from upstream dams not releasing water during dry periods
<i>Hypselobarbus mussullah</i>	Clear and fast flowing large forest streams and rivers in the upland areas	Pollution and introduction of exotic species
<i>Puntius crescentus</i>	Perennial river	Untreated industrial effluents released directly into the river
<i>Pterocryptis wynaadensis</i>	Inhabits fast flowing river, canals and streams	loss of habitat, siltation and destructive fishing
<i>Parapsilorhynchus elongatus</i>	Rapid moving shallow clear water with a sandy and pebbly bottom	Increasing tourism and recreational activities as well as deforestation
<i>Eurylepis poonaensis</i>	Grasslands and scrub jungles in the hill ranges	Rapid urbanization and tourism related developmental activities
<i>Cremnoconchus carinatus</i>	Restricted to spray zones of streams and waterfalls in the Western Ghats	Waterfalls found along roadsides that are threatened by highway widening
<i>Ammannia nagpurensis</i>	Paddy fields, river banks and other moist places	Urbanization, pollution and land conversion for agricultural purposes
<i>Dimeria hohenackeri</i>	Scattered in open areas in grassy patches along slopes of ghats to plains	Land conversion, housing, industrialization, roads, mining and quarrying
<i>Eriocaulon anshiense</i>	Rocky slopes along the streams surrounded by moist deciduous forests	Water diversion of the stream for agriculture
<i>Isachne swaminathanii</i>	Wet flooded grasslands and shrubby wetlands	Marshy grasslands are under threat in the Western Ghats due to urbanization
<i>Rotala ritchiei</i>	Wetland ecosystems are being depleted in the areas where this species occurs	Urbanization
<i>Ardeotis nigriceps</i>	Arid and semi-arid grasslands with scattered short scrub, bushes and low intensity cultivation	Widespread hunting for sport and food, accelerated by vehicular access to remote areas
<i>Vanellus gregarius</i>	Mainly in the transition zones between Stipa and Artemisia grassland steppes	Illegal hunting during migration and on the wintering grounds may now be the primary threat

<i>Gyps bengalensis</i>	Plains and less frequently in hilly regions, and open areas	Fire occurrences
<i>Sarcogyps calvus</i>	Well-wooded hills and dry deciduous forest with rivers	Intensification of agriculture
<i>Gyps indicus</i>	Cities, towns and villages near cultivated areas, and in open and wooded areas	Consumes livestock remains that treated with anti-inflammatory drug diclofenac
<i>Heteroglaux blewitti</i>	fairly open dry deciduous forest dominated by teak <i>Tectona grandis</i>	Forest encroachment and degradation due cultivation, grazing and settlements
<i>Sypheotides indicus</i>	Dry grasslands in lowland areas (below 250 m)	Reductions of grassland area due to conversion into agriculture
<i>Sterna acuticauda</i>	Found on large rivers and marshes, occasionally on smaller pools, and ditches	Collection of eggs for food and illegal fishing in protected areas
<i>Haliaeetus leucoryphus</i>	Principally large lakes and rivers	Wetlands have been drained or converted for agriculture and human settlements.
<i>Neophron percnopterus</i>	Nests on ledges or in caves on cliffs but occasionally also in large trees, buildings	Consumes livestock remains that treated with anti-inflammatory drug diclofenac
<i>Aquila nipalensis</i>	Steppe and semi-desert	Consumes livestock remains that treated with anti-inflammatory drug diclofenac
<i>Falco cherrug</i>	Open grassy landscapes such as desert edge, semi-desert, steppes, agricultural and arid montane areas	Suffered mainly from electrocution on power lines and decreased prey availability
<i>Leptoptilos dubius</i>	Wetlands and nesting in tall trees with closed canopies and bamboo clumps, and historically on cliffs	Felling of nest-trees; and drainage, conversion, pollution and over-exploitation of wetlands.

D. Socio-Economic

1. Population

120. As of 2011, population census of the state revealed a total of 24.421 million households with 112.374 million individuals. By gender, the male outnumbers the female with 58.243 million and 54.243 million, respectively. The most populated district is Thane with 11.060 million followed by Pune, Nashik, and Nagpur with 9.429, 6.107, and 4.653 million individuals, respectively. Conversely, the least populated districts are Sinndudurgh, Gadchiroli, and Hingoli with 0.848, 1.072, and 1.177 million, respectively. **Error! Reference source not found.** presents the detailed population distribution by district.

121. The Scheduled Castes, comprises 11.81% of the total population (2011) or 13.276 million of which 6.768 million are male and 6.508 are female. Most of the scheduled castes are in Pune, Nagpur, and Thane with 1.2, 0.9, 0.7 million, respectively. Scheduled tribes, informally defined as “primitive traits, distinctive culture, geographical isolation, shyness of contact with the community at large, and backwardness” are formally declared by the Union President in compliance to relevant notifications. In Maharashtra as of 2011, the census estimates 10.510 million people are considered as part of a scheduled tribe of which 5.315

million are male and 5.195 are female. Thane, Nashik, and Nandurbar have an aggregate scheduled tribe population of 4,247 million.

122. About 12% of the total population or 13.226 million are less than 6 years old. In terms of literacy, 73% of 81.554 million are literate of which 55% are male and 45% are female. Conversely, 27% are considered illiterate accounting for 30.820 million individuals.

123. The working population was estimated at 43.763 million (2011) representing 39% of the population of which 69% are male. Of the total labor force, 26% are main cultivators, 25% are main agricultural laborers, and 2% are in main household industries.³⁸ Marginal workers, defined as “those who did not work for at least 183 days in the preceding 12 months to the census taking” was estimated at 5.666 million of 13% of the total workforce of the state. Finally, the non-working population of the state in the same census year was estimated at 62.946 million or 56% of the population of which 41% are male and 59% are female.

Name	Type	No of Households	Total Population Person	Total Population Male	Total Population Female	Name	Type	No of Households	Total Population Person	Total Population Male	Total Population Female
MAHARASHTRA	Total	24,421,519	112,374,333	58,243,056	54,131,277	Aurangabad	Total	751,915	3,701,282	1,924,469	1,776,813
MAHARASHTRA	Rural	13,214,738	61,556,074	31,539,034	30,017,040	Aurangabad	Rural	420,950	2,081,112	1,081,825	999,287
MAHARASHTRA	Urban	11,206,781	50,818,259	26,704,022	24,114,237	Aurangabad	Urban	330,965	1,620,170	842,644	777,526
Nandurbar	Total	323,521	1,648,295	833,170	815,125	Nashik	Total	1,222,887	6,107,187	3,157,186	2,950,001
Nandurbar	Rural	272,783	1,372,821	687,671	685,150	Nashik	Rural	677,310	3,509,814	1,804,712	1,705,102
Nandurbar	Urban	50,738	275,474	145,499	129,975	Nashik	Urban	545,577	2,597,373	1,352,474	1,244,899
Dhule	Total	408,874	2,050,862	1,054,031	996,831	Thane	Total	2,529,165	11,060,148	5,865,078	5,195,070
Dhule	Rural	296,717	1,479,826	758,916	720,910	Thane	Rural	541,599	2,545,470	1,300,136	1,245,334
Dhule	Urban	112,157	571,036	295,115	275,921	Thane	Urban	1,987,566	8,514,678	4,564,942	3,949,736
Jalgaon	Total	903,643	4,229,917	2,197,365	2,032,552	Mumbai Suburban	Total	2,105,604	9,356,962	5,031,323	4,325,639
Jalgaon	Rural	624,570	2,887,206	1,500,514	1,386,692	Mumbai Suburban	Rural	-	-	-	-
Jalgaon	Urban	279,073	1,342,711	696,851	645,860	Mumbai Suburban	Urban	2,105,604	9,356,962	5,031,323	4,325,639
Buldana	Total	561,504	2,586,258	1,337,560	1,248,698	Mumbai	Total	674,339	3,085,411	1,684,608	1,400,803
Buldana	Rural	451,284	2,037,398	1,055,242	982,156	Mumbai	Rural	-	-	-	-
Buldana	Urban	110,220	548,860	282,318	266,542	Mumbai	Urban	674,339	3,085,411	1,684,608	1,400,803
Akola	Total	395,690	1,813,906	932,334	881,572	Raigarh	Total	611,790	2,634,200	1,344,345	1,289,855
Akola	Rural	250,160	1,094,165	563,933	530,232	Raigarh	Rural	381,204	1,664,005	836,996	827,009
Akola	Urban	145,530	719,741	368,401	351,340	Raigarh	Urban	230,586	970,195	507,349	462,846
Washim	Total	259,464	1,197,160	620,302	576,858	Pune	Total	2,151,503	9,429,408	4,924,105	4,505,303
Washim	Rural	218,403	985,747	511,727	474,020	Pune	Rural	779,972	3,678,226	1,903,440	1,774,786
Washim	Urban	41,061	211,413	108,575	102,838	Pune	Urban	1,371,531	5,751,182	3,020,665	2,730,517
Amravati	Total	647,451	2,888,445	1,480,768	1,407,677	Ahmadnagar	Total	930,024	4,543,159	2,342,825	2,200,334
Amravati	Rural	430,282	1,851,158	950,633	900,525	Ahmadnagar	Rural	739,083	3,630,542	1,872,907	1,757,635
Amravati	Urban	217,169	1,037,287	530,135	507,152	Ahmadnagar	Urban	190,941	912,617	469,918	442,699
Wardha	Total	309,846	1,300,774	668,385	632,389	Bid	Total	535,835	2,585,049	1,349,106	1,235,943
Wardha	Rural	212,493	877,474	451,874	425,600	Bid	Rural	435,588	2,070,751	1,082,978	987,773
Wardha	Urban	97,353	423,300	216,511	206,789	Bid	Urban	100,247	514,298	266,128	248,170
Nagpur	Total	1,041,544	4,653,570	2,384,975	2,268,595	Latur	Total	481,572	2,454,196	1,273,140	1,181,056
Nagpur	Rural	339,997	1,474,811	758,357	716,454	Latur	Rural	363,409	1,829,216	949,707	879,509
Nagpur	Urban	701,547	3,178,759	1,626,618	1,552,141	Latur	Urban	118,163	624,980	323,433	301,547
Bhandara	Total	278,076	1,200,334	605,520	594,814	Osmanabad	Total	351,281	1,657,576	861,535	796,041
Bhandara	Rural	224,933	966,503	487,484	479,019	Osmanabad	Rural	296,494	1,376,519	716,237	660,282
Bhandara	Urban	53,143	233,831	118,036	115,795	Osmanabad	Urban	54,787	281,057	145,298	135,759
Gondiya	Total	292,369	1,322,507	661,554	660,953	Solapur	Total	873,167	4,317,756	2,227,852	2,089,904
Gondiya	Rural	243,840	1,096,577	547,934	548,643	Solapur	Rural	593,560	2,918,665	1,518,343	1,400,322
Gondiya	Urban	48,529	225,930	113,620	112,310	Solapur	Urban	279,607	1,399,091	709,509	689,582
Gadchiroli	Total	250,435	1,072,942	541,328	531,614	Satara	Total	653,735	3,003,741	1,510,842	1,492,899
Gadchiroli	Rural	222,413	954,909	481,290	473,619	Satara	Rural	528,587	2,433,363	1,219,749	1,213,614
Gadchiroli	Urban	28,022	118,033	60,038	57,995	Satara	Urban	125,148	570,378	291,093	279,285
Chandrapur	Total	536,686	2,204,307	1,123,834	1,080,473	Ratnagiri	Total	397,115	1,615,069	761,121	853,948
Chandrapur	Rural	356,228	1,428,929	726,106	702,823	Ratnagiri	Rural	335,318	1,351,346	630,213	721,133
Chandrapur	Urban	180,458	775,378	397,728	377,650	Ratnagiri	Urban	61,797	263,723	130,908	132,815
Yavatmal	Total	646,886	2,772,348	1,419,965	1,352,383	Sindhudurg	Total	209,839	849,651	417,332	432,319
Yavatmal	Rural	515,502	2,174,195	1,115,148	1,059,047	Sindhudurg	Rural	183,201	742,645	363,268	379,377
Yavatmal	Urban	131,384	598,153	304,817	293,336	Sindhudurg	Urban	26,638	107,006	54,064	52,942
Nanded	Total	665,434	3,361,292	1,730,075	1,631,217	Kolhapur	Total	840,240	3,876,001	1,980,658	1,895,343
Nanded	Rural	494,341	2,447,394	1,258,160	1,189,234	Kolhapur	Rural	568,519	2,645,992	1,348,815	1,297,177
Nanded	Urban	171,093	913,898	471,915	441,983	Kolhapur	Urban	271,721	1,230,009	631,843	598,166
Hingoli	Total	228,868	1,177,345	606,294	571,051	Sangli	Total	598,386	2,822,143	1,435,728	1,386,415
Hingoli	Rural	196,255	998,612	514,430	484,182	Sangli	Rural	442,436	2,102,786	1,071,124	1,031,662
Hingoli	Urban	32,613	178,733	91,864	86,869	Sangli	Urban	155,950	719,357	364,604	354,753
Parbhani	Total	361,130	1,836,086	942,870	893,216						
Parbhani	Rural	256,399	1,266,280	651,886	614,394						
Parbhani	Urban	104,731	569,806	290,984	278,822						
Jalna	Total	391,701	1,959,046	1,011,473	947,573						
Jalna	Rural	320,908	1,581,617	817,279	764,338						
Jalna	Urban	70,793	377,429	194,194	183,235						

Figure 27. Population Distribution by Household, Urban, Rural, and by Gender. Maharashtra, 2011

³⁸ Census definition of 'Household Industry': Household industry was defined as an industry conducted by the head of the household himself/herself and/or by the members of the household at home or within the village in rural areas, and only within the precincts of the house where the household lived in urban areas.

Name	Type	Population in the age group 0-6 Person	Population in the age group 0-6 Male	Population in the age group 0-6 Female	Name	Type	Population in the age group 0-6 Person	Population in the age group 0-6 Male	Population in the age group 0-6 Female
MAHARASHTRA	Total	13,326,517	7,035,391	6,291,126					
MAHARASHTRA	Rural	7,688,954	4,067,399	3,621,555					
MAHARASHTRA	Urban	5,637,563	2,967,992	2,669,571					
Nandurbar	Total	240,222	123,582	116,640	Aurangabad	Total	532,659	286,721	245,938
Nandurbar	Rural	207,516	106,233	101,283	Aurangabad	Rural	306,364	165,510	140,854
Nandurbar	Urban	32,706	17,349	15,357	Aurangabad	Urban	226,295	121,211	105,084
Dhule	Total	273,507	144,121	129,386	Nashik	Total	827,935	438,050	389,885
Dhule	Rural	206,036	108,085	97,951	Nashik	Rural	496,060	262,482	233,578
Dhule	Urban	67,471	36,036	31,435	Nashik	Urban	331,875	175,568	156,307
Jalgaon	Total	532,005	288,827	243,178	Thane	Total	1,327,146	689,665	637,481
Jalgaon	Rural	375,676	203,933	171,743	Thane	Rural	364,206	185,687	178,519
Jalgaon	Urban	156,329	84,894	71,435	Thane	Urban	962,940	503,978	458,962
Buldana	Total	332,125	179,072	153,053	Mumbai Suburban	Total	930,884	486,696	444,188
Buldana	Rural	264,970	143,051	121,919	Mumbai Suburban	Rural	-	-	-
Buldana	Urban	67,155	36,021	31,134	Mumbai Suburban	Urban	930,884	486,696	444,188
Akola	Total	211,080	110,372	100,708	Mumbai	Total	272,886	142,566	130,320
Akola	Rural	129,187	67,347	61,840	Mumbai	Rural	-	-	-
Akola	Urban	81,893	43,025	38,868	Mumbai	Urban	272,886	142,566	130,320
Washim	Total	152,190	81,686	70,504	Raigarh	Total	300,815	155,437	145,378
Washim	Rural	125,583	67,515	58,068	Raigarh	Rural	188,804	96,875	91,929
Washim	Urban	26,607	14,171	12,436	Raigarh	Urban	112,011	58,562	53,449
Amravati	Total	311,391	160,934	150,457	Pune	Total	1,104,959	586,665	518,294
Amravati	Rural	204,552	105,268	99,284	Pune	Rural	440,102	235,248	204,854
Amravati	Urban	106,839	55,666	51,173	Pune	Urban	664,857	351,417	313,440
Wardha	Total	128,901	67,187	61,714	Ahmadnagar	Total	556,014	300,238	255,776
Wardha	Rural	88,224	45,798	42,426	Ahmadnagar	Rural	450,473	243,665	206,808
Wardha	Urban	40,677	21,389	19,288	Ahmadnagar	Urban	105,541	56,573	48,968
Nagpur	Total	497,087	257,438	239,649	Bid	Total	352,890	195,245	157,645
Nagpur	Rural	164,963	84,973	79,990	Bid	Rural	283,628	157,895	125,733
Nagpur	Urban	332,124	172,465	159,659	Bid	Urban	69,262	37,350	31,912
Bhandara	Total	126,025	64,626	61,399	Latur	Total	317,811	168,237	149,574
Bhandara	Rural	103,261	52,829	50,432	Latur	Rural	238,335	126,156	112,179
Bhandara	Urban	22,764	11,797	10,967	Latur	Urban	79,476	42,081	37,395
Gondiya	Total	140,365	71,764	68,601	Osmanabad	Total	207,096	110,919	96,177
Gondiya	Rural	117,577	60,006	57,571	Osmanabad	Rural	171,560	91,913	79,647
Gondiya	Urban	22,788	11,758	11,030	Osmanabad	Urban	35,536	19,006	16,530
Gadchiroli	Total	120,272	61,320	58,952	Solapur	Total	538,453	285,879	252,574
Gadchiroli	Rural	108,521	55,191	53,330	Solapur	Rural	376,328	200,863	175,465
Gadchiroli	Urban	11,751	6,129	5,622	Solapur	Urban	162,125	85,016	77,109
Chandrapur	Total	231,316	118,471	112,845	Satara	Total	317,885	167,729	150,156
Chandrapur	Rural	154,465	78,642	75,823	Satara	Rural	258,567	136,325	122,242
Chandrapur	Urban	76,851	39,829	37,022	Satara	Urban	59,318	31,404	27,914
Yavatmal	Total	330,180	171,782	158,398	Ratnagiri	Total	155,560	80,333	75,227
Yavatmal	Rural	265,301	137,512	127,789	Ratnagiri	Rural	129,073	66,623	62,450
Yavatmal	Urban	64,879	34,270	30,609	Ratnagiri	Urban	26,487	13,710	12,777
Nanded	Total	459,572	240,620	218,952	Sindhudurg	Total	71,193	37,034	34,159
Nanded	Rural	341,023	178,075	162,948	Sindhudurg	Rural	61,715	32,038	29,677
Nanded	Urban	118,549	62,545	56,004	Sindhudurg	Urban	9,478	4,996	4,482
Hingoli	Total	165,716	88,052	77,664	Kolhapur	Total	408,942	219,521	189,421
Hingoli	Rural	141,780	75,268	66,512	Kolhapur	Rural	279,956	150,362	129,594
Hingoli	Urban	23,936	12,784	11,152	Kolhapur	Urban	128,986	69,159	59,827
Parbhani	Total	257,320	136,605	120,715	Sangli	Total	306,777	164,355	142,422
Parbhani	Rural	179,962	95,996	83,966	Sangli	Rural	230,283	123,855	106,428
Parbhani	Urban	77,358	40,609	36,749	Sangli	Urban	76,494	40,500	35,994
Jalna	Total	287,338	153,642	133,696					
Jalna	Rural	234,903	126,180	108,723					
Jalna	Urban	52,435	27,462	24,973					

Figure 28. Population 0-6 Years Old by District, State of Maharashtra, 2011

2. Economy

124. The State of Maharashtra is one of the most developed and prosperous state in the Union. Its capital, Mumbai City, has become one of the most important sea ports that handles huge amount of foreign trades. It is also the movie center of the nation. Around Mumbai, cities like Pune has developed a wide range of industries, while Nagpur and Solapur are well known for its textile and agro-industrial products.

125. The principal difficulty towards the full development of agriculture in the state is the lack of rainfall. To address the limited area for production, the state government has embarked on electrification, irrigation pumps, hybrid seeds, modern production and post-harvest facilities. The state is the largest producer sugarcane and a dominant producer of sorghum, millet and pulses. Wherever rainfall is sufficient, people tend to plant rice and wheat. Cotton, tobacco, peanuts are also sown in rainfall-rich areas. The state is also known for its mangoes, cashew nuts, bananas, grapes, and oranges.

126. Maharashtra is blessed with mineral resources such as manganese, coal, iron ore, limestone, copper, bauxite, silica sand, and common sal. Petroleum deposits are explored and extracted along the marine waters of Mumbai. Hydroelectric and thermal powerplants located in Nagpur and Chandrapur provides the power needs of the state. One of India's first nuclear power plant was built in Tarapur.

127. The state is known for its oldest and largest manufacturing of cotton textiles with facilities located in Mumbai, Nagpur, Solapur, Akola, and Amravati while woolen products come from Nagpur and Solapur. Other manufacturing hubs are:

- (i) Edible oils – Jalgaon, Dhule and
- (ii) sugar refining - Kolhapur, Ahmadnagar, Sangli and Miraj
- (iii) Fruit canning and preservation - Nagpur, Bhusawal, Ratnagiri, and Mumbai
- (iv) Forest products (timber, bamboo, sandalwood, and tendu leaves) – Pune, Wardha, Solapur, Uttara—the latter used for rolling bidi (Indian cigarettes).
- (v) Small-scale agro-processing of food grains – statewide

128. Along the Mumbai–Pune corridor is an intensive concentration of heavy industry and high technology that includes off-shore oil exploration, oil refining, automobile assembly, agricultural machineries, transport equipment, rubber products, electric and oil pumps, lathes, compressors, sugar-mill machinery, typewriters, refrigerators, and electronic equipment. The areas of Nagpur, Chandrapur, and Bhandara are centers for coal-based ferroalloys, manganese and iron ores, and cement industries.

3. Transportation

129. The state has a well-developed transport system. Its rail network like the Konkan Railway links Mumbai the rest of the major urban centers in the state with Wardha and Nagpur serving as important junctions. The national highways connect to Delhi, Kolkata (Calcutta), Allahabad, Hyderabad, and Bengaluru (Bangalore). Air connections on daily basis serves domestic passengers to Pune, Nagpur, Aurangabad, and Nashik while Mumbai is also a major international hub for air transport.

130. The MRRDA carried out classified traffic counts on project road sections during project preparation, and derived average daily traffic flows —constituting “normal” traffic on the project road sections—from these counts. The roads are currently in poor condition. Once they are upgraded, traffic flows are expected to increase by 10%. This is assumed to be a conservative estimate. The project road sections are the most direct connections between rural habitations and urban centers. As such traffic flows are not expected to increase due to these roads being used as alternative routes to other destinations.

131. In the absence of historical traffic growth data on the project road sections, this analysis is based on vehicle growth rates, population growth rates, and economic growth rates. Elasticity of traffic growth is estimated in relation to these parameters, and in turn used to make traffic projections.

132. The number of registered vehicles in Maharashtra has been growing at 8.5% per year during the 2013–2018 period. Registered *two-wheeled vehicles* and cars have been growing

at about 9.0% per year, followed by goods carrying vehicles (7%) and buses (6%).³⁹ The state has the largest economy in India, and the growth rate of the state's economy and of registered vehicles are close to national averages. The state economy has grown at a rate of 7.4% during the 5 years from 2013 to 2018 but has slowed down to 5.7% in 2019–2020. Considering the slowdown, the economy is expected to grow at 5-6% in the next 3 years. The growth rate for registered vehicles in rural areas is expected to be lower than the state average, and accordingly growth rates over the analysis period has been derived. The traffic growth rates estimated for different vehicle categories for traffic projection are given in Table 2.

Table 16: Traffic Growth Rates used in Projections

Vehicle Type	2020–2025	2025–2030	2030–2035	Beyond 2035
Car/Van/Jeep	5.4	4.7	4.1	3.1
Two-wheeler	5.3	4.7	4.1	3.3
Bus	3.5	3.1	2.7	2.2
Goods Vehicles	3.8	3.3	2.8	2.2

Source: Asian Development Bank estimates.

³⁹ Government of Maharashtra, Planning Department, Directorate of Economics and Statistics. March 2018. *Economic Survey of Maharashtra (for the years FY2013 to FY2018)*. Mumbai.

V. IMPACT ASSESSMENT AND MITIGATION MEASURES

133. Rural road and bridge improvement project are likely to bring several changes in the local environment both beneficial and unfavorable. This section of the report identifies the nature, extent, and magnitude of likely impacts to the environment, which is attributable to the additional financing works. This chapter presents the environmental assessment and planning addressing the environmental impacts and risk associated during pre-construction, construction and operation stages.

134. In consultation with the district engineers and the technical consultants of MRRDA, the chapter starts with the identification and screening of potential impacts of the project components (e.g. site mobilization, establishment of camps, road construction, and road operation). Interaction of these general components with specific environmental aspects (e.g. physical, biological, and social) were identified through a series of discussions with the community stakeholders, panchayat, non-government organizations, and local district forest offices.

135. The civil work components that are anticipated to have substantial interaction with the environment are the following:

(i) **Preconstruction Phase:**

- (a) Road and bridge alignment and design – involves the screening and selection roads to avoid environment sensitive areas, and survey
- (b) finalization of the alignment including minor geometric realignment particularly on intersections and sharp curves
- (c) Utility shifting – removal and transfer from the carriage way of electric, telephone, and water supply pipelines, drainage pipes, and hand pumps, among others.
- (d) Construction mobilization - land clearing, installation of electricity and other utility connections, perimeter fencing, establishment of storage areas, waste disposal, and installation of production equipment (cold mix, concrete batching, rock crusher, casting) in the labor and camp sites.
- (e) Site clearing – clearing and grubbing of road land including uprooting of vegetation, grass, brushes, shrubs, samplings, and trees, removal of stump, and disposal of unwanted materials, and selling of serviceable materials. This also includes the dismantling of existing structures like culverts, hume pipes, bridges, and retaining walls and their proper disposal

(ii) **Construction Phase:**

- (a) Excavation (roads and bridges) – soil, ordinary, or hard rocks for roadworks using hydraulic excavators and tippers, including cutting and loading, trimming of bottom and side slopes, grades and cross graded
- (b) Embankment (roads) – with materials obtained from roadway cutting and borrow pits that includes construction of surface drains
- (c) Foundation (bridges) – providing concrete or plain cement in foundations and placing TMT bar reinforcement.
- (d) Sub-base (roads and bridges) – involves the construction of the granular sub-base, compacting with smooth wheel roller
- (e) Sub-grade (roads) – road subgrade and earthen shoulder requiring materials transport, spreading, grading to required slope, and compaction of; spreading of graded gravel in uniform layer and compaction up to required density;

- (f) Superstructure (bridges) – laying of reinforced cement concrete and fitting of TMT bars (for the solid slab, ballast wall, kerb and wearing coat), fixing railings and expansion joints.
 - (g) Flexible pavement (roads) – WBM with crushable screening by providing, laying, spreading and compacting stone aggregates to WBM specification including spreading, hand packing, rolling, applying and brooming crushable screening to fill-up the interstices of coarse aggregate, watering and compacting; ack coat application with bituminous emulsion distributor; Application of 20mm open graded premix carpet using bituminous binder; and provision of seal coat
 - (h) Road Furnitures (roads and bridges) – installation of cautionary and information signs, kilometer stones using reinforced concrete, and granite/quartzite guard stones. This also includes white color washing of road side trees, metal beam crash barriers, cat's eyes, road markings with thermoplastic compound, and vertical and road delineators.
- (iii) **Post-Construction Phase:**
- (a) Road and bridge maintenance
 - (b) Vegetation control – involves periodic mechanical mowing, trimming, removal of brush, and removal of trees when necessary to enhance aesthetics and to prevent potential safety hazards (e.g. reduced visibility, obstruction of signs, and debris in the roadway).

A. Identification and Assessment of Environmental Impacts

136. The identification of potential effect requires the definition of the environment into its physical, biological, and social components that are at risk due to the improvements for the target 1,100 rural roads and 236 bridges with in 34 project districts. Like a Leopold matrix, it involves an integration grid between the valued environmental components and project activities. The valued environmental components for this project were drawn from the environmental baseline and are as follows:

- (i) Physical environment – air quality and greenhouse gas emissions, land and soil, surface water quality and quantity, and groundwater quality and quantity
- (ii) Biological environment – terrestrial vegetation, avifauna, and fish species
- (iii) Social environment – private land and buildings, public infrastructures, sound environment, aesthetic and visual, and community and occupational health and safety

137. The assessment of potential environmental impacts requires the definition of the effects associated with the rural roads and bridges upgrading in terms of intensity, duration, and scope as follows:

- (i) **Intensity of the effect:** The intensity of the effect refers to the level of disruption to the component. Three levels have been defined:
 - (a) Low: Little change in the characteristics of the component. Difficult to quantify;
 - (b) Average: Change in certain characteristics of the component. The change may be quantifiable;
 - (c) High: Change in all or in the main characteristics of the component. The change is quantifiable
- (ii) **Duration of the effect:** Duration means the time dimension of the effect. The terms permanent, temporary and short are used to describe the period (time):
 - (a) Short-lived: the effect disappears promptly;
 - (b) Temporary: the effect is felt during one project activity or, at most, throughout implementation of the project;

- (c) Permanent: the effect has repercussions for the life of the infrastructure.
- (iii) **Scope of the effect:** The scope describes the spatial dimension of the effect caused by an action in the environment. It refers to the distance or area covered by the disruption. The terms regional, local and limited are used to describe the scope:
- (a) Limited: the scope is limited when the action affects only one environmental element located near the project;
 - (b) Local: the scope is local when the action affects the study area;
 - (c) Regional: the scope is regional when the action affects areas beyond the study area
- (iv) **Assessment of the potential effect.** Three parameters are incorporated into a multicriteria matrix, making it possible to place the potential effect into one of three categories:
- (a) Major (MAJ): signifies an effect that is permanent and that affects the integrity, diversity and sustainability of the element. Such an effect substantially or immediately alters the quality of the environment.
 - (b) Medium (MED): signifies a perceptible, temporary and/or low return effect that has little impact on the environmental component and is not irreversible. Such an effect is short-lived and/or limited in scope.
 - (c) Minor (MIN): signifies that the effect is non-existent or virtually non-existent, that it does not affect the environmental component in any observable or quantifiable way and that it is related to a randomly occurring natural effect. As a rule, this would be a short-lived effect, limited in scope.

Table 17. Multi-Criteria Analysis to Determine the Potential Environmental Impacts

Intensity	Scope Duration	Short-lived	Temporary	Permanent
Low	Limited	MIN	MIN	MED
	Local	MIN	MIN	MED
	Regional	MIN	MED	MAJ
Average	Limited	MIN	MED	MED
	Local	MED	MED	MAJ
	Regional	MED	MAJ	MAJ
High	Limited	MED	MAJ	MAJ
	Local	MED	MAJ	MAJ
	Regional	MAJ	MAJ	MAJ

138. The relationship between the project phases and components, and the environment were established to identify anticipated environmental impact is provided in the succeeding figure.

Table 18. Interaction between Environmental Components and Maharashtra RCIP Road Improvement Additional Financing

Environmental Component	Pre-construction			Construction						Operation	
	RA	US	CC	DW	RC	BC	QB	CP	SR	RM	VC
<i>Physical Environment</i>											
Air Quality and GHG											
Land and Soil											
Surface water quality and quantity											
Groundwater quality and quantity											
<i>Biological Environment</i>											
Terrestrial Vegetation											
Wildlife											
<i>Social Environment</i>											
Private land and buildings											
Public infrastructures											
Sound level											
Aesthetic and visual											
Community OHS											
COVID-19											

RA: Road and alignment, **US:** Utility Shifting, **CC:** Construction Mobilization and Camp Site Location, **DW:** Drainage Works, **RC:** Road Construction, **BC:** Bridge Construction, **QB:** Quarries and borrow pits, **CP:** Construction Plants, **SR:** Site restoration, **RM:** Road Maintenance and **VC:** Vegetation control

B. Summary of Impacts Assessment and Mitigation measures

139. The succeeding sections present findings of impact assessment and corresponding mitigation measures. These is referenced to the potential risks and impacts shown in the previous Table 17. Potential environmental impacts corresponding to the specific project activities and components were qualitatively assessed in terms of intensity, duration, and scope and potential effects were categorized into major, medium, and minor as defined previously.

1. Project Design and Pre-Construction Stage

a. Road and Bridge Selection Criteria

140. The most significant mitigation measure adopted by the project is the strict implementation of a set of selection criteria that avoids rural roads and bridges that can pose significant adverse impacts and located within sensitive areas. This effectively limits the variation among roads and bridges to a common design, and allows the preparation, training, and implementation of similar environmental management plans.

141. The environmental selection criteria of candidate rural road and bridges are:

- (i) Subproject will not disturb any cultural heritage designated by the government or by the international agencies, such as United Nations Educational, Scientific

and Cultural Organization (UNESCO), and shall avoid any monuments of cultural or historical importance.

- (ii) Subproject will not pass through any designated wildlife sanctuaries, national park, notified Eco-sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area.
- (iii) Subproject to comply with local and National legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009.
- (iv) Alignment finalization considering availability of right of way (ROW) and in consultation with local people.
- (v) ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines.
- (vi) Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure.
- (vii) The road shall follow natural topography to avoid excessive cut and fill.

b. Clearing of vegetation and removing trees

142. The reformation of the road embankment and the construction of earthen shoulders is not expected to result to substantial removal of trees. Based on transect walks documented on each road-specific environment checklist, a total of more than 1,684 trees may be affected by the project. Impacts will be mitigated as follows:

- (i) All efforts shall be taken to avoid tree cutting wherever possible.
- (ii) Requisite permission from forest department shall be obtained for cutting of roadside trees.
- (iii) Provision of Compensatory Afforestation shall be made on 1:6 ratio basis (Maharashtra State policy).
- (iv) Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation.
- (v) A roadside plantation plan may be prepared by the PIU as part of the DPR, and finalized in consultation with the State Forest Department and PRI. The plantations shall be in accordance with the IRC:SP:21-1979 Manual on Landscaping and IRC:66-1976.
- (vi) The vegetative cover shall be removed and disposed in consultation with community.

c. Shifting of utilities and common property resources

143. Confining the proposed road improvements along existing alignment pose risk of affecting 2,214 electric poles and 14 borewells that has encroached on the roadway embankment. These utilities are required to be shifted in compliance to IRC guidelines. Konkan has the most number of affected electric poles with 643 followed by Nagpur, Pune, and Aurangabad with 491, 484, and 272, respectively. Affected borewells are in Aurangabad, Pune and Nagpur. There are 4 temples that may be affected by the project located in Aurangabad and Pune. Mitigation measures during the pre-construction stage are as follow:

- (i) The road land width shall be clearly demarcated on the ground.
- (ii) All efforts will be made to minimize shifting of utilities and common property resources
- (iii) Utility and community structure shifting shall be planned in consultations and concurrence of the community
- (iv) Required permissions and necessary actions will be taken on a timely basis for removing and shifting utility structures and common property resources before road construction activities begin.

d. Design and planning of embankment construction

144. One of the key considerations in finalizing alignment is to balance cut and fill of soils to minimize cost. Although the project will be confined to the existing alignment and already conforming to the natural topography therefore reducing soil disturbance. The district of Ahmednagar has the most roads covered requiring increase in elevation at 168 kms followed by Pune, Osmanabad and Beed at 132 kms each. For the bridges, Aurangabad, Nashik and Nagpur has the most number at 61, 55 and 54, respectively. To minimize impacts during pre-construction stage, the following mitigations measures were observed.

- (i) The alignment design shall consider options to minimize excessive cuts and fills.
- (ii) The cut off material shall be planned to be used for embankment to minimize borrow earth requirement.
- (iii) The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage.
- (iv) The topsoil of the cut and fill area shall be used for embankment slope protection
- (v) Embankment will be designed above High Flood Level (HFL) in flood prone areas where feasible.

e. Hydrology and Drainage

145. Except for Konkan Region specifically along the Sadhyari Range, the project regions have flat terrain with low ground slopes and dissected by numerous rivers, streams, and irrigation canals. Poor drainage design can increase the risk of flooding upstream of the road, increase the flood flow velocity across culverts which in turn can cause scouring downstream, altering the natural level of terrain. To avoid these impacts on the local hydrology, studies must be conducted in large catchment areas to limit the afflux and provide adequate waterway for cross-drainage structures. Adequate drainage arrangements as per IRC:SP-20:2002 have to be provided. More specifically:

- (i) Provision of adequate cross drainage structure will be made to ensure smooth passage of water and maintaining natural drainage pattern of the area.
- (ii) The discharge capacity of the cross drainage structure will be designed accordingly.
- (iii) Provision of adequate drainage structures will be made in water stagnant/logging areas.
- (iv) The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff.
- (v) Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides.
- (vi) Provision of concrete road construction in habitat area with drainage of both side of the road shall be made as per the design provision and with adequate slope to prevent any water logging.

f. Establishment of Construction Camp, temporary office and storage area

146. Poorly sited construction camps pose risk of deteriorating the quality of receiving water from process and domestic wastewater, waste oil and lubricants, loss of topsoil, generation of solid wastes such as construction debris (dismantled pavement and culverts) and municipal, compete with local demands for water and electricity, loss of vegetation from camp clearing and firewood for cooking, and occupational and community health and safety. Design and pre-construction mitigation measures to address these risks are:

- (i) Construction camp sites will be located away from any local human settlements and forested areas (minimum 0.5 km away) and preferably located on lands, which are not productive (barren/waste lands presently).
- (ii) Similarly, temporary office and storage areas shall be located away from human settlement areas and forested areas (minimum 0.5 km).
- (iii) The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities.
- (iv) The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.
- (v) All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible.
- (vi) The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children.
- (vii) Personal Protective Equipment (PPEs) like helmet, boots, earplugs for workers, first aid and firefighting equipment shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire.
- (viii) Provision shall be made for domestic solid waste disposal in a controlled manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling.
- (ix) Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage.

g. Traffic Management and Road Safety

147. Road and bridge improvements, such as shoulder construction, construction or reconstruction of drainage structures and construction vehicles use, will impede the traffic flows. These will result in congestion, delays and increase in noise and exhaust emissions. In built up areas, the pedestrian traffic will also be affected particularly in market areas, schools, and places of work. Prior to construction, the following measures will be implemented: need to be given special attention to ensure safety of road user.

148. The following mitigation measures will need to be adopted:

- (i) Identify the areas where temporary traffic diversion may be required.
- (ii) Prepare appropriate traffic movement plan approved by respective PIU for ensuring continued safe flow of traffic, pedestrians and all road users during construction.
- (iii) Wherever, cross drainage structure work require longer construction time and road is to be blocked for longer duration, the PIU/DPR consultant shall define appropriate measures for traffic diversion before the start of the construction.
- (iv) Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and retro reflective in nature for good visibility both during the day and night. It is proposed for the respective PIU to discuss with the railways division/department for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing All measures for traffic control and safety in accordance with IRC codes:99-1988 will be followed. Selection and location of regulatory as well as informatory signs as per IRC: 67-2001, depending upon the geometry of the road.

2. Construction Phase

a. Sourcing and transportation of construction material

149. The sourcing and transportation of construction materials poses a wide range of potential impacts to the environment. The borrowing of earth from new quarries will cause loss of valuable top soil, disfiguration of the land scape, community hazards due to the excavated areas, potential breeding ground of mosquitoes in the stagnant water, and removal of vegetation.

150. The transport of construction materials that includes soil, gravel, bitumen, asphalt, and construction materials may damage soil if done through new tracks of by-passes. This is particularly significant along the road embankment where additional lanes may be required just to maneuver the equipment or temporary staging area for material stockpiles. Improper transport can result to materials spillage that can pose traffic hazards, and in case of petroleum and lubricants needed by for equipment operation can contaminate surface and ground water.

151. The following mitigation measures are included in the contractor's responsibilities:

(i) Borrow Earth:

- (a) The borrow earth shall be obtained from identified locations and with prior permission of landowner and clear understanding for its rehabilitation consistent with the provisions of IRC:10-1961.
- (b) The re-habilitation plan may include the following:
- (c) Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface.
- (d) Borrow areas might be used for aquaculture in case landowner wants such development. o The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.
- (e) Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas.
- (f) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (g) Borrowing of earth will not be done continuously through out the stretch. o Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- (h) Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- (i) The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).
- (j) The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.
- (k) Fly ash will be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment.

(ii) Aggregate:

- (a) The stone aggregate shall be sourced from existing licensed quarries
- (b) Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU.

- (c) Topsoil to be stockpiled and protected for use at the rehabilitation stage
- (iii) Transportation of Construction Material
 - (a) Existing tracks / roads are to be used for hauling of materials to the extent possible.
 - (b) Prior to construction of roads, topsoil shall be preserved and shall be used for other useful purposes like using in turfing of embankment.
 - (c) The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any.
 - (d) Topsoil to be stockpiled and protected for use at the rehabilitation stage
- (iv) Transportation of Construction Material
 - (a) Existing tracks / roads are to be used for hauling of materials to the extent possible.
 - (b) Prior to construction of roads, topsoil shall be preserved and shall be used for other useful purposes like using in turfing of embankment.
 - (c) The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any.

b. Loss of Productive Soil, erosion and land use change

152. One of the key objectives of the project is to enhance the agricultural productivity of the Maharashtra by improving connectivity between production, community, and market areas. However, several road construction activities to a certain extent, may reduce agricultural production areas particularly along the narrow strip of land adjacent to the road formation. The increase in the road surface elevation above the high flood level will require broadening the embankment formation which may require additional lands if the side slopes are maintained. Construction camps and storage areas may reduce productive agricultural lands if sited on these areas. Loose road embankment slopes may cause erosion during monsoon season which can contaminate adjacent agricultural lands and reduce productivity.

153. To address these risks, the following measures will be implemented.

- (i) The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes.
- (ii) It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion.
- (iii) Cut and fill shall be planned as per IRC provisions and rural road manual.
- (iv) All steep cuts shall be flattened and benched.
- (v) Shrubs shall be planted in loose soil area.
- (vi) IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration.
- (vii) It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over back to land owner

c. Compaction and Contamination of Soil

154. Movement of vehicles outside the existing roads and tracks, leaks from fuel and lubricant storage, and irresponsible vehicular maintenance can cause soil compaction and contamination. Compaction will render these lands useless for agriculture as well as contamination with fuel and lubricants.

155. The following mitigations measures will be implemented by the Contractors:
- (i) To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route.
 - (ii) The productive land shall be reclaimed after construction activity.
 - (iii) Fuel and lubricants shall be stored at the predefined storage location.
 - (iv) The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils.
 - (v) All efforts shall be made to minimize the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal.
 - (vi) To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.

d. Construction Debris and waste

156. The dismantling of old pavement, culverts, soil unsuitable for road base and sub-base will generate substantial amount of solid waste that will entail hauling and disposal costs. Other wastes that will be generated although smaller in quantities include: concrete, masonry, and brick rubble and other wastes like acids and alkaline solutions, waste oils and oily sludge, batteries, timber, and plastics. Disposal areas are limited at the Panchayat levels, mostly designed to cater to domestic wastes and the additional construction debris will shorten the lives of these permitted dumps if no measure of waste minimization and re-use are implemented by the contractors.

157. To avoid and minimize these impacts, the following measures will be implemented by the Contractor.

- (i) Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping.
- (ii) Unusable debris material should be suitably disposed of at pre-designated disposal locations, with approval of the concerned authority.
- (iii) The bituminous wastes shall be disposed in secure manner at designated landfill sites only in an environmentally accepted manner.
- (iv) For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. Unproductive/wastelands shall be selected with the consent of villagers and Panchayat for the same. The dumping site should be of adequate capacity. It should be located at least 500 m away from the residential areas. Dumping sites should be away from water bodies to prevent any contamination of these bodies.

e. Air and Noise Quality

158. During the construction stage air quality impacts are mainly associated with the movement of vehicles on unpaved haul roads, soil and gravel extraction along the vicinity of borrow pits, soil movement, and ground shaping related to the embankment formation. Mud tracked onto public roads will dry out and generate dust through resuspension. Dust is the major air quality problem from construction sites. Particle sizes vary considerably depending on their origin and construction activity.

159. Construction activities and equipment like breaking of old pavement, ground shaping, and materials transport will generate substantial noise that are expected to exceed national standards during the short construction phase.

160. The following mitigation measures will be implemented by the contractor to minimize air quality and noise impacts.

- (i) Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- (ii) Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas.
- (iii) Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements.
- (iv) Material storage areas shall also be located downwind of the habitation area.
- (v) Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions.
- (vi) Diesel Generating (DG) sets shall also be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5 KVA and about 0.7 m for 10 KVA DG sets, above top of sound proofing enclosure of the DG set). Low Sulphur diesel shall be used in DG sets and other construction machineries where available. Construction vehicles and machineries shall be periodically maintained.

f. Tree plantation

161. Based on transect walk surveys, may affect almost 1,684 trees from the improvement of 2,965 kilometers of rural roads. These trees are located along the formation that poses road hazards as well as the stability of the road embankments. During construction, all efforts will be expanded to further minimize the number of trees to be cleared through minor geometric realignment. However, in cases where the clearing is necessary, the State of Maharashtra requires compensatory afforestation of 1:6 which to be complied with the MRRDA prior to the start of construction in the affected toad section.

g. Wildlife protection

162. The state of Maharashtra has a number of wildlife sanctuaries and national parks, which are home to wide variety of species. Some of these species are Tigers, Wild Water Buffalo, Dhole and Asian Elephant. Apart from that, these protected zones and forest serve as home to numerous Avian species and other migratory birds every year. The additional financing did not include rural roads and bridges in forests, coastal zones and national parks that are potentially habitats of endangered species, and trigger national policy and SPS requirements. To ensure wildlife protection during project implementation, the mitigation measures are incorporated in EMP.

163. These mitigation measures will be implemented by the contractor to protect wildlife in project areas:

- (i) Fencing wherever there is expected animal movement
- (ii) Workers will avoid hunting, gathering and harvesting of wildlife for food, selling and domestication
- (iii) There will be no destruction and disturbing of wildlife habitats
- (iv) In case there are endangered wildlife in the area, the contractor will inform immediately the local forest department on the sighting of such species
- (v) With the help of local forest department, the contractor and PIU will provide awareness on wildlife and habitat protection to the workers every beginning of the construction season.

h. Ground Water and Surface Water Quality and Availability

164. Majority of the State except for a thin strip of land along the Indian Ocean, suffers from lack of surface and ground water. The entire state itself is considered as the one of the most drought-prone in the entire Union. Unplanned and uncoordinated extraction of process and domestic waters required by the project may result to complaints downstream or from the surrounding community that relies on groundwater.

165. To ensure the competition between other water users are minimized, the following measures will be implemented by the Contractors.

- (i) Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority if applicable
- (ii) The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected.
- (iii) Water intensive activities shall not be undertaken during summer period to the extent feasible.
- (iv) Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible o Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity.
- (v) Preventive measures like slope stabilization, etc. shall be taken for prevention of siltation in water bodies

i. Hydrology, Sedimentation and Erosion of the river

166. Bridge works involves construction of permanent structures across a watercourse. The construction activities may pose risk and impacts on the local environment, and river hydrology and quality. The construction of the bridge design may require containing the flow of the river and entry of sediment materials. This could lead to alteration of the natural flow of water and risk to downstream habitats and communities.

167. To minimize the impacts of the bridge works, the following measures will be implemented:

- (i) Design bridge foundation, piers and stabilization works will be based on the hydrological studies and hydrological patterns of the river.
- (ii) Bridge works need to consider the changes in hydrological flow and behavior of the river.
- (iii) Approach roads level is raised above High Flood Level (HFL) wherever road level is lesser than HFL.
- (iv) Bridge construction works is done during lean flow period.
- (v) Minor rivers could be diverted for a short period and will be brought back to its original course immediately after construction.
- (vi) Construction of piers must include measures to contain the siltation such as silt fencing.
- (vii) Construction of piers should be limited to a minimum area within the river.
- (viii) Embankment slopes will be modified suitably to restrict the soil debris entering water bodies.
- (ix) Silt is collected and stockpiled for possible reuse as surfacing of slopes where they have to be revegetated.
- (x) No earthworks and stone works will prevent natural flow of rivers, streams and water canals or existing drainage system.
- (xi) Use of retaining walls at water bodies to minimize siltation.

- (xii) Regular checks shall be done for soil erosion and turfing conditions of river training structures for its effective maintenance.

j. Occupational Health and Safety

168. Working besides heavy equipment in close confines of the active construction area where vehicles continue to use the other lane provides hazardous conditions to the workers and community. Processing equipment like hot mix plant and rock crushers exposes workers to high temperatures and noise levels, large rotating units that can dismember limbs, and the repetitive nature of work are components that makes the construction camps hazardous. The following measures will be implemented during the construction phase to reduce the risk to life and injuries.

- (i) The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers.
- (ii) Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly.
- (iii) Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas.
- (iv) Domestic solid waste at construction camp shall be segregated into biodegradable and nonbiodegradable waste.

k. Corona virus disease 2019 (COVID-19)

169. A respiratory illness caused by a virus called SARS-CoV-2. Potential sources of exposure include having close contact with a person who is ill with COVID-19, and touching nose, mouth, or eyes after touching surfaces contaminated with the virus or handling items that others infected with COVID-19 have touched. To mitigate the impact of COVID-19, COVID-19 Health and Safety Guidance (Appendix 7) following national regulations and health advice, and international good practice recommendations should be prepared and implemented such as the following:

- (i) Use the PPE (e.g. facemask) as appropriate.
- (ii) Ensure all equipment and vehicles used are routinely disinfected.
- (iii) Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp.
- (iv) Place adequate washbasins, disinfectant tub, dispenser for sanitizer.
- (v) Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites.
- (vi) Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken

3. Post Construction Phase

a. Air and Noise Quality

170. Improvements in the road surface, increase in road traffic capacity, and the anticipated economic improvements of the roads and bridges will increase traffic volume and speed. This will result to increase in vehicular emissions and noise due to wheel-pavement interaction. Eventually, this could impact human health of residents along the project locations. The control of vehicular emissions is beyond the purview of the MRRDA, but the annual mandatory vehicular emissions test required by the Transportation Department will ensure emissions are maintained within standards.

171. The MRRDA will install and maintain awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due to vehicle movement. Speed limitation and honking restrictions may be enforced near sensitive locations.

b. Site restoration

172. All contractors are required to bring the construction sites including camps to a condition that is similar before constructions. This includes: (i) borrow areas rehabilitation will be ensured as per the agreed plan with the landowner; (ii) obtain clearance from PIU before handing over the site to MRRDA; and (iii) Environment Specialist to undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for improving the survivability of the tree if required.

c. Hydrology and Drainage

173. The installed culverts and side drains must be regularly maintained and ensure free flow of water across the channel to avoid drainage congestion and water logging. The MRRDA will conduct regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season and rejuvenation of the drainage system by removing encroachments/ congestions shall be regularly conducted

Table 19: Analysis of Environmental Impacts for the RCIP Additional Financing

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
Pre-Construction	Road selection and prioritization	Terrestrial	Heritage sites, protected areas, availability of RoW, terrain	Low	Permanent	Local	Medium	<p>The road will be part of district core network and will comply with PMGSY guidelines</p> <p>Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.</p> <p>Subproject will not pass through any designated wild life sanctuaries, national park, notified Eco sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area.</p> <p>Subproject to comply with local and National legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009.</p> <p>Alignment finalization considering availability of right of way and in</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>consultation with local people.</p> <p>ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines.</p> <p>Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure.</p> <p>The road shall follow natural topography to avoid excessive cut and fill</p>	
Pre-Construction	Road Alignment and Design	Terrestrial Vegetation	Tree cutting	Low	Permanent	Local	Medium	<p>The road land width requiring clearing shall be clearly demarcated on ground.</p> <p>Avoid or minimize the number of trees to be cleared.</p> <p>Avoid the requirement of forestland for road construction. In case unavoidable, minimize it to extent possible by exploring alternative options. In case, requirement of forestland is unavoidable, determine</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								the legal status of forestland and initiate	
Pre-Construction	Road Alignment and design	Land and Buildings	Localized flooding from inadequate drainage	Average	Permanent	Limited	Medium	Construction of concrete pavement in community areas like bazaars with covered side drains considering alignment level and natural drainage channels.	Non-significant
Pre-Construction	Road Alignment and design	Community Safety	Road crashes	High	Permanent	Local	Major	<p>Make provisions of crash barriers at accident prone areas as identified in the road safety studies.</p> <p>Provision of rumble strips in community areas to regulate speed.</p> <p>Provision of retro-reflective warning sign boards nears school, hospital, religious places and forests areas</p> <p>Provision of proper side-walks /pedestrian zone along the road near habitat areas, school, hospital, religious places and forests</p> <p>Compliance with norms specified in MRRDA and PMGSY codes for rural roads for curvature and grading</p> <p>Provision of safety kerb at all bridges</p>	significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
Pre-Construction	Construction and Camp Site Location	Land and Building	Disturbance of inhabited areas	Low	Short-lived	Limited	Minimum	<p>The construction campsites shall be located away from any local human settlement areas and preferably located on lands, which are barren/waste lands.</p> <p>The camps shall be located, at a minimum, 5 km from forest areas to deter trespassing of construction labor.</p> <p>The campsites shall be provided with adequate water supply, sanitation and all requisite infrastructure facilities. This would minimize dependence on outside resources, presently being used by local populace and minimize undesirable social friction thereof.</p> <p>The camps shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.</p> <p>After completion of construction works, location of campsites shall be restored to its previous state by</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>undertaking cleanup operations.</p> <p>The location, layout and basic facility provision of each labor camp will be submitted to Project Implementation Unit (PIU) and Project Management Unit - Environment Specialist (PMU-ES) prior to their construction. The construction shall commence only after their approvals.</p> <p>Preparation of solid waste management plan that includes collection, storage, and disposal subject to the review and approval of the PMU-ES.</p>	
Pre-Construction	Utility shifting	Public infrastructures	Disruption of utility services to local community	Low	Short-lived	Limited	Minor	<p>All telephone and electrical poles/wires, water pipelines and underground cables should be shifted before start of construction</p> <p>Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services Local people must be informed through appropriate means about</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								the time of shifting of utility structures and potential disruption of services if any	
Pre-Construction	Utility shifting	Aesthetic and visual	Diggings, shifting and reestablishment of poles will impair the view of community areas particularly along heavily settled areas	Low	Short-lived	Limited	Minor	<p>Immediately complete the utility shifting to reduce the duration of impact and restore the disturbed areas</p> <p>Provide visual barriers, when necessary, on active construction zones.</p> <p>Consultation with affected people prior to the start of utility shifting presenting construction timelines and guidelines</p> <p>Proper disposal of demolition debris</p>	Non-significant
Pre-Construction	Construction Mobilization and Camp Site Location	Air Quality and GHG	Increase on air pollutants and GHG	Low	Short-lived	Limited	Minor	<p>Transport, loading and unloading of loose and fine materials through covered vehicles.</p> <p>Paved or compact approach roads.</p> <p>Storage areas to be located downwind of the habitation area. Water spraying on earthworks, unpaved haulage roads and other dust prone areas.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								Provision of PPEs to workers	
Pre-Construction	Construction Mobilization and Camp Site Location	Land and Soil	Establishment of camps will result to disturbance of land and soil which may result to loss in agricultural lands	Low	Short-lived	Limited	Minor	<p>During land clearing operations, topsoil shall be collected, preserved, and reused as a base for turfing of embankment slopes or development of barren areas along roadside.</p> <p>Equipment to be stationed in the designated ROW to avoid compaction.</p> <p>Approach roads/ haulage roads shall be designed along the barren and hard soil area to reduce the compaction.</p>	Non-significant
Pre-Construction	Construction Mobilization and Camp Site Location	Surface Water Quality and Quantity	Decrease of water quality of rivers	Low	Short-lived	Limited	Minor	<p>No vehicles or equipment should be parked or refueled near water-bodies, to avoid contamination from fuel and lubricants.</p> <p>Oil and grease traps and fueling platforms to be provided at refueling locations.</p> <p>All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.	
Pre-Construction	Construction Mobilization and Camp Site Location	Groundwater Quality and Quantity	Oil and lubricant spills from the transport and heavy equipment may contaminate groundwaters in the camp sites Improper disposal of sewage from the camp sites	Low	Short-lived	Limited	Minor	Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil. Oil-Interceptors shall be provided at wash down and refueling areas. Waste oil and oil-soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to authorized vendors	Non-significant
Pre-Construction	Construction Mobilization and Camp Site Location	Terrestrial Vegetation	Loss of vegetation from land clearing in the camp sites	Low	Short-lived	Limited	Minor	Minimize tree cutting to the extent possible. Plantation of trees on both sides of the road. Additional plantation near river banks to check erosion as part of compensatory plantation	Non-significant
Pre-Construction	Construction Mobilization and Camp Site Location	Private Land and Buildings	Private structures on rented areas for camp site may be affected/ cleared to	Low	Short-lived	Limited	Minor	Route heavily loaded trucks away from residential areas.	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
			accommodate equipment or from their operation					Select areas with the fewest homes in routing haul trucks. Operate earthmoving equipment as far away from vibration sensitive sites	
Pre-Construction	Construction Mobilization and Camp Site Location	Sound Environment	Increase in noise during clearing from equipment operation and establishment of camp structures	Low	Short-lived	Limited	Minor	Construction equipment and machinery to be fitted with silencers and maintained properly. Only IS approved equipment shall be used for construction activities. Timing of noisy activities shall be done during night time and weekends near schools and selected suitable times near temples when there are no visitors, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards. Provision of temporary noise barrier at sensitive locations or near sources. Time regulation near residential, built up and	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								forest areas to daylight hours. Honking restrictions near sensitive areas	
Construction	Drainage work	Land and soil	Compaction of soil and impact on quarry haul roads due to movement or vehicles	Low	Temporary	Limited	Minor	During land clearing operations, topsoil shall be collected, preserved, and reused as a base for turbing of embankment slopes or development of barren areas along roadside. Approach roads/ haulage roads shall be designed along the barren and hard soil area to reduce the compaction.	Non-significant
Construction	Drainage work	Surface water quality	Disturbance of waterway bed to cause increase suspended solids	Low	Temporary	Limited	Minor	Provision of Silt fencing shall be made at water bodies. Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be revegetated. Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.	Non-significant
Construction	Drainage work	Public Infrastructure	The works may damage the road used by	Low	Temporary	Local	Medium	Temporary access and diversion, with proper drainage facilities shall	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
			local and regional population					<p>be planned by the contractor and approved by the PIU.</p> <p>Access to the schools, temples and other public places must be maintained when construction takes place near them.</p> <p>The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for Night time traffic and precautions for transportation of hazardous materials.</p> <p>The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								only one side of the existing road. The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from PIU.	
Construction	Road Construction (Excavation, embankment, subbase, sub-grade, flexible pavement, road furnitures)	Air quality and GHG	Fugitive dust emission and fumes from construction vehicles	High	Short-lived	Local	Medium	Transport, loading and unloading of loose and fine materials through covered vehicles. Paved approach roads. Storage areas to be located downwind of the habitation area. Water spraying on earthworks, unpaved haulage roads and other dust prone areas such as unpaved roads Provision of PPEs to workers. Regular maintenance of machinery and equipment.	Non-significant
Construction	Road Construction (Excavation, embankment, subbase, sub-grade, flexible pavement,	Land and Soil	Slope failure and Soil erosion due to construction activities, earthwork, and cut and fill, stockpiles etc.	Low	Temporary	Limited	Minor	Bio-turfing of embankments to protect slopes. Slope protection by stone pitching, masonry retaining walls, and	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
	road furnitres)							<p>planting of grass and trees.</p> <p>The side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Care should be taken that the slope gradient shall not be greater than 2:1.</p> <p>The earth stockpiles to be provided with gentle slopes to prevent soil erosion.</p>	
Construction	Road Construction (Excavation, embankment , subbase, sub-grade, flexible pavement, road furnitres)	Surface water quality and quantity	Sourcing of water during construction could compete with the local demand	Low	Temporary	Limited	Minor	<p>Provisions shall be made to connect road side drains with exit to nearby ponds.</p> <p>Existing drainage system to be maintained and further enhanced. Embankment slopes to be modified suitably to restrict the soil debris entering water bodies.</p> <p>Provision of Silt fencing shall be made at water bodies.</p> <p>Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>they have to be revegetated.</p> <p>Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.</p> <p>No vehicles or equipment should be parked or refueled near water-bodies, to avoid contamination from fuel and lubricants.</p> <p>Oil and grease traps and fueling platforms to be provided at refueling locations.</p> <p>All chemicals and oil shall be stored away from water and concrete platform with catchment pit for spills collection.</p> <p>All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.</p> <p>Readily available, simple to understand and preferably written in the</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>local language emergency response procedure, including reporting, will be provided by the contractors</p> <p>Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected.</p>	
Construction	Road Construction (Excavataion , embankment , subbase, sub-grade, flexible pavement, road furniture)	Terrestrial Vegetation	Loss of vegetation	Low	Temporary	Limited	Minor	<p>Minimize tree cutting to the extent possible.</p> <p>Plantation of trees on both sides of the road. Additional plantation near river banks to check erosion as part of compensatory plantation.</p>	Non-significant
Construction	Road Construction (Excavataion , embankment , subbase, sub-grade, flexible pavement, road furniture)	Wildlife	Crashes with Domesticated animals	Low	Local	Temporary	Minor	Installation of warning signs on know active mammal crossings for equipment operator to reduce speed.	Nonsignificant
Construction	Road Construction (Excavation, embankment , subbase,	Private land and Building	Damage to private lands and buildings from vibration due to	Low	Short-lived	Limited	Minor	Route heavily loaded trucks away from residential areas.	Nonsignificant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
	sub-grade, flexible pavement, road furniture)		movement of heavy equipment					<p>Select areas with the fewest homes in routing haul trucks.</p> <p>Operate earthmoving equipment as far away from vibration sensitive sites</p> <p>Phase demolition of existing pavement and structures earth moving, and ground impacting activities not to occur simultaneously.</p> <p>Avoid nighttime activities. Avoid vibratory rollers and packers near sensitive areas such as schools and place of worship.</p>	
Construction	Road Construction (Excavation, embankment , subbase, sub-grade, flexible pavement, road furniture)	Public Infrastructures	Soil compaction producing vibration can damage buildings and pipes	Low	Short-lived	Limited	Minor	<p>Route heavily loaded trucks away from residential streets.</p> <p>Select streets with the fewest homes in routing haul trucks.</p> <p>Operate earthmoving equipment as far away from vibration sensitive sites</p> <p>Phase demolition of existing pavement and structures earth moving, and ground impacting</p>	Nonsignificant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>activities not to occur simultaneously.</p> <p>Avoid nighttime activities.</p> <p>Avoid vibratory rollers and packers near sensitive areas</p>	
Construction	Road Construction (Excavation, embankment, subbase, sub-grade, flexible pavement, road furniture)	Sound environment	Noise from construction vehicle, equipment and machinery can elevate ambient noise	High	Short-lived	Local	Medium	<p>All equipment to be timely serviced and properly maintained.</p> <p>Traffic bottlenecks to be removed.</p> <p>Construction equipment and machinery to be fitted with silencers and maintained properly.</p> <p>Only approved equipment shall be used for construction activities.</p> <p>Timing of noisy construction activities shall be done during night time and weekends near schools and selected suitable times near temples when there are no visitors, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction</p>	Nonsignificant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>to avoid the accumulation of noise beyond standards. Else provision of temporary noise barrier at sensitive locations or near sources.</p> <p>Time regulation near residential, built up and forest areas construction shall be restricted to daylight hours.</p> <p>Honking restrictions near sensitive areas</p> <p>PPEs to workers</p>	
Construction	Road Construction (Excavation, embankment, subbase, sub-grade, flexible pavement, road furniture)	Community and occupational health and safety	Increase human mortality and injuries	Average	Temporary	Local	Medium	<p>The location, layout and basic facility provision of each labor camp will be submitted to PMU-ES and PIU prior to construction. The construction shall commence only after approval of PMU-ES and PIU. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner as approved by the PIU.</p> <p>Adequate water and sanitary latrines with septic tanks attached to</p>	Nonsignificant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>soak pits shall be provided.</p> <p>Preventive medical care to be provided to workers including a First-Aid kit that must be available in the camp.</p> <p>Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste must be carried out.</p> <p>The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health.</p> <p>No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community.</p> <p>Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.</p> <p>Contractors to adopt and maintain safe working practices.</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Usage of fluorescent and retroreflector signage, in local language at the construction sites</p> <p>Training to workers on safety procedures and precautions.</p> <p>Mandatory appointment of safety officer.</p> <p>All regulations regarding safe excavations, trenches and safe means of entry and egress shall be complied with.</p> <p>Provision of a readily available first aid unit including an adequate supply of dressing materials.</p> <p>The contractor will not employ any person below the age of 16 years for any work</p> <p>Use of hazardous material should be minimized and/or restricted.</p> <p>Emergency plan (to be approved by engineer) shall be prepared to</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>respond to any accidents or emergencies.</p> <p>Temporary access and diversion, with proper drainage facilities.</p> <p>Access to the schools, temples and other public places must be maintained when construction takes place near them.</p> <p>Restrict access to construction sites to authorized personnel.</p> <p>Physical separation must be provided for movement of vehicular and human traffic.</p> <p>Adequate signage must be provided for safe traffic movement</p>	
Construction	Road Construction (Excavation, embankment, subbase, sub-grade, flexible pavement, road furniture)	Risks due to COVID-19	Workers' health risks	High	Temporary	Local	Medium	Prepare and implement a comprehensive COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices.	Significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Avoid labor-intensive works as much as possible</p> <p>Ensure all to use the Personal Protective Equipment (PPE) as appropriate</p> <p>Ensure all equipment and vehicles used are routinely disinfected</p> <p>Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp</p> <p>Place adequate washbasins, disinfectant tub, dispenser for sanitizer</p> <p>Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and</p> <p>Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite;</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
Construction	Road Construction (Excavation, embankment, subbase, sub-grade, flexible pavement, road furniture)	Physical Cultural Resources	Chance-find	Low	Short-lived	Local	Minor	<p>Prevent personnel or other persons from removing or damaging any of these discoveries.</p> <p>The contractor will promptly notify the contractor and PIU of such discoveries and carry out the contractor's instructions for dealing with them.</p> <p>Any chance finding of archaeological artefact/object during construction should be reported to Maharashtra's Department of Archaeology;</p> <p>No project activity should be carried in that area until clearance is obtained from Maharashtra's Department of Archaeology or concerned government agency.</p>	Non-significant
Construction	Bridge Construction	Air quality and GHG	Fugitive dust emission and fumes from construction vehicles	High	Short-lived	Local	Medium	<p>Transport, loading and unloading of loose and fine materials through covered vehicles.</p> <p>Paved approach roads.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Storage areas to be located downwind of the habitation area.</p> <p>Water spraying on earthworks, unpaved haulage roads and other dust prone areas such as unpaved roads</p> <p>Provision of PPEs to workers. Regular maintenance of machinery and equipment.</p>	
Construction	Bridge Construction	Land and Soil	Soil erosion due to construction activities, earthwork, and cut and fill, stockpiles etc.	Low	Temporary	Limited	Minor	<p>Bio-turfing of embankments to protect slopes.</p> <p>Slope protection, stone pitching, masonry retaining walls, planting of grass and trees.</p> <p>The side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. slope gradient not greater than 2:1.</p> <p>The earth stockpiles to be provided with gentle slopes to prevent soil erosion.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
Construction	Bridge Construction	Surface water quality and quantity	Siltation, Change in river course	Low	Temporary	Limited	Minor	<p>Construction of piers must include measures to contain the siltation such as silt fencing</p> <p>Construction of piers is limited to a minimum area within the river</p> <p>Embankment slopes is modified suitably to restrict the soil debris entering water bodies.</p> <p>Silt is collected and stockpiled for possible reuse as surfacing of slopes</p> <p>No earthworks and stone works will prevent natural flow of rivers, streams and water canals or existing drainage system</p> <p>Use of retaining walls at water bodies to minimize siltation</p> <p>Regular checks for soil erosion and turfing conditions of river training structures for its effective maintenance</p>	Non-significant
Construction	Bridge Construction	Terrestrial Vegetation	Loss of vegetation	Low	Temporary	Limited	Minor	<p>Minimize tree cutting to the extent possible.</p> <p>Plantation of trees on both sides of the road.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								Additional plantation near river banks to check erosion as part of compensatory plantation.	
Construction	Bridge Construction	Wildlife	Hunting, gathering, destruction of habitat and impediment of movement	Low	Temporary	Limited	Minor	<p>Installation of warning signs on known active mammal crossings for equipment operator to reduce speed.</p> <p>Workers will avoid hunting, gathering and harvesting of wildlife for food, selling and domestication</p> <p>There will be no destruction and disturbing of wildlife habitats</p> <p>In case there are endangered wildlife in the area, the contractor will inform immediately the local forest department on the sighting of such species</p> <p>With the help of local forest department, the contractor and PIU will provide awareness on wildlife and habitat protection to the workers every beginning of the construction season</p>	Non-significant
Construction	Bridge Construction	Private land and Building	Damage to private lands and buildings	Low	Short-lived	Limited	Minor	Route heavily loaded trucks away from residential areas.	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
			from vibration due to movement of heavy equipment					<p>Select areas with the fewest homes in routing haul trucks.</p> <p>Operate earthmoving equipment as far away from vibration sensitive sites</p> <p>Phase demolition of existing pavement and structures earth moving, and ground impacting activities not to occur simultaneously.</p> <p>Avoid nighttime activities. Avoid vibratory rollers and packers near sensitive areas such as schools and place of worship.</p>	
Construction	Bridge Construction	Public Infrastructures	Soil compaction producing vibration and nuisance to nearby community	Low	Short-lived	Limited	Minor	<p>Route heavily loaded trucks away from residential streets.</p> <p>Select streets with the fewest homes in routing haul trucks.</p> <p>Operate earthmoving equipment as far away from vibration sensitive sites</p> <p>Phase demolition of existing pavement and structures earth moving,</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>and ground impacting activities not to occur simultaneously.</p> <p>Avoid night time activities.</p> <p>Avoid vibratory rollers and packers near sensitive areas</p>	
Construction	Bridge Construction	Sound environment	Noise from construction vehicle, equipment and machinery can elevate ambient noise	High	Short-lived	Local	Medium	<p>All equipment to be timely serviced and properly maintained.</p> <p>Traffic bottlenecks to be removed.</p> <p>Construction equipment and machinery to be fitted with silencers and maintained properly.</p> <p>Only approved equipment shall be used for construction activities.</p> <p>Timing of noisy construction activities shall be done during night time and weekends near schools and selected suitable times near temples when there are no visitors, concurrent noisy operations may be separated to reduce the total noise generated,</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards. Else provision of temporary noise barrier at sensitive locations or near sources.</p> <p>Time regulation near residential, built up and forest areas construction shall be restricted to daylight hours.</p> <p>Honking restrictions near sensitive areas</p> <p>PPEs to workers</p>	
Construction	Bridge Construction	Community and occupational health and safety	Increase human mortality and injuries	Average	Temporary	Local	Medium	<p>The location, layout and basic facility provision of each labor camp will be submitted to PMU-ES and PIU prior to construction. The construction shall commence only after approval of PMU-ES and PIU. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner as approved by the PIU.</p> <p>Adequate water and sanitary latrines with</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>septic tanks attached to soak pits shall be provided.</p> <p>Preventive medical care to be provided to workers including a First-Aid kit that must be available in the camp.</p> <p>Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste must be carried out.</p> <p>The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health.</p> <p>No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community.</p> <p>Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.</p> <p>Contractors to adopt and maintain safe working practices.</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Usage of fluorescent and retroreflector signage, in local language at the construction sites</p> <p>Training to workers on safety procedures and precautions.</p> <p>Mandatory appointment of safety officer.</p> <p>All regulations regarding safe excavations, trenches and safe means of entry and egress shall be complied with.</p> <p>Provision of a readily available first aid unit including an adequate supply of dressing materials.</p> <p>The contractor will not employ any person below the age of 16 years for any work</p> <p>Use of hazardous material should be minimized and/or restricted.</p> <p>Emergency plan (to be approved by engineer) shall be prepared to</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>respond to any accidents or emergencies.</p> <p>Temporary access and diversion, with proper drainage facilities.</p> <p>Access to the schools, temples and other public places must be maintained when construction takes place near them.</p> <p>Restrict access to construction sites to authorized personnel.</p> <p>Physical separation must be provided for movement of vehicular and human traffic.</p> <p>Adequate signage must be provided for safe traffic movement</p>	
Construction	Bridge Construction	Risks due to COVID-19	Workers' health risks	High	Temporary	Local	Medium	Prepare and implement a comprehensive COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices.	significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Avoid labor-intensive works as much as possible</p> <p>Ensure all to use the Personal Protective Equipment (PPE) as appropriate</p> <p>Ensure all equipment and vehicles used are routinely disinfected</p> <p>Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp</p> <p>Place adequate washbasins, disinfectant tub, dispenser for sanitizer</p> <p>Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and</p> <p>Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								any necessary actions to be taken	
Construction	Bridge Construction	Physical Cultural Resources	Chance-find	Low	Short-lived	Local	Minor	<p>Prevent personnel or other persons from removing or damaging any of these discoveries.</p> <p>The contractor will promptly notify the contractor and PIU of such discoveries and carry out the contractor's instructions for dealing with them.</p> <p>Any chance finding of archaeological artefact/object during construction should be reported to Maharashtra's Department of Archaeology;</p> <p>No project activity should be carried in that area until clearance is obtained from Maharashtra's Department of Archaeology or concerned government agency.</p>	Non-significant
Construction	Quarries and borrow sites	Air quality and GHG	Deterioration of air quality along haul road due to increase in dust	Low	Short-lived	Limited	Minor	Transport of materials in covered trucks.	Nonsignificant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								Ensure adequate water sprinkling of storage and rock crushing operation.	
Construction	Quarries and borrow sites	Land and soil	Loss of productive lands and topsoil	Average	Permanent	Limited	Major	<p>Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents.</p> <p>Topsoil to be stockpiled and protected for use at the rehabilitation stage.</p> <p>Borrow areas not to be dug continuously.</p> <p>Aggregates will be sourced from existing licensed quarries.</p>	
Construction	Quarries and borrow sites	Surface water quality	Deterioration of receiving water quality from surface runoff	Low	Temporary	Limited	Minor	<p>Installation of bunds around exposed area</p> <p>Collection of surface runoff in sedimentation pond prior to disposal.</p>	Nonsignificant
Construction	Quarries and borrow sites	Sound Environment	Increase noise level in quarries from blasting, rock crushing, and hauling	Average	Short-lived	Limited	Minor	<p>Comply with the location separation distance from nearest inhabited area</p> <p>Use materials storage piles to attenuate noise</p>	Nonsignificant
Construction	Quarries and borrow sites	Community and occupational health and safety	Increase risk of accident from open borrow areas	Low	Permanent	Limited	Medium	<p>Depths and slopes of borrow pits to be comply with MRRDA and PMGSY guidelines.</p> <p>To the extent borrow areas shall be sited away from habituated areas.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fishpond in consultation with land owner/community.</p> <p>Rehabilitation of the borrow areas as per Guidelines for re-development of Borrow Areas.</p>	
Construction	Construction Plant operation	Air Quality and GHG	Air quality deterioration from plant combustion and fugitive emissions	Low	Short-lived	Limited	Minor	<p>Batching, WMM mixing plants and crushers preferably downwind direction from the nearest settlement.</p> <p>Only crushers licensed by the Government of India shall be used DG sets with stacks of adequate height and use of low Sulphur diesel as fuel.</p>	Non-significant
Construction	Construction Plant and Camp Site Operation	Surface water quality	Deterioration of receiving water quality from batching and cold mix plants effluents	Low	Short-lived	Limited	Minor	<p>Collection of all surface runoff and facility washing to a sedimentation basin prior to disposal</p> <p>Proper collection, storage, and disposal of waste according to the approved solid waste management plan.</p>	

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
Construction	Construction Plant and Camp Site Operation	Groundwater quality	Deterioration of ground water quality	Low	Temporary	Limited	Minor	<p>Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil.</p> <p>To avoid soil contamination Oil-Interceptors shall be provided at wash down and Refueling areas.</p> <p>Waste oil and oil soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to authorized vendors Collection and treatment of sewage in septic tanks</p>	
Construction	Construction Plant and Camp Site Operation	Private lands and buildings	Damage to private lands and properties	Low	Short-lived	Limited	Minor	<p>Locate plants and camp sites away from Community areas.</p> <p>In case of leased properties, ensure the proposed activities are clearly stated in the agreement and nearby properties are consulted and prior consent secured.</p>	Non-significant
Construction	Construction Plant and Camp Site Operation	Sound Environment	Increase in noise level due to batching plant and hot mix plant operations	Low	Short-lived	Limited	Minor	<p>Observe regular and proper maintenance of plant equipment</p> <p>Install silencers on all tail/ emission pipes</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Establish multi-layer vegetation in-between the plant and nearest sensitive receptor for attenuation</p> <p>To the extent possible, enclose noise generating equipment with noise barriers</p>	
Post Construction	Site Restoration	Land and soil Clean-up Operations, Restoration and Rehabilitation		Low	Short-lived	Limited	Minor	<p>Contractor will prepare site restoration plans, which will be approved by the PIU and PMU-ES.</p> <p>The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. All construction zones including river-beds, culverts, road-side areas, camps, WMM plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the satisfaction of the PIU and PMU-ES.</p> <p>All the opened borrow areas will be rehabilitated and DES will certify in this regard.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
Operation	Road Repair	Public Infrastructures	Localized flooding and damage to road from clogging of drainage	Low	Short-lived	Limited	Minor	Regular cleaning of drainage before start of monsoon and proper disposal of debris	Non-significant
Operation	Road Repair	Community and occupational health and safety	Risk of injury to pedestrian and road users	Low	Short-lived	Limited	Minor	<p>Training to workers on safety procedures and precautions.</p> <p>Mandatory appointment of safety officer. Provision of a readily available first aid unit including an adequate supply of dressing materials.</p> <p>The contractor will not employ any person below the age of 16 years for any work</p> <p>Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies.</p> <p>Temporary access and diversion, with proper drainage facilities. Access to the schools, temples and other public places must be maintained when construction takes place near them.</p>	Non-significant

Project Phase	Project Component	Environmental Components	Description of the Environmental Effects	Intensity	Duration	Scope	Assessment of Potential Effect	Required Mitigation Measures	Significance of Residual Effect
								<p>Fencing wherever cattle movement is expected.</p> <p>Restrict access to construction sites to authorized personnel. Physical separation must be provided for movement of vehicular and human traffic.</p> <p>Adequate signage must be provided for safe traffic movement</p>	
Operation	Vegetation Control	Community and occupational health and safety	Risk of injury to pedestrian and road users	Low	Temporary	Limited	Minor	Vegetation clearing to enhance aesthetic and prevent potential safety hazard like reduced visibility, obstruction of signs, and debris in the roadway.	Non-significant

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Public Consultation Background

174. The ADB's SPS requires consultation with affected communities and stakeholders and their participation in the project design and implementation. Based on the community's experience, knowledge, and expectations, the consultations process will benefit the MRRDA and ADB to gain suitable and acceptable for the project. Some of the key characteristics of meaningful consultations are timing, conduct, gender inclusive, and responsiveness. Consultations are conducted early and sustained throughout the project life and information disclosed in timely manner that allowed the communities to make informed decisions. The public consultation free from coercion ensuring participation is voluntary. The consultations ensure inclusive and responsive to the disadvantage and vulnerable members of the community to ensure their concerns are considered in the project design and implementation. Finally, consultations should show proofs that relevant views generated during the consultation process are considered in the design.

B. Consultation Method and Information Disclosure

175. The principal consultation method for the additional financing is the transect walk. A transect walk requires both MRRDA District Engineers and stakeholders to "walk" or survey the entire stretch and identify issues pertaining to availability of land to accommodate needed (i) engineering, road safety, and climate resilience measures; (ii) key sensitive resources like trees, utilities, physical cultural resources; (iii) road hazards; and (iv) other community requirements that should be considered by the project. It facilitates timely consultation that is early enough to influence the design, provides venue to have a common understanding of the project, voluntary participation is promoted, and inclusive in terms of gender and vulnerable members of the community.

176. Consultations meetings were also organized by MRRDA District Engineers at all community areas to disseminate project information (carried out in local Bengali language). Junior and assistant engineers of the MRRDA, social experts of the consulting team hired by the MRRDA, ADB environment team, local community members took part in the community consultations and the transect walks.

177. An information booklet was distributed prior to the transect walk providing information on the following; (i) identification the project, project proponent, and development partners; (ii) description of how the community will participate at various stages of the project cycle; (iii) grievances redress mechanism (GRM); (iv) voluntary land donation procedure; definition of vulnerable affected persons (VAP); support and assistance to VAP; and (v) contact details.

178. The public consultations were carried out October 2019 to March 2020 as part of the field works and DPR preparation.

C. Participants to the Transect Walk

179. The succeeding table provides the number of participants to the transect walk. There were 7,429 stakeholders that participated in the transect walks organized mainly by the district engineers through the panchayats. Of the total number of participants, 1,909 were female comprising 26%.

Table 20. Number of participants of the transect walks in every region.

Regions	Total no. of participants	No. of Women Participants	Percentage of Women (%)
Amravati Region	856	156	18
Aurangabad Region	1568	380	24
Konkan Region	652	234	36
Nagpur Region	2294	635	28
Nashik Region	1462	388	27
Pune Region	597	116	19
Total	7,429	1,909	26

D. Results of Public Consultation

180. As already mentioned, inside habitation areas and in village sections where the road is narrow, the road width has been constricted to avoid damage to structures. Following impacts could also occur during civil works period which will cause public nuisance and were all addressed on the detailed project reports. The succeeding table presents the principal common concerns raised and how these were addressed in the general EMP.

Table 21: Comments raised by the community or transect walk participants

Comments and Concerns Raised	EMP provisions/ suggestions from the community
Temporary loss of access/disruption of traffic	<p>Plan the appropriate traffic diversion schemes to avoid inconvenience due to construction works to present road users.</p> <p>Diversion schemes are required to ensure smooth traffic flow, minimize accidents to road users during construction works.</p> <p>The traffic diversion signs should clearly visible particularly at night.</p> <p>Avoid inconvenience to the local community due to movement of materials.</p>
Shifting of utility supply lines causing disruption to the supply.	All public utilities (power transmission cables, telephone cables, water/sewerage lines, etc) within road land width will be inventoried, and arrange for relocation/shifting to adjacent areas in consultation with the respective agencies/authorities.
Damage to irrigation channels that have been placed across some of the selected roads	<p>Mitigation measures to contain erosion and drainage problems are essential because the road construction works will raise, extend and enlarge existing roadway/tracks all along the alignment.</p> <p>The engineering measures for countering soil erosion, slope protection, drainage wherever required will be considered and implemented as per relevant Road Design Standard as per IRC 73 2015 (Rural Road) and Environmental Assessment Guidelines for MPRRRA Projects</p>

	<p>Measures like selection of less erodible material for embankment construction, compaction, adequate embankment slopes and turfing shall be considered as per provisions and Technical Specifications for construction of Rural Roads, as per IRC 73 2015</p> <p>Refer to hydrological studies to ensure that construction of drainage structures is not likely to alter drainage pattern, and discharge capacities of drainage structures are designed to facilitate smooth passage of water and heading up or flooding is avoided even in flood season.</p> <p>Schedule the construction works to dry season so that impacts on water quality of stream/river is minimize or avoided.</p> <p>Precaution shall be exercised to prevent oil/lubricant/hydrocarbon contamination of channel bed during construction works.</p> <p>Spillage, if any, shall be immediately cleared with utmost caution to leave no traces.</p> <p>Ensure all construction wastes are removed from work sitex and stream/ riverbeds are to be cleaned up (at least 50 m on both upstream and downstream sides of water courses) after completion of construction but prior to onset of monsoon. As per The Hazardous Wastes (Management and Handling) Rules, 1989 are to exercise the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986).</p>
Dust, noise and vibration impacts will be felt by the people living near road sections during construction works. High vibration levels may damage structures close to the road edge. The civil contracts should include appropriate measures to avoid/ manage the issues of dust, noise.	<p>Ensure stone quarries and crushing units have pollution control system; occupational safety procedures/practices in place and regular inspection shall be carried to ensure compliance. This shall be a pre-condition for sourcing of materials from quarries/crushing plants.</p> <p>Dust suppression along transportation links is to be ensured by deploying water tankers with sprinkling system are to be deployed along haul roads.</p> <p>The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. Transportation links are to be inspected daily to clear accidental spillage, if any. should be addressed in accordance with Environment (Protection) Act, 1986 &The Hazardous Wastes (Management and Handling) Rules, 1989 are to exercise the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986).</p>
Care should be taken to avoid any accidental damages to common properties such as	<p>During clearing operations, any treasure trove, slabs with epigraphically evidence or edicts, sculptural or any material found and appear to have historical importance, it should be brought to the notice of Department of Archaeological Survey of India, and</p>

<p>Shrines, wells, water pipes, stand posts located close to the roads.</p>	<p>instructions of this Department, if any, must be followed. Small temples, shrines if any is within the road land width, the same may be shifted to adjacent areas in consultation with local community leaders.</p> <p>Establish and maintain interaction with local community to ensure that no social resentment sets in due to operations.</p> <p>Contractors shall comply with the National Monument Authority Rules, 2011, Ancient Monuments and Archaeological Sites and Remains (Framing of Heritage Bye laws and Other Functions of Competent Authority) Rules, 2011</p>
<p>Issues raised by participants (transect walks) on bridge improvement</p>	<p>Construction of new bridge on existing unbridged river crossing</p> <p>Suitable land is available for the existing bridge access path and there is no need to acquire any private land</p> <p>There is no community or vulnerable class of private land near the proposed bridge sites</p> <p>The proposed bridges do not have any community features and therefore does not impede the construction of the bridge.</p> <p>During the dry season, there is no fishing and any other type of financial activity in the river bed</p> <p>During the construction of the bridge, the contractor should consult the villagers at the proper place and fix the cantonment and store construction materials at the proper place</p> <p>Construction of the bridge as soon as possible so that villagers will not have to bear the burden of the upcoming rainy season</p> <p>Also, after the construction of the bridge, the villagers will receive timely medical facilities</p> <p>No change needed in the alignment of the bridge</p> <p>To ensure that villagers do not suffer any problem during the construction of the bridge and ensure proper construction of the bridge</p>

E. Information Disclosure

181. Information was disclosed through public consultation and more formally by making documents and other materials available in a form and at a location in which they can be easily accessed by stakeholders. This involved making a summary of draft reports available (in the local language) at public locations and providing a mechanism for the receipt of comments and making documents available more widely. In this regard, the ADB and MMRDA will disclose this IEE

report, among others, in their own websites. Any future update in the IEE will be reviewed by the ADB prior to disclosure on the ADB website.

182. Monitoring is one of the components of EMP. Monitoring of physical, biological and socio-economic parameters of the environment of this project will be carried out. The outcomes of the monitoring activities will be maintained in a database. The results of monitoring will also be disclosed to the local people, school students and other interested stakeholders. In the process of compliance monitoring of the project construction, local people and construction workers will be consulted. The annual monitoring reports will also be disclosed on the ADB website from the start of construction until the Project Completion Report is finalized.

183. The MMRDA will extend and expand the consultation and disclosure process during the implementation (construction) of the project. The feedback of the affected people, stakeholders and the public has been incorporated in the detailed project design for implementation during construction.

F. Public Consultation and Communication Plan for future

184. This IEE and other relevant project documents will be posted on the websites of MMRDA and ADB. The consultation process will continue and expanded during the project implementation to ensure stakeholders participate fully in project execution, as well as to implement comprehensive information, education, and communication plan.

185. The public consultation and disclosure program with all interested and affected parties will remain a continuous process throughout the project implementation, and shall include the following:

- (i) Consultations during construction phase
 - (a) Public meetings with affected communities to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and
 - (b) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and to provide a mechanism through which stakeholders can participate in project monitoring and evaluation.
- (ii) Project disclosure
 - (a) Public information campaigns (via newspaper, flyers, and media) to explain the project to the wider population of the State and prepare them for disruptions they may experience once construction is underway;
 - (b) Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in local language;
 - (c) Formal disclosure of completed project reports by making copies available at convenient locations in the State, and informing the public of their availability; and
 - (d) Providing a mechanism through which comments can be made.

186. For the benefit of the community, the executive summary of this IEE may be translated in the local language and made available at (i) District Engineer's Offices, (ii) Regional offices, (iii) MMRDA-PMU; and (iv) contractor's campsites. MMRDA will be ensured that the hard copies of IEE are kept at places which are conveniently accessible to people, to disclose the document and

at the same time creating wider public awareness. An electronic version of the IEE Report will be placed in the official website of executing and implementing agencies and the ADB website after approval of the IEE by ADB.

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

187. The EMP contains the agreements between MRRDA and ADB on the implementation of mitigation measures, monitoring program, cost estimates, and institutional arrangement to ensure that no significant adverse impacts results from the project intervention.

188. The basic objectives of the EMP are to:

- (i) establish the roles and responsibilities of all parties involved in the project's environmental management;
- (ii) ensure implementation of recommended actions aimed at environmental management and its enhancement; and
- (iii) ensure that the environment and its surrounding areas are protected and developed to meet the needs of the local communities including other stakeholders and safeguard and the interests of the common people.

189. A general EMP is prepared and presented in Appendix 3 (rural roads) and 5 (bridges) and will form part of the bidding documents. The costs for the mitigation measures other than the compensatory plantation are dealt under the engineering (civil works) and resettlement (compensation) estimate.

190. To be more effective during implementation, the EMP will be attached to the tender documents. As part of the environmental management, the procedures for workers' health and safety; public safety and reducing inconvenience and disposal of construction wastes, etc., are also included.

191. A road and bridge specific EMP (SEMP) is to be prepared by the contractor based on the general EMP provided in the IEE. The SEMP will perform a risk assessment of all mitigation options and will propose site specific mitigation options that would be appropriate and commensurate with the actual impact. The contractor shall submit SEMP for Engineer's endorsement. The Contractor will not be able to start the construction works before the approval of SEMP from the Engineer.

B. Environmental Management and Monitoring

Since the rural roads and bridges to be upgraded are short, with an average length of 11 kilometers per construction package for roads and average 46 meters per package for the bridges, the construction period maybe less than 1 year which is shorter than the typical ADB monitoring and reporting frequency requirement of annually for Category B projects like the RCIP Bangladesh. Similar to rural road connectivity and upgrading projects in India, Sri Lanka, and Nepal, monitoring and reporting are conducted at least five times based on the physical accomplishment and maintenance of the road project as follow: (i) once prior to start of construction; (ii) second after third month of start of construction or 25% construction, whichever comes first; (iii) third report after ninth month of construction or 75% construction, whichever comes first; and (iv) fourth and fifth on completion of construction or after one month of first and second year of maintenance period. Annual summaries of the monitoring reports are compiled, project-level environmental performance status assessed, and overall compliance performance is stated to form the annual monitoring reports for review by ADB and public disclosure. Annual monitoring reports are prepared starting from the start of construction until the project completion report is issued. The total environmental management plan implementation of the additional financing is estimated at 0.4% of the total civil works cost.

192. Environmental monitoring is an essential component of the implementation of EMP. The environmental monitoring program (EMoP) is prepared to monitor the implementation performance and compliance of the project to the EMP. An environmental monitoring plan is prepared focusing the following objectives:

- (i) To ensure that impacts do not exceed the established legal standards
- (ii) To check the implementation of mitigation measures in the manner described in the IEE report
- (iii) To monitor implementation of the EMP.
- (iv) To provide an early warning of potential environmental damage
- (v) To check whether the proposed mitigation measures have achieved the intended results, and or/ other environmental impacts occurred

193. The monitoring plan will be used for performance monitoring of the project. A monitoring plan defining all parameters to be monitored, with tentative location, project stages for measurements, implementation and institutional responsibility for different environmental components is prepared for all stages of project. Appendix 4 and 6 shows the EMoP for the rural roads and bridges, respectively.

C. Institutional Setting to Implement the Environmental Safeguards

194. The State of Maharashtra acting through the Maharashtra Rural Road Development Association (MRRDA) will be the executing and implementing agency. A PMU established within MRRDA will support project implementation. The Secretary cum Chief Executive Officer of MRRDA will be responsible for project coordination and monitoring. There will be 34 project implementation units (PIUs) in 34 districts under 6 regions. More specifically, the PMU-RCIP will be the key institution for the successful implementation of the project and ensure compliance to ADB safeguards as contemplated in the environmental management and monitoring plans. The responsibilities of various agencies and parties for implementing environment safeguards are provided the succeeding section.

195. MRRDA's PMU is responsible for the overall compliance with ADB's SPS and all applicable laws and rules under the Ministry of Environment and Forest (MOEF). The PMU will be supported by six Environment Specialists, and 34 district engineers (executive engineers) to ensure project implementation complies with the PAM and EMP.

196. The PMU will:

- (i) ensure compliance with all environment-related statutory requirements of MRRDA and Contractor;
- (ii) review and finalize road specific EMPs prepared by the Environment Specialists and district engineers;
- (iii) be overall responsible for the timely endorsement and signing of key documents and forwarding the same to the respective agency for processing of clearances and permits including but not limited to: forestry clearance; tree cutting permit; permission for construction material quarrying; consent to operate hot mix plants, crushers, and batching plants; consent for disposal of sewage from labour camp; and pollution under control for motor vehicles, etc.;
- (iv) ensure preparation, submission, and review of annual environmental monitoring reports for disclosure on ADB and MRRDA websites;
- (v) conduct training and workshops on environmental management to include site induction of all staff and workers involved in the construction. These include all district engineers, and staff and laborers of all contractors;

- (vi) guided by the initial environmental examination approved by ADB and MRRDA, design and implement an effective environmental monitoring program; this includes but is not limited to inspections, monitoring forms prepared by the contractors, inspection protocols for the Environment Specialists, and Grievance and Redress Mechanism including intake form and documentation;
- (vii) take proactive and timely measures to address any environment safeguards related challenges at the national or division/district levels such as delays in processing of clearances during pre-construction stage and significant grievances (during construction stage);
- (viii) review and approve, for submission to MRRDA and ADB, periodic environmental monitoring reports submitted by the Environment Specialists; lead in complying with disclosure of periodic environmental monitoring reports; and
- (ix) ensure GRM, as envisaged in the EMP, is in place and finalize preparation disclosure of monitoring reports.

197. Environment Specialists. Each of the MRRDA Regional Office will have a consultant Environment Specialists to support the Additional Chief Engineer and District Engineers in supervising the implementation of the EMP and EMoP by the Contractor through the following:

- (i) in coordination with the contractor's environment focal person (EFP), prepare road-specific EMPs and EMoPs, guided by the general EMP and based on the more detailed survey;
- (ii) guide and review all sub-plans identified in the IEE and EMP to be prepared by the Contractor to include camp layout, waste/debris management plan, borrow area management plan, traffic management plan;
- (iii) conduct environmental site induction training to all contractors and PIUs to ensure understanding of the EMP, domestic environmental laws and regulations requirements particularly on the required clearances and permits, training on occupational and community health and safety, timely mobilization of the Contractor's EFP, and review subplans required in the EMP and advise the District Engineer on their adequacy, who in turn, will instruct the Contractor to make necessary revisions;
- (iv) ensure Contractor secures necessary permits and clearances;
- (v) ensure the environmental monitoring report template is adapted by the Contractor in the preparation and submission of the monitoring reports forms;
- (vi) conduct at least three (3) environmental inspections during the construction phase: (a) First report at pre-construction stage, (b) Second report after three months of start of construction or on completion of 25% construction, and (c) Third report after seven (7) months of start of construction or on completion of 75% of construction;
- (vii) monthly site and follow-up inspection to ensure the veracity of the submitted monitoring reports and enforce the EMP and EMoP;
- (viii) prepare summary monthly, quarterly, and semi-annual monitoring reports from the periodic compliance inspection monitoring and review of the environmental monitoring reports, prepared by the Contractor's EFP, for the review and guidance of the PMU and PIUs;
- (ix) conduct compliance conference with the Contractor to discuss non-compliance and agree on corrective measures;
- (x) advise the Contractor through the District Engineer how to comply with requirements to address non-compliances;
- (xi) report apparent unanticipated impacts, recommend mitigation measures to be implemented by the PIUs and update the IEE report; and

- (xii) recommend to PMU sanctions in case of recalcitrant contractors.

198. The PIU will:

- (i) ensure all contractors obtain permits, licenses, etc. for activities such as the operation of asphalt plants, quarries, borrow areas etc. before the implementation of the respective construction activity;
- (ii) carry out regular field verification and review environmental compliances by the Contractor during project implementation, in coordination with the Environment Specialist and the Contractor's EFP;
- (iii) provide environmental observations recorded during any all site-visits to the Environmental Specialist that may include but not limited to excessive dust, loud noises, improper disposal of wastes, chemical/oil spills, camp hygiene, health and safety, and improper borrow area management.
- (iv) In case of imminent danger to environmental quality, life, and properties that may result from poor environmental management plan implementation, immediately instruct the Contractor to cease and desist the construction activities that pose risk and conduct immediate containment and mitigation activities.

199. **Contractor.** The Contractor is the principal agent to implement the EMP and EMoP during the pre- and construction stages. Specifically, the Contractor will:

- (i) appoint the Contractor's EFP and attend the site induction workshop to be organized by the Environment Specialist;
- (ii) obtain necessary environmental license(s), permits etc. from relevant agencies as specified in the IEE and this project administration manual for associated facilities for project road works, quarries, wet mix plant etc. prior to commencement of civil works contracts;
- (iii) as part of detailed survey, collect the baseline data on environmental quality before the start of physical works⁴⁰ and continue collection of environmental quality data as given in the EMoP during construction and operation;
- (iv) revised the EMP and EMoP, in coordination with the Environment Specialist, based on detailed road survey
- (v) implement all mitigation measures in the EMP and activities in the EMoP;
- (vi) ensure that all workers, site agents, including site supervisors and management, participate in training sessions delivered;
- (vii) during the 1-year construction period, submit a fully accomplished 3-periodic environmental monitoring forms representing pre-, during-, and post-environmental management plan implementation status to the District Engineer and Environment Specialist;
- (viii) during the 5-year maintenance period, submit semi-annual environmental monitoring reports to the PMU;
- (ix) ensure compliance with environmental statutory requirements and contractual obligations;
- (x) participate in resolving issues as a member of the grievance redress committee (GRC);
- (xi) respond promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional environmental mitigation measures as necessary; and

⁴⁰ Pre-construction monitoring report.

(xii) based on the results of EMP monitoring, cooperate with the Environment Specialist to implement environmental corrective actions and corrective action plans, as necessary.

200. ADB is responsible for the following:

- (i) review rapid environmental assessment checklist and endorse or modify classification proposed by the executing agency;
- (ii) review IEE report and disclose the final reports on the ADB website as required;
- (iii) issue no-objection on subproject's approval based on the IEE report;
- (iv) monitor implementation of the EMP through due diligence missions;
- (v) assist MRRDA, if required, in carrying out its responsibilities and in building capacity for safeguard compliance;
- (vi) monitor overall compliance of the subprojects to this PAM; and
- (vii) if necessary, provide further guidance to MRRDA on the format, content, and scope of the IEE report and annual monitoring reports for submission to ADB.

VIII. ANALYSIS OF ALTERNATIVES

201. Analysis of alternatives is considered as part of IEE report and the ADB SPS' principle, which involves an examination of alternative ways to achieve objectives of the proposed project. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the environmental impacts. The no-action and with-project option on environmental impacts are discussed as follows.

A. No-action option

202. In general, the rural roads and bridges are in poor condition, and rain cuts and erosion has encroached up to the carriageway. No-action option will allow the non-implementation of the proposed improvements of rural road and bridge under the additional financing, hence no intervention will be done. Social, economical and educational development of people depend on accessibility. A large number of people in the rural areas are not connected with the all-weather roads. For no-action option, the employment opportunities and basic necessities (i.e. health, education) are difficult to reach rural masses without a system of good road network.

203. The no-action option has both advantage and negative impacts on the environment and community. If improvements and repairs of the roads and bridges are not implemented, the present poor condition of the infrastructures will increase the transportation time and cost for the local people to the district headquarter and markets and vice versa resulting into low level of productivity of the rural areas. The no-action option will prevent some of the environmental impacts (i.e. construction pollution, and occupational health and safety risks), but at the cost of poverty and hardship of the people. Most of the roads and bridges have inadequate safety provisions that would be source of risks for road users and pedestrians. Horizontal and vertical profiles are incoherent to applicable national code provisions, and horizontal curve is mostly insufficient in built-up areas.

B. With project option

204. The proposed project interventions are within 6 regions of the state. These roads and bridges within the target areas are considered with the accessibility and connectivity requirements of the community people. Every unconnected habitation should be provided with connectivity through at least one road link, which meets their socio-economic requirements. A habitation can be defined as a cluster of population, living in an area, the location of which does not change over time. A habitation is considered connected through an access of all-weather road and/or bridge.

205. All weather road and bridge engineering structures will be built based on using proper specification and design and with various cross drainage works as per the national specifications. The rural roads and bridges designs are based on the (i) specifications for rural roads (2004), (ii) Indian Road Congress (IRC):SP:20 (2002), (iii) IRC:SP13:2004, (iv) IRC:SP:82:2008 and (v) Guidelines for Bridge Designs by the Designs Circle of Public Works Department (PWD), Maharashtra.

206. In view of the potential environmental impacts, the comparison of the no-action scenario and with the project scenario is shown in the following table.

Table 22. Potential environmental impacts of the no-action option and with project scenario

Environmental Component	No-action option	With Project Scenario
Air Quality and GHG	May increase due to poor condition of the roads and bridges, and traffic build-up	Construction will result to decline on air quality, but will improve during project's operations due to improved road and bridge conditions
Land and Soil	No quarrying and soil compaction	Compaction of soil and impact on quarry haul roads due to vehicle movements
Surface water quality and quantity	No effect on river	Temporary siltation and change in river course due to construction, which will be mitigated through specific measures in the EMP
Groundwater quality and quantity	No effect	Contamination of groundwaters from potential oil and lubricant spills <u>due to construction, which will be mitigated through specific measures in the EMP</u>
Terrestrial Vegetation	No effect	Compensatory planting will be undertaken (if necessary)
Wildlife	No effect	No habitat encroachment, but minimal impacts on river quality during constructions
Private land and buildings	No effect	No effect
Public infrastructures	Localized flooding due to poor road drainage	After construction, cross-drainage structures and side shoulders will help in draining run-off
Sound level	Increasing traffic volume	Temporary increase in noise level from construction vehicles and machine use. During operations, speed limits to be enforced to mitigate noise coming from vehicles
Aesthetic and visual	Degrading structures	Diggings, shifting and reestablishment of poles will temporarily impair the view of community areas particularly along heavily settled areas. Compensatory plantation to be undertaken in areas endorsed by Department of Forest.
Community OHS	Road accidents due to poor road and bridge condition	Construction related risks. During operation stage improved oad safety and well-being are expected as awareness signboards will be provided to slowdown driving near community areas. Speed limits and honking restrictions to be enforced ear sensitive locations.

207. During IEE preparation, the location of the project components are selected to improve the connectivity of the people. The land is stable and not prone to geological hazards. There are no sensitive habitats within the project influence, and known historical monuments are not within the impact areas of the additional financing. Hence, with project scenario is considered as a better option.

IX. GRIEVANCE REDRESS MECHANISM

A. Grievance Redress Mechanism

208. A GRC will be organized by MRRDA during the project design and preparation stage. This GRC will have three levels: PIU, Region, and PMU levels as illustrated in Table 17. The GRC provides a readily accessible organization and mechanisms to all project affected persons and stakeholders in voicing concerns and lodging complaints, while the GRM defines a time-bound and transparent process to resolve social and environmental concerns linked to the project. The operational and administrative cost of the GRC will be provided by MRRDA.

209. The following describes the three-levels of GRC under the project:

- (i) **First Level of GRC (Field level):** A GRC will be formed at the Gram Panchayat level headed by the concerned MRRDA PIU Engineer and consisting Head of Gram Panchayat (Sarpanch/Mukhiya)/local leader nominated by Gram Panchayat (Chairperson), representative of the Gram Panchayat, and Contractor's Environment/Social/Gender Focal Person. Most of the grievances received at this level would be local in nature and will be both in verbal and written form. The GRC at the field level will keep a record including date of the GRC meeting, number and types of grievances received, name of the complainant and time taken for redressal of the grievance. The First Level of GRC should ensure that at least 30% members in GRCs are women.
- (ii) **Second Level of GRC (District Level):** The Second Level GRC would be established at the district (PIU) level headed by the respective Executive Engineer. A Grievance Register will be maintained at the PIU level documenting the date and type of grievance received, the date of personal hearing provided to the complainant, the date when grievance was redressed or if not redressed date of forwarding the grievance to the GRC. All grievances that cannot be resolved at the PIU level and in cases where the complainant is not satisfied with the decision will be referred to the Project Level Committee (Head Office).

The GRC will meet regularly, at least once a month, on a prefixed date. All grievances registered will be reviewed and resolved within four weeks of the date of receipt of the grievance. The complainant/petitioner will have the right to be heard by the GRC before the committee gives its decision. Communication, in writing should be sent to the aggrieved person about the date, time and venue of the GRC meeting and make it known that s/he is entitled for personal hearing and that representation through proxy will be not be entertained. Decisions of the district level GRC will be final unless an appeal is referred to the Chief Executive Officer, MRRDA. If the committee is unable to arrive at a decision through consensus, the matter will be referred to the appellate authority with a note on opinion of the committee members. The complaint/concern will be redressed in four weeks and written communication should be sent to the complainant about the decision taken.

- (iii) **Third Level of GRC (Project Level):** The Project Director at the head office will function as an appellate authority. Decision on the appeal will be communicated to complainant within two weeks.

210. The existence of the GRM does not preclude or serves as prerequisite for the complainant from accessing the local jurisdictional court of law or other authorities to seek redress at any given time.

211. People who are, or may in the future be, adversely affected by the project may submit complaints to the ADB's Accountability Mechanism that provides an independent forum and process to people adversely affected by ADB-assisted projects after making efforts in good faith to solve their problems through the GRC and also by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.

Table 23: Composition of the GRC members per level

Field-Level Committee	District-Level Committee	Project-Level Committee
<ul style="list-style-type: none"> • Concerned MRRDA PIU Engineer • Head of Gram Panchayat / local leader nominated by Gram Panchayat (Chairperson), • Representative of the Gram Panchayat • Contractor's Environmental/Social/Gender Focal Person • Ensure that at least 30% of the committee members are women 	<ul style="list-style-type: none"> • Executive Engineer PIU • PISC Social & Gender Expert and Environment Expert • Contractor's Environmental/Social/Gender Focal Person 	<ul style="list-style-type: none"> • Project Director PMU • Concerned Region Superintending Engineer • Concerned MRRDA PIU Executive Engineer • Concerned Region PISC Social & Gender Specialist and Environment Expert • Contractor's Environmental/Social/Gender Focal Person

MRRDA : Maharashtra Rural Road Development Association, **PISC**: Project Implementation Support Consultants, **PIU**: Project Implementation Unit, **PMU**: Project Management Unit.

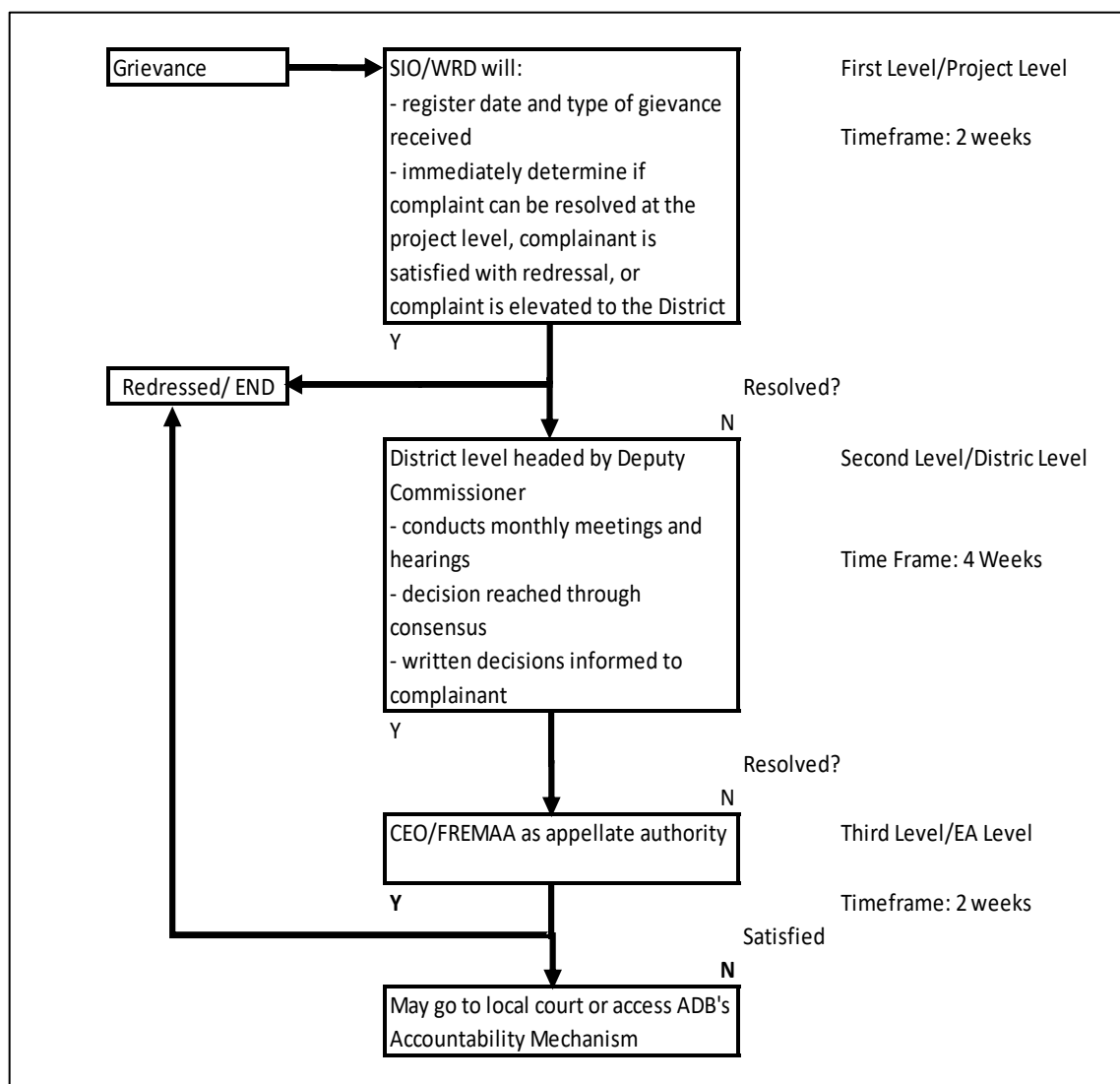


Figure 29: Framework of the GRM process

IX. CONCLUSION AND RECOMMENDATION

A. Conclusion

212. The findings of IEE for the additional financing's roads and bridges indicate that impacts are mostly similar, and subprojects are unlikely to cause any significant environmental impacts. While some of the impacts are negative there are likely to occur during construction stage, are temporary in nature, and can be mitigated with minor to negligible residual impacts.

213. The project received immense support from local people, as they perceive that this project will improve the overall connectivity and bring various economic opportunities to the people of the State.

214. The project is classified environmental category *B* in accordance with ADB's SPS. Impacts from 1,100 rural roads and 236 bridges were screened and assessed using an environmental checklist developed in similar projects and adapted to local conditions and road design. From these environmental checklists, a single IEE report was prepared in line with the ADB's SPS. Proposed construction activities are typical of road reconstruction and upgrading. All the rural roads and bridges are existing, and no by-passes or land acquisition are anticipated. Most of the negative impacts are coterminous with the construction stage, site-specific, limited within the construction corridor, and easily mitigated. Anticipated environmental impacts are typical such as the generation of dust, noise, exhausts from haul trucks and hot mix plants, and waste from construction and worker camps; water contamination; and occupational health and safety hazards. MRRDA has integrated mitigation measures for all anticipated impacts through the incorporation of a standard EMP in the bidding documents and provision of road-specific EMPs with the DPRs. An integrated social and environmental GRM has been formed to continue receiving feedback and complaints from affected parties and addressing them during the construction and operation stages. To ensure the effective implementation of safeguards requirements, MRRDA institution will be augmented by environmental experts at the regional level. The IEE will be disclosed on the ADB and MRRDA websites.

215. With the projected increase in rainfall due to climate change in the near term, more frequent and intense flooding particularly on rural roads located near river courses is anticipated. The MRRDA has adopted climate resilient road designs to address this risk and in consultation with local communities identified vulnerable sections of rural roads to be upgraded under the project. Adaptation measures include the increase in cross-drainage capacities, construction of new cost drains, increase in final road surface elevation, strengthening of road embankment through construction of retaining walls, and construction of new side drains to protect pavement against prolonged submergence. The cost of these adaptation measures is estimated \$31.7 million and incorporated in the civil works.

216. The impacts identified are mostly related to alignment selection, land clearing, borrowing earth, and cutting of avenue trees, shifting of utilities and community structures, establishment of construction camp or material storage areas, transportation of material and operation of hot and cold mix plants. All identified impacts are either eliminated or minimized through design consideration and suitable mitigative measures.

217. Environmental management plan (EMP) covering all stages of road construction (design, construction and operation) is prepared with defined responsibility for its implementation. The EMoP is also prepared to ensure effective implementation of EMPs. The MRRDA has defined institutional setup including specified responsibility for environmental management. Existing capacity of the MRRDA for implementing environmental safeguard issues need substantial

strengthening. Environmental specialist will be provided at the PMU and Division levels as part of the PISC to provide the needed expertise.

218. Any major changes or any major additional work other than the proposed project activities will require preparation of another environmental assessment. This additional assessment will have to be submitted by MRRDA for ADB for concurrence before civil works commence.

219. The implementation of prescribed mitigation measures will minimize/avoid the adverse impacts. Moreover, the impacts shall be monitored continually by implementing and updating the EMP and EMoP. This IEE is prepared based on individual environmental checklists and detailed project reports. Subproject specific EMP will be improved by the contractor as per the final provisions made under DPRs and findings on the field validation and survey during pre-construction phase. The subproject specific EMPs, if there is any change, shall also be sent to ADB for information by the PMU.

220. Executing agency shall ensure that EMP and EMoP is included in Bill of Quantity and forms part of bid document and civil works contract. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and Sanitation facilities at construction camp and temporary office/material storage place. The same shall be revised if necessary, during project implementation or if there is any change in the project design. Any such change shall be reported to ADB as well.

Appendix-1

List of rural roads under the Maharashtra RCIP Additional Financing.

District	Block	Name of Road	Length (Km)
Akola	Akola	MDR- 12 to Bahirkhed Road	1.20
		Umari To Chachondi Road	3.60
		S.H. 281 to Ugwa Road	1.90
		MDR- 11 to Palodi Gotra Road	2.50
		S.H. 281 to Sangavi kh. Farmabad Road	3.30
		S.H. 281 Sukoda to Khadaki Road	3.30
		S.H. 281 to Kanadi Road	1.10
		S.H. 284 to Varudi Road	1.10
Akola	Akot	Bordi Ramapur Road	1.90
		S.H. 47 to Jalgaon Nahate Road	4.60
		S.H. 281 to Tandulwadi Kherda Road	4.50
		S.H. 47 to Jainpur Pimpri Road	5.00
Akola	Telhara	Bhamberi to Kheldeshpande Road	6.00
		Manbda Atakali To Tq. Border Road	4.20
		Takali to Pathardi Road	2.75
Akola	Murtijapur	Virwada app. Road	1.20
		S.H. 200 to Ballarkhed Road	1.60
		Sonori To Pota Road	3.60
		Kurum to Wadgaon Road	5.30
		SHW 282 to Aarkhed Nimba Dhanora Road	8.30
		Sherwadi to Dhanora Road	4.30
Akola	Barshitakli	ODR- 34 to Pimpalgaon Hande Road	2.00
		Bhendgaon to Wadala Road	2.60
		ODR- 34 to Swarkhed Road	2.00
		SH-273 to Pimpalkhuta Road	4.20
		S.H. 273 to Redwa Road	5.50
Akola	Balapur	Vyala To Degaon Road	6.40
		Paras To Hasanapur Road	3.00
		SH-279 To Sangvi Road	1.50
		Vyala to Gaigaon Rly Station Road	5.08

Akola	Patur	S.H. 284 to Tandali kh.-Belura Bk. Road	2.55
		MDR-27 To Pastul Road	2.00
		Boadkha Approach Road	0.60
		NH-161 To Chinchakhed Road	1.00
		NH-161 To Shirla Road	1.50
		Gawandgaon To Padshingi Road	3.33
		Charmoli To Chondhi Road	2.00
Akola		Total	116.51
Amaravati	Achalpur	ODR-76 to Khojanpur Chamak	2.80
		SH-24 (Pandhari) to Waghdoh	2.20
		SH -24 to Wadura road	3.00
Amaravati	Amaravati	SH- 308 to Rawalgaon	3.50
		MDRü-18 to Narsingpur	1.20
		Yesurna to Sawali (Kh.)	3.15
Amaravati	Amaravati	Antora to Bramhanwada	1.40
		MSH-14 to Changapur	0.90
		MDRü-28 to Khanapur	4.60
		SH-308 to Malegaon - Kekatpur	4.60
Amaravati	Bhatukaly	SH-280 to Wasewadi	2.32
		MSH-14 to Nimkheda	2.55
		SH-47 to Nindodi	4.20
Amaravati	Chandur Railway	MDR- 34 Jawra to Ibrahimpur Baggi	3.00
		Dighi Kolhe to Dhanora Mogal	3.15
		Tuljapurü To Shirajgaon Korde	3.20
Amaravati	Dhamangaon Railway	Narangwadi Bhilli to Nimbhora Raj	3.10
		Borgaon Nistane to Sonora Kakade	3.00
Amaravati	Dhamangaon Railway	SH-280 to Naygaon	3.20
Amaravati	Dharani	MSH - Kadhao to Duni	4.10
Amaravati	Warud	Mamdapur to Zolamba - MDR-43	4.13
		Amadapur To Dawargaon	2.90
		Wadala to Morchund	2.73
		Surali to Fattepur Chinchargavhan	4.08
Amaravati		Total	73.01
Washim	Mangrulpir	Shelu Bajar to Yedshi Road	4.20
		SH-289 to Chakawa Road	0.90
		SH-273 to Icha Road	1.60
		SH-273 (Pardi Tad) to Pimpalkhuta Road	4.50
Washim	Mangrulpir	SH-289 to Warud Bk. Road	4.00
		SH-273 to Kolabi Road	2.50

Washim	Malegaon	Amana to Dharmwadi Road	3.45
		NH-161 to Zodga (Bk) Road	2.50
		Nandhana to Sakharapur Road	7.05
		MSH-12 to Givha Road	2.20
		Kolgaon to Tarodi Road	2.50
		MSH-12 to Keli Road	2.30
Washim	Karanja	Gaiwal Fata to Gaiwal Raod	2.20
		Jalalpur Fata to Jalalpur Road	1.00
		Khanapur Fata to Khanapur Road	2.00
		Wai Fata to Wai Road	0.90
		Ganeshpur Fata to Ganeshpur Road	1.10
		Nagalwadi Fata to Nagalwadi Road	0.60
		SH 274 to Shatadpur Road	1.60
		Shevati Fata to Shevati Road	0.60
Washim	Manora	Karkheda to Yashwant Nagar Road	2.40
		Gavha to Chakur Road	3.30
		Sakhardoh to Singdoh Borvha Road	2.40
		Giroli Pimpri to Devthana Road	3.15
Washim		Total	58.95
Buldhana	Buldhana	MSH-13 to Hanawatkhed	4.20
		SH-24 to Dattapur	0.65
		SH-24 to Afajalpur	2.25
		Nandra Koli to Ajisapur	1.60
		SH-24 to Palaskhed Naik	1.30
		SH-24 to Ijalapur	1.60
		SH-24 to Januna	1.50
Buldhana	Buldhana	MDR 24 TO Dhangarpur	1.50
		O.D.R 104 To Sindkhed	1.40
Buldhana	Nandura	MDR 07 [Narkhed] to Hingna Isapur	3.10
		ODR-54 to Hingana Bhota	0.60
		ODR-50 to Dolkhed Tq border	1.80
		ODR-34 to Pimpri Koli	4.00
		ODR-39 to Dhadi - Taka	2.10
Buldhana	Jalgaon Jamod	ODR-08 to Uti	1.20
		Madakhed to Illora	2.70
		SH-278 To Nimbhora Kh	1.00
		ODR 07 to Takli	1.08
Buldhana	Shegaon	ODR 53 To Tivan Bk	1.00
		ODR 53 To Sangwa	1.50

		SH 24 To Chincholi	1.20
		MDR 05 To Khatkhed	0.60
		ODR 54 To Kathora	1.20
		SH 24 TO Sawarna	1.00
Buldhana	Lonar	SH-51 to Gotra Bhiwapur MDR-45	2.35
		MDR-44 to Pahur	4.60
		MSH-12 to Maharchikana	2.00
		MSH-12 to Khalegaon	2.00
Buldhana	Sindkhed Raja	MDR-32 to Ratali	2.90
		ODR-140 to Umangaon	1.85
		MSH-12 to Pimpalgaon Lendi	1.40
		MDR-37 to Nimgaon Wayal	2.40
		MDR-32 to Gunj Tq. Border	2.00
Buldhana		Total	61.58
Yavatmal	Digras	Chincholi Khandapur Dhanora (Kh) Aamala Road	6.40
Yavatmal	Ghatanji	Sevanager to Jarang to Jarang Tanda	1.92
		SH-314 to Mathani Road	3.20
		SH-290 to (Shivani) to Bhutai Pod Road	1.01
Yavatmal	Maregaon	ODR-116 to Shirampur (Rampur) Rod	0.51
Yavatmal	Maregaon	Kumbha to Indira Gram Road	2.25
		Sarati to Jankai Pod Road	0.50
		Hiwara to Mukta Road	3.12
		Gaurala to Net Road	1.40
Yavatmal	Ralegaon	Wadki to Pimplapur Road	3.95
		SH-317 to Chikana Road	2.61
		MDR-109 to Chikhali Road	1.34
		SH-317 to Yekburji Road	0.88
		SH-317 to Ladaki Road	0.72
Yavatmal	Umared	MDR-62 to Dighadi Road	1.70
		Mulava to Hatala Road	3.25
Yavatmal	Babhulgaon	SH-317 to DEOGAON	4.71
		MDR-15 to Krishanapur	3.00
Yavatmal	Darvha	SH-290 to Ramgaon Sevadas Road	5.00
		Mahagaon to Pabhal Road	1.00
		Sawangi to Karmala Road	3.00
		Bramhi to Pimpalgaon Road	2.40
Yavatmal	Pandarkawada	SH-317 to Kodari pod Road	0.82
		SH-314 to Ghonsi Pod Road	2.25

		ODR-130 to Nagezari Road	3.29
		SH-273 to Karanwadi to Jawahar nager Road	4.83
Yavatmal	Wani	Ghonsa to Sonegaon Road	3.20
		SH-319 to Manki Road	0.68
		SH-319 to wadjapur Road	1.53
		SH-319 to Umari Road	0.60
		MSH-14 to Kesurli Road	1.71
		Mendholi to Gop[alpur (Warzadi Devi) Road	2.12
Yavatmal		Total	74.90
Osmanabad	Bhoom	WANGI(BH) TO Gunjalwasti	1.20
		sadesangvi TO Dombale wasti (Sadesangvi)	1.10
		Nawalgaon TO warewadgaon	2.90
Osmanabad	Paranda	VR-104(Wakadi) TO Sonmalewasti	1.15
		SH-68 TO Morewasti	1.53
		MDR-09 ASU TO Jagtapwasti	1.00
		MDR-08 TO Tabilewasti-SarakWasti-Padolwasti	1.35
		ODR-02 TO Movlaiwasti	2.50
		MDR-08 TO Gaibiwasti	1.10
		MDR-07 TO Chawanwadi	2.00
Osmanabad	Osmanabad	Jagji TO Jagji Tanda	1.20
		Dautpur TO Pathrudwadi	1.00
		Ghuggi TO Eknathwadi	1.50
		Sarola TO Shindewadi	5.47
		SH- 238-Panchaghavan-Pati TO Panchgavan	2.70
		Kangara TO Dhutta	3.55
		SH-238 TO Baramgaon (Kh)	0.55
		SH-237 Umbregavan TO Wadarwasti	0.60
		SH- 238-kangara-Pati TO Kangara	2.51
		SH-238-Bhandari TO Bhandari	1.90
		NH-361 TO Patil Nagar	0.90
Osmanabad	Tuljapur	Khadki Khadki to Shivaji Nagar (ZPD)	3.75
		NH-65 To Chavanwadi(A)	1.50
		SH 206 SH 206 to Lakade Wasti	1.39
		Kilaj MDR 37 to Gawandi Tanda	2.21
		SH 206 to Haglur Road	2.60
		SH 206 SH 206 to Manewadi	2.16
		TR-09 TO MAILARPUR TANDA	0.80

		Omerga TR-15 TO Loharwadi Raod	0.78
		NH 65 NH 65 to Babhalgaon	1.60
Osmanabad	Washi	NH-211 NH-211 to Bori road	0.50
		NH-52 NH-52 to Pangardharwadi	3.75
		MDR 40 MDR-40 to Kati Tanda	2.00
		TR-18 TR-18 to Sindphal	5.70
Osmanabad	Tuljapur	MDR-33 Apsinga to Saricha Tanda	1.10
		SH 208 SH-208 to Bhatambra	0.50
		SH 206 SH 206 to Nagzari Tanda	5.80
		SH-206 SH-208 to Nagzari wasti (Tanda) Road	1.70
		SH-208 SH-208 to Dindegaoon	0.52
		SH-208 SH-208 to Kalegaon	0.55
		SH-208 SH- 208 to Yemagarwadi	2.35
Osmanabad	Umerga	T-11 TO Nisheri Tanda Aurad	4.90
		T-02 TO Kavtha	2.30
		T-16 TO Vhantal	3.50
		MRL-08 TO Kadadora	2.40
		T-01 TO Raje bhaskar	2.90
Osmanabad	Kalamb	SH-209 TO Andhora Paradhiwasti	2.00
		Bhosa TO Mali wasti	3.60
		SH-208 TO Diksal New Wasti	1.19
Osmanabad	Kalamb	SH-236 TO Kothala-Gairan wasti	2.60
		MDR-19 TO Shiradhon tanda	3.20
Osmanabad	Bhoom	SH 62 TO Dukkanwadi	3.60
		MDR 11 TO Takale wasti Farne wasti	1.30
		SH 57 TO Hadongri,Taluka Border	1.50
		MDR 9 TO Mohitenagar	1.10
		MDR 4 TO Birobachiwadi Dandegaon	3.60
		T-13 TO Tintaraj Murumkar wasti/Sable wasti	1.50
		ODR 13 TO Jagdal wasti 1	0.50
Osmanabad	Paranda	SH-210 TO Wangegavan-Thorbolewasti-Jagtapwasti	3.20
		Kukkadgaon TO Kukkadgaon-Shindewasti-Bhawakarwasti	1.30
		ODR-11 TO Domgaon No1-Rammandir	2.20
Osmanabad	Paranda	ODR-03 TO Parewadi-Desalewasti-Bhadavalkarwsti	2.40
		SH-210 TO Hangewadi	2.50

Osmanabad		Total	132.26
Nanded	Mahur	SH-265 to Met	2.00
		MDR-6 to Hingni	2.02
		ODR-5 to Lasanwadi	2.00
		SH-265 to Ruplanaik tanda	2.50
		MDR-5 to Anjani	0.90
		MDR-6 to Digdi Bk.	1.65
Nanded	Kinvat	Bhilgaon	1.54
		Pitambarwadi	2.50
Nanded	Himayatnagar	Msh-10 to Karala	1.43
		Msh-10 to Shibdara	2.52
Nanded	Mudkhed	Odr-156 to Tirkaswadi	1.89
		Odr-57 to Gopalwadi	0.69
Nanded	Umari	MDR-4-0Bolsa Kh.	3.28
		SH-260-Aswaldari -Aswaldari Tanda-Shivnagar -Tanda	5.10
Nanded	Loha	MDR-52-Maski	0.63
		MDR-58-Gaundgaon Vasunaik Tanda	3.21
		SH-255-Madki	0.51
		MSH-6-Mangrul	1.32
		WadgaonWadgaon tanda	1.26
Nanded	Kandhar	ODR-108-Navarangpura	1.23
		ODR-108-Wanjarwadi	1.89
Nanded	Mukhed	MDR-66 to Hippalnari-Roopchand Tand	2.93
		SH-256 to Gadgyalwadi-Honwadajwadi	1.80
		MSH-16 to Girturwadi (Hulgundwadi)	2.01
		SH-256 to CHINCHANPALLI TANDA	2.76
		MDR-77 to FATRU TANDA	2.57
Nanded	Mukhed	MDR-89 to DAHAMANGAON	1.60
		MDR-71 To ANDEGAONWADI-SAWLITANDAANDEGAON	2.85
		MDR-66 To NIVALI -KHOBTA TANDA	2.55
		ODR-168 To SOCIETY TANDA -LAKHU TANDA	1.75
		SH-256 To UMARDARI -SHIVLING WADI	1.55
Nanded	Naigaon	Krshnoor To Nilegavhan	2.80
		MSH-07 To Bhopal	1.75
		MDR-85 To Rui kh	1.70
Nanded		Total	68.69

Hingoli	Aundha	MDR-04 to Devwadi Wasti	2.87
		MSH -2 to Kathoda	2.30
		MDR-20 to Rupur Tanda	0.75
		MSH -2 to Umara	3.00
		MDR-18 to Tapowan	3.40
		MSH -2 to Sendursana	3.00
Hingoli	Wasmata	KURUNDA to Neharunagar	1.66
		SH-255 to Babhulgaon wasti	3.51
		SH -256 to Kothari, Kothari Tanda	1.75
		ODR - 37 to Chincholi	1.42
		MSH-02 to Singi Waghi	2.30
		MDR -6 to Wapti	1.33
		MDR -4 to Pangra Shinde	0.93
		SH -256 to Sunegaon,Hiwara	1.56
		MDR - 6 to Kupti	0.83
Hingoli	Hingoli	MDR-3 to Patan	1.20
		SH-214 to Paheni to Attarwadi	4.80
		SH-249 to to Digras K to Dategaon	1.50
		NH-161 to Kothalaj	2.70
		MDR-29 to Vidoli Sawad	5.25
		MDR-3 to Limbi	0.90
		Yelki to Belther	2.41
		MDR-9 to Killewadgaon	2.20
		MDR-9 to Potra	0.81
		MDR-10 to Kalyachi wadi	2.74
Hingoli	Sengaon	Sakhara to Kahakar Kh	5.34
		MDR-25 to Kelsula Weltura	5.95
		SH-214 to Sukali Kh	3.30
		ODR-26 to Hivra nike	2.85
		SH-258 to Mhalshi	7.32
Hingoli		Total	79.88
Beed	Ambejogai	MDR-57 To Bagzari	6.75
		MDR-58 To Jaihanuman Tanda	5.00
		MDR-57 Ujani to Khapertone	4.60
		ODR-139 Near Pattiwadgaon to Muslewadi (Latur Dist. Border)	3.80
Beed	Kej	Kumbephal to Janegaon-Hanumanwasti	3.10
		MDR-44 near Hole To Ladewadgaon	4.60
		SH-64 to Sonesangvi	3.10

Beed	Dharur	Aranwadi to Maliwasti	8.70
		MDR 46 to Gopalpur Lamantanda	1.20
		SH 232 Wagholi	3.30
		MSH 16 to Jaitapur	5.00
Beed	Wadwani	MDR-18 to Dethewadi	2.30
		MSH-16 to Parbhani Tanda	5.30
		Chinchala to Chinchala Tanda	2.20
		SH-222 to Dongerwasti-Kardwadi	3.30
Beed	Majalgaon	NH-222 TO JAYKWADI	2.60
		SH-209 TO TAKARWADI	0.75
		MDR-48 TO HANUMANAGARTANDA	1.60
		ODR-65 TO WANMAL TANDA	1.15
Beed	Georai	Antarwali To Mirgaon-Pangulgaon To MDR 26	9.50
		MDR 24 To Thakurwadi Tanda	2.25
		MDR 24 To Gulaj	1.75
		SH 50 To Kathoda	1.75
Beed	Beed	ODR-51 To Jadhavwasti	5.80
		SH-55 To Khandepargaon	3.00
		SH-55 To Antharwanpimpri	3.35
Beed	Patoda	SH 55to Patoda -Laulwasti - Talepimpalgaon	6.50
		SH 64 Nafarwadi to Patilwasti (Yewalwadi)	2.70
		SH 55 to Jawlala	1.00
		ODR-20 to Kantahalwadi	1.00
		Hundewadi to Nakadewadi	1.90
		ODR 22 Parner to Kutewadi	2.20
Beed	Shirur	MDR-28 to Ramunaik Tanda ,Nimgaon	6.10
Beed	Ashti	ODR-14 to Hajipur-Saptewasti	0.70
		MSH-16 to Karkhel Bk & Sangvi Patan	7.20
		SH-70 to Wadgaon	3.10
		MDR-03 to Bhawarwadi	3.85
Beed		Total	132.00
Latur	Ausa	MSH-06 to Budhada(Old)	1.33
		SH-239 Karajgaon	4.87
		SH-239 to Wagholi	3.15
		SH-239 to Fattepur	2.20
		TR-17 (ODR-99) to Almala	3.15
		SH-239 Kalmata	3.50
Latur	Nilanga	Jau to SH- 238 (Nanand)	4.30

		Dapka Tanda to SH- 244 (Nilanga)	2.30
		Kandakwadi (Sitaphalwadi) to ODR-91	2.28
		Nelwad to SH-237	1.50
Latur	Udgir	(TR-09) ODR -59 to Mancha Tanda	3.18
Latur	Ahmedpur	(TR-09) ODR -59 to Mancha Tanda	1.85
		MSH - 06 to Ajaniwadi	1.23
		MDR - 18 to Kawalwadi	3.63
		SH - 248 to Molwanwadi	1.11
		MSH - 06 to Fulsewadi	1.05
		SH - 56 to Salunkwadi	1.50
		MDR - 19 to Mawalgaon	2.49
Latur	Latur	ODR-130 to Shirala	3.12
		SH-236 to Vaishali nagar	1.00
		ODR12 to Kasargaon	1.00
		MSH-06 to Kolpa tanda	0.70
		MDR11 to Dhanora	1.10
		SH-236 to Dhoki	2.10
		MDR11 to Almala Tanda	1.30
Latur	Chakur	Nalegaon to Limbalwadi	5.22
		SH-245 to Anandwadi	3.00
Latur	Renapur	SH-232 kolgaon to Shera Nagapur to Palasi	11.60
Latur	Latur	ODR-130 Masala to Bhosa Nilkanth	2.70
		MDR-10 to Hisori	0.56
		SH-236 to Tandulwadi	0.54
		Salgara Bk to Dagadwadi	1.89
Latur		Total	80.45
Parbhani	Sonpeth	ODR 25 to Naikota Bondargaon Road	5.45
		ODR 23 to Buktarwadi Road	1.20
		ODR 23 to Paradhwadi	1.65
		MDR -18 to Chukarpimpri	1.10
		SH -221 to Gavalipimpri	1.22
Parbhani	Pathri	ODR-38 To Dongargao Road	6.20
		SH -61 to varkhed road	1.00
		SH 61 to Renapur road	1.35
Parbhani	Manvat	SH 253 to sawangi Nagar Road	1.00
		SH 253 to Mangarul Road	2.50
Parbhani	Parbhani	SH -248 To Tadpangri Road	1.50
Parbhani	Parbhani	NH 222 to Alapur Pandhari	1.00

		NH 222 to Rahati	0.80
		SH 61 to Shirshi Bk	2.00
		MDR 35 to Paralgavan	3.50
		NH 222 to Asola Road	1.00
		SH 61 to Shirshi kh	1.21
		MDR 7 to Pimpalgaon Tong	1.10
Parbhani	Jintur	ODR 37 to jamb kh	1.40
		ODR 6 to Sorja	2.40
		SH 248 to Shaikh road	3.15
		MDR 2 to Chamane Telwadi Road	2.85
Parbhani	Selu	SH 253 to Kajale Rohina Road	5.00
		ODR 2 to Kuda Road	2.80
		SH 253 to Pimprala Road	1.50
		SH 235 to Wakki Road	1.15
Parbhani	Jintur	SH 248 To Yesegao- kadsawangi to MDR 30	7.90
		MDR 02 to Belura Belura Tanda	2.40
Parbhani	Gangakhed	Wadwani to Katkarwadi	1.35
		MDR 21 to Bramanathwadi	2.86
		MSH 16 to Dattawadi shankar wadi	2.00
		MDR 21 to Chinch Takali Road	1.30
		SH 248 to Dharasur	2.30
Parbhani	Purna	SH 236 to kalgaon road	4.36
		SH 61 to kanadkheda	0.90
		SH 61 to Khambegaon Road	4.05
		MSH 25 to Dhangar Takali to Kantheshwar Road	2.70
Parbhani	Palam	ODR 16 to Sayala Umar thadi road	4.20
		ODR 8 to regaon road	2.00
		ODR 8 to Dhotara	2.80
Parbhani		Total	96.15
Aurangabad	Kannad	MDR-10 to Kolmbi Makta	6.30
		NH-211 to Bahirgaon	4.00
Aurangabad	Fulambri	ODR-81 to Waghola-Waghola wadi	3.90
		SH-48 to Babhulgaon	2.00
		ODR-81 to Shevta (Bk.)	0.85
		ODR-79 to Hivra	3.51
Aurangabad	Khultabad	SH-216 to Borwadi Golegaon	3.48
		SH-216 to Malkapur	3.00
		SH-219 to Gandheshwar	2.90

Aurangabad	Soigaon	SH-24 to Navhi tanda	1.50
		Palaskheda to Warkhedi (kh.) - Warkhedi tanda	4.81
		Tidka to Pohari (kh.)	2.63
Aurangabad	Sillod	Borgaon Sarwani to Borgaon wadi	2.06
		Dongargaon to Pardeshiwadi	2.50
		Ambhai to Ramwadi	0.90
		Ambhai to Khaparkheda	2.00
Aurangabad	Paithan	MDR-33 to Lohgaon (bk.)-Mawasgavhan	3.00
		SH-211 to Zodegaon Road	3.70
		SH-26 to Takli Paithan Borgaon	4.20
		ODR-37 to Sanapwadi	0.70
Aurangabad	Vaijapur	MDR-27 Janephal to Hilalpur	1.69
		MDR-26 to Pendephal	2.22
		Mhaski to Sidhapur	2.73
		MDR-26 Rahegaon to Rajura	3.75
		Babhulgaon to Pathri	2.19
		MDR-61 to Biroli	1.38
		Pimpalgaon Khandala to Malegaon Kannad	3.79
Aurangabad	Auranagabad	MDR-18 to Hirapur	4.10
		MSH-05 to Kabirmath	3.00
		SH-211 to Laigaon	3.35
		SH-219 to Hatmali	3.20
Aurangabad	Gangapur	SH 65 to Mahalgaon Kate Pimpalgaon	9.00
		SH-215 to Kadim Shahapur	1.02
		ODR-59 to Tandulwadi	4.80
		MDR-43 to Shivpur	3.14
Aurangabad		Total	107.30
Jalna	Jalna	SH-222 to Wasaram Tanda	1.00
		Jalgaon to Bazi Umrud	2.80
		SH-222 to Bibi Pimpalgaon to SH 227	5.20
Jalna	Jalna	Pachanwadgaon to Pokalwadgaon	4.13
		Nipani Pokhari to Khodepuri	1.50
		MSH-12 to Gawli Pokhari	2.50
		Ahankar Deulgaon to Dhavdi	4.00
Jalna	Badnapur	Dhamangaon to Gavhalwadi	6.30
		ODR-160 (Manjargaon) to Kumbhari	6.40
Jalna	Bhokardan	SH-215 to Latifpur -Khadki -SH226	5.75

Jalna	Bhokardan	SH-223 to Merkheda	1.80
		SH-51 to Perjapur-Avhana - District Border	4.80
		SH-215 to Dagadwadi-Kathora Bazar - MDR-1	2.30
		SH-51 to Takli Bhokardan	9.60
Jalna	Jafrabad	SH-228 to Deulgaon Ualge	4.40
		SH-51 to Dawargaon Devi Dawargaon to Sawangi	2.50
		SH-51 to Devlegavhan to MDR-10 (Dongaon)	5.20
Jalna	Ghansavangi	Nathnagar to Rajurkar Kotha	5.15
		Nathnagar to Bhadli	5.90
Jalna	Ghansavangi	Maneapuri to Raniuchegaon	4.38
Jalna	Ambad	Karanjala to Jalura	1.00
		SH-211 to Bhagwannagar	1.20
		MSH-13 to Lalwadi	0.65
		MSH-13 to Dawargaon Pangri	4.50
		MDR-17 to Chambharwadi	1.00
		ODR-114 to Bhivandi Bodkha	2.00
		SH-61 to Ramchandra Naikwadi	2.00
Jalna	Partur	Anandgaon to Lakaddara	5.01
		Seoga to Antarwala	4.60
		Kankadwadi - Satara Wahegaon to SH-61	5.00
Jalna	Mantha	MDR-13 to Kedar Wakdi	2.50
		Dhoksal to Arda Tolaji	4.60
		Naldav to Khoradsawangi	3.98
		Kedhali to Hatwan Punarwasan	4.20
Jalna		Total	127.85
Raigad	Raigad	SH 103-Borle-Jite-Kumbhe	2.59
		ODR 23 To Chinchawali-Salwad-Nasarapur	3.20
		Khandape- Tiwane To Sandashi	4.30
		Thane Jilha Border To Bedisgaon	1.99
	Karjat	SH 76 To Koshane- Wave	2.00
Raigad	Pen	NH 17 to Kharoshi	1.83
		MDR 24 to USAR App. ROAD	1.50
Raigad	Alibag	CHAUL WAVE TO AMBEPUR BELOSHI ROAD	3.20
		MDR 35 TO ZALKHAND ROAD	2.70
Raigad	Sudhagad	SH 93 to PEDALI NAWGHAR	2.15
		GOMASHI to FANASWADI ROAD	1.80

Raigad	Mangaon	SH-98 To PANOSE ROAD	3.45
		NH-17, DAKHANE To MUNDEWADI ROAD	3.80
Raigad	Tala	KHAMABHIVALI TO RAHATAD BANDAR ROAD	3.90
		VR 22 TO CHARAI ADIWASIWADI ,BELGHAR NAJIK ROAD	1.35
Raigad	Shrivardhan	MSH 4, RANAVALI WADGHAR APPROACH ROAD	3.90
Raigad	Mhasal	SH-98 SAWAR to CHIRGAON BUDDHAWADI	2.50
		ODR-129, PASHT to MORAVANE RAOD	2.00
Raigad	Poladpur	Aad To Kineshwarwadi	3.50
		SH-138 To Kapade Bk To Mahalunge	2.60
		Palchil To Sawarichwadi, To Jatachiwadi	2.80
Raigad	Mangaon	NH-17, KALVAN To KALVAN ADIWASIWADI	3.25
Raigad	Sudhagad	S.H.93 to GOMASHI BALSAI ROAD	1.30
Raigad		Total	61.61
Palghar	Palghar	Nalshet (Malshet) To Kosbad	4.00
		Kudan Malinaka Mothekudan Bhendvan	3.00
		NH-8 To Botgaon	1.80
		S.H.34 Devkhop Ambadi Vevur	2.57
Palghar	Vasai	N.H.8 to Bharolgaon	0.88
Palghar	Vikramgad	S.H.73 to Ghaneda	6.70
		S.H.76 to Bhutpada	3.71
		ODR 78 to Vaijalpada	3.05
Palghar	Talasari	Vevji Nanapada to Bavalpada Road	1.32
		Sawane to Sawarpada	1.98
		Kurze to Mhasapada	2.97
Palghar	Dahanu	Agawan to Humaripada	2.29
		Raytaligaon to Chimbapada	2.49
		Dehane Kaspada to Talaipada	1.60
		Agawan to Dongaripada	1.53
Palghar	Wada	Mandava to Gavalipada	0.90
		Varale to Harijanvasti	2.20
		Sonashiv to Mhaskepada	2.23
		Wada Umbarothe	4.77
		Shivajinagar to Gandhare	2.06
Palghar	Palghar	Shilatepada Road	1.60
		Khardi Talavpada	2.30
Palghar	Dahanu	S.H.30 to Ganjad Shetachapada	1.65

Palghar		Total	57.58
Sindhudurg	Devgad	Aare Nirom main road to Bodevwadi Budhvale Rd.	3.70
		Halyesada Varanwadi Mithmumbri Kunkeshwar Talewadi Rd.	5.00
		NH 177 to Palekarwadi Rd	3.40
		Dabhole Patakarwadi Rd.	2.00
		MDR 13 to Kinjwade Chirekhan Rd.	3.25
		SH 179 to Kalwi Tembwadi Rd.	3.70
		MSH 4 to Poyare Masvi Rd	3.70
		Hadpid Pimpalwadi to Khalchiwadi Rd.	1.90
Sindhudurg	Dodamarg	Zolambe Bhidewadi Dapatewadi Bhatwadi Road	3.64
		Maneri Dewoolwadi Road	1.65
		Matane Bharadwadi to Dhangarwadi Road	2.07
		Vazare to Matane Taliwadi Road	2.00
		Kalane Nutanwadi Road	0.90
Sindhudurg	Malvan	Wayngani Boudhwadi Sapalebag Tondavali Rd.	5.49
		MSH 4 to Achara Ganpati Mandir Rameshwar Mandir Dongarewadi Parwadi Rd	3.63
		Viran Malond Rd	4.10
Sindhudurg	Vaibhavwadi	Kokisare Talekarwadi Khambalwadi Borchiwadi Napane Jod Rd.	2.80
		Nerle Hadge Rd.	2.00
		Kolpe Bhusarwadi Rd.	1.42
		Sadure ODR 10 to Tambalghati Soudarne Rd.	2.76
Sindhudurg	Vengurla	Adeli Bhatwadi to Shambhubavani Mandir Road	2.07
		Kochara Chavhata Umbarache pani Road	1.65
		Aravali Sakhelekhhol Asoli Road	0.90
		Redi Sovdagarwadi Road	1.10
Sindhudurg		Total	64.83
Ratnagiri	Dapoli	Sadave to Shirde road	1.59
		Pophalawne Belwadi chinkatewadi to Kondhe Madhaliwadi Smashanbhumi road	3.10
		Sanglat Sherwal Tetwali	2.00
		Chikhali main road	1.00
		Karanjali Pavanal Katran Road	1.00
Ratnagiri	Dapoli	Aagarwayngani Kalki Satere[tarf.Haweli] Kelil road	1.55

		Gimhawane Chandranagar road	2.00
		Vanoshi Bhiwbandar road	1.00
		Palgad Bazarpeth road	1.00
		Aasud app.road	2.00
		Sh to Bondavali Saterekond road	1.00
Ratnagiri	Khed	Bhelsai Gangwadi Mathurawadi Pawarwadi road.	1.00
		Shirawali Sutarwadi Guravwadi Dhadavewadi Boudhawadi road.	1.70
		Lavel Awashi road.	1.80
		Lavel Budhawadi road.	0.85
		Mani Dabhil Road	1.36
		Lote Ghanekhunt road.	2.63
		Udhale Kalkaiwadi road.	1.00
		Sheldi Hedwadi road.	1.23
Ratnagiri	Guhaghar	Shrungartali Janvle Road	1.00
		Kolavali Pacherisada Pacheriagar Avre Road	4.70
		Pali Pejlewadi Kalmundi Road	3.00
		Veldur GharatwadiDhopatwadi Road	2.00
		Palshet ramanewadi Ghadaswadi road	2.00
		Narvan Karde Muslondi Road	2.00
Ratnagiri	Chiplun	Hadkani Ghadwadi to Nandgaon Road	3.30
		Kutare Badekond To Furus Road	4.70
		Tivare Kumbharwadi Road	1.70
		Kolkewadi Pachim Hasarewadi Road	2.20
		Dalvatne Morevane To Valoti Road	2.20
Ratnagiri	Sangmeshwar	Mhabale shivane nandlag MDR 48 mayurbag road	3.50
		Rajwadi Chikhali Rangav Pachambe Road	4.20
		Kalmbaste maladewadi to MDR 47 road	2.50
		Vandri Ambavali Tamhane Road	1.00
		ODR 59 Phungus Medhe Tarf Phungus Manjare Road	2.00
Ratnagiri	Ratnagiri	Panwal Bouddhawadi Ghawaliwadi road	2.00
		MDR4 Waigani Ubarewadi	1.00
		ODR 128 Kotharwadi road	2.50
		ODR 78 Pejewadi shindewadi Joshiwadi Road	1.80
		Nirul Mavalatiwadi to Golap Dhopatwadi	1.00
Ratnagiri	Rajapur	Panhale Valye road	4.20

		Dongar Vilye Padave Sakhar Chavanwadi	3.60
		Aadivare RundheTali	4.30
		Aangle Solye Sutarwadi to Bouddhawadi Phupheri Primary Helth Center	3.50
Ratnagiri	Rajapur	Nanar Mondewadi road	1.20
		Gothiware Karvine Chinchawadi Mahar Shetwadi Sagave road	2.70
		Ozar Khadi Kolvan	2.61
		Tulasavade Jambhavali Solye road	5.00
Ratnagiri		Total	106.20
Thane	Ambarnath	Done Vangni Station to Karav Gharolwadi to MDR-76 Road	3.20
	Kalyan	Kosale To Gerse	1.26
Thane	Bhivandi	SH-81 to Haripada Road	2.80
		SH-82 (Kasne) to Khairpada Road	2.50
		VR-84 Nimbavli to Dhamangaon Road	1.75
		ODR 129 to Thakurpada Road	1.05
		Bharodi Surai Sarang Bhatale Mankoli Road	0.56
		Padgha Bypass Road	1.70
Thane	Murbad	NH222 Dhanivali To Brahmangaon to approach to shirgaon Road	3.95
		VR 100 Masale Fanaswadi & Masale Santwadi	0.70
Thane		Total	19.47
Nagpur	Umred	ODR-260 to Masala road	2.60
		SH-353 to Kalamna Upto (Dist. Border) road	4.31
Nagpur	Umred	SH-353 to Singori road	2.40
Nagpur	Kuhi	Tarna to Virkhandi-Hardoli Road	6.67
		Lanjala-Pipala-Dhanoli-Titur kem Approach road	5.33
Nagpur	Savner	NH-69 to Burujwada - Kodegaon road	4.39
Nagpur	Parshivani	Nayakund to Mehendi road	3.05
		Mehendi to Bakhari road	4.00
Nagpur	Ramtek	Shirpur Bori to SH-338	2.00
		NH-07 to Patgovari Road	3.15
		Ramtek To Kachurwahi Road	7.00
Nagpur	Mauda	Morgaon-Tanda-Mahalgaoon Upto District Border road	3.80
		PavadDouna-Mohadi-Chirva road	9.10
Nagpur	Kamathi	Bhugaon to Jakhegaon Road	3.60

		Babulkheda to Bellori (Hanuman Tekdi) road	1.40
Nagpur	Hingana	Digdoh-Isasani-Vagdhara-Raypur road	4.54
Nagpur	Narkhed	Khairgaon - yerla - Parsodi To Bhishnur Narkhed road	7.08
		Ambada - Banor to Umtha Jamgaon Ranwadi road SH-293 road	9.80
Nagpur	Katol	Aajangaon to Dhawalapur road	2.91
		Savali to Hatla road	3.04
		Borgaon Chikhali Masod road	2.58
Nagpur	Kalmeshwar	Sonpur to Yerangaon road	3.20
		Sawali (Bk) to Dhapewada road	2.50
		Gondkhairi to Kalambi road	6.80
Nagpur	Nagpur	MSH-09- Kalamna to Nimba road	3.00
		Fetri - Chicholi - Khadgaon road	5.00
		Ashti to Paradi Road	2.41
Nagpur		Total	115.66
Chandrapur	Shindewahi	Sindewahi - Indira Nagar - Waneri to Minghari	7.17
Chandrapur	Savali	ODR-71(Nifandra) to Barsagad	2.27
Chandrapur	Nagbhid	ODR-106 to Akapur	2.58
		ODR-126 to Girgaon	4.37
Chandrapur	Warora	VR -60 to Ashti	1.70
		SH-314 (Bhendla) to Poha -Khemjai	6.33
		SH -331 Warora to Marda	5.70
Chandrapur	Rajura	Warur to Sakharwahi	3.25
		SH-372 (Gowari) to MSH-10	4.75
		ODR-29 to Antargaon	2.40
Chandrapur	Gondpimpri	Chak Ghadoli to Bhanarheti	3.60
		SH -369 to Gujar	1.95
Chandrapur	Korapana	MSH-10 (Wasandi) to Kargaon (BK)	5.38
		MDR-15 (Nandgaon) to Jaitapur	6.01
		MSH-10 (Asan) to Kadholi	6.65
Chandrapur		Total	64.11
Wardha	Karanja	MDR-5 To Khapri	4.10
		Linga Mandvi To Pipari	2.50
Wardha	Ashti	Manikwada To Teka Kolha	2.00
		Manikwada To Wadegaon	4.10
Wardha	Arvi	SHW-295 To Mandala	2.00
		Ahirwada To Juna Ahirwada	2.20

		SH-325 Khairi To Saldara	4.10
		SHW-295 To Salfal Sawarkheda	3.42
Wardha	Arvi	Kharangana (Heti) to Nandora	2.91
		Madna to Taluka border	3.06
		MDR-10 to Bori	3.00
Wardha	Devli	Chitki Kawtha (Z) to Kawtha (Rly)	2.40
		SHW-295 Kolona Ghodegaon To Sonora	3.50
		Ganeshpur To Bopapur wani	2.93
		Nandora To Muradgaon	2.20
Wardha	Wardha	Pujai to Yesamba road	4.90
Wardha	Hinganghat	ODR-39 Takali To Kanholi	2.00
Wardha	Selu	NH-361 To MDR-16 Surgaon	4.59
		Morchapur to Yenkapur (Ramana) to SH-321.	5.00
		SH-267 Keli To Kharda	2.53
Wardha	Wardha	NH-361 to Ganeshpur	5.84
Wardha	Hinganghat	ODR-80 To Dorala	2.14
		NH-7 To Shahalangadi	2.02
		SHW-322 To Sultanpur to Umri	2.34
Wardha	Samudrapur	SHW-331 to Mangli Ubda	4.20
Wardha	Samudrapur	Mahagaon To Waigaon Gond	3.21
		NH-7 Ramnagar To Parsodi	2.75
		SHW-326 to Sawarkheda Hiwara	4.71
Wardha		Total	90.65
Bhandara	Tumsar	MDR-6 Bramhantola to Binaki Gonditola Sukali Nakul To Nadighat Road	6.34
Bhandara	Tumsar	Garra - Bagheda To Pawanara Road	4.86
Bhandara	Mohadi	Sitepar To Salebardi Road	5.51
		Dhop To Malinda Road	3.30
Bhandara	Mohadi	S.H.355-jamb To Lohara Road	4.26
		Kardi To Dawdipar Road	4.65
		Kusari to Mandhal Road	4.77
Bhandara	Pavani	Dhamani - Mohari - Bachewadi Road	6.32
Bhandara	Bhandara	N.H. 6 To Bhojapur upto S.H.338 Road	2.47
		Hattidoi - Satona Road	4.16
	Pavani	S.H.355 - Kondha to Somnala (Bu)	2.92
		S.H.354 - Borgaon to Mangali Road	3.73
Bhandara	Lakhandur	Asola-Athali Road	2.43
		Kudegaon - Gawarala Road	3.20
Bhandara	Lakhani	Kolara - Zarap - Ghodezari - Kolari Road	5.70

	Sakoli	N.H.6 To Pathari - Tudmapuri - Khamba - Jambhali District Border Road	4.46
Bhandara	Sakoli	MDR-30 To Umri - Mahalgaon Road	3.10
		N.H.6 To Sakoli-Gadkumbhali- Lawari Road	4.54
Bhandara		Total	76.72
Gadchiroli	Aheri	MSH 09 to Cherapalli Dina Raod	2.65
Gadchiroli	Dhanora	Salebhatti to chawela Road	7.13
Gadchiroli		Total	9.78
Gondia	Aamgaon	SH-335 Kalimati Manekasa Road	2.55
Gondia	Aamgaon	SH-365 Kalimati Katurli Road	2.63
		SH-358 Kakodi Dhobitola Road	2.48
Gondia	Arjuni/ Morgaon	MSH-11 to Kholi Road	4.17
		Chapti to Bortola Road	2.83
		Pushpanagar (B) to Pushpnagar (A) Road	2.57
		ODR-126 (Tukum/Sa) Kanhalgaon Road	2.58
Gondia	Devri	NH-6 to Kumbhartola Road	2.00
		NH-6 to Pitambartola Masulkasa Road	2.22
		SH-358 to Chilhati Tumdikasa Road	2.00
Gondia	Gondia	Nangpura Murri to Shendritola Road	2.24
		SH-335 to Bhagwattola Hiwara Road	2.35
		MDR-09 Chutiya to Rapewada Taluka Border Road	3.95
Gondia	Gondia	Dhakni to Fattepur Road	1.11
		MDR-09 to Lodhitola Road	1.63
		Tedhwa to Marartola Road	1.55
Gondia	Sadak/Arjuni	MSH-11 to Mundharitola Road	1.58
		ODR-89 to Ghatbori (Kohali) Road	1.50
		ODR-84 (Ghategaon) to Sitepar Road	2.16
		MSH-11 (Maneri) to Rakatola Road	1.93
		NH-6 to Khurshipar Road	1.91
		Pathantola to Pipartola Road	2.72
Gondia	Salekasa	Pipariya Gallatola Road	4.09
		Kopalgadh Vicharpur Chandsuraj Road	3.11
		Kotra Sindhitola Road	3.06
Gondia	Tiroda	Khalbanda Karutola to Dawaniwada Road	2.63
		Sarandi Bayewada to Kesalwada Road	4.46
		Koylari to Nandalpar Join Road	1.40
		Mundikota to Chandori to Bagholi Road	1.93

Gondia	Goregaon	Dattamandiar Dongrutola to Satwa Road	2.72
Gondia	Tiroda	Gangla to Khodgaon Road	3.12
		Bhajepar to Khurshipar Road	2.35
		MDR-335 to Malpuri Road	3.03
		Satwa Chichgaon to Bagholi Road	2.02
Gondia		Total	84.58
Ahmednagar	Akole	Rajur to Kokanewadi	4.29
		MDR-17(Manik Ozar) to Kumshet.(Part Ambit Phata to Kumshet)	3.00
		SH-50 to Malegaon Thakarwadi	4.08
		ODR-24 To Katalapur	2.55
Ahmednagar	Jamkhed	Kharda Shukrawar Peth to Gitewadi Chaudhari Gandhaneshwar	4.50
		SH-57 to Satewadi Naygaon	3.10
		SH-57 to Balgavhan	1.30
		Sangavi to Musalmanwasti	2.00
		Tukai Wasti(Halgaon) to Kharat Wadi	1.70
Ahmednagar	Karjat	Karjat to Dhere Mala Rajput Wadi	4.60
		Ganeshwadi Lakshminagar to Bhambora	4.00
		Nimgaon (Gavthan) to Bhairav Nath Vidyalay	1.00
		Therwadi to Mhasobawadi	1.60
Ahmednagar	Ahmednagar	Agadgaon to Mordara	1.30
		Kamargaon to Vitthalwadi	3.30
		Nimgaon Wagha (MDR-01) to Kapsewasti	1.35
		Sarolakasar to Daremala	1.70
		Kaudgaon to Ranhani to Gorewasti Bhendekarwasti	5.54
		Gunawadi to Ralegan	1.10
Ahmednagar	Newasa	Tarwadi to Shirsagar Wasti	1.62
		Ghodhegaon (ODR-321) to Bhingarde Wasti	1.90
		Shingave Tukai to Vidhate Wasti	2.31
Ahmednagar	Newasa	Nagar Aurangabad highway to Kangoni	1.74
		Newasa Bahirwadi Road to Yadavwasti	1.38
		Panaswadi to Jarewasti (Lohgaon Road)	3.00
		Rastapur to hingaldevi	2.04
Ahmednagar	Parner	Mavalewadi to Ghavtewasti	4.00
		Astgaon Dhokati to Amlewasti	2.20
		Jamgaon to Sarola Advai	3.30

		Jamgaon Matha Sathewasti to Lonihaveli	3.33
		SH-58 to Hanumanwadi	2.38
		NH-222 to Dhotre Kh.	3.50
Ahmednagar		Alhanwadi (ODR-90) to Kakadara	2.00
		Manikdaundi to Sonalwadi	2.80
		NH-222 to Pimpalgavhan	2.60
		Hatral to Dhavlewadi	1.70
		Kherda to Hadkewasti	3.50
		Pagori Pimpalgaon to Nagrewast(Gaibi)	3.25
		MDR-33 to Somthane Kh.	2.20
		Shirapur to Lomtewasti Phata Pantaswadi	2.40
Ahmednagar	Rahuri	Umbare to Dagwasti	3.71
		Dhanore to Shindewasti	2.34
		Sankrapur to Landewadi	2.07
Ahmednagar	Rahuri	VR-02 to Kombadwadi Khadakwadi	4.40
		Manori to Ganpatwadi	1.98
		ODR-61 to Trimbakpur	2.50
Ahmednagar	Shrirampur	SH-36 to Dighi Taluka Border	3.00
		Bhokar to Ghumandev	1.50
		Bhokar to Adbangnath	4.50
Ahmednagar	Sangamner	Kauthe Kh. Khandgedara to Sawrgaon Ghule	6.03
		Darewadi to Sakur	2.98
		Chandanpuri to Sirapur	2.61
		Lohare -Sutarmala to Adgaon	1.50
		Talegaon dighe to Ranmala Sayale	2.10
		Maldad to Nimgaon Bojapur (Part Karakhana gat to Gunjalwadi)	1.78
		Satapur Baba to Zarekathi	1.00
		Kanoli to wabale wasti	1.16
		Kanganwadi to Khali	0.99
Ahmednagar	Shrigonda	Nimbavi to Pandavgiri	1.50
		SH-67 to Arangaon Labdewasti	3.40
Ahmednagar	Shrigonda	MDR-56 to Visapur Shindewadi	2.50
		Pimpalgaon Pisa to Vishnuchi wadi	1.50
		Yalapane to gawadewadi	1.80
		Belwandi Kothar to Gayranwasti	1.90
		Ghotvi to Ranmala	2.20
		Ajanuj to malewadi	1.40

Ahmednagar		Total	167.51
Nandurbar	Nandurbar	MSH-8 Thanepada Aakhatwade	8.16
		MDR-19 to Hol Haveli (Dahindule)	3.90
		MSH-8 to Nandarkhe	3.01
		ODR-66 to Amalthe	1.53
Nandurbar	Nandurbar	Kandre Nimbhel to ODR-66	7.00
		Nagaon to ODR 66 (Hol)	5.30
		Junmohida to Hatmohida	2.82
Nandurbar	Nawapur	SH-09 to Kasare	4.53
		ODR-34- Bari to Katwanpada	2.00
		Navagaon to Yaha Mogi Temple	1.83
Nandurbar	Nawapur	MDR-29 to Dogaliphali	2.50
		Rayangan to Kokanipada	2.28
		Jamada-Vasada- to Chikhali	6.45
Nandurbar	Shahada	SH-4 to Kakarda Bk	5.29
		Budighavan to Chikhali KH	3.95
		Wagharde to Titari	4.90
		Sonval to Tarhavad Javde via Borad Akaspur	2.74
Nandurbar		Total	68.19
Dhule	Sakri	MDR 33(Manjari) to Matkutipada to Baripada Road	2.88
		Kuttarmare to Dhavalivihir Road	5.65
		NH-6 to Astane Vijapur Pada Road	2.55
Dhule	Sakri	ODR28 to Tekpada - Abutbara Road	7.56
		Gavhani pada to Malpada Road	3.48
		MDR-35 to Navagaon Road	1.55
Dhule	Shirpur	Arthe Bharwade to Tembhe Road	6.30
		SH-12 to Patharde To Balde Road	4.05
Dhule	Shirpur	Godi to Thalner Road	7.59
		MDR-12 to Ajnad Road	3.50
Dhule	Shirpur	ODR-38(chadse) to wadi Road	2.45
		Vikhran To Bhampur Road	4.06
		N.H.3 to Pimpri aadhe Road	1.77
		Hadakhed to Hingonilauki Road	4.01
Dhule	Shindkheda	Dhavade to SH-6 to Zirave Road	1.32
		Bamhane to Nave Kolade Road	3.81
Dhule	Shindkheda	SH-12 to Parasmal Road	1.06
		Khalane to MDR-14 to Vitai Road	4.80

		NH-3 to Pimperkheda Road	1.30
		SH-12 to Darkheda Road	1.21
Dhule		Total	70.90
Jalgaon	Bhadgaon	Kanashi Lon Ghusardi kh.Road	3.81
		Batsar to Nave Batsar	1.95
Jalgaon	Bhusaval	Varangao to Daryapur Road	1.99
		Jogalkheda Nave to Bharkheda Road	0.99
Jalgaon	Bhusaval	MDR27-to Jaogalkhori Road	2.00
Jalgaon	Bodhwad	SH-270 to Chinchakheda Road	6.40
Jalgaon	Dharangaon	MDR -57 to Khamkheda Road	2.49
		Sarve kh.to Bhone (Taluka .Broder)Road	2.74
		MDR -52 to Pimpri Road	2.00
		MDR- 58 to Bhamardi Road	6.03
Jalgaon	Erandol	Tade to Nipane to Aanand Nagar Tanda	3.57
		Tade to S.H- 25 to Nandkhurd v Nandkhurd Bk Road .	2.49
		Kasoda-Farkande Fata to Farkande Road	3.18
Jalgaon	Jamner	MDR -29 to Shelgaon Road	3.81
		S.H - 46 to Khumbhari Bk.	3.22
		MDR-05 to Bhagdara (Shahapur)Road	4.04
Jalgaon	Pachora	SH-39 (Khajola) to Pimpri BK.Road	2.22
		Samner to Gulabwadi Road	4.05
		SH-19 Lohari BK. Lohari Kh.Wanegaon Road	3.03
		Lohara (MDR29) to Tapeswar Road	2.05
		Galan bk.Balad bk.	4.67
		SH-40 to Veruli Road	3.33
Jalgaon	Parola	Parola to Wanjari Kh.Road	1.56
		S.H 01 to Bodarde Road	1.60
		Dholi Velhane to Karmad BK.Road	3.24
		Morfal to Palaskheda Sim to Nagav Road	4.06
Jalgaon	Parola	N.H-06 to Sangavi Vitner Road	0.90
		NH-marg (Sarva to Bahute) Road	2.85
Jalgaon	Raver	S.H-04 Khanapur -Nirul -Padla Bk. To District Broder Road	5.34
		Khirdi Kh.to Rembhote to Ajande Road	4.56
		Yenpur -Sulwadi to Koloda Road	4.80
Jalgaon	Yaval	Savkheda Sim to Gyaran Road	3.32
		SH-04 to Shirsad to Pilode Road	5.00

Jalgaon		Total	107.29
Nashik	Malegaon	ODR-128 to Pole Factory road	3.70
Nashik	Malegaon	MDR-93 to Pawarwadi road	0.72
		MSH-8 to Nilgavhan road	1.56
Nashik	Malegaon	MDR-54 to Saatmane road	2.20
		MDR-62 to Zadewasti road	6.80
		MDR-97 to Chinchgavhan road	2.40
		MDR-97 to Machipada road	5.60
Nashik	Nashik	MDR 36 To Valmik Nagar road	0.70
		Pimpri saiyyad To Kisannagar road	3.00
		ODR 119 To Ramshej road	1.94
		Dari To Chaloskarwasti road	1.77
		MSH 2 To Godse wasti road	0.98
		MDR 26 To Karanjkar Wasti road	1.45
		Vinchur Gavli To MSH 2 road	1.97
Nashik	Nandgaon	ODR-155 to Babhulwadi road	2.40
		Vanjarwadi to Jadhavwasti road	2.50
		SH-24 to Shastrinagar road	2.01
		SH-24 to Hirenagar road	4.10
		Bhoyegaon to Naikwadi road	5.80
		Jaamdari to charantanda road	1.00
		Borale to Aamode road	3.10
Nashik	Niphad	MDR-27 to Berwadi road	2.24
		MSH-02 to Gondegaon road	1.85
		NH-03 to Nipaani Mala road	1.00
		MSH-02 to Darna Sangvi road	2.20
		MSH-02 to Shimpi Taakli road	1.90
		MSH-02 to Lalpadi road	2.19
		MSH-02 (Niphad) to Jalgaon, Kathargaon, Kuradgaon, Karanjgaon to Bhendali road	4.90
		SH-27 (Nandur Madhmeshwar) to Sarolethadi road	1.50
Nashik	Peth	MSH 2 (Peth) To Behedmal , Jambhulmal road	6.90
Nashik	Sinner	SH-37 (Chincholi) to Nashik Sugar Factory road	2.80
		SH-37 (Vinchur Dalvi) to Lahvit (Hodala) road	1.20
		MDR-28 (Sinner rural) to Maparwadi-Bhairavnath mandir road	1.55
		Sonambe to Aadwadi road	1.92

		SH-27 (Nimgaon) to Sinner Tal. Hadh (Bhendhali) road	2.60
Nashik	Sinner	SH-35 (Komalwadi) to Gangaalwadi road	4.90
		ODR-167 (Nirhale) to Gulapur road	1.55
		ODR-167 (Nirhale) to Yadavwasti road	2.52
		SH-50 (Dodi Bhu.) to Thakarwadi road	2.50
Nashik		Total	101.92
Satara	Khatav	Garawdi to pasuchamala diskal road	1.00
		MDR 38 to Loni Road	2.00
		SH 147 bhosre to Dikanwadi Kokrale (part SH 147 to Kokrale Road)	2.00
Satara	Khatav	MDR 45 Vikhale to Autadwadi Road	3.15
		SH 143 to Taraswadi to garudi road	2.15
		MDR 35 to Thorwewadi Road	1.60
		MDR 38 to Dhakatwadi Road	2.50
		SH 146 to Satewadi manewadi Road	1.30
Satara	Maan	Shindi Khurd to Matt wasti Khandyachi Wadi Gardachiwadi Road	4.00
		SH-139 to Sastesar Wasti Road	1.50
		MDR-47 to Dadaswada Road	2.40
		Bijawadi To Limb Khor Road	1.48
		Bijwadi (SH-60) to Jagdale wasti Pachwad Road	2.40
Satara	Mahabaleshwar	MDR-17 to Zhanzwad Road	1.51
		SH-139 (Dhandekar) to Godavali Road	2.04
Satara	Patan	TR-02 to Nadoli Road	2.30
		TR-06 (Divshi Bk.) to Marul Haveli Road	3.60
		TR-3 to Nawadi Road	1.52
		Mandure to Nivkane Road	1.65
		TR-11 to Varpewadi Road	2.00
Satara	Khandala	Karnwadi to Zhagalwadi Road	3.20
		MDR-3 to Sukhed Road	2.23
		SH-131 to Wathar Road	1.50
		NH-4 to Dhangerwadi Road	1.70
Satara	Phaltan	MSH-15 to Ambemala Road	2.00
		MSH-15 to Parhar Kh. Road	2.60
		MDR-7 to Sathe Road	2.13
Satara	Satara	SH-140 to Bhramhanwadi Road	1.32
		SH-140 Kodaoali to Pandharwadi	2.53
		MDR 29 to Morewadi Road	5.18

		NH 4 to Valse Road	1.20
		MDR 37 (Nagthane) to Harpalwadi Road	3.19
Satara	Karad	Ond to Ondoshi Road	3.65
		Yelgaon to Shewalwadi Road	1.73
		Kole to Ambawde (Harijanwasti) Road	2.45
		Umbraj to Godwadi to Andharwadi Road	2.20
Satara		Total	80.90
Kolhapur	Ajara	MDR 58 to Harapavade road	3.02
		Honyali to Kardewadi road	1.20
		MDR 2 to Bhadavanwadi road	1.73
Kolhapur	Chandgad	MDR -68 te Dhekoliwadi road	3.00
		MDR -61 te Jakhanhatti road	4.80
		MDR -76 to Jelugade road	1.28
		SH-180 to Tawarewadi Dist. Kolhapur	1.43
		MDR 60 to Dhamapur road	2.37
Kolhapur	Gadhinglaj	SH 189 (Mahagaon) to Kamatwadi	1.80
		SH 188 to Nandapachivadi road	1.30
		ODR-200 to Dholgarwadi (Dhole vasahat) road.	2.60
		SH 189 to Desaiwadi road.	2.00
Kolhapur	Gaganbawada	SH 177 to Sangashi road	0.50
		SH 177 to Kirave road	0.50
		MDR-24 to Harijanwada road	1.25
Kolhapur	Gaganbawada	MDR39 to Nareweli road.	0.75
		SH177 to Tekawadi(Tisangi) road.	0.80
		MDR24 to Ambewadi (Kode Bk)road.	1.43
Kolhapur	Radhanagari	ODR 61 to Majgaon road	2.33
Kolhapur	Shahuwadi	SH 150 Girgaon to Dhanagarawadi road	6.10
Kolhapur	Shirol	SH 200 Shirdhon to Malbhag road	1.00
		SH 195 Abdullat to Indira Vasahat.	0.98
		MDR-32 Ghosarwad to Kallamawadi road	0.60
		SH 153 Terwad to Gangapur, Ganeshnagar Vasahat road.	1.20
		MDR 33 June Danwad to LaxminMandir road	1.70
		ODR 44 Nandani to Chougule mala road.	2.20
Kolhapur	Bhudargad	SH 155 to Navarasawadi road	1.48
		SH 189 to Bamane road	1.30
		SH -189 to Aambavne road	2.05
		Waghapur to Guravwadi road .	1.20

		Barave to Ingalewadi road	2.10
		Kelewadi to Bhandibhamba road	1.98
Kolhapur		Total	57.96
Sangli	Aatpadi	Shetphale to Rantab Patil Mala	3.40
		VR 101(Lingivare) to Mahadikwadi	1.30
		MDR-53(Rajewadi) to Dhole Mala	2.80
		SH-153 to ranmala	3.00
Sangli	Aatpadi	Vibhutwadi to Kurandwadi	4.70
		Bombewadi to Lonarwadi	5.20
Sangli	Jat	L-339 (Shegaon) to Chapraswasti	2.40
		T-13(Revnal) to Revnal	4.26
		L306-(Bevanur) to Shinde Kalwal mala	3.16
		T-09(Jirgyal) to Shelkewasti	1.40
		T-01(Daphalapur) to Jaighawan	3.19
Sangli	Jat	T-04(K.Bobalad) to Lamantanda wasti	3.56
		T-18 (JadarBoblad) to Birajardumdongwasti	4.45
		T-04(Sankh) to Bajantriwasti	3.30
		L-14(Balgaon) to Jiginni wasti	4.05
Sangli	Kadegaon	Hingangaon(Bk) to Nandninagar	2.80
		Shirasgaon to Kumbharwasi (Mhasobadevalay)	2.05
		Asad to Padukawasti	1.70
		Hingangaon(kh) to Jadhavmala	2.04
Sangli		Ghogaon to JunaGhogaon	3.20
		Bambawade to Suryavanshiwadi	1.40
		Andhali to Kuranmala	1.60
Sangli	Shirala	TR-3(Kandur) to Patilwasti	1.64
		T-09SH 158(Takave) to Yelwi Wasti	1.00
		Bhatshirgaon to Satalewadi	2.10
		T03 Sagaon to Ralewasti	1.02
		T08 Aundhi to Durundewadi	0.83
		P.T.Varun to Kholewasti	1.40
		T05 P.T. varun to Dafalewadi	1.75
		T02 SH-150 (Bilashi Malwadi Road) to Dhaswadi	1.80
Sangli	Tasgaon	Siddhewadi to Madhavan Wasti	1.40
		Ped to Vithumala	3.20
		Manjadre to Kharademala	2.90
		Dahiwadi to Devkar,chavan ,sutar wasti	2.34
		Aravade to Waghwasti	1.65

		Savalaj to Sonarkimala	1.30
		Bastawade to Parekarwasti	1.65
		Dhawali to Zirvalmala	2.00
Sangli		Total	92.93
Solapur	Akkalkot	TR-7 to Kallahipparga	3.90
		TR-15 to Badole (kh)	2.20
		TR-2 to Mamdabad	2.00
		Gholasgaon to Zopadpatti	2.40
Solapur	Barshi	Ghari to Pathari	2.45
		TR-18 to Borgaon (kh)	1.90
		TR-3 (Kari) to Nariwadi	4.95
		TR-9 to Sarjapur	1.25
Solapur	Karmala	Dhokari to Mangwadewasti (Bitargaon)	1.20
		Dhokari to Sangavewasti (Bitargaon)	2.10
		Kandar to Dhadaswasti	1.30
		Kandar to Jahagirdarwasti	1.30
		TR-9 (Wangi1) to Mahindra Patilwasti Bitargaon	4.00
		Chikhalthan to Markadwasti	2.20
Solapur	Madha	Upalai (Bk) to Mhasobawadi	3.52
		Kevad to Chavanwadi	2.50
		Tulashi to Hanumanwadi	3.50
		Rui to Jadhavwasti	1.50
		Ghoti to Kanhapuri (Block Border)	2.00
Solapur	Malshiras	Kothale to Mungighat	1.50
Solapur		Dharmapuri to Kacharewadi	2.15
		Pimpri to Shindewasti Sai Mandir	2.55
		Londhe Mohitewadi to Potekarwasti Sonmala	1.90
		Fondshiras to Bodarewasti, Devkarwasti	3.50
Solapur	Mangalvedha	Arali to Chavanwasti	3.75
		Khomnal to Hivargaon	2.00
		Uchhethan to Jagtapwasti	2.00
		Marwade to Masalwasti	2.00
Solapur	Mohol	Kuranwadi to Thite Jagtapwasti	2.00
		Diksal to Somsidheshwarwasti	3.00
		Anagar to Karbhariwasti	3.50
		Ashti to Chavan Vyavharewasti	3.20
Solapur	North Solapur	Kondi to Akolakati to Sawantwadi	10.00
Solapur	Pandharpur	Fulchincholi to Patilwasti (Pohargaon Road)	2.50

		Wadi Kuroli to Patilwasti	1.30
		Khardi to Patilwasti	1.00
		Bhalwani to Shendagewadi	3.50
		Kasegaon to Kachkalwasti - Siddheshwarwasti-Gul Factory (L-47)	4.00
Solapur	Sangola	Junoni to Bendwasti	2.00
		(TR-5) Udanwadi to Zapachiwadi	2.50
		Hatkar Mangewadi to Rajagewasti	4.00
		Hatid to Shimpiwasti	3.00
Solapur	South Solapur	Kandalgaon to Kambalewasti	3.50
		Mandrup to Shastriwasti	4.00
		Bhandarkawathe to Sangmeshwar Nagar	4.00
Solapur		Total	124.52
Pune	Ambegaon	NH-50 Londhemala road	2.38
		SH-129 Chincholi to Thakarwadi road	4.48
		NH-50 Manipur Sondemala road	2.27
		MDR-21 Javle Laygude wasti road	2.25
		MDR-13 Nirgudsir to Cholicmala road	2.64
		ODR-39 Bhagdi to Jadhavwadi road	4.90
		MDR-21 (Khadki) to Bhormala road	0.80
		Manchar Ganjalewasti road	1.00
Pune	Haveli	SH-133 to Kolhewadi road	0.70
		MDR-136 Holkarwadi to Zhambdewadi road	1.10
		SH-115 Bahuli to Potewadi road	0.50
		SH-132 Gorhe khu. Zhalnewadi road	1.00
		SH-131 to Antule Nagar (Pisoli) road	1.00
		SH-126 to Gujar Nimbalkarwadi road	2.00
		SH-09 Urulikanchan to Tupewasti road	1.00
		MDR-29 Nhavi Sandas to Shitolewasti road	2.10
		SH-09 Kunjirwadi to Kharwade wasti road	1.00
		SH-68 Shirsvadi to Nagavde wasti road	1.35
		Sartopwadi to Gunjal mala road	1.00
Pune	Maval	ODR-61 to Karwandwadi road	1.63
		MDR-105 to Sawantwasti road	1.13
		MDR-88 to Ghardale wasti Road	1.03
		Bebadhol to Dhamane Road	2.59
		Pachane to Khilarewasti Road	2.75
		Kusgaon to Shadagewasti Road	2.30

		Nigade to Shirewasti Road	4.52
Pune	Nbaramati	Parvadi to Shipkulewasti road	1.90
		ODR-183 (Kurnewadi) to Khalatewasti Pinglewasti road	1.25
		Anjangaon to Barvkarwasti road	2.35
		MDR-70 (Chopdaj) to Malimala Rasalmala Nimbalkarmala Salunkhemala road	3.35
		Wanevadi to Jagtapwasti Malshi road	2.10
		MDR-31 to Atolewasti road	1.72
Pune	Indapur	NH-09 to Kachrewasti road	2.83
		SH-124 (Walchandnagar) to Jamdade wasti road	1.75
		SH-54 (Lamjewadi) to wablewasti road	2.72
		ODR-195 Sapkalwadi to ODR-202 Sarkwasti road	1.55
Pune	Junnar	SH-129 to Khilarwadi road	1.43
		MDR-1 to Muktai Mandir Road	1.89
		MDR-9 to Bhavani nagar road	2.32
		ODR-111 to Sarni road	1.99
		SH-128 to Lauki road	2.44
		SH-128 to Bhorwadi road	2.06
Pune	Khed	Koyali Tarfe Chakan to Dongarewasti road	2.50
		MDR-17 to Thopatwadi road	1.75
		MDR-17 to Balshingwadi road	1.75
		MDR-16 to Sawantwadi road	2.00
Pune	Mulshi	MDR-26 to Chikhalgaon road	1.15
		MDR-32 to Nandiwali Vadbathar road	1.38
		MDR-27 Kagurmal road	0.80
		SH- 130 to Dhumalwadi Devkarwadi road	1.13
		MDR-26 to Tikdewadi road	1.50
		MDR-109 to Kemsewadi road	0.88
		MDR-27 to Dighewadi Dhangarwasti road	6.01
		MDR-32 to Kondhar Gorewasti Katkariwasti road	4.06
Pune	Shirur	MDR-23 Chandoh to Panmandmala road	2.50
		MDR-51 Ganegaon Khalsa to Padmawati road	3.20
		SH-117 Mukhai to Inamdar wasti road	2.00
		Kathapur khu. To Verumala road	2.13
Pune	Bhor	Kari to Gholeavad road	4.00
		MDR-47 to Thoptevadi road	1.00

	Velha	SH-132 to Bhabwade road	1.00
		MDR-141 to Kurtwadi road	1.17
		SH-106 to Katurdewasti road	0.90
		ODR -74 to Padalwadi road	0.50
		VR-56 to Nalwat road	2.50
Pune	Velha	Barshimal to Shenwad road	2.40
		Asani Damguda to Malekarwasti road	1.06
Pune		Total	132.28
Maharashtra		Total	2,965.07

Appendix-2

List of bridges under the Maharashtra RCIP Additional Financing.

Sr. No.	District	Block	Name of Road with Bridge Chainage	Length of Bridge (m)
NASHIK REGION				
1	Ahmednagar	Pathardi	1)Construction & 5 year Maintenance of submersible bridge on Yeli Kolsangavi to Somthane Nalwade Road @ Ch 2/690 Tal.-Pathardi Dist.- Ahmednagar	30
2		Shevgan	2)Construction & 5 year Maintenance of submersible bridge across Khatkali River on Mungi to Pingewadi (MDR 30) Road @ Ch 2/740 Tal.- Shevgaon Dist.- Ahmednagar	60
3		Pathardi	3)Construction & 5 year Maintenance of submersible bridge across Nanni river on Tisgaon to chichondi Road @ Ch 4/050 Tal.-Pathardi Dist.- Ahmednagar	70
4		Shevgan	4)Construction & 5 year Maintenance of submersible bridge across Dhora River on Bhatkudgaon to Shahajapur Road (Part- Lolegaon- wadule bk Shahajapur @ Ch 7/400 Tal.-Shevgaon Dist.- Ahmednagar	70
5		Parner	1)Construction & 5 year Maintenance of Submersible Bridge across Nalla on Renawadi to Nighoj Road @ Ch. 5/600 Tal.Parner Dist. Ahmednagar	12
6		Rahuri	2)Construction & 5 year Maintenance of Bridge across Canal on Pimpalgaon Funagi to Guha Road @ Ch. 4/860 Tal. Rahuri Dist. Ahmednagar	10
7		Rahuri	3)Construction & 5 year Maintenance of submersible bridge on MSH-08 To Deshwandi, kondhwad, Shilegaon, Kendal, pimpri valan To Taluka Border Road @ Ch 12/450 Tal- Rahuri Dist.- Ahmednagar	36
7	Ahmednagar		Total	288
1	Dhule	Sakri	1)Construction of Bridge @ Ch. 9/822 on Dusane to Fofade to Aakhade to Vasdara Road	60
2			2)Construction of Bridge @ Ch. 4/635 on Agarpada to Balsane to Karle Road	100
3		Sakri	1)Construction of Bridge @ Ch. 0/100 on Sakri - Bhadane to Nanvan to Behed Road	100
4			2)Construction of Bridge @ Ch. 6/680 on NH-06 to Mahir to Tembhe Road	24
5		Dhule	1)Construction of Bridge @ Ch. 9/800 on NH-211 to Mordad Tandna (Road	80
6			2)Construction of Bridge @ Ch. 4/100 on Borkund to Nane Road	80
7		Shirpur	1)Construction of Bridge @ Ch. 7/300 on MDR-1 to Gurhadpada Road	40
8		Shindkheda	1)Construction of Bridge @ Ch. 4/620 on MSH-1 to Methi to Kharde Road	18
9			2)Construction of Bridge @ Ch. 0/295 on Rohane to Chimthaval Road	30

10			3)Construction of Bridge @ Ch. 2/070 on SH-10 to Rudane Road	21
11			4)Construction of Bridge @ Ch. 2/610 on SH-10 to Rudane Road	14
12			5)Construction of Bridge @ Ch. 7/290 on SH-10 to Rudane Road	21
12	Dhule		Total	588
1	JALGAON	Dharangaon	1.Constructing a Submersible Bridge on MDR-57 Dhar to Chorgaon Road (TR-03), Taluka - Dharangaon, District -	20
2		Dharangaon	2.Constructing a Submersible Bridge on MDR-57 Dhar to Chorgaon Road (TR-03), Taluka - Dharangaon, District -	20
3			3.Constructing a Submersible Bridge on MDR-57 Dhar to Chorgaon Road (TR-03), Taluka - Dharangaon, District -	15
4			4.Constructing a Submersible Bridge on MDR-57 to Pathrad - Vanjari - Khapati to Borkheda Road, (MRL-02) , Near Borkheda Village, Taluka - Dharangaon, District - Jalgaon.	20
5		Jalgaon	5.Upgradation of NH-06 to Tarsod road. Km 0/000 to3/420. Tal- Jalgaon. Dist- Jalgaon.	25
6		Jalgaon	6.Upgradation of Bilkheda to Balwadi road. KM 0/000 to 1/400.Tal- Jalgaon. Dist- Jalgaon.	25
7		BODWAD	1.Constructing a Submersible Bridge on SH-46 (Bodwad) to shelwad - Waki Road (TR- 09), At K.M. 0/900, Taluka - Bodwad, District - Jalgaon.	25
8		RAVER	2.Constructing a Submersible Bridge on SH-04 (Raver) to Bhor - Punkheda - Patondi - Therola - Dhurkheda Road (TR-07), At K.M. 2/120, Taluka - Raver, District - Jalgaon.	98
9		YAWAL	3.Construction of Submersible Bridge on SH-04 (Sangavi Bk) to Satod - Kolwad - Asarbari Road (TR-13), At K.M. 0/200, Taluka - Yawal, District - Jalgaon.	36
10		YAWAL	4.Construction of Submersible Bridge on SH-04 (Sangavi Bk) to Satod - Kolwad - Asarbari Road (TR-13), At K.M. 2/150, Taluka - Yawal, District - Jalgaon.	24
11		JAMNER	1.Constructing a Submersible Bridge on SH-42 to Savatkhedha Road (MRL-24), At K.M. 2/320, Taluka - Jamner, District - Jalgaon.	120
12			2.Constructing a Submersible Bridge on MDR-29 to Shelgaon Road, at CH. 0/350, Near Shelgaon Village, Taluka - Jamner, District - Jalgaon.	120
13		PACHORA	1.Constructing a Submersible Bridge on SH-19 to Lohtar - Galan (Bk) - Chinchole - Nagardeola - Khajola - Sarve (Bk) - Taluka Border, (TR-09) at CH. 22/860, Across Gadad River Near Khajola Village, Taluka - Pachora, District - Jalgaon.	70
14		JAMNER	2.Constructing a Submersible Bridge on NH-05 to Chinchkheda tarfe wakadi	15

15			3.Constructing a Submersible Bridge on NH-05 to Chinchkheda tarfe wakadi	60
16		JAMNER	4.Constructing a Submersible Bridge on SH-46 to Godhri Road, (MRL-10), Near Godhri	25
17			5.Constructing a Submersible Bridge on SH-46 to Godhri Road, (MRL-10), Near Godhri	20
18		CHOPDA	1.Constructing a Submersible Bridge on SH-04 to Malkheda- Shendani Road, Taluka - Chopda, District - Jalgaon.	15
19			2.Constructing a Submersible Bridge on SH-04 to Malkheda- Shendani Road, Taluka - Chopda, District - Jalgaon.	25
20			3.Constructing a Submersible Bridge on SH-04 to Malkheda- Shendani Road, Taluka - Chopda, District - Jalgaon.	15
20	JALGAON		Total	793
1	Nandurbar	Taloda	1.Construction of Bridge @ Ch. 8/370 km on Chinode,Pratappur siligpur To Karade To Tuleja Road (TR-05)	80
2		Akrani	2.Construction of Bridge @ Ch. 2/040 km on SH-08 To Goriya Road (TR-16)	77
3		Akrani	3.Construction of Bridge @ Ch. 2/890 km on ODR-45 to Asali,Ramsalla Road (MRL-62)	48
4		Shahada	1.Construction of Bridge @ Ch. 0/315 km on Vadali to Kakarada Road (MRL-09)	35
5		Shahada	2.Construction of Bridge @ Ch. 2/360 km on Shrikhed to Bhortek Road (LR-29)	90
6		Akkalkuwa	1.Construction of Bridge @ Ch. 0/725 km on Kakadkunt to Ranzani Road (MRL-18)	90
7		Akkalkuwa	1.Construction of Bridge @ Ch. 1/630 km on SH-03 To Itwai Road (LR-04)	126
8		Navapur	1.Construction of Bridge @ Ch. 3/870 km on SH-09 Devalipada ,Parkoti ,Sonare to Dugali Road (TR-15)	48
8	Nandurbar		Total	594
1	Nashik	BAGLAN	1.Constructing a Submersible Bridge on SH-27 (Aaskheda) to Waghale - Shripurwade - Wade - Tingri - Hindalbari Road, (TR-7) at CH. 8/310, Taluka - Baglan, District - Nashik.	25
2		BAGLAN	2.Constructing a Submersible Bridge on SH-27 (Aaskheda) to Waghale - Shripurwade - Wade - Tingri - Hindalbari Road, (TR-7) at CH. 10/110, Taluka - Baglan, District - Nashik.	30
3		KALWAN	3.Constructing a Submersible Bridge on SH-07 (Daregaon) to Deolivani - Tirhal (Bk) Road, (TR-18) at CH. 11/570, Taluka - Kalwan, District - Nashik.	25
4		CHANDWAD	1.Constructing a Submersible Bridge on NH-03 (Mangrul) to Bharvir - Talwade - Chinchole - Shirsane - Narayangaon - Jopul Road, (TR-18) at CH. 7/750, Taluka - Chandwad, District - Nashik.	36
5		MALEGAON	2.Constructing a Submersible Bridge on SH-10 to Kaulane - Astane - Jalku - Sayane Road, (TR-11) at CH. 8/200, Taluka - Malegaon, District - Nashik.	70

6		MALEGAON	3.Constructing a Submersible Bridge on MSH-08 (Khakurdi) to Mordar Road, (L-93) at CH. 5/500, Near Mordar Village, Taluka - Malegaon, District - Nashik.	40
7		NANDGAON	1.Constructing a Submersible Bridge on SH-25 (Sakora) to Chandore - Rankheda Road, (TR-10) at CH. 4/750, Across Manyad River, Near Chandori Village, Taluka - Nandgaon, District - Nashik.	100
8		NANDGAON	2.Constructing a Submersible Bridge on SH-24 (Hiswal) to Gadarewadi - Kondhar - Nandur Road, (TR-14) at CH. 3/750, Across Panjhan River, Near Nandur Village, Taluka - Nandgaon, District - Nashik.	80
8	Nashik		Total	406
TOATL BRIDGES		55		2669
NAGPUR REGION				
1	Bhandara	Tumsar	Construction of Submersible Bridge in Km. 0/676 on SH-337 To Lendezari- Khapa- Rongha Road.	20
2	Bhandara	Tumsar	Construction of Submersible Bridge in Km. 2/814 on SH-337 To Lendezari- Khapa- Rongha Road.	25
3	Bhandara	Tumsar	Construction of Submersible Bridge in Km. 1/250 on SH-355 Dongarla To Navargaon Road	30
4	Bhandara	Tumsar	Construction of Submersible Bridge in Km. 1/00 on SH-355 Kharbi To Panjara- Mandhal Road	15
5	Bhandara	Pauni	Construction of Submersible Bridge in Km. 3/580 on SH-355 To Singori- Rohna- Selari Upto MDR-36 Road	40
6	Bhandara	Lakhani	Construction of Submersible Bridge in Km. 9/750 on SH-361 Kaneri To Kesalwada- Rengola- Mangali-Kitadi Road	28
7	Bhandara	Sakoli	Construction of Submersible Bridge in Km. 3/940 on NH-06 To Kumbhali- Mohghata Road	100
8	Bhandara	Sakoli	Construction of Submersible Bridge in Km. 6/400 on Mundipar- Kitadi- Baradkinhi- Girola- Bonde Road	120
9	Bhandara	Sakoli	Construction of Submersible Bridge in Km. 3/750 on NH-06 To Sakoli- Gadkumbhali- Lawari Road	80
9	Bhandara		Total	458
1	Chandrapur	Korpana	Construction of Major Bridge on @ 3/090 Awalpur to Kawathala Village (S.H 373)	40
2	Chandrapur	Korpana	Construction of Major Bridge on @ 3/460 Awalpur to Kawathala Village (S.H 373)	50
3	Chandrapur	Gondpipari	Construction of Major Bridge On @ 1/027 SH-369 (Heti Somanpalli) to Chiwanda	90
4	Chandrapur	Chimur	Construction of Major Bridge On @ 5/780 Neri to Wagheda Road	120
5	Chandrapur	Chimur	Construction of Major Bridge @ 9/480 On SH-322 Neri to MDR-26 Motegaon Road	20
7	Chandrapur	Warora	Construction of Major Bridge @ 7/800 on SH-331 Temurda to Kem	24
6	Chandrapur	Bramhapuri	Construction of Bridge @ 5/200 on SH-322 (Wandra) to Mendki	51
8	Chandrapur	Bramhapuri	Construction of Major Bridge @0/500 on SH-322 to Chitakbodra,	30

9	Chandrapur	Bramhapuri	Construction of Major Bridge @0/850 on SH-322 to Chitakbodra	30
9	Chandrapur		Total	455
1	Gadchiroli	Dhanora	Construction of Bridge at Ch. 1/400 & ch.2/450 on SH 378 to Sakhera to ushirpar Road(Extra % - 20%)	16
2	Gadchiroli	Armori	Construction of Bridge at Ch. 1/700 on SH 363 Jogisakhera Rampur Kaneri Road(Extra % - 10%)	64
2	Gadchiroli		Total	80
1	Gondia	Amgaon	Construction of Submersible Bridge in Km. 2/200 on Fukkitmeta To Makkatola Road	40
2	Gondia	Arjuni Morgaon	Construction of Submersible Bridge in Km. 1/600 on Pushpanagar (A) To Pushpanagar (B) Road	80
3	Gondia	Deori	Construction of Submersible Bridge in Km. 3/500 on ODR-110 Herpar- Istari- Gujarbadga Road	18
4	Gondia	Goregaon	Construction of Submersible Bridge in Km. 3/112 on MSH-11 To Hirdamali- Mohgaon- Boritola Road	20
5	Gondia	Sadak Arjuni	Construction of Submersible Bridge in Km. 0/080 on MDR-39 Bhoyartola To Bakkitola Road	35
6	Gondia	Sadak Arjuni	Construction of Submersible Bridge in Km. 3/200 on MSH-11 (Palasgaon) To Murpar Ram Road.	35
7	Gondia	Sadak Arjuni	Construction of Submersible Bridge in Km. 6/400 on MSH-11 (Dawwa) To Ghoti- Ghategaon- Mundipar Road	70
8	Gondia	Sadak Arjuni	Construction of Submersible Bridge in Km. 3/655 on MSH-11 Wadegaon- Mahuli Road	60
9	Gondia	Sadak Arjuni	Construction of Submersible Bridge in Km. 1/850 on Khajari To Girola Road	60
10	Gondia	Sadak Arjuni	Construction of Submersible Bridge in Km. 3/700 on Khajari To Girola Road	60
11	Gondia	Tirora	Construction of Submersible Bridge in Km. 2/183 on Tirora- Kawalewada- Marartola- Karti (Bj.) Road	20
12	Gondia	Tirora	Construction of Submersible Bridge in Km.0/787 on MDR-01 Malhi To Navezari Road	50
12	Gondia		Total	548
1	Nagpur	Kamptee	Construction of Submersible Bridge in Km. 3/500 on MDR-40 (Lonkhairy To SH-346 (Tandulwani) Road	28
2	Nagpur	Katol	Construction of Submersible Bridge in Km. 0/585 on SH-335 To Mukani Road	70
3	Nagpur	Hingna	Construction of Submersible Bridge in Km. 0/050 on NH-07 To Kinhi Road	100
3	Nagpur		Total	198
1	Wardha	Arvi	Construction of Bridge at Ch.6/000 on SH - 323 (Choramba) to Sukali	18
2	Wardha	Arvi	Construction of Bridge at Ch. 0/500 on Sh - 325 Parsodi to SH - 323 Kinhala.(Skew - 39)	18
3	Wardha	Arvi	Construction of Bridge at Ch. 7/200 on Sh - 325 Parsodi to Sh - 323 Kinhala(Skew - 39 %)	18
4	Wardha	Ashti	Construction of Bridge at Ch. 4/210 on Kinhala to Petahamadpur Road(skew 56)	21

5	Wardha	Ashti	Construction of Bridge at Ch. 1/480 on Kinhala to Petahamadpur Road	18
6	Wardha	Ashti	Construction of Bridge at Ch. 0/710 on Kinhala to Chincholi	21
7	Wardha	Deoli	Construction of Bridge @ in Km.- 8/110 on MDR-12 to Anji Sati Road	36
8	Wardha	Deoli	Construction of Bridge @ in Km.- 6/700 on Vijaygopal To Sawangi - Yende Road	18
9	Wardha	Deoli	Construction of Bridge @ in Km.1/800 On Kolona - Ghodegaon Road	18
10	Wardha	Hinganghat	Construction of Minor Bridge In Km. 8/550 ON ODR- 37 - Khangaon to Sati (T.B.) Road	20
11	Wardha	Hinganghat	Construction of Minor Bridge @ Ch.0/625 on Dhiwari Pipri To Sawangi Road (LR- 54)	21
12	Wardha	Karanja	Construction of Bridge @ in Km. - 1/850 on ODR-86 To Linga Mandvi Road	77
13	Wardha	Karanja	Construction of Bridge at Ch.4/080 on Borgaon G to Susund Heti.	28
14	Wardha	Samudrapur	Construction of Bridge @ in Km. -4/210 On Babapur - Sakurli Road	88
15	Wardha	Samudrapur	Construction of Bridge @ in Km. -7/625 On Babapur - Sakurli Road	90
16	Wardha	Samudrapur	Construction of Minor Bridge @ Ch.8/750 on SH-326 (Samudrapur) To SH-322 (Umari) Road	20
17	Wardha	Samudrapur	Construction of Minor Bridge @ Ch9/695 on SH-326 (Samudrapur) To SH-322 (Umari) Road	24
18	Wardha	Seloo	Construction of Minor Bridge In Km-0/250 on MDR-16 To Antargaon Road	21
19	Wardha	Wardha	Construction of Bridge In Km- 1/100 on SH-267 to Dorli Dhulwa road.	70
19	Wardha		Total	645
TOATL BRIDGES		54		2384
AURANGABD REGION				
1	Aurangabad	Gangapur	Consruction & 5 year Maintaince Bridge at CH.0.578 and 0.690 km on MDR-149 Toki To Kate-Pimpalgaon (TR-16) Rd.	48
2	Aurangabad	Vaijapur	Construction and 5 Year Maintenance of Submersible Bridge on road Shivoor to Kharaj @ Ch-11/875 (T-19) Km 12/09 Ta.Vaijapur	35
3	Aurangabad	Sillod	Construction and 5 Year Maintenance of Submersible Bridge a/c Purna River @ Ch. 13/500 near Savkheda on SH.40 Ghatnandra to Savkheda Andhari Taluka Border TR -10	90
4	Aurangabad	Phulambri	Construction and 5 Year Maintenance of Bridge across Girja river on Wanegaon (Bk) to Shirodi at Km. 0/150 Block. Phulambri Dist. Aurangabad.	90
5	Aurangabad	Paithan	Construction and 5 Year Maintenance of Submersible Bridge on SH-26 to Indegaon Nandar-Sal-Wadgaon-Kaundoor @ Ch. 11/288 Km 0/00 to 13/950 Tq.Paithan	120
6	Aurangabad	Paithan	Construction and 5 Year Maintenance of Submersible Bridge on SH-26 to Indegaon Nandar-Sal-Wadgaon-Kaundoor @ Ch-6/658 Km 0/00 to 13/950 Tq.Paithan	30

7	Aurangabad	Paithan	Construction and 5 Year Maintenance of Submersible Bridge on ODR-48 to Georai (kh.) - Georai (Bk.)-Honobachiwadi Km 0/00 to 7/00 Tq.Paithan (AUR-29)	30
7	Aurangabad		Total	443
1	Beed	Ambejogai	Construction & 5 Year Maintenance of Submersible Bridge @ Ch. 1/400 on MDR-54 near Pimpri to Talegaon	74
2	Beed	Patoda	Construction & 5 Year Maintenance of Submersible Bridge @ Ch. 0/400 on MSH 16 to Khadakwadi Tq. Patoda	89
3	Beed	Ashti	Construction & 5 Year Maintenance of Submersible Bridge @ Ch. 5/00 on SH-70 to Takalsing-Hingni	74
4	Beed	Shirur	Construction & 5 Year Maintenance of Submersible Bridge @ Ch. 2/350 on MDR28 to Gaijipur	89
5	Beed	Majalgaon	Construction & 5 Year Maintenance of Submersible Bridge @ Ch. 2/820 on SH-55 to Gujarwadi	30
6	Beed	Beed	Construction & 5 Year Maintenance of Submersible Bridge @ Ch. 0/210 on Pimpalwadi to Bhalwanioroad on Bindusara river	118
6	Beed		Total	474
1	Hingoli	Kalamnuri	Construction of bride Sandas to Salegaon road	42
2	Hingoli	Kalamnuri	Construction of Bridge across main canel on MDR - 07 to belmandal road	57
2	Hingoli		Total	99
1	Jalna	Jalna	Jaitapur-Antarwal Road at ch. 0/800 Block Jalna Dist Jalna	15
2	Jalna	Jalna	Sondev-Pathrud-Umbri-Jaitapur Road at ch. 4/700	8
3	Jalna	Badnapur	MSH-02 to Padali-Pirsawangi-Bhilpuri (ODR-118) Road (T-05) at ch. 5/200	40
4	Jalna	Bhokardan	SH-223 to Devlgaon tad-Borgaon Taru to Kedarkheda Road at ch. 4/600	90
5	Jalna	Jafrabad	SH-51-Mahora - Ghankheda-Jawkheda-Borkhewdi Gayki (T-10) Road at ch. 5/200	60
6	Jalna	Jafrabad	Shipora Village on Jafrabad-Nimkheda-Deolzari-Shipora Sawarkheda to Sonkheda (T- 02) Road at ch. 9/900	15
6	Jalna		Total	228
1	Latur	DEONI	CONST OF SUBMERSIBLE BRIDGE AT CH 0/290 ON MDR 39-GURNAL-BOROL-SHIVAJINAGAR TANDA-WAGDARI UPTO BORDER KM 0/0 TO 12/500 BLOCK DEONI DIST LATUR	40
2	Latur	NILANGA	CONST OF SUBMERSIBLE BRIDGE AT CH 6/500 ON TAMBARWADI-HALSI-TAGARKHEDA TO AURAD(SH) TO SH-244 OF CH KM 0/0 TO 9/000 BLOCK NILANGA DIST LATUR	40
3	Latur	DEONI	CONST OF SUBMERSIBLE BRIDGE AT CH 9/920 ON MDR 39-GURNAL-BOROL-SHIVAJINAGAR TANDA-WAGDARI UPTO BORDER KM 0/0 TO 12/500 BLOCK DEONI DIST LATUR	120
4	Latur	AHMADPUR	CONST OF SUBMERSIBLE BRIDGE AT CH 1/200 ON SH-56-AHMADPUR-KALEGAONWADI ROAD KM 0/0 TO 5/000 BLOCK AHMADPUR DIST LATUR	28

5	Latur	CHAKUR	CONST OF SUBMERSIBLE BRIDGE AT CH 4/640 ON SH-268-MAHANDOL-SANDOL ROAD OF KM 0/0 TO 6/000 BLOCK CHAKUR DIST LATUR	28
6	Latur	JALKOT	CONST OF SUBMERSIBLE BRIDGE AT CH 2/370 ON SH-250 TO DONGARGAON-MARSANGVI TO ODR-54 KM 0/0 TO 9/480 BLOCK JALKOT DIST LATUR	32
7	Latur	RENAPUR	CONST OF BOX CELL UNIT AT CH 2/400 ON RENAPUR TO GHANSAWARGAON ROAD OF KM 0/0 TO 4/000 BLOCK RENAPUR DIST LATUR	40
7	Latur		Total	328
1	Nanded	Deglur	Construction and five Year Maintenance of Bridge on MSH-7 to Rampur Bhaktapur ch 4/890	23
2	Nanded	Deglur	Construction and five Year Maintenance of Bridge on Deglur Tadkhel Road ch 1/820	20
3	Nanded	Deglur	Construction and five Year Maintenance of Bridge on Deglur Tadkhel Road ch 2/810	20
4	Nanded	Deglur	Construction and five Year Maintenance of Bridge on Deglur Tadkhel Road ch 3/500	20
5	Nanded	Deglur	Construction and five Year Maintenance of Bridge on Deglur Tadkhel Road ch 4/250	20
6	Nanded	Deglur	Construction and five Year Maintenance of Bridge on Deglur Tadkhel Road ch 4/950	20
7	Nanded	Mukhed	Construction and five Year Maintenance of Bridge on SH-256 to kundrala karpi tanda ch 2/00	45
8	Nanded	Umri	Construction and five Year Maintenance of Bridge on MDR-40 to Bolsa ch 2/300	35
9	Nanded	Naigaon	Construction and five Year Maintenance of Bridge on Godamgaon Ancholi Hipparga Krushnur Barbada Takali TQ Border ch 14/200	50
10	Nanded	Kandhar	Construction and five Year Maintenance of Bridge on ODR-166 to Bhukmari Tq.Border 0/800	18
11	Nanded	Kandhar	Construction and five Year Maintenance of Bridge on MDR-20 to Nandanwan sawleshwar Datala Road ch 5/500	20
12	Nanded	Kandhar	Construction and five Year Maintenance of Bridge on ODR-108 to Wanjarwadi ch 1/700	18
13	Nanded	Himayatnager	Construction and five Year Maintenance of Bridge on MSH-10 Tembhi sawana road	20
14	Nanded	Himayatnager	Construction and five Year Maintenance of Bridge on MSH-10 Mangrul to Warangatakali road ch 2/100	90
15	Nanded	Mahur	Construction and five Year Maintenance of Bridge on MDR-6 Borwadi Bhimpur ch 0/300	40
16	Nanded	Hadgaon	Construction and five Year Maintenance of Bridge on SH-251 Lingapur ch 11/600	100
16	Nanded		Total	559
1	Osmanabad	Osmanabad	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 4/500 ON NH-52-OSMANABAD-UPLA(M) ROAD KM 0/0 TO 5/000 BLOCK OSMANABAD DIST OSMANABAD.	21

2	Osmanabad	Osmanabad	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 0/400 ON SAROLA TO SHINDEWADI ROAD KM 0/0 TO 5/470 BLOCK OSMANABAD DIST OSMANABAD.	21
3	Osmanabad	Tuljapur	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 11/656 ON SH-09-NALDURG-CHIKUNDRA-KILAJ ROAD KM 0/0 TO 14/900 BLOCK TULJAPUR DIST OSMANABAD.	42
4	Osmanabad	Tuljapur	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 1/200 ON NH-65 TO MULEWADI-SHETE TANDA ROAD KM 0/0 TO 2/700 BLOCK TULJAPUR DIST OSMANABAD.	21
5	OSMANABAD	Kallam	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 10/100 ON MDR-19 TO NIPANI-PADOLI-NAIGAON ROAD KM 0/0 TO 10/600 BLOCK KALLAM DIST OSMANABAD.	56
6	Osmanabad	Kallam	Construction of High Level Bridge on road From Bhosa to Gour Maliwasti at ch 0/510	63
7	Osmanabad	Kallam	Proposed Construction and 5 year maintenance of High Level Bridge on road from Kothala to Gairanwasti at ch 0/710	40
8	Osmanabad	Kallam	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 9/050 SH 236 Hingangaon Awadsirpura Saudana (A) Km 0/00 to 14/00 Block Kallam Dist. Osmanabad	56
9	Osmanabad	Bhoom	Construction of High Level Bridge on road From Tintaraj to Murumkarwasti /sable wasti at ch 0/800	48
10	Osmanabad	Paranda	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 1/00 MDR-01 to Shridharwadi Maskewasti Road Km 0/00 to 2/200 (L-71) Block Paranda Dist. Osmanabad	28
11	Osmanabad	Paranda	CONSTRUCTION OF SUBMERSIBLE BRIDGE AT CH 3/500 SH-210 To Ingonda Watephal Lonarwadi Tandulwadi Kokarwadi Dist-Border Road CH-0/00 To 16/500	80
12	Osmanabad	Lohara	Proposed construction of Submerssible Bridge across River; on Road from T 09 to Kothali CH 0/800	42
13	Osmanabad	Omerga	Proposed Construction and 5 year maintenace of High Level Bridge on road from MDR 41 to Kamalpur at ch 2/200	77
13	Osmanabad		Total	596
1	Parbhani	Parbhani	Construction of Submercible Bridge @ Ch-8/800 From MDR-35 To Jodparli Road	36
2	Parbhani	Jintur	Construction of Submercible Bridge @ Ch-8/800 From SH-248 To Bori-Varna-Nivali Road	96
3	Parbhani	Manwat	Construction of Submercible Bridge @ Ch-10/690 From SH-61 To Rampuri Road	80
4	Parbhani	Selu	Construction of Submercible Bridge @ Ch-5/455 From SH-221 To Khari-Sawngi (P.C) Road	64
4	Parbhani		Total	276
TOATL BRIDGES		61		3003
KONKAN REGION				
1	Palghar	Vikramgad	Proposed Improvement and five year Maintenance of Submersible Bridge on road from SH 73 to Shilshet Kev Mhasroli Kurze at ch 6/950	74

2	Palghar	Dahanu	Proposed Improvement and five year Maintenance of High Level Bridge on road from Kainad to Nandare , Kankradi at ch 0/280	18
3	Palghar	Vikramgad	Bridge on road from Gadade to Sawade at 2/810	24
4	Palghar	Mokhada	Proposed Improvement and five year Maintenance of High Level Bridge on road from SH 37 to Kochale road at ch 0/150	19
5	Palghar	Mokhada	Proposed Improvement and five year Maintenance of High Level Bridge on road from SH 37 to Kochale road at ch 4/180	19
6	Palghar	Mokhada	Proposed Improvement and five year Maintenance of High Level Bridge on road from Poshera, Khoch to Chandrachimet Road at ch 0/900	18
7	Palghar	Mokhada	Proposed Improvement and five year Maintenance of High Level Bridge on road from Poshera, Khoch to Chandrachimet Road at ch 3/375	28
8	Palghar	Vikramgad	Bridge on road from SH 73 to Shilshet Kev Mhasroli Kurze at ch 2/140	70
8	Palghar		Total	269
1	Raigad	Shrivardhan	MSH4 to Guladhe Budhwadi Road @ Chainage 1+480	21
2	Raigad	Alibag	Bridge on Nehuli Karle road at chainege 0+850	48
3	Raigad	Sudhagad	Bridge on Kalamb to Kalamb Thakurwadi Road @ Chainage1+100 km, Tal Sudhagad, District Raigad	40
4	Raigad	Karjat	Bridge on Posari to Arwand Salokh Road @ Chainage 2+300 km, Tal Karjat, District Raigad	30
5	Raigad	Panvel	Bridge on NH-17 to Chirvat Sangurli Road @ Chainage 0+500 km, Tal Panvel, District Raigad	21
5	Raigad		Total	160
1	Sindhudurg	Malwan	Bridge on Shirwande Dalitwasti Kirlos Road @ Chainage 4+400 km, Tal Malwan, District Sindhudurg	120
2	Sindhudurg	Devgad	Bridge on Torsol phata to Valivande Babarwadi Road @ Chainage 4+000 km, Tal Deogad, District Sindhudurg	8
3	Sindhudurg	Kankavali	Bridge on Nadgive berle shirpe Road @ Chainage 0/325, Tal Kankawali, District Sindhudurg	10
4	Sindhudurg	Sawantwadi	Bridge on Majgaon chiptewadi Road @ Chainage 3+600, Tal Sawantwadi, District Sindhudurg	6
5	Sindhudurg	Dodamarg	Bridge on Talkat Kumbhavade Chovkul Road @ Chainage 0+150 km, Tal Dodamarg, District Sindhudurg	40
5	Sindhudurg		Total	184
TOATL BRIDGES		18		613
PUNE REGION				
1	Pune	Khed	Proposed Construction and five year maintenance of Bridge on Road from Kanhersar to Zodagewadi at CH 0/715; Taluka: Khed , Dist ; Pune	40
2	Pune	Maval	(NH-04) Kamshet to Khandshi Across Indrayani River	79
2	Pune		Total	119
1	Sangli	Shirala	Uplave to Kadamwadi Road at ch. 1/600	55
1	Sangli		Total	55

1	Solapur	Malshiras	Construction and 5 year maintenace of Bridge on road from Malshiras to Dahigaon at CH 15/850	35
2	Solapur	Malshiras	Construction and 5 year maintenace of Bridge on road from Bondale to Shingorni at CH 18/750	15
3	Solapur	Mohol	Construction and 5 year maintenace of Bridge across Sinaa River; on Road from Mohal to Diksal at CH 0/215	77
4	Solapur	Mangalwedha	Construction and 5 year maintenace of Bridge on Road from T-01 to Sidhapur at CH 6/300	59
5	Solapur	Mangalwedha	Construction and 5 year maintenace of Bridge on road from Huljanti to Salgar (Khu) (TR-05) at ch. 2/525	79
6	Solapur	South Solapur	Construction and 5 year maintenace of Bridge on Road from Madre to Shindkhed Chandrahal at CH 5/150	20
7	Solapur	Barshi	Construction and 5 year maintenace of Bridge on Road from Barshi to Kari (District Border) at CH 13/445	36
8	Solapur	Barshi	Construction and 5 year maintenace of Bridge on road from TR 10 to Dhamngaon (Du) at ch 5/455	55
9	Solapur	Barshi	Construction and 5 year maintenace of Bridge on road from Ghanegaon to Sakat (MRL-11) at ch 3/000	56
10	Solapur	Barshi	Construction and 5 year maintenace of Bridge on road from Ghanegaon to Sakat (MRL-11) at ch 1/500	50
11	Solapur	Madha	Construction and 5 year maintenace of Bridge across Bend nalla on Madha to Mahadpur Darfal Road @ ch 3/000 Tal.-Madha Dist.- Solapur	50
12	Solapur	Barshi	Construction and 5 year maintenace of Bridge across Bedki nalla on TR-05 to Kapsi, sawargaon Road @ ch 3/300 Tal.-Barshi Dist.- Solapur	40
12	Solapur		Total	572
TOATL BRIDGES		15		746
AMRAVATI REGION				
1	Akola	Akola	Construction of Submersible Bridge On Amanatpur to Takli (jalam) Road At Ch- 5/100	75
2	Akola	Murtizapur	Construction of Submersible Bridge On MDR-14 to Mohobatpur Road At Ch- 2/700	56
3	Akola	Murtizapur	Construction of Submersible Bridge On Sonori to Pota Road At Ch- 2/500	25
4	Akola	Balapur	Construction of Submersible Bridge On Sangvi Jamdev Road At Ch- 1/500	100
5	Akola	Patur	Construction of Submersible Bridge On SH-279 Digras kh to Digras bk. Road At Ch- 1/300	80
6	Akola	Patur	Construction of Submersible Bridge On Babhulgaon to Sasti Road At Ch- 6/350	60
7	Akola	Patur	Construction of Submersible Bridge On NH- 161 to Shirla Road At Ch- 1/500	50
8	Akola	Barshitakli	Construction of Submersible Bridge On SH-273 Zodga To Khopadi Dist. Border Road At Ch- 0/100	50
8	Akola		Total	496

1	Amarawati	Dharni	Construction of Bridge on Lawada-chipoli- to Hatnada rd.ch. 9/100	42
2			Construction of Bridge on Lawada-chipoli- to Hatnada rd.ch 7/500	90
3	Amarawati	Dharni	Construction of Bridge on Bhawaidhana - Lakdu Harijanbasti-Bibamal ch.6/200	30
4			Construction of Bridge on MSH - Kadhao to Duni ch.1/500	35
5	Amarawati	Dhamangaon Rly.	Construction of Bridge on MSH-12 to Kashikhed road ch. 4/700	21
6	Amarawati	Nandgaon Kh.	Construction of Bridge on MSH-14 to Dhanora Jog Road ch. 1/600	18
7			Construction of Bridge on Golegaon - Jagatpur - Shivra ch. 0/700	49
8	Amarawati	Morshi	Construction of Bridge on Lihida , Asona, Talni-Pardi Road ch. 0/250	60
9	Amarawati	Warud	Construction of Bridge on Loni - to Kachurna road ch. 10/00	18
10	Amarawati	Anjanagaon Surji	Construction of Bridge on MDR- 16 (Kasbegavhan) - Kapustalni - Ratnapur ch 0/300	56
11			Construction of Bridge on ODR-78 (sategaon) wadura to Murhadevi road ch. 5/800	42
12	Amarawati	Amarawati	Construction of Bridge on Antora to Bramhanwada rd. ch.0/600	49
12	Amarawati		Total	510
1	Buldana	Buldana	Construction of Bridge on SH-24 to Afajalpur Road at Ch.0/200 Tq. Buldana Dist- Buldana	60
2	Buldana	Motala	Construction of Bridge on SH-277 to Kothali to Longhat Road At Ch. 0/190 Tq. Motala Dist Buldana	35
3	Buldana	Motala	Construction of Bridge on SH-277 to Kothali to Longhat Road At Ch. 0/720 Tq. Motala Dist Buldana	66
3	Buldana		Total	161
1	Washim	Washim	Construction of Minor Bridge on MDR-2 (Wagholi Khurd) to Adoli Road At.Ch-3/840 Km (TR-12) Tq.Washim, Dist.Washim	20
2	Washim	Washim	Construction of Minor Bridge on MDR-2 (Wagholi Khurd) to Adoli Road At.Ch-9/130 Km (TR-12)Tq.Washim, Dist.Washim	20
3	Washim	Malegaon	Construction of Minor Bridge On MDR-6 (Mutha) to Shirpur (MDR-5) Road At.Ch-0/293 Km (TR-15) in Tq.Malegaon, Dist.Washim	30
4	Washim	Malegaon	Construction of Minor Bridge On MDR-6 (Mutha) to Shirpur (MDR-5) Road At.Ch-2/075 Km (TR-15) in Tq.Malegaon, Dist.Washim	20
5	Washim	Mangrulpir	Construction of Bridge On MDR-19 to Shegi Dabhdhi Kumbhi Vasantwadi upto Dist Border Road At Ch:- 7/625 km(TR-14) Tq-Mangrulpir,Dist.Washim.	42
6	Washim	Mangrulpir	Construction of Bridge On MDR-19 to Shegi Dabhdhi Kumbhi Vasantwadi upto Dist Border Road At Ch:- 16/550 km (TR-14)Tq-Mangrulpir,Dist.Washim.	91
7	Washim	Manora	Construction of Bridge On Sakhardoh to Singhdoh Road At Ch:- 0/270 km (LR-22)Tq-Mangrulpir,Dist.Washim.	40
8	Washim	Manora	Construction of Bridge On Giroli to Kherda Road At Ch:- 0/120 Km (LR-18) Tq-Mangrulpir,Dist.Washim.	30

8	Washim		Total	293
1	Yavatmal	Kalamb	Construction of Bridge in km 0/750 on NH-361 to Muradpur Road (VR61)	45
2	Yavatmal	Pandharkawada	Construction of Bridge in km 4/200 on Karegaon to Mohadari Road (MRL-09)	21
2	Yavatmal		Total	66
TOTAL BRIDGES		33	TOTAL AMRAVATI REGION	1526
TOTAL MAHARASHTRA		236	Total	10941

General Environmental Management Plan for the rural roads

Road Name:
Total Length:
Block Name:
District name:

(Note: Please refer to the Environmental Checklists for individual roads and enter details under column on Location/Numbers. This step will convert this standard EMP into a road specific EMP to be attached to the DPR for each road)

Project Action/ Environmental Attributes	Mitigation measures	Location/ Numbers	Costs	Responsible for Implementing	Responsible for Monitoring
<i>Design and Pre-Construction Stage</i>					
Climate change consideration and vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check given: <ul style="list-style-type: none"> No rural roads is subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges and volcanic eruptions The sustainability and cost of the roads will not be affected by the changes in precipitation patterns or evaporation rates over the lifespan of the project Resources of the rural roads will not be affected by climate changes Nearby community will not increase the vulnerability of the project. Rural roads will not affect the surrounding area Planting of additional trees for increasing the carbon sink. The tree maybe planted with the help of Panchayat Raj Institution (PRI) 	All through the alignment of each rural road	Design cost	PIU, Design consultants	PIU, MMRDA
Finalization of alignment	<ul style="list-style-type: none"> The road will be part of district core network and will comply with PMGSY guidelines Road works will not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and will 	All through the alignment of each rural road	Design cost	PIU, Design consultants	PIU, MMRDA

	<p>avoid any monuments of cultural or historical importance.</p> <ul style="list-style-type: none"> • Project works will not pass through any designated wildlife sanctuaries, national parks, notified eco-sensitive areas or are of international significance such as protective wetland designated under Wetland Convention, and reserve forest. • Project to comply with local and national legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement (SPS) 2009. • Alignment finalization considering availability of right of way (ROW) and in consultation with local people. • ROW should be reduced in built-up or constricted areas to minimize land acquisition as per PMGSY guidelines. • Adjust alignment to the extent feasible to avoid tree cuttings, shifting of utilities or community structure. • Road improvement will follow natural topography to avoid excessive cut and fill 				
Land acquisition	<ul style="list-style-type: none"> • Land acquisition, compensation packages, resettlement and rehabilitation, poverty alleviation programs for affected people and all related issues addressed through Social impacts and Resettlement and Rehabilitation report 221. 	All through the alignment of each rural road	Land to be made through available and necessary costs if any to be borne by the state	PIU	PIU, MRRDA, PISC
Clearing of vegetation and removing trees	<ul style="list-style-type: none"> • All efforts will be taken to avoid tree cutting wherever possible. • Required permission/clearance from department/s will be obtained for cutting of roadside trees. • Provision of compensatory Afforestation will be made 	<p>All through the alignment of each rural road</p> <p>(Indicate the chainages where tree cutting and</p>	Cost for Forestry clearance for diversion of forest land and obtaining tree cutting permit are to be borne by the state.	Forest clearance and permit is to be obtained by the PIU. Compensatory plantation is to be carried out in coordination with PRI	PIU, PISC

	on 1:6 ratio basis (Maharashtra State) <ul style="list-style-type: none"> • Permission will be taken for diversion of any forest land if involved. Provision will be made for additional compensation tree plantation. • The vegetative cover will be removed and disposed in consultation with community 	diversion of forest land is required, and the proposed plantation location)	Cost for compensatory forestation is to be borne by state or PRI-NREGA scheme.	under schemes such as NREGA or local Forest Department	
Shifting of utilities and common property resources	<ul style="list-style-type: none"> • Road land width will be clearly demarcated on the ground • All efforts will be made to minimize shifting of utilities and common property resources • Utility and community structure shifting will be planned in consultation and concurrence of the community • Required permissions and necessary actions will be taken on a timely basis for removing and shifting utility structures and common property resources before road construction activities begin. 	All through the alignment of each rural road. (Indicate the chainages where shifting of utility structures and common property resources are required. Include total numbers of each structure required for shifting/ removal)	Cost to cover shifting and common property resources will be covered by the state.	PIU, contractor, utility agencies	PIU, PISC
Design and planning embankment	<ul style="list-style-type: none"> • The alignment design will consider options to minimize excessive cuts and fills • Cut material will be planned and assessed for reused as embankment to minimize borrow earth requirement • Design will be as per relevant Indian Road Congress (IRC) provisions for cut and fill, slope protection and drainage • Top soil of the cut and fill area will be used for embankment slope protection 	All through the alignment of each rural roads (Indicate the chainages that are prone to floods)	Part of the project cost	PIU, Design Consultants	PIU, MMRDA
Hydrology and Drainage	<ul style="list-style-type: none"> • Provision of adequate cross drainage (CD) structures will be made to ensure good passage of water during rainfall and maintaining natural 	Near all drainage crossings, nalas, rivers, streams and ponds.	Included in project costs.	PIU, Design consultants	PIU, MRRDA

	<p>drainage platform of the area.</p> <ul style="list-style-type: none"> • The discharge pattern of the CD structure will be planned accordingly. • Provision of adequate drainage structures will be made in water stagnant/ logging areas. • Construction works near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. • Additional CD structures will be provided in areas where nearby land is sloping towards road alignment on both the sides. • Concrete road construction in habitat areas with drainage on both sides of the road will be provided. The provision of drainage and adequate slope will prevent any water logging. • Consent to establish and operate should be obtained from the State of Pollution Control Board and comply with all consent conditions 	(Indicate chainages where earthen/ structural cross drains, streams, ponds and rivers exist)			
Establishment of construction camp, temporary office and storage area	<ul style="list-style-type: none"> • Construction camp sites will be located away from any local human settlements and forested areas (minimum 0.5 km away) and preferably located on lands, which are not productive (barren/waste lands presently). • Temporary office and storage areas shall be located away from human settlement areas and forested areas (minimum 0.5 km) • The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. • The construction camps, office and storage areas shall have provision of septic tank/soak pit of 	Locations of the construction camp, temporary office and storage areas	To be included in contractor's cost	Contractor	PIU, PISC

	<p>adequate capacity so that it can function properly for the entire duration of its use.</p> <ul style="list-style-type: none"> • All construction camps shall have provision for rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. • The construction camp, office and storage areas shall have provision for health care facilities for adults, pregnant women and children. • Consent to establish and operate shall be obtained from the State of Pollution Control Board and comply with all consent conditions. • Personal protective equipment (PPE) like helmet, boots, earplugs for workers, first aid and fire fighting equipment shall be available at construction sites before start of constructions 				
Traffic Management and Road Safety	<ul style="list-style-type: none"> • Identify areas where temporary traffic diversion maybe required • Prepare appropriate traffic movement plan, approved by respective PIU, for ensuring continued safe flow of traffic, pedestrians and all road users during construction. • Wherever CD structure work require longer construction time and road is to be blocked for longer duration, the PIU/ DPR consultant will define appropriate measures for traffic diversion before the start of the construction • Adequate signboards will be placed much ahead of the diversion site to caution road users. The road signs should be bold and retro reflective in nature for good visibility, both day and night • It is proposed for the respective PIU to discuss with the railways division/ 	<p>As proposed under DPR and determined by the contractor and approved by PIC/PIU</p> <p>(Indicate the chainages which may require traffic diversions where possible and include the target alternate routes)</p>	To be included in contractor's costs	Contractors	PIU, PISC

	department for providing adequate safety measures at unmanned railway crossing where applicable. Adequate and clearly visible signs will be provided on both sides of the railway crossing. All measures for traffic control and safety in accordance with IRC codes:99-1988 will be followed.				
Risks due to COVID-19	<ul style="list-style-type: none"> Prepare an outline and guidance for COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices (Appendix 7). 	Along rural roads, and construction camps, temporary office and storage areas	To be included under contractor's costs	PIU, PISC	MRRDA
<i>Construction Stage</i>					
Sourcing and transportation of construction materials	<p><i>Borrow Earth</i></p> <ul style="list-style-type: none"> The borrow earth will be obtained from identified locations and with prior permission from landowners and clear understanding for its rehabilitation. Rehabilitation plan may include the following: <ul style="list-style-type: none"> Borrow pits will be backfilled with rejected construction wastes (inert materials) and will be given a vegetative cover. If this not possible, then excavation slopes will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface. Borrow areas might be used for aquaculture, in case the landowner wants such development. IRC:10-1961 guidelines should be used for selection of borrow pits and amounts that can be borrowed Borrowing earth from agricultural land will be minimized to the extent possible. No earthen 	<p>Indicate location of probable locations of borrow areas.</p> <p>Include name and location of identified quarries</p> <p>Indicate the roads for hauling of construction materials as approved by the PIU</p>	To be included under the contractor's costs	Contractor	PIU, PISC

	<p>material will be borrowed from already low-lying areas</p> <ul style="list-style-type: none"> • 15 cm topsoil stripped-off from the borrow pit and this will be stored in designated areas. The heights of the stockpiles should not exceed 2m and the side slopes are not steeper than 1:2 (vertical: horizontal) • Borrowing of earth will not be done continuously throughout the stretch. Ridges (not less 8m width) will be left at intervals not exceeding 300m. • Small drains will be cut through the ridges, if necessary, to facilitate drainage. • Slope of the edges will be maintained not steeper than 1:4 (vertical: horizontal) • Depth of borrow pits will not be more than 30cm after stripping the 15 cm topsoil • Fly ash will be used along road embankment as per IRC guidelines wherever thermal power plant is located within 100km of the road alignment <p><i>Aggregate</i></p> <ul style="list-style-type: none"> • Stone aggregate will be source from existing licensed quarries • Copies of consent/ approval/ rehabilitation plan for use of the existing sources will be submitted to PIU. • Topsoil will be stockpiled and protected for use during the rehabilitation stages <p><i>Transportation of construction materials</i></p> <ul style="list-style-type: none"> • Existing tracks/ roads are to be used for hauling of materials to the extent possible • Prior to construction of roads, topsoil will be preserved for other useful 				
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	<p>purposes such as turfing the embankment.</p> <ul style="list-style-type: none"> • Vehicles deployed for material transportation will be spillage proof to minimize the loss of materials during transport. The transportation links or roads should be inspected at least twice daily to clear accidental spillage, if any. • Topsoil should be stockpiled and protected for use during the rehabilitation stage 				
Loss of productive soil, erosion and land use change	<ul style="list-style-type: none"> • Topsoil from the productive land (borrow areas, road widening areas, etc.) will be preserved and reused for plantation purposes • Topsoil will be used as cover for growing vegetation at embankment slopes as protection against erosion • Cut and fill will be planned as per IRC provisions and rural road manual • All steep cuts will be flattened and benched • Shrubs will be planted in loose soil area • IRC:56 – 1974 will be considered for treatment of embankment slopes for erosion control • Land taken on lease as access roads, construction camp and temporary office, and storage facility is restored back to the original land-use before handing it over back to land owner 	Identify the chainage of the road	To be included under contractor's cost	Contractor	PIU, MMRDA
Compaction and contamination of soil	<ul style="list-style-type: none"> • To prevent soil compaction in the adjoining productive lands (beyond the ROW), movement of construction vehicles, machinery and equipment will be restricted to the designated haulage route. • Productive land will be restored after construction activity. • Fuel and lubricants will be stored at the pre-defined storage location • Storage area will be made paved with gentle slope towards the corner. 	<p>Identify the chainage of the road and description of the immediate land use that are susceptible to soil compaction</p> <p>Indicate location of the storage area</p>	To be included under contractor's cost	Contractor	PIU, PISC

	<p>Discharge points of the storage area should be connected to a chamber where there are possible spills.</p> <ul style="list-style-type: none"> • All efforts will be made to minimize the waste generation. Unavoidable waste will be stored at the designated place prior to disposal. • Oil interceptors will be provided to avoid soil contamination at the wash-down and refuelling area. Oil and grease spills, and oil soaked materials should be collected and stored in labeled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold-off to SPCB/MOEF authorized refiners 				
Construction Debris and waste	<ul style="list-style-type: none"> • Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. • With approval of the concerned authority, unusable debris materials must be disposed at pre-designated disposal locations. • The bituminous waste will be disposed in secure manner at designated landfill sites only and by environmentally accepted manner. • For removal of debris, wastes and its disposal, MORTH guidelines should be followed. • Unproductive/wastelands will be selected with the consent of villagers and Panchayat for the same. • Dumping site should be at adequate capacity. It should be located at least 500 m away from the residential areas and away from water bodies to prevent any contamination 	<p>All through the alignment of each rural roads</p> <p>Identify the disposal areas of: Bituminous waste Construction debris</p>	To be include under contractor's costs	Contractor	PIU, PISC
Air Quality and Noise Levels	<ul style="list-style-type: none"> • Vehicles carrying loose and fine materials like sand and aggregate will be covered. 	All through the alignment of each rural	To be include under contractor's costs	Contractor	PIU, MRRDA

	<ul style="list-style-type: none"> Dust suppression measures (such as water sprinkling) will be done at all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. Mixing plants and asphalt (hot mix) plants should be located at least 0.5 km away and in downwind direction of the human settlements. Material storage areas will be located downwind of the habitation area. Consent to establish and operate shall be obtained from SPCB and comply with all consent conditions. Hot mix plant will be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Diesel generating (DG) sets should be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5KVA and about 0.7m for 10 KVA DG sets, above top of sound proofing enclosure of the DG set) Low Sulphur diesel will be used for DG. Sets and other construction machineries. Construction vehicles and machines will be periodically maintained 	roads as assigned by the PIU			
Tree plantation	<ul style="list-style-type: none"> Compensatory afforestation will be at 1:6 ratio basis (tree removed: seedling replacement) Compensatory afforestation will be planted at areas suggested by the local Forest Department Follow-up maintenance of the planting seedlings will be done for a minimum of 3 years 	Indicate the number of trees required for planting and location of the plantation sites	Costs to be covered by the state or PRI under schemes such as NRGEA	PIU to coordinate compensatory forestation with PRI under schemes such as NREGA or local Forest Department	PIU, PISC
Wildlife protection	<ul style="list-style-type: none"> Fencing wherever there is expected animal movements Workers will avoid hunting, gathering and harvesting of 	Throughout the project road section	To be include under contractor's costs	Contractor	PIU, MRRDA, PISC

	<p>wildlife for food, selling and domestication</p> <ul style="list-style-type: none"> • There will be no destruction and disturbing of wildlife habitats • In case there are endangered wildlife in the area, the contractor will inform immediately the local forest department on the sighting of such species • With the help of local forest department, the contractor and PIU will provide awareness on wildlife and habitat protection to the workers every beginning of the construction season. 				
Groundwater and surface water quality and availability	<ul style="list-style-type: none"> • Required permission/clearance will be obtained for the abstraction of groundwater from the Ground Water Board/ Central Ground Water Authority, if applicable • Contractor will arrange with the community for the constructions' water requirement, in order to avoid impact on the water supply for the nearby people. • Water intensive activities will not be undertaken during summer period to extent possible. • Where ponds are not available, water harvesting pits will be constructed, if necessary • Preventive measures like slope stabilization, etc. will be done to minimize siltation of water bodies. 	Location of the water sources	To be included under contractor's costs	Contractor	PIU, PISC
Occupational Health and Safety	<ul style="list-style-type: none"> • PPE will be provided to the construction workers. • Provision of well stocked first aid kits and medical supplies at camp sites and regular EHS training • Worker's exposure to noise will be restricted to less than 8 hours a day. Workers' duty station will be regulated accordingly. • Mobile toilets (with septic tanks) fitted with anaerobic treatment facility will be provided at construction 	Along rural roads, and construction camps, temporary office and storage areas	To be included under contractor's costs	Contractor	PIU, PISC

	camps, temporary office and storage areas. <ul style="list-style-type: none"> • Domestic solid waste at construction camp will be segregated into biodegradable and nonbiodegradable wastes • Every start of the construction season, contractor provided (i) health and safety, and (ii) HIV and diseases prevention to workers. 				
Risks due to COVID-19	<ul style="list-style-type: none"> • Prepare and implement a comprehensive COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices (Appendix 7). • Avoid labor-intensive works as much as possible • Ensure all to use the Personal Protective Equipment (PPE) as appropriate • Ensure all equipment and vehicles used are routinely disinfected • Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp • Place adequate washbasins, disinfectant tub, dispenser for sanitizer • Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and • Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken 	Along rural roads, and construction camps, temporary office and storage areas	To be included under contractor's costs	Contractor	PIU, PISC
<i>Post-Construction and Operation Stage</i>					
Air Quality and Noise Levels	<ul style="list-style-type: none"> • Awareness signboards will be provided to slowdown driving near community areas. Speed limitation and honking restrictions could be enforced near sensitive locations 	All project locations as determined by the contractor and approved by the PIUY	To be included under contractor's costs	Contractor	PIU, PISC

Site Restoration	<ul style="list-style-type: none"> • All former construction camp/ temporary office/ material storage should be restored to its original conditions • Borrow areas rehabilitation should be performed as planned • Obtain clearance from PIU before handing over the construction camp/ temporary office/ material storage sites • PIC to undertake survival survey report with recommendations for improving the survival of the seedlings and submit to PIU the status of the compensatory tree plantation. 	All project locations of construction camp, temporary office, material storage, borrow areas and planting areas	To be included under contractor's costs	Contractor	PIU, PISC
Hydrology and drainage	<ul style="list-style-type: none"> • Regular cleaning or removal of deposited silt and/or debris along drainage channels and outlet points before monsoon season. • Rejuvenation of the drainage system by removing encroachments/ congestions 	Entire rural road	To be covered under maintenance costs	PIU	PIU, MMRDA

Appendix-4.1

Environmental Monitoring Plan (EMoP) for the rural roads during Design and Pre-Construction Stage

Monitoring Responsibility: Contractor with Support from PIC Environment Specialist

Monitoring Frequency: Only once (prior to start of construction)

Road Name /District Name:

Road Length:

Report No.:

Environmental Attributes	Mitigation Measures	Location	Monitoring Indicator, if applicable	Compliance status	Corrective action proposed in case of delay
Climate change consideration and vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check given : <ul style="list-style-type: none"> No rural roads is subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges and volcanic eruptions The sustainability and cost of the roads will not be affected by the changes in precipitation patterns or evaporation rates over the lifespan of the project Resources of the rural roads will not be affected by climate changes Nearby community will not increase the vulnerability of the project. Rural roads will not affect the surrounding area Planting of additional trees for increasing the carbon sink. The tree maybe planted with the help of Panchayat Raj Institution (PRI) 	Location specified on the EMP and actual findings in the field	<p>Climate change vulnerability check are included in the first report of the contractor to the PIU.</p> <p>Records of the number of trees, and number of seedlings and locations of the planting areas</p>		
Finalization of alignment	<ul style="list-style-type: none"> Road works did not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and will avoid any monuments of cultural or historical importance. Project works did not pass through any designated wildlife sanctuaries, national parks, notified eco-sensitive areas or are of international significance 	Location specified on the EMP and actual findings in the field	<p>Included in the first report of the contractor to the PIU, if any occurred:</p> <p>-cultural heritage area - forest</p>		

	<p>such as protective wetland designated under Wetland Convention, and reserve forest.</p> <ul style="list-style-type: none"> • Project to comply with local and national legislative requirements such as forest clearance for diversion of forestland • Alignment finalization considered availability of right of way (ROW) and in consultation with local people. • ROW are reduced in built-up or constricted areas to minimize land acquisition as per PMGSY guidelines. • Road alignment adjusted to avoid tree cuttings, shifting of utilities or community structure. • Road improvement followed natural topography to avoid excessive cut and fill 		Submit to PIU and clearances and permits from government authorities		
Clearing of vegetation and removing trees	<ul style="list-style-type: none"> • Minimized tree cutting wherever possible. • Permission/ clearance from department/s obtained for cutting of roadside trees. • Permission for diversion of any forest land if involved. Provision for additional compensation tree plantation 	Location specified on the EMP and actual findings in the field	Submit to PIU and clearances and permits from government authorities		
Shifting of utilities and common property resources	<ul style="list-style-type: none"> • Road land width demarcated on the ground • Minimized shifting of utilities and common property resources • Utility and community structure shifting plan in consultation and concurrence of the community 	Location specified on the EMP and actual findings in the field	<p>Submit to PIU and clearances and permits from government authorities</p> <p>Records agreement with the community</p>		
Design and planning embankment	<ul style="list-style-type: none"> • The alignment design considered options to minimize excessive cuts and fills • Cut material was planned and assessed for reuse as embankment • Road design is based on relevant Indian Road Congress (IRC) provisions for cut and fill, slope protection and drainage 	Location specified on the EMP and actual findings in the field	Included in the first report of the contractor to the PIU		
Hydrology and Drainage	<ul style="list-style-type: none"> • Cross drainage (CD) structure was planned accordingly. • Provision of adequate drainage structures was made in water stagnant/ logging areas. • Construction works near water body was planned during dry 	Location specified on the EMP and actual findings in the field	Included in the first report of the contractor to the PIU		

	<p>season so that water quality of the water channel is not affected due to siltation and rain water runoff.</p> <ul style="list-style-type: none"> • Additional CD structures provided in areas where nearby land is sloping towards road alignment on both the sides • Consent to establish and operate obtained from the State of Pollution Control Board and comply with all consent conditions. 		<p>Submit to PIU and clearances and permits from government authorities</p> <p>Records agreement with the community</p>		
Establishment of construction camp, temporary office and storage area	<ul style="list-style-type: none"> • Construction camp, temporary office sites and material storages located away from any local human settlements and forested areas (minimum 0.5 km away) and preferably located on lands, which are not productive (barren/waste lands presently). • The construction camps, office and storage areas have provision of adequate water supply, sanitation and all requisite infrastructure facilities. • The construction camp, office and storage areas have provision for health care facilities for adults, pregnant women and children. • Consent to establish and operate shall be obtained from the State of Pollution Control Board and comply with all consent conditions. • Personal protective equipment (PPE) like helmet, boots, earplugs for workers, first aid and fire fighting equipment are available at construction sites before start of constructions 	Location specified on the EMP and actual findings in the field	<p>Included in the first report of the contractor to the PIU</p> <p>Submit to PIU and clearances and permits from government authorities</p> <p>Records agreement with the community</p>		
Traffic Management and Road Safety	<ul style="list-style-type: none"> • Identified areas where temporary traffic diversion • Prepared appropriate traffic movement plan and approved by the PIU. 	Location specified on the EMP and actual findings in the field	Traffic diversion plan submitted by contractor and approved by PIU		
Risks due to COVID-19	<ul style="list-style-type: none"> • Prepare an outline and provide guidance for COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices (Appendix 7). 	Along rural roads, and construction camps, temporary office and storage areas	COVID-19 Health and Safety Plan submitted by contractor and approved by PIU		

Appendix-4.2

Environmental Monitoring Plan (EMoP) for rural roads during Construction Stage

Monitoring Responsibility: Contractor with support from PIC Environmental Specialist

Monitoring Frequency: First report at the 3rd month after the start of construction or 25% construction progress. 2nd report on the 9th month or 75% construction progress.

Project Details:

Road Stretch Name:

Monitoring Report No.:

Environmental Attributes	Mitigation Measures	Location	Monitoring Indicator	Compliance status	Corrective action proposed in case of delay
Sourcing and transportation of construction materials	<p><i>Borrow Earth</i></p> <ul style="list-style-type: none"> The borrow earth obtained from identified locations and with permission from landowners and clear understanding for its rehabilitation Borrowing earth from agricultural land was minimized. No earthen material taken borrowed from already low-lying areas 15 cm topsoil stripped-off from the borrow pit and stored in designated areas. The heights of the stockpiles are at 2m or less and the side slopes are not steeper than 1:2 (vertical: horizontal) Borrowing of earth is not done continuously throughout the stretch. Ridges (not less 8m width) will be left at intervals not exceeding 300m. To facilitate drainage, small drains are cut through the ridges, if necessary. Borrow pit slope (at the edges) is maintained not steeper than 1:4 (vertical: horizontal) Depth of borrow pits is not more than 30cm after stripping the 15 cm topsoil Fly ash is used along road embankment as per IRC guidelines wherever thermal power plant is located within 100km of the road alignment 	Indicate the locations of each the mitigation measures such as top soil storage area, borrow pit sources, transportation routes and among others	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Rehabilitation plan of the borrow pit area</p> <p>Photographs of the stockpiles and borrow pits</p> <p>Agreement document with landowner for the borrow pits</p> <p>Community complaints</p> <p>Sources of aggregates' permits or license from the government</p> <p>Map of the roads for hauling</p> <p>Vehicle and machine valid emission permit</p> <p>Daily inspection record of roads used</p>		

	<p><i>Aggregate</i></p> <ul style="list-style-type: none"> Stone aggregate is sourced from existing licensed quarries Copies of consent/ approval/ rehabilitation plan for use of the existing sources will be submitted to PIU. Topsoil is stockpiled and protected for use during the rehabilitation stages <p><i>Transportation of construction materials</i></p> <ul style="list-style-type: none"> Existing tracks/ roads are used for hauling of materials Prior to construction of roads, topsoil are preserved for other useful purposes such as turfing the embankment. Vehicles deployed for material transportation are spillage proof to minimize the loss of materials during transport. The transportation links or roads should be inspected at least twice daily to clear accidental spillage, if any. For use during the rehabilitation stage, topsoil should stockpiled and protected 		hauling for any accidental spillage		
Loss of productive soil, erosion and land use change	<ul style="list-style-type: none"> Topsoil are used as cover for growing vegetation at embankment slopes as protection against erosion All steep cuts are flattened and benched Shrubs are planted in loose soil area IRC:56 – 1974 is considered for treatment of embankment slopes for erosion control Land taken on lease as access roads, construction camp and temporary office, and storage facility is restored back to the original land-use before handing it over back to land owner. 	Indicate the locations of each the mitigation measures such area of the embankments with topsoil, leased land, growing vegetation and among others	<p>Report on erosion control method according to IRC:56 – 1974 Along the embankments</p> <p>Report on the Restoration of land</p> <p>Growing vegetation along embankments</p>		
Compaction and contamination of soil	<ul style="list-style-type: none"> To prevent soil compaction in the adjoining productive lands (beyond the ROW), movement of construction vehicles, machinery and equipment is restricted to 	Indicate the locations of each the mitigation measures such as oil	Corresponding mitigation measures are documented on the monthly report to PIU,		

	<p>the designated haulage route.</p> <ul style="list-style-type: none"> • Productive land is restored after construction activity. • Fuel and lubricants is stored at the pre-defined storage location • Storage area is made paved with gentle slope towards the corner. Discharge points of the storage area should be connected to a chamber where there are possible spills. • Wastes are stored at the designated place prior to disposal. • Oil interceptors is provided to avoid soil contamination at the wash-down and refuelling area. Oil and grease spills, and oil soaked materials should be collected and stored in labeled containers 	and grease's final disposal, authorized refinery area, disposal of solid wastes and among others	<p>including map of haulage route and photographs of each of the measures</p> <p>Licenses and permits of the authorized refinery and waste disposal area</p>		
Construction Debris and waste	<ul style="list-style-type: none"> • Excavated materials is used for backfilling embankments, filling pits, and landscaping. • Unusable debris materials are disposed at pre-designated disposal locations • The bituminous waste is disposed at designated landfill sites only and by environmentally accepted manner. • Dumping site should be at adequate capacity. It should be located at least 500 m away from the residential areas and away from water bodies to prevent any contamination. 	Indicate the locations of each the mitigation measures such as places embankments, disposal area of unusable materials, lease land, landfill and among others	<p>Compliance report to MORTH guidelines</p> <p>Report on the consent from villagers and Panchayat for disposal area</p> <p>License and permit of the landfill</p>		
Wildlife protection	<ul style="list-style-type: none"> • Fencing where there is expected animal movements • Workers avoided hunting, gathering and harvesting of wildlife for food, selling and domestication • There is no destruction and disturbing of wildlife habitats • In case there were endangered wildlife in the area, the contractor informed the local forest 	<p>Indicate the locations of wildlife sightings</p> <p>Record the type of wildlife sightings in the area</p>	Wildlife awareness from local forest department		

	<p>department on the sighting of such species</p> <ul style="list-style-type: none"> With the help of local forest department, the contractor and PIU provided awareness on wildlife and habitat protection to the workers every beginning of the construction season. 				
Air Quality and Noise Levels	<ul style="list-style-type: none"> Vehicles carrying loose and fine materials like sand and aggregate are covered. Dust suppression measures (such as water sprinkling) is done at all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. Mixing plants and asphalt (hot mix) plants are located at least 0.5 km away and in downwind direction of the human settlements. Material storage areas are located downwind of the habitation area. Consent to establish and operate are obtained from SPCB and comply with all consent conditions. Hot mix plant are fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Diesel generating (DG) sets are fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5KVA and about 0.7m for 10 KVA DG sets, above top of sound proofing enclosure of the DG set) Low Sulphur diesel are used for DG. Sets and other construction machineries. Construction vehicles and machines will be periodically maintained 	Indicate the locations of each the mitigation measures such as mixing plant area, material storage	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Permit and licenses of the mixing plants</p> <p>Air quality and noise level monitoring at areas near communities and periods as designated by the PIU</p>		
Groundwater and surface water quality and availability	<ul style="list-style-type: none"> Required permission/clearance are obtained for the abstraction of groundwater from the Ground Water Board/ Central Ground Water Authority, if applicable 	Locations of each the mitigation measures as applicable such as sources of water and	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Permission or clearance</p>		

	<ul style="list-style-type: none"> • In order to avoid impact on the water supply for the nearby people, contractor arranged with the community for the constructions' water requirement • Water intensive activities is not done during summer period to extent possible. • Where ponds are not available, water harvesting pits are constructed, if necessary • Preventive measures like slope stabilization, etc. are done to minimize siltation of water bodies. 	community zones	from Ground Water Board/ Central Ground Water Authority		
Occupational Health and Safety	<ul style="list-style-type: none"> • PPE will be provided to the construction workers. • Worker's exposure to noise will be restricted to less than 8 hours a day. Workers' duty station will be regulated accordingly. • Mobile toilets (with septic tanks) fitted with anaerobic treatment facility will be provided at construction camps, temporary office and storage areas. • Domestic solid waste at construction camp will be segregated into biodegradable and nonbiodegradable wastes • Every start of the construction season, contractor provided (i) health and safety, and (ii) HIV and diseases prevention to workers 	Location of the construction camps, temporary office, storage areas and on-site areas	Report on the compliance to the mitigation measures to PIU		
Risks due to COVID-19	<ul style="list-style-type: none"> • Prepare and implement a comprehensive COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices. • Avoid labor-intensive works as much as possible • Ensure all to use the Personal Protective Equipment (PPE) as appropriate • Ensure all equipment and vehicles used are routinely disinfected 	Location of the construction camps, temporary office, storage areas and on-site areas	<p>COVID-19 Health and Safety Guidance/Plan</p> <p>Weekly monitoring of compliance to COVID-19 Health and Safety Guidance/Plan</p>		

	<ul style="list-style-type: none"> • Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp • Place adequate washbasins, disinfectant tub, dispenser for sanitizer • Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and • Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken 				
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Environmental Monitoring Plan (EMoP) for the rural roads during Post Construction Stage

Monitoring Responsibility: *PIU*

Monitoring Frequency: *On completion of construction and after 1 month the of 1st, 2nd, 3rd, 4th and 5th year of maintenance period*

Project Details:

Road Stretch Name:

Monitoring Report No.:

Environmental Attributes	Mitigation Measures	Location	Monitoring Indicator	Compliance status	Corrective action proposed in case of delay
Air Quality and Noise Levels	<ul style="list-style-type: none"> Awareness signboards are useful to slowdown driving near community areas. Speed limitation and honking restrictions are enforced near sensitive locations 	Places of the signboards	Signboards are functional and ship-shape		
Site Restoration	<ul style="list-style-type: none"> All former construction camp/ temporary office/ material storage restored original conditions Borrow areas rehabilitation performed as planned Contractor obtained clearance from PIU before handling over the construction camp/ temporary office/ material storage sites PIC performed survival survey report with recommendations for improving the survival of the seedlings and submit to PIU the status of the compensatory tree plantation. 	Camp, temporary office and material storage Borrow areas Planting areas	clearance from PIU before handling over the construction camp/ temporary office seedling survival survey report with recommendations		
Hydrology and drainage	<ul style="list-style-type: none"> Regular cleaning or removal of deposited silt and/or debris along drainage channels and outlet points before monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions 	Drainage channels of roads	Report on the conditions of the drainage channels and outlet points		

Appendix-5

Standard Environmental Management Plan (EMP) for Bridges

Bridge Name:

Total Length:

Block Name:

District name:

(Note: Please refer to the Environmental Checklists for individual roads and enter details under column on Location/Numbers. This step will convert this standard EMP into a bridge-specific EMP to be attached to the DPR for each bridge)

Project Action/ Environmental Attributes	Mitigation measures	Location/ Numbers	Costs	Responsible for Implementing	Responsible for Monitoring
<i>Design and Pre-Construction Stage</i>					
Climate change consideration and vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check given : <ul style="list-style-type: none"> The sustainability and cost of the bridge will not be affected by the changes in precipitation patterns or evaporation rates over the lifespan of the project Construction resources of the bridge will not be affected by climate changes Nearby community will not increase the vulnerability of the project. Bridge will not affect the surrounding area Planting of additional trees for increasing the carbon sink. The tree maybe planted with the help of Panchayat Raj Institution (PRI) 	Indicate bridge's name and area	Design cost	PIU, Design consultants	PIU, MMRDA
Finalization of bridges	<ul style="list-style-type: none"> Bridge works will not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and will avoid any monuments of cultural or historical importance. Project works will not pass through any designated wildlife sanctuaries, national parks, notified eco-sensitive areas or are of international significance such as protective wetland 	Indicate bridge's name and area	Design cost	PIU, Design consultants	PIU, MMRDA

	<p>designated under Wetland Convention, and reserve forest.</p> <ul style="list-style-type: none"> • Project to comply with local and national legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement (SPS) 2009. • Alignment finalization considering availability of right of way (ROW) and in consultation with local people. • ROW of the bridge's approach roads should be reduced in built-up or constricted areas to minimize land acquisition as per PMGSY guidelines. • Minimize tree cuttings, shifting of utilities or community structure. • Approach road will follow natural topography to avoid excessive cut and fill 				
Clearing of vegetation and removing trees	<ul style="list-style-type: none"> • All efforts will be taken to avoid tree cutting wherever possible. • Required permission/clearance from department/s will be obtained for cutting of roadside trees. • Provision of compensatory Afforestation will be made on 1:6 ratio basis (Maharashtra State) • Permission will be taken for diversion of any forest land if involved. Provision will be made for additional compensation tree plantation. • The vegetative cover will be removed and disposed in consultation with community 	<p>Indicate bridge's name and area</p> <p>Indicate the number of trees to be removed and the proposed plantation location</p>	<p>Cost for Forestry clearance for diversion of forest land and obtaining tree cutting permit are to be borne by the state.</p> <p>Cost for compensatory forestation is to be borne by state or PRI-NREGA scheme.</p>	<p>Forest clearance and permit is to be obtained by the PIU. Compensatory plantation is to be carried out in coordination with PRI under schemes such as NREGA or local Forest Department</p>	PIU, PISC
Shifting of utilities and common property resources	<ul style="list-style-type: none"> • Bridge width and length will be clearly demarcated • All efforts will be made to minimize shifting of utilities and common property resources • Utility and community structure shifting will be planned in consultation and concurrence of the community 	<p>Indicate bridge's name and area</p> <p>Indicate the total numbers of each structure required for</p>	<p>Cost to cover shifting and common property resources will be covered by the state.</p>	<p>PIU, contractor, utility agencies</p>	PIU, PISC

	<ul style="list-style-type: none"> Required permissions and necessary actions will be taken on a timely basis for removing and shifting utility structures and common property resources before road construction activities begin. 	shifting or removal			
Hydrology and Drainage	<ul style="list-style-type: none"> Construction works near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. Consent to establish and operate should be obtained from the State of Pollution Control Board and comply with all consent conditions 	<p>Indicate bridge's name and area</p> <p>Indicate the name of drainage crossings, nalas, rivers, streams and ponds.</p>	Included in project costs.	PIU, Design consultants	PIU, MRRDA
Establishment of construction camp, temporary office and storage area	<ul style="list-style-type: none"> Construction camp sites will be located away from any local human settlements and forested areas (minimum 0.5 km away) and preferably located on lands, which are not productive (barren/waste lands presently). Temporary office and storage areas shall be located away from human settlement areas and forested areas (minimum 0.5 km) The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. All construction camps shall have provision for rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. The construction camp, office and storage areas shall have provision for health care facilities for adults, pregnant women and children. 	Indicate the places of the construction camp, temporary office and storage area	To be included in contractor's cost	Contractor	PIU, PISC

	<ul style="list-style-type: none"> Consent to establish and operate shall be obtained from the State of Pollution Control Board and comply with all consent conditions. Personal protective equipment (PPE) like helmet, boots, earplugs for workers, first aid and fire fighting equipment shall be available at construction sites before start of constructions 				
Traffic Management and Road Safety	<ul style="list-style-type: none"> Identify areas where temporary traffic diversion maybe required Prepare appropriate traffic movement plan, approved by respective PIU, for ensuring continued safe flow of traffic, pedestrians and all road users during construction. Wherever bridge work require longer construction time and bridge is to be blocked for longer duration, the PIU/ DPR consultant will define appropriate measures for traffic diversion before the start of the construction Adequate signboards will be placed much ahead of the diversion site to caution road users. Warning signs should be bold and retro reflective in nature for good visibility, both day and night 	Indicate the areas for temporary traffic diversion As proposed under DPR and determined by the contractor and approved by PIC/PIU	To be included in contractor's costs	Contractors	PIU, PISC
Risks due to COVID-19	<ul style="list-style-type: none"> Prepare an outline and guidance for COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices (Appendix 7). 	Along bridges, and construction camps, temporary office and storage areas	To be included under contractor's costs	PIU, PISC	MRRDA
<i>Construction Stage</i>					
Sourcing and transportation of construction materials	<p><i>Borrow Earth</i></p> <ul style="list-style-type: none"> The borrow earth will be obtained from identified locations and with prior permission from landowners and clear understanding for its rehabilitation. Rehabilitation plan may include the following: <ul style="list-style-type: none"> Borrow pits will be backfilled with rejected 	<p>Indicate probable locations of borrow areas.</p> <p>Include the name and location of identified quarries</p>	To be included under the contractor's costs	Contractor	PIU, PISC

	<p>construction wastes (inert materials) and will be given a vegetative cover. If this not possible, then excavation slopes will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface.</p> <ul style="list-style-type: none"> - Borrow areas might be used for aquaculture, in case the landowner wants such development. - IRC:10-1961 guidelines should be used for selection of borrow pits and amounts that can be borrowed • Borrowing earth from agricultural land will be minimized to the extent possible. No earthen material will be borrowed from already low-lying areas • 15 cm topsoil stripped-off from the borrow pit and this will be stored in designated areas. The heights of the stockpiles should not exceed 2m and the side slopes are not steeper than 1:2 (vertical: horizontal) • Borrowing of earth will not be done continuously throughout the stretch. Ridges (not less 8m width) will be left at intervals not exceeding 300m. • Small drains will be cut through the ridges, if necessary, to facilitate drainage. • Slope of the edges will be maintained not steeper than 1:4 (vertical: horizontal) • Depth of borrow pits will not be more than 30cm after stripping the 15 cm topsoil • Fly ash will be used along road embankment as per IRC guidelines wherever thermal power plant is located within 100km of the road alignment <p><i>Aggregate</i></p>				
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	<ul style="list-style-type: none"> Stone aggregate will be source from existing licensed quarries Copies of consent/ approval/ rehabilitation plan for use of the existing sources will be submitted to PIU. Topsoil will be stockpiled and protected for use during the rehabilitation stages <p><i>Transportation of construction materials</i></p> <ul style="list-style-type: none"> Existing tracks/ roads are to be used for hauling of materials to the extent possible Prior to construction of roads, topsoil will be preserved for other useful purposes such as turfing the embankment. Vehicles deployed for material transportation will be spillage proof to minimize the loss of materials during transport. The transportation links or roads should be inspected at least twice daily to clear accidental spillage, if any. Topsoil should be stockpiled and protected for use during the rehabilitation stage 				
Loss of productive soil, erosion and land use change	<ul style="list-style-type: none"> Topsoil from the productive land (borrow areas) will be preserved and reused for plantation purposes Topsoil will be used as cover for growing vegetation at embankment slopes as protection against erosion Cut and fill will be planned as per IRC provisions and rural road manual All steep cuts will be flattened and benched Shrubs will be planted in loose soil area IRC:56 – 1974 will be considered for treatment of embankment slopes for erosion control Land taken on lease as access roads, construction camp and temporary office, and storage facility is 	<p>Indicate bridge's name and area</p> <p>Include the impacted zones</p>	To be included under contractor's cost	Contractor	PIU/MMRDA

	restored back to the original land-use before handling it over back to land owner				
Compaction and contamination of soil	<ul style="list-style-type: none"> To prevent soil compaction in the adjoining productive lands (beyond the ROW), movement of construction vehicles, machinery and equipment will be restricted to the designated haulage route. Productive land will be restored after construction activity. Fuel and lubricants will be stored at the pre-defined storage location Storage area will be made paved with gentle slope towards the corner. Discharge points of the storage area should be connected to a chamber where there are possible spills. All efforts will be made to minimize the waste generation. Unavoidable waste will be stored at the designated place prior to disposal. Oil interceptors will be provided to avoid soil contamination at the wash-down and refuelling area. Oil and grease spills, and oil soaked materials should be collected and stored in labeled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold-off to SPCB/MOEF authorized refiners 	<p>Indicate bridge's name and area</p> <p>Include the impacted zones</p>	To be included under contractor's cost	Contractor	PIU, PISC
Construction Debris and waste	<ul style="list-style-type: none"> Useful construction debris will be recovered for filling pits, landscaping and other construction works. With approval of the concerned authority, unusable debris materials must be disposed at pre-designated disposal locations. The bituminous waste will be disposed in secure manner at designated landfill sites only and by environmentally accepted manner. 	<p>Indicate bridge's name and area</p> <p>Include the impacted zones</p>	To be include under contractor's costs	Contractor	PIU, PISC

	<ul style="list-style-type: none"> • For removal of debris, wastes and its disposal, MORTH guidelines should be followed. • Unproductive/wastelands will be selected with the consent of villagers and Panchayat for the same. • Dumping site should be at adequate capacity. It should be located at least 500 m away from the residential areas and away from water bodies to prevent any contamination 				
Impacts on the hydrology, sedimentation and erosion patterns of the river	<ul style="list-style-type: none"> • To minimize issues on the change on the course of the river, erosion and inundation, bridge works need to consider the changes in hydrological flow and behavior of the river • Design bridge foundation, piers and stabilization works will be based on the hydrological studies and hydrological patterns of the river 	<p>Indicate bridge's name, river and area</p> <p>Include the impacted zones</p>	To be include under contractor's costs	Contractor	PIU, PISC
Alteration in surface water hydrology	<ul style="list-style-type: none"> • Existing river system will be maintained and further enhanced • Approach roads level will be raised above High Flood Level (HFL) wherever road level is lesser than HFL. • Bridge construction works will be done during lean flow period. • In some cases, these minor rivers could be diverted for a short period and will be brought back to its original course immediately after construction 	<p>Indicate bridge's name, river and area</p> <p>Include the impacted zones</p>	To be include under contractor's costs	Contractor	PIU, PISC
Siltation in water bodies due to construction activities/ earthwork	<ul style="list-style-type: none"> • As excess siltation can impact wildlife activities, construction of piers must include measures to contain the siltation such as silt fencing • Construction of piers should be limited to a minimum area within the river • Embankment slopes will be modified suitably to restrict the soil debris entering water bodies. • Silt will be collected and stockpiled for possible reuse as surfacing of 	<p>Indicate bridge's name, river and area</p> <p>Include the impacted zones</p>	To be include under contractor's costs	Contractor	PIU, PISC

	<p>slopes where they have to be revegetated</p> <ul style="list-style-type: none"> • No earthworks and stone works will prevent natural flow of rivers, streams and water canals or existing drainage system • Use of retaining walls at water bodies to minimize siltation • Regular checks will be done for soil erosion and turfing conditions of river training structures for its effective maintenance 				
Pedestrian and Wildlife Protection	<ul style="list-style-type: none"> • Temporary access and diversion, with proper drainage facilities. • Access to the schools, temples and other public places must be maintained when construction takes place near bridge improvement works • Fencing wherever there is expected animal movements • Workers will avoid hunting, gathering and harvesting of wildlife for food, selling and domestication • There will be no destruction and disturbing of wildlife habitats • In case there are endangered wildlife in the area, the contractor will inform immediately the local forest department on the sighting of such species • With the help of local forest department, the contractor and PIU will provide awareness on wildlife and habitat protection to the workers every beginning of the construction season. 	<p>Indicate bridge's name, river and area</p> <p>Include the impacted zones</p>	To be include under contractor's costs	Contractor	PIU, PISC
Water logging	<ul style="list-style-type: none"> • Regular visual checks and cleaning of drains will be done along the river to ensure that flow of water is maintained through CD and rivers. • Avoid stagnating water bodies 	<p>Indicate bridge's name, river and area</p> <p>Include the impacted zones</p>	To be include under contractor's costs	Contractor	PIU, PISC
Air Quality and Noise Levels	<ul style="list-style-type: none"> • Vehicles carrying loose and fine materials like sand and aggregate will be covered. • Dust suppression measures (such as water sprinkling) 	Human settlements near the bridge	To be include under contractor's costs	Contractor	PIU, MRRDA

	<p>will be done at all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas.</p> <ul style="list-style-type: none"> • Mixing plants and asphalt (hot mix) plants should be located at least 0.5 km away and in downwind direction of the human settlements. • Material storage areas will be located downwind of the habitation area. • Consent to establish and operate shall be obtained from SPCB and comply with all consent conditions. • Hot mix plant will be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. • Diesel generating (DG) sets should be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5KVA and about 0.7m for 10 KVA DG sets, above top of sound proofing enclosure of the DG set) • Low Sulphur diesel will be used for DG. Sets and other construction machineries. Construction vehicles and machines will be periodically maintained 				
Tree plantation	<ul style="list-style-type: none"> • Compensatory afforestation will be at 1:6 ratio basis (tree removed: seedling replacement) • Compensatory afforestation will be planted at areas suggested by the local Forest Department • Follow-up maintenance of the planting seedlings will be done for a minimum of 3 years 	<p>Include the number of trees required for planting and location of the plantation sites</p>	<p>Costs to be covered by the state or PRI under schemes such as NREGA</p>	<p>PIU to coordinate compensatory forestation with PRI under schemes such as NREGA or local Forest Department</p>	<p>PIU, PISC</p>
Groundwater and surface water quality and availability	<ul style="list-style-type: none"> • Required permission/clearance will be obtained for the abstraction of groundwater from the Ground Water Board/ Central Ground Water Authority, if applicable • Contractor will arrange with the community for the 	<p>Indicate bridge's name and area</p> <p>Include the impacted zones</p>	<p>To be included under contractor's costs</p>	<p>Contractor</p>	<p>PIU, PISC</p>

	<p>constructions' water requirement, in order to avoid impact on the water supply for the nearby people.</p> <ul style="list-style-type: none"> • Water intensive activities will not be undertaken during summer period to extent possible. • Where ponds are not available, water harvesting pits will be constructed, if necessary • Preventive measures like slope stabilization, etc. will be done to minimize siltation of water bodies. 				
Occupational Health and Safety	<ul style="list-style-type: none"> • PPE will be provided to the construction workers. • Provision of well stocked first aid kits and medical supplies at camp sites and regular EHS training • Worker's exposure to noise will be restricted to less than 8 hours a day. Workers' duty station will be regulated accordingly. • Mobile toilets (with septic tanks) fitted with anaerobic treatment facility will be provided at construction camps, temporary office and storage areas. • Domestic solid waste at construction camp will be segregated into biodegradable and nonbiodegradable wastes • Every start of the construction season, contractor will provide (i) health and safety, and (ii) HIV and diseases prevention to workers. 	<p>Indicate bridge's name and area</p> <p>Include the impacted zones</p>	To be included under contractor's costs	Contractor	PIU, PISC
Risks due to COVID-19	<ul style="list-style-type: none"> • Prepare and implement a comprehensive COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices (Appendix 7). • Avoid labor-intensive works as much as possible • Ensure all to use the Personal Protective Equipment (PPE) as appropriate 	Along bridges, and construction camps, temporary office and storage areas	To be included under contractor's costs	Contractor	PIU, PISC

	<ul style="list-style-type: none"> • Ensure all equipment and vehicles used are routinely disinfected • Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp • Place adequate washbasins, disinfectant tub, dispenser for sanitizer • Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and • Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken 				
<i>Post-Construction and Operation Stage</i>					
Air Quality and Noise Levels	<ul style="list-style-type: none"> • Awareness signboards will be provided to slowdown driving near community areas. Speed limitation and honking restrictions could be enforced near sensitive locations 	Human settlements near the bridge	To be included under contractor's costs	Contractor	PIU, PISC
Site Restoration	<ul style="list-style-type: none"> • All former construction camp/ temporary office/ material storage should be restored to its original conditions • Borrow areas rehabilitation should be performed as planned • Obtain clearance from PIU before handing over the construction camp/ temporary office/ material storage sites • PIC to undertake survival survey report with recommendations for improving the survival of the seedlings and submit to PIU the status of the compensatory tree plantation. 	All project locations of construction camp, temporary office, material storage, borrow areas and planting areas	To be included under contractor's costs	Contractor	PIU, PISC
Hydrology and drainage	<ul style="list-style-type: none"> • Regular cleaning or removal of deposited silt and/or debris along rivers and CD outlet points before monsoon season. • Rejuvenation of the drainage system by removing encroachments/ congestions 	bridge area	To be covered under maintenance costs	PIU	PIU, MMRDA

Appendix-6.1

Environmental Monitoring Plan (EMoP) for Bridges during Design and Pre-Construction Stage

Monitoring Responsibility: Contractor with Support from PIC Environmental specialist

Monitoring Frequency: Only once (prior to start of construction)

Bridge Name /District Name:

Bridge Length:

Report No.:

Environmental Attributes	Mitigation Measures	Location	Monitoring Indicator, if applicable	Compliance status	Corrective action proposed in case of delay
Climate change consideration and vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check given : <ul style="list-style-type: none"> The sustainability and cost of the bridge will not be affected by the changes in precipitation patterns or evaporation rates over the lifespan of the project Construction resources of the bridge will not be affected by climate changes Nearby community will not increase the vulnerability of the project. Bridge will not affect the surrounding area Planting of additional trees for increasing the carbon sink. The tree maybe planted with the help of Panchayat Raj Institution (PRI) 	Location specified on the EMP and actual findings in the field	<p>Climate change vulnerability check are included in the first report of the contractor to the PIU.</p> <p>Records of the number of trees, and number of seedlings and locations of the planting areas</p>		
Finalization of alignment	<ul style="list-style-type: none"> Bridge works will not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and will avoid any monuments of cultural or historical importance. Project works will not pass through any designated wildlife sanctuaries, national parks, notified eco-sensitive areas or are of international significance such as protective wetland designated under Wetland Convention, and reserve forest. 	Location specified on the EMP and actual findings in the field	<p>Included in the first report of the contractor to the PIU, if any occurred:</p> <p>-cultural heritage area - forest</p> <p>Submit to PIU and clearances and permits from government authorities</p>		

	<ul style="list-style-type: none"> • Project to comply with local and national legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement (SPS) 2009. • Alignment finalization considering availability of right of way (ROW) and in consultation with local people. • ROW of the bridge's approach roads should be reduced in built-up or constricted areas to minimize land acquisition as per PMGSY guidelines. • Minimize tree cuttings, shifting of utilities or community structure. • Approach road will follow natural topography to avoid excessive cut and fill 				
Clearing of vegetation and removing trees	<ul style="list-style-type: none"> • Minimized tree cutting wherever possible. • Permission/ clearance from department/s obtained for cutting of roadside trees. • Permission for diversion of any forest land if involved. Provision for additional compensation tree plantation 	Location specified on the EMP and actual findings in the field	Submit to PIU and clearances and permits from government authorities		
Shifting of utilities and common property resources	<ul style="list-style-type: none"> • Bridge width and length will be clearly demarcated • Minimized shifting of utilities and common property resources • Utility and community structure shifting plan in consultation and concurrence of the community 	Location specified on the EMP and actual findings in the field	Submit to PIU and clearances and permits from government authorities Records agreement with the community		
Hydrology and Drainage	<ul style="list-style-type: none"> • Construction works near water body was planned during dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. • Consent to establish and operate obtained from the State of Pollution Control Board and comply with all consent conditions. 	Location specified on the EMP and actual findings in the field	Included in the first report of the contractor to the PIU Submit to PIU and clearances and permits from government authorities Records agreement with the community		

Establishment of construction camp, temporary office and storage area	<ul style="list-style-type: none"> Construction camp, temporary office sites and material storages located away from any local human settlements and forested areas (minimum 0.5 km away) and preferably located on lands, which are not productive (barren/waste lands presently). The construction camps, office and storage areas have provision of adequate water supply, sanitation and all requisite infrastructure facilities. The construction camp, office and storage areas have provision for health care facilities for adults, pregnant women and children. Consent to establish and operate shall be obtained from the State of Pollution Control Board and comply with all consent conditions. Personal protective equipment (PPE) like helmet, boots, earplugs for workers, first aid and fire fighting equipment are available at construction sites before start of constructions 	Location specified on the EMP and actual findings in the field	<p>Included in the first report of the contractor to the PIU</p> <p>Submit to PIU and clearances and permits from government authorities</p> <p>Records agreement with the community</p>		
Traffic Management and Road Safety	<ul style="list-style-type: none"> Identified areas where temporary traffic diversion Prepared appropriate traffic movement plan and approved by the PIU. 	Location specified on the EMP and actual findings in the field			
Risks due to COVID-19	<ul style="list-style-type: none"> Prepare an outline and guidance for COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting relevant international good practices (Appendix 7). 	Along bridges, and construction camps, temporary office and storage areas	To be included under contractor's costs	PIU, PISC	MRRDA

Appendix-6.2

Environmental Monitoring Plan (EMoP) for Bridges during Construction StageMonitoring Responsibility: Contractor with support from PIC Environmental SpecialistMonitoring Frequency: First report at the 3rd month after the start of construction or 25% construction progress. 2nd report on the 9th month or 75% construction progress.

Project Details:

Bridge Name:

Monitoring Report No.:

Environmental Attributes	Mitigation Measures	Location	Monitoring Indicator	Compliance status	Corrective action proposed in case of delay
Sourcing and transportation of construction materials	<p><i>Borrow Earth</i></p> <ul style="list-style-type: none"> The borrow earth obtained from identified locations and with permission from landowners and clear understanding for its rehabilitation Borrowing earth from agricultural land was minimized. No earthen material taken borrowed from already low-lying areas 15 cm topsoil stripped-off from the borrow pit and stored in designated areas. The heights of the stockpiles are at 2m or less and the side slopes are not steeper than 1:2 (vertical: horizontal) Borrowing of earth is not done continuously throughout the stretch. Ridges (not less 8m width) will be left at intervals not exceeding 300m. To facilitate drainage, small drains is cut through the ridges, if necessary. Borrow pit slope (at the edges) is maintained not steeper than 1:4 (vertical: horizontal) Depth of borrow pits is not more than 30cm after stripping the 15 cm topsoil Fly ash is used along road embankment as per IRC guidelines wherever thermal power plant is located within 100km of the road alignment <p><i>Aggregate</i></p>	Indicate the locations of each the mitigation measures such as top soil storage area, borrow pit sources, transportation routes and among others	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Rehabilitation plan of the borrow pit area</p> <p>Photographs of the stockpiles and borrow pits</p> <p>Agreement document with landowner for the borrow pits</p> <p>Community complaints</p> <p>Sources of aggregates' permits or license from the government</p> <p>Map of the roads for hauling</p> <p>Vehicle and machine valid emission permit</p> <p>Daily inspection record of roads used hauling for any</p>		

	<ul style="list-style-type: none"> Stone aggregate is sourced from existing licensed quarries Copies of consent/ approval/ rehabilitation plan for use of the existing sources will be submitted to PIU. Topsoil is stockpiled and protected for use during the rehabilitation stages <p><i>Transportation of construction materials</i></p> <ul style="list-style-type: none"> Existing tracks/ roads are used for hauling of materials Prior to construction of roads, topsoil are preserved for other useful purposes such as turfing the embankment. Vehicles deployed for material transportation are spillage proof to minimize the loss of materials during transport. The transportation links or roads should be inspected at least twice daily to clear accidental spillage, if any. For use during the rehabilitation stage, topsoil should stockpiled and protected 		accidental spillage		
Loss of productive soil, erosion and land use change	<ul style="list-style-type: none"> Topsoil are used as cover for growing vegetation at embankment slopes as protection against erosion All steep cuts are flattened and benched Shrubs are planted in loose soil area IRC:56 – 1974 is considered for treatment of embankment slopes for erosion control Land taken on lease as access roads, construction camp and temporary office, and storage facility is restored back to the original land-use before handing it over back to land owner. 	Indicate the locations of each the mitigation measures such area of the embankments with topsoil, leased land, growing vegetation and among others	<p>Report on erosion control method according to IRC:56 – 1974 Along the embankments</p> <p>Report on the Restoration of land</p> <p>Growing vegetation along embankments</p>		
Compaction and contamination of soil	<ul style="list-style-type: none"> To prevent soil compaction in the adjoining productive lands (beyond the ROW), movement of construction vehicles, machinery and equipment is restricted to 	Indicate the locations of each the mitigation measures such as oil and grease's	Corresponding mitigation measures are documented on the monthly report to PIU, including map		

	<p>the designated haulage route.</p> <ul style="list-style-type: none"> • Productive land is restored after construction activity. • Fuel and lubricants is stored at the pre-defined storage location • Storage area is made paved with gentle slope towards the corner. Discharge points of the storage area should be connected to a chamber where there are possible spills. • Wastes are stored at the designated place prior to disposal. • Oil interceptors is provided to avoid soil contamination at the wash-down and refuelling area. Oil and grease spills, and oil soaked materials should be collected and stored in labeled containers 	final disposal, authorized refinery area, disposal of solid wastes and among others	<p>of haulage route and photographs of each of the measures</p> <p>Licenses and permits of the authorized refinery and waste disposal area</p>		
Construction Debris and waste	<ul style="list-style-type: none"> • Excavated materials is used for backfilling embankments, filling pits, and landscaping. • Unusable debris materials are disposed at pre-designated disposal locations • The bituminous waste is disposed at designated landfill sites only and by environmentally accepted manner. • Dumping site should be at adequate capacity. It should be located at least 500 m away from the residential areas and away from water bodies to prevent any contamination. 	Indicate the locations of each the mitigation measures such as places embankments, disposal area of unusable materials, lease land, landfill and among others	<p>Compliance report to MORTH guidelines</p> <p>Report on the consent from villagers and Panchayat for disposal area</p> <p>License and permit of the landfill</p>		
Impacts on the hydrology, sedimentation and erosion patterns of the river	<ul style="list-style-type: none"> • Bridge works need considered the changes in hydrological flow and behavior of the river • Design bridge foundation, piers and stabilization works are based on the hydrological studies and hydrological patterns of the river 	Indicate the locations of each the mitigation measures	Report on the compliance to the mitigation measures to PIU		
Alteration in surface water hydrology	<ul style="list-style-type: none"> • Existing river system maintained and further enhanced 	Indicate the locations of each the	Report on the compliance to the mitigation		

	<ul style="list-style-type: none"> • Approach roads level are raised above High Flood Level (HFL) wherever road level is lesser than HFL. • Bridge construction works are done during lean flow period. • In some cases, minor rivers are diverted for a short period and brought back to its original course immediately after construction 	mitigation measures	measures to PIU		
Siltation in water bodies due to construction activities/ earthwork	<ul style="list-style-type: none"> • As excess siltation can impact wildlife activities, construction of piers must include measures to contain the siltation such as silt fencing • Construction of piers is limited to a minimum area within the river • Embankment slopes are modified suitably to restrict the soil debris entering water bodies. • Silt is collected and stockpiled for possible reuse as surfacing of slopes where they have to be revegetated • No earthworks and stone works have prevented the natural flow of rivers, streams and water canals or existing drainage system • Use of retaining walls at water bodies to minimize siltation • Regular checks are done for soil erosion and turfing conditions of river training structures 	Indicate the locations of each the mitigation measures	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Water quality monitoring at bridge area and periods as designated by the PIU</p>		
Pedestrian and animal movement	<ul style="list-style-type: none"> • Temporary access and diversion, with proper drainage facilities. • Access to the schools, temples and other public places are maintained when construction takes place near bridge improvement works • Fencing wherever there is expected animal movements • Workers avoided hunting, gathering and harvesting of wildlife for food, selling and domestication • There is no destruction and disturbing of wildlife habitats 	Indicate the locations of each the mitigation measures	Report on the compliance to the mitigation measures to PIU		

	<ul style="list-style-type: none"> • In case there were endangered wildlife in the area, the contractor informed immediately the local forest department on the sighting of such species • With the help of local forest department, the contractor and PIU provided awareness on wildlife and habitat protection to the workers every beginning of the construction season 				
Water logging	<ul style="list-style-type: none"> • Regular visual checks and cleaning of drains are done along the river to ensure that flow of water is maintained through CD and rivers. • Avoid stagnating water bodies 	Indicate the locations of each the mitigation measures	Report on the compliance to the mitigation measures to PIU		
Air Quality and Noise Levels	<ul style="list-style-type: none"> • Vehicles carrying loose and fine materials like sand and aggregate are covered. • Dust suppression measures (such as water sprinkling) is done at all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. • Mixing plants and asphalt (hot mix) plants are located at least 0.5 km away and in downwind direction of the human settlements. • Material storage areas are located downwind of the habitation area. • Consent to establish and operate are obtained from SPCB and comply with all consent conditions. • Hot mix plant are fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. • Diesel generating (DG) sets are fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5KVA and about 0.7m for 10 KVA DG sets, above top of sound proofing enclosure of the DG set) • Low Sulphur diesel are used for DG. Sets and other 	Indicate the locations of each the mitigation measures such as mixing plant area, material storage	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Permit and licenses of the mixing plants</p> <p>Air quality and noise level monitoring at areas near communities and periods as designated by the PIU</p>		

	construction machineries. Construction vehicles and machines will be periodically maintained				
Groundwater and surface water quality and availability	<ul style="list-style-type: none"> • Required permission/clearance are obtained for the abstraction of groundwater from the Ground Water Board/ Central Ground Water Authority, if applicable • In order to avoid impact on the water supply for the nearby people, contractor arranged with the community for the constructions' water requirement • Water intensive activities is not done during summer period to extent possible. • Where ponds are not available, water harvesting pits are constructed, if necessary • Preventive measures like slope stabilization, etc. are done to minimize siltation of water bodies. 	Locations of each the mitigation measures as applicable such as sources of water and community zones	<p>Report on the compliance to the mitigation measures to PIU</p> <p>Permission or clearance from Ground Water Board/ Central Ground Water Authority</p>		
Occupational Health and Safety	<ul style="list-style-type: none"> • PPE will be provided to the construction workers. • Worker's exposure to noise will be restricted to less than 8 hours a day. Workers' duty station will be regulated accordingly. • Mobile toilets (with septic tanks) fitted with anaerobic treatment facility will be provided at construction camps, temporary office and storage areas. • Domestic solid waste at construction camp will be segregated into biodegradable and nonbiodegradable wastes • Every start of the construction season, contractor provided (i) health and safety, and (ii) HIV and diseases prevention to workers. 	Location of the construction camps, temporary office, storage areas and on-site areas	Report on the compliance to the mitigation measures to PIU		
Risks due to COVID-19	<ul style="list-style-type: none"> • Prepare and implement a comprehensive COVID-19 Health and Safety Guidance/Plan in compliance to national regulations and health advice, and adopting 	Location of the construction camps, temporary office, storage areas and on-site areas	<p>COVID-19 Health and Safety Guidance/Plan</p> <p>Weekly monitoring of compliance to</p>		

	<p>relevant international good practices.</p> <ul style="list-style-type: none"> • Avoid labor-intensive works as much as possible • Ensure all to use the Personal Protective Equipment (PPE) as appropriate • Ensure all equipment and vehicles used are routinely disinfected • Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp • Place adequate washbasins, disinfectant tub, dispenser for sanitizer • Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites; and • Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken 		COVID-19 Health and Safety Guidance/Plan		
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Appendix-6.3

Environmental Monitoring Plan (EMoP) for Bridges during Post Construction StageMonitoring Responsibility: *PIU*Monitoring Frequency: *On completion of construction and after 1 month the of 1st, 2nd, 3rd, 4th and 5th year of maintenance period*

Project Details:

Bridge Name:

Monitoring Report No.:

Environmental Attributes	Mitigation Measures	Location	Monitoring Indicator	Compliance status	Corrective action proposed in case of delay
Air Quality and Noise Levels	<ul style="list-style-type: none"> Awareness signboards will be provided to slowdown driving near community areas. Speed limitation and honking restrictions could be enforced near sensitive locations 	Places of the signboards	Signboards are functional and ship-shape		
Site Restoration	<ul style="list-style-type: none"> All former construction camp/ temporary office/ material storage should be restored to its original conditions Borrow areas rehabilitation should be performed as planned Obtain clearance from PIU before handling over the construction camp/ temporary office/ material storage sites PIC to undertake survival survey report with recommendations for improving the survival of the seedlings and submit to PIU the status of the compensatory tree plantation. 	Camp, temporary office and material storage Borrow areas Planting areas	clearance from PIU before handling over the construction camp/ temporary office seedling survival survey report with recommendations		
Hydrology and drainage	<ul style="list-style-type: none"> Regular cleaning or removal of deposited silt and/or debris along rivers and CD outlet points before monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions 	Bridge and river	Report on the conditions of the rivers and outlet points		

Proposed outline for MRRDA to prepare a COVID-19 Health and Safety (HS) Plan

COVID-19 Health and Safety (HS) Plan outline

1. **Introduction to the project and purpose of COVID-19 HS Plan (1-2 pages)**
 - 1.1 **Brief description of the project (2-3 paragraphs)**
 - 1.2 **Purpose of COVID-19 HS Plan (2-3 paragraphs).** Include specific reference to local COVID-19 cases.
 - 1.3 **Institutional setup and key personal.** Staff responsible in developing and executing the COVID-19 HS Plan. Kindly include the responsibilities of each staff assign to the team (include the cleaning/maintenance staff also)
2. **Site Assessment**
 - 2.1 **Risk assessment on site-specific infections** (at least 4 paragraphs) Note: The key staff of the contractor should conduct a risk assessment by:
 - (i) Identifying the level of epidemiology in the construction area (ex. recent numbers of COVID-19 patients and suspected infections).
 - (ii) Understand what specific construction activities that have high risk of COVID-19 infections
 - (iii) Document the places where the staff and workers are staying, and how they access construction sites.
 - (iv) Examine the campsite amenities (e.g. quarters, mess hall and wash rooms) if can be modified to allow staff and workers practice physical distancing and practice hygiene
 - (v) construction facilities (e.g. batching plants, storage areas, campsites, etc.) can be modified to implement health and infection prevention and control measures (e.g. additional hand cleaning stations) aligned with national and international COVID-19 guidelines?
 - 2.2 **Contractor's Staff.** Include the list of key staff who shall be assigned in opening/ reopening the sites and oversee COVID-19 HS Plan. (Name and contact details). (1 matrix)
 - 2.3 List of health centers or medical facilities that has the capacity treat COVID-19 patients (1 matrix)
3. **Guidelines on construction and operations** (show the lists of protocols or guidelines for each sub-sections)
 - 3.1 Measures to record the health condition of the workers.
...
 - 3.2 Measures to monitor the health condition of staff and workers.
...
 - 3.3 Measures to maintaining the health, hygiene and safety at the field and office.
...
 - 3.4 Measures to transport work force, material and equipment to and from site.

...

3.5 Measures to maintain equipment and vehicle from contamination

...

3.6 Procedures to disinfect material brought into the site.

...

3.7 Procedure to manage visitors and other deliveries to site.

...

3.8 Measures on the use of PPEs

...

3.9 Measures dispose (e.g. face masks). Note that open burning shall not be accepted as a measure of disposal.

...

4. Awareness creation, routine and regular health/ hygienic practices

4.1 Health and Safety Awareness programs. (List all the awareness programmes that will be conducted, what are schedule of programmes, and who shall conduct the awareness events)

4.2 Health and Safety Routines. (Provide a list of regular and routine health/ hygiene practices that would be carried out for work force and staff.)

5. COVID-19 Emergency preparedness (Indicate the resources that would available at site and measures that would be taken if a COVID 19 patient (or suspected case) is found within the work force.)

*Kindly refer to the link below for further guidance and useful references.

<https://www.adb.org/publications/safety-well-being-workers-communities-covid-19>