



Zonal Master Plan for Matheran Eco-sensitive Zone (MESZ) 2016-36

(Provisions for Zonal
Master Plan of Matheran
Eco-sensitive Zone)

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Sanctioned by the Govt. in Urban Development Department vide Notification No.:TPS-1218/2888/CR-120/18/(Revised)/UD-12, dated 07th August, 2019 issued under Section 15 of Maharashtra Regional & Town Planning Act, 1966.

Town Planning Officer &
Chief, Planning Division,
MMRDA

Metropolitan Commissioner,
MMRDA

Secretary, MMPC
& Jt. Director Town
Planning



Deputy Secretary
Urban Development Deptt
Mantralaya, Mumbai - 32

Mumbai Metropolitan Planning Committee (MMPC)

Mumbai Metropolitan Region Development Authority (MMRDA)

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List of Abbreviations

1	AKBSNA	Ambernath Kulgaon Badlapur Surrounding Notified Area
2	AMC	Ambernath Municipal Council
3	CCT	Continuous Contour Trenching
4	CGWB	Central Ground Water Board
5	CNB	Cement Nala Bandh
6	CR	Central Railway
7	CWC	Central Water Commission
8	DCF	Deputy Conservator of Forest
9	DP	Development Plan
10	EIS	Environment Improvement Society
11	ELU	Existing Land Use
12	ESZ	Eco-Sensitive Zone
13	GOI	Government of India
14	GOM	Government of Maharashtra
15	GSDA	Groundwater Survey and Development Agency
16	GWL	Ground Water Level
17	HCS	Heritage Conservation Society
18	INTACH	Indian National Trust For Art and Cultural Heritage
19	ISRO	Indian Space Research Organisation
20	ITDP	Integrated Tribal Development Project
21	JFM	Joint Forest Management
22	KBMC	Kulgaon Badlapur Municipal Council
23	m bgl	Meters Below Ground Level
24	MCGM	Municipal Corporation of Greater Mumbai
25	MEDA	Maharashtra Energy Development Agency
26	MESZ	Matheran Eco-Sensitive Zone
27	MHSMC	Matheran Hill Station Municipal Council
28	MLR	Matheran Light Railway
29	MMC	Multi-Modal Corridor
30	MMR	Mumbai Metropolitan Region
31	MMRDA	Mumbai Metropolitan Region Development Authority
32	MOEFCC	Ministry of Environment, Forest and Climate Change
33	MR and TP Act	Maharashtra Regional and Town Planning Act, 1966
34	MRPL	M/S Matheran Ropeways Private Limited
35	MRSAC	Maharashtra Remote Sensing And Application Centre
36	MSRDC	Maharashtra State Road Development Corporation
37	MTDC	Maharashtra Tourism Development Corporation
38	MJP	Maharashtra Jeevan Pradhikaran
39	NHAI	National Highway Authority of India
40	NAINA	Navi Mumbai Airport Influence Notified Area
41	NH	National Highway
42	NMMC	Navi Mumbai Municipal Corporation
43	NRSC	National Remote Sensing Centre



44	OTSP	Other Tribal Sub Plan
45	PLU	Proposed Land Use
46	PMC	Panvel Municipal Corporation
47	PWD	Public Works Department
48	RGNDWM	Rajiv Gandhi National Drinking Water Mission
49	RKVY	Rashtriya Krishi Vikas Yojana
50	SPA	Special Planning Authority
51	SH	State Highway
52	ST	Scheduled Tribe
53	TCC	Tourist Carrying Capacity
54	TMC	Tourist Management Committee
55	WPR	Workforce Participation Ratio
56	WRIS	Water Resource Information System



Chapter 1
Mumbai Metropolitan Regional Plan, 2016-36
 (Provisions for Zonal Master Plan of Matheran Eco-sensitive Zone)

1.1. Background

The Mumbai Metropolitan Region Development Authority (MMRDA) with the consent of Mumbai Metropolitan Planning Committee (MMPC) has prepared the Regional Plan of Mumbai Metropolitan Region (MMR), 2016-36. The Eco-sensitive Zone (ESZ) of Matheran and surrounding area as per the Ministry of Environment, Forest and Climate Change's (MoEFCC) Notification dated 04.02.2003 is a part of Mumbai Metropolitan Region. Land Use and Development Control Regulations which are the two most important components of the Plan for ESZ are a part of the Regional Plan for MMR, 2016-36.

This report incorporates the extracted provisions from said Regional Plan related to, and provisions for the said eco-sensitive zone as per the MoEFCC's Notification dated 04.02.2003.

1.2. Zonal Master Plan (ZMP) for MESZ

The Zonal Master Plan addresses the following:

1. Issues pertaining to restoration of the denuded areas, management of catchment areas, watershed management, groundwater management, soil and moisture conservation, provision of fuel wood, needs of the local community and such other aspects of the ecology/environment that need attention.
2. Indicating areas of Hill slopes that need to be conserved.
3. Demarcation of all the existing Gaothans, Gaothan expansion areas, forests, green areas, horticultural areas, agricultural areas, orchards, tribal areas including tribal hamlets, natural springs, natural heritage sites, historic Neral-Matheran railway line and other environmentally and ecologically sensitive areas.
4. Indicating measures and laying down stipulations for regulating traffic, especially the through-traffic in the eco-sensitive zone.

1.3. Area and Boundary of the Notified Zone

Table 1: Taluka-wise Details of villages and Gaothans within the MESZ, as per census 2011.

Sr. No.	Taluka	Number of villages covered	
		Fully	Partially
1	Raigad District	3	64
i	Karjat	0	17
ii	Khalapur	0	11
iii	Panvel	3	36
2	Thane District		15
i	Ambarnath	0	15
	Total (1+2)	3	79

Source: MoEFCC's Notification on MESZ dated 04.02.03, Census 2011.

The eco-sensitive zone partly covers Panvel, Khalapur and Karjat Talukas in Raigad District and part of Ambarnath Taluka in Thane District (refer Map No. 3). The area of the notified zone is 214.73 sq km; however considering the 200 meter wide buffer zone along the ESZ, the total area adds up to 251.56 sq. kms as clarified by the MoEFCC in its amended notification dated 16th January, 2004. The amendment clarifies that the ESZ



includes the 200 meter wide buffer around it. As per the Notification, the MESZ comprises of 90 settlements, 87 villages partially and 3 villages entirely.

On account of changes in the administrative boundaries and merger of certain villages in census 2011, the number of settlements in MESZ is now 85 (includes Matheran Hill Station Municipal Council area, forest area of Ambernath and Kulgaon-Badlapur Municipal Councils, 3 entire villages and 79 part villages).

Following is the Taluka-wise list of villages merged as per census 2011

A. Karjat Taluka

- i. Village Kalamboli is merged into village Damat.
- ii. Village Shelu is merged into Village Shelu.

B. Panvel Taluka

- i. Villages Chorme is merged into village Nitalas.
- ii. Villages Karambeli is merged into village Dundre.

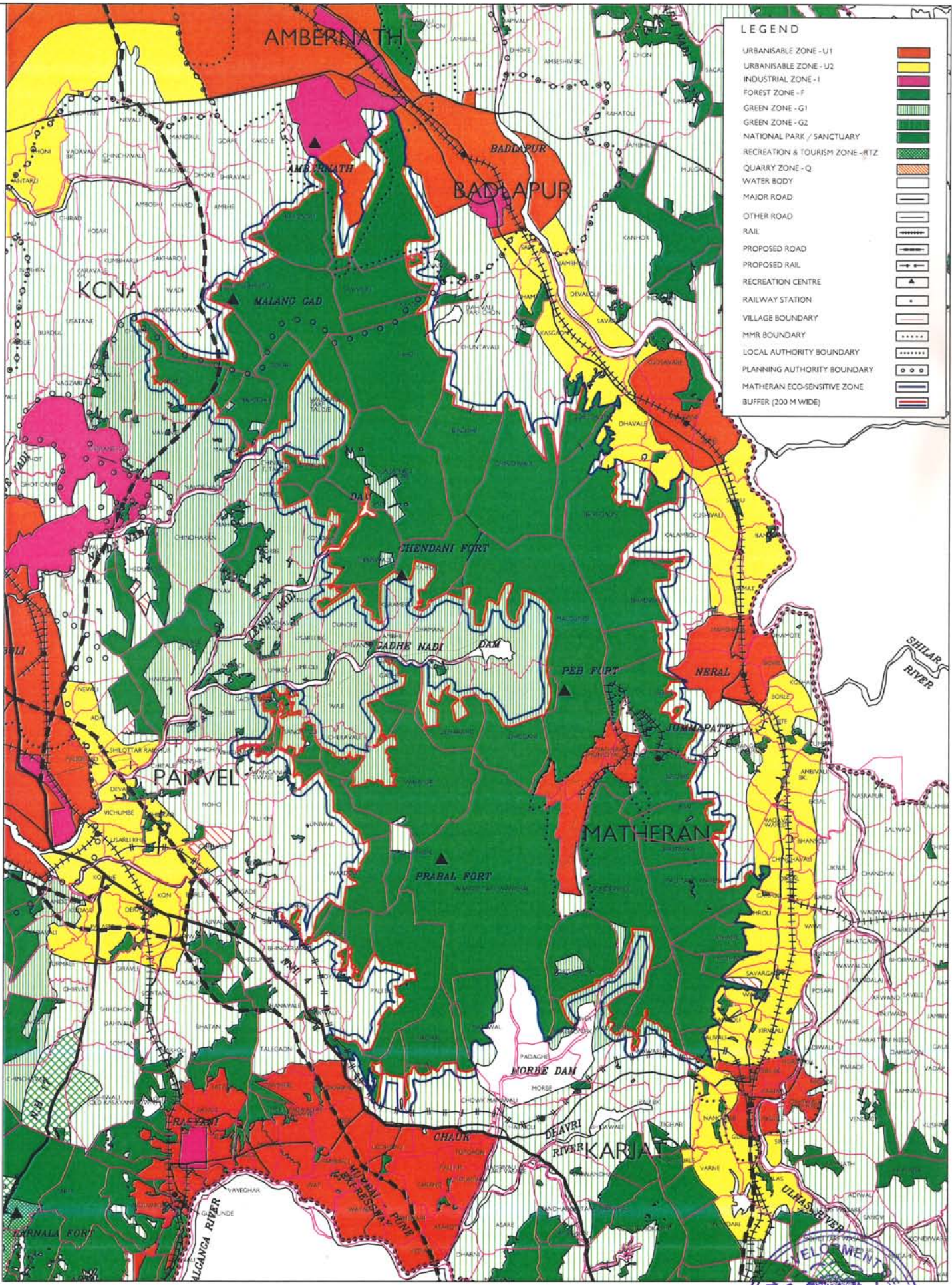
C. Ambernath Taluka

- i. Villages Chikhholi, Jambhivali, Katrap are included in Ambernath Municipal Council.
- ii. Village Shirgaon is included in Kulgaon-Badlapur Municipal Council.

Matheran Hill Station Municipal Council with a population of 4,393 persons (as per Census 2011) is the single largest settlement in the notified area.

As per the GIS based revised base map of Mumbai Metropolitan Region, the notified Matheran Eco-Sensitive Zone measures 248.51 sq. km. instead of 251.56 sq. km. (mentioned in the amended notification dated 16.01.2004) including the 200 m wide buffer.



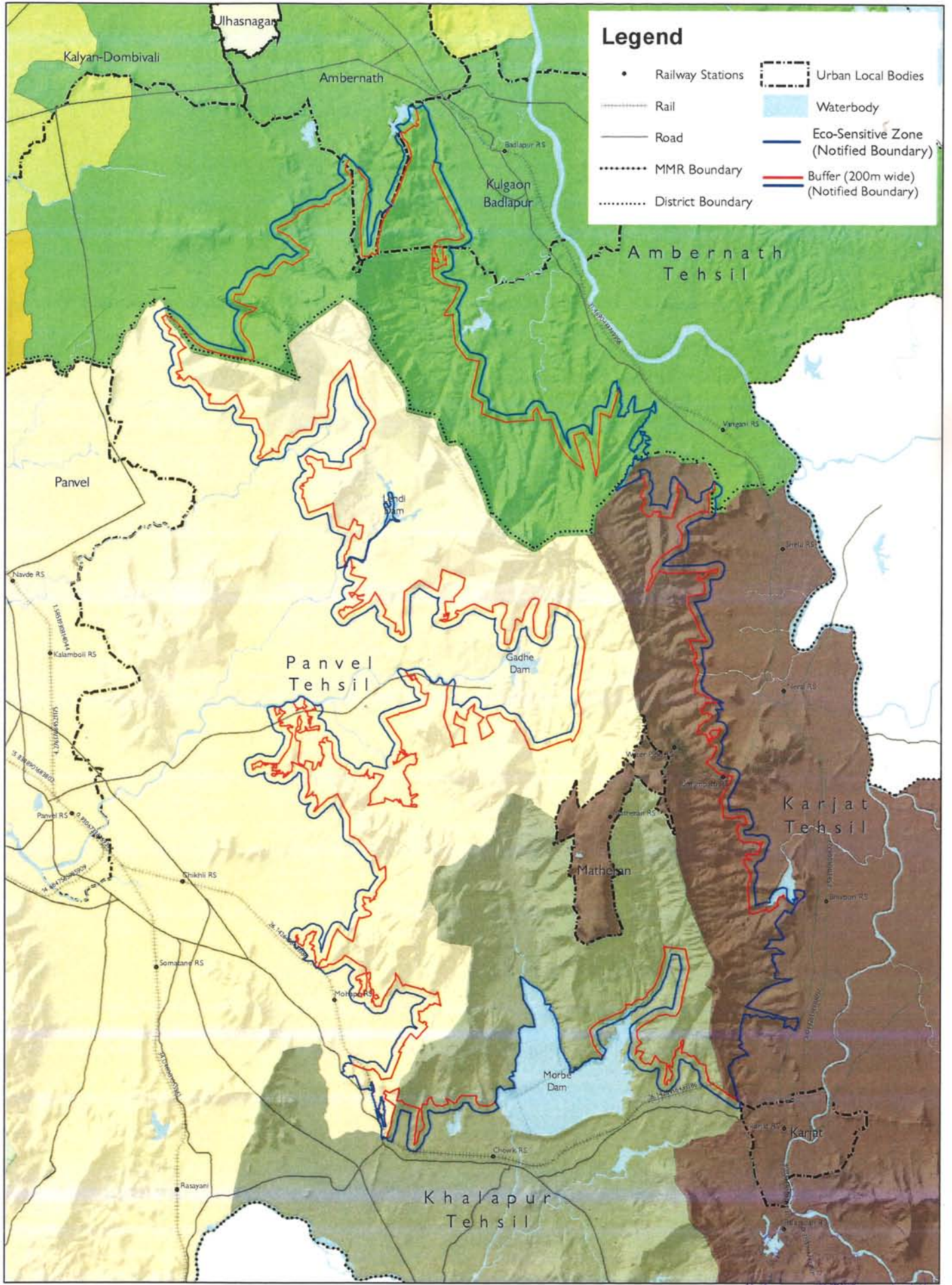



 Mumbai Metropolitan
 Region Development
 Authority (MMRDA)

MATHERAN ECO-SENSITIVE ZONE - NOTIFIED BOUNDARY
 Part Plan of Sanctioned Regional Plan of Mumbai Metropolitan Region, 1996-2011
 indicating Matheran Eco-Sensitive Zone

SCALE 1:50,000

 URBAN PLANNING AND CONSTRUCTION
 DEPARTMENT
 MAHARASHTRA, MUMBAI



Legend

- Railway Stations
- Rail
- Road
- MMR Boundary
- District Boundary
- Urban Local Bodies
- Waterbody
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)



Administrative Boundaries

Matheran Eco-sensitive Zone

0 0.75 1.5 3 4.5 Kmts.

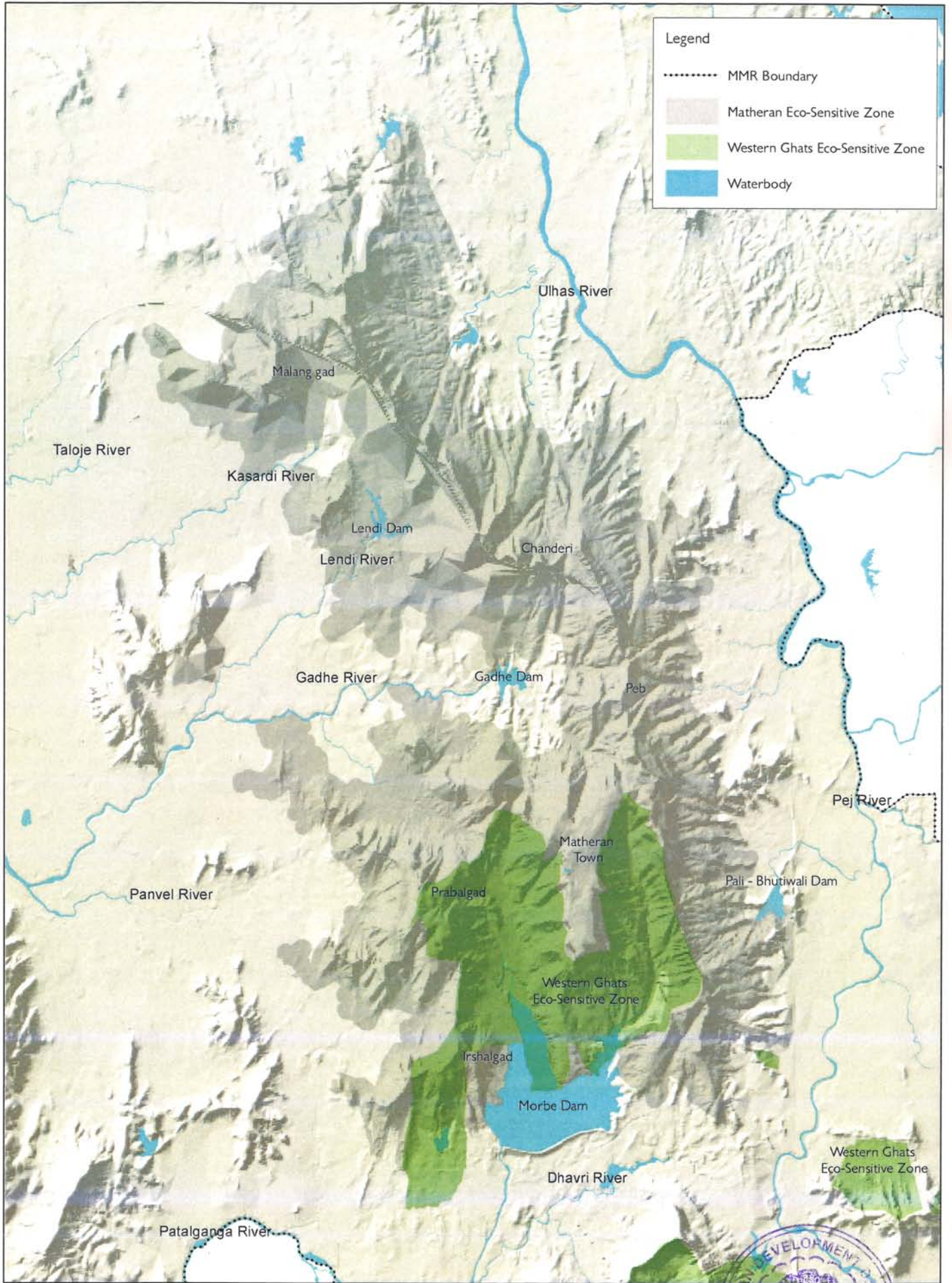
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Map No. **02**

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N

MAHARASHTRA, MUMBAI



Legend

- MMR Boundary
- Matheran Eco-Sensitive Zone
- Western Ghats Eco-Sensitive Zone
- Waterbody



Natural Features

Matheran Eco-sensitive Zone

0 0.75 1.5 3 4.5 Kms
Scale: - 1 : 1,50,000

Map No. **03**



Chapter 2 Natural Features of MESZ

2.1. Location

The Eco-sensitive Zone is a part of the Mumbai Metropolitan Region. The Matheran-Malang Gad hill range, which forms part of the Sahyadri hill range, is located in the south-eastern portion of the Mumbai Metropolitan Region. The MESZ extends over parts of Karjat, Khalapur and Panvel Talukas of Raigad district and Ambernath Taluka of Thane district. The Navi Mumbai Airport Influence Notified Area (NAINA) is to the west of the MESZ, while the Ambernath and Kulgaon-Badlapur Municipal Councils abutt the northern boundary. State Highway no. 79 is on the eastern side of the MESZ and the Panvel-Karjat Railway line and Morbe dam are to the south of the MESZ.

Geographically, the MESZ lies between 18° 54' 34" to 19° 10' 37" N and 73° 08' 33" E to 73° 19' 28" E (Refer Figure 1).

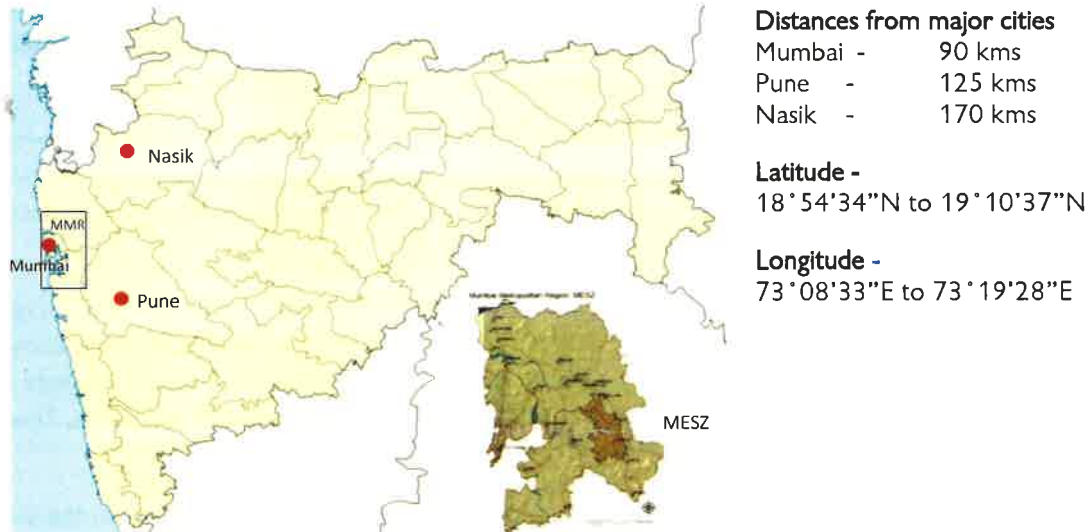


Figure 1: Location of MESZ

Also, the High Level Working Group for the Western Ghats Eco-sensitive Zone constituted by the MoEFCC has identified approximately thirty-seven per cent of the Western Ghats, covering an area of 59,940 sq. km as ecologically sensitive. The MoEFCC vide its draft notification no. S.O.2435 dated 04.09.2015 has notified the Western Ghats Eco-sensitive Region extending over six states namely, Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu. Four villages included in the Matheran Eco-sensitive Zone namely, Sondewadi, Warose tarf Wankhal, Borgaon Kh. and Nadhal in Khalapur Taluka of Raigad district are a part of the proposed Western Ghats Eco-Sensitive Zone.



2.2. Climate and Natural Features

2.2.1. Climate

Matheran and its surrounding area have a cool and pleasant climate throughout the year. As in the whole of Western India, summer, monsoon and winter are the three main seasons in Matheran. The average annual temperature ranges from 17° Celsius to 30° Celsius with the lowest temperature on the hill plunging up to 7° Celsius in winter. The characteristically cool and dry winter extends from October to February while the maximum temperature is experienced during the months of April and May. The monsoons in Matheran that spread over four months from June to September are particularly heavy and continuous. The average annual rainfall on the hill is about 5,167.5 mm. with the maximum occurring in the month of July, while the rainfall in the lower altitudes roughly varies from 3,267 to 3,630 mm.

2.2.2. Geology

The entire Eco-Sensitive Zone of Matheran is covered by Basaltic Rock formations which are also called as Deccan basalts or Deccan Traps. These black coloured basalts are of younger age, their intensity of weathering is low and the jointing and fracturing of the rock is also low. The major portion of the area is therefore covered by hard compact Basalts. The depth of the highly to moderately weathered basalt trap is 2 to 4 m.

These Basaltic rocks are capped by the red coloured laterite on Matheran Plateau with an average thickness of 12 to 15 meters. The formation of laterite or the 'laterisation' is attributed to the chemical weathering of the basalt occurring over the years due to heavy rainfall which actually leads to leaching of all bases leaving behind the concentration of iron and aluminium.

The laterite is a soft rock, purplish red in colour variegated with yellow, green, white and amber tints. When freshly quarried, it can be easily cut into blocks while on exposure to atmosphere it becomes extremely hard. It is an ideal medium for masonry as well as mortars. The trap constituting the body of the hill lies in several layers of enormous thickness, which are well seen from some of the points. These layers normally having plain surface are columnar at certain locations.

The trap varying in chemical composition disintegrates and forms soil on the sloping hillside. In this soil, bushes and large trees have sprung up and the consecutive layers are thus separated by belts of forest growing on the slopes that have been formed by the detritus.

The depth of laterite crest varies from place to place on the plateau. Along the edge of the plateaux one can observe masses of laterite rocks of great size, weathered and rounded, in all stages of decomposition. The layer of laterite is porous and highly absorbent behaving like a huge sponge holding the rainwater initially and then releasing it gradually.

Original lateritic top is now in disintegrated form. Disintegration of laterite is a very typical process, which has divided the plateau in three broad geomorphic units: Lateritic cap, top slopes and marginal slopes. The loose laterite soil and Lateritic boulders are visible on the immediate slopes. The presence of laterite has affected the lithological and hydrological characteristics of the plateau, which in turn affect the vegetation, soil, moisture, water table, springs and drainage pattern.

2.2.3. Hydrogeology

As mentioned in the preceding section, the Matheran area is covered by Basaltic Rock formations which are also called as Deccan basalts or Deccan Traps. The wells and bore wells in the Matheran area are tapping these younger basalts that have low weathering and fracturing. Therefore, bore wells yield less



quantity of water during summer months. Deeper aquifers are also not promising in the area owing to the geological formation.

2.2.4. Soil

The Maharashtra Remote Sensing and Application Center (MRSAC) had undertaken the mapping of soils and other geological information for the entire state of Maharashtra using high resolution satellite imagery in the year 2007. The interpretation of the said data for Matheran area is presented below:

- a) **Soil Type:** Matheran is characterised by its red soil or the lateritic soil. The laterite cap produces a poorer soil but when completely decomposed and well mixed with vegetable mould, can support large trees, especially at higher elevations like Matheran. The lateritic soil found in Matheran having low pH value of 4.5 and high percentage of Silica and Alumina is ideal to support semi-evergreen type of forest. The depth of topsoil rich in essential organic matter varies from 15 centimetres to 35 centimetres on the plateau.
- b) **Soil Texture:** The area is predominantly covered with gravelly sandy clay loam and the gravelly clay type both of which have very good drainage properties. These two soil types cover almost 95.45 % of the MESZ, of which 74% is covered by the gravelly sandy clay loam type (refer Map No. 4).
- c) **Soil Depth:** The soil cover in MESZ area is generally shallow with approximately 77.32% area having 10-25 cm soil depth. The MRSAC has identified soil depth in the Matheran town as extremely shallow i.e. <10 cm (refer Map No. 5).
- d) **Soil Drainage:** Almost the entire MESZ is well drained (about 95%) barring villages Sangatoli & Ambivali in Panvel Taluka and Nanivali in Khalapur Taluka which are moderately drained (refer Map No. 6).
- e) **Erosion:** Almost 53.87 % of the area of the MESZ is prone to moderate to severe erosion while 6.07 % area is prone to severe erosion. The ridge of the Matheran Hill Range is vulnerable to moderate to severe erosion which is also the origin of many streams and rivulets. As is observed from the MRSAC maps, the village of Khairwadi (at the foothills), parts of villages Kondap, Nitale, Vavanje, Mahodar, Wangani Tarf Taloje, Shiravali, Chinchavali Tarf Taloje and Dhodani of Panvel Taluka are severely erosion prone. Parts of Savaroli, Varade, Bhoj and Bendshil villages at the foothills of the forest zone in Ambarnath Taluka are also severely erosion prone. The development pressures and the very nature of the laterite soils to erode are making Matheran Town more prone to erosion. It is also observed that the area surrounding the Lendi Dam in village Karambeli Tarf Taloje and Bhoj Dam in village Bhoj are vulnerable to severe erosion. The area around the Gadhe Dam, Morbe Dam and Dam near Village Pali.T. Waredi is also prone to Moderate to severe and sever erosion. Similarly, the area along the Lendi and Gadhe rivers is also prone to severe erosion (refer Map No. 7).

2.2.5. Topography

The Eco-sensitive Zone consists of the Matheran-Malang Gad Hill Range as well as the area along the foothills of the range. The altitude ranges from 50 m to 800 m above the mean sea level. The highest point lies on the Matheran Hill at an altitude of 800 m. The hill-tops and slopes are mostly forested with deciduous forest while agricultural plantation and settlements are observed on the lower slopes and foothills. The higher elevation of the hills has faced much soil erosion due to the winds as a result of which exposed rock can be observed. Most of the hill region is covered by shrub and grassland covers.

The profile of Matheran Hill resembles the western edge of Sahyadri, which ends abruptly with an escarpment resembling a sheer wall at places. The escarpment of Matheran hill has a stepped profile as the trap constituting the body of the hill lies in several layers and each layer is separated from the other by a narrow terrace. Deep ravines or 'Daras' are formed at the junctions of the spurs with the main body of the hill and near the projected headlands. Ghogal Dara, Galt Dara, Ghabad Dara, Gijnai Dara



and Takya Dara are among major ravines associated with the edge of the plateau (Source - Matheran: A Comprehensive Heritage Listing Proposal, prepared by INTACH for MMR-HCS).

Table 2: Slope Analysis for MESZ

S.No	Slope	Per cent of area
1	1-3 %	0.01
2	3-5%	7.76
3	5-10%	12.70
4	10-15%	9.10
5	15-35%	38.97
6	35-50%	30.14
7	Habitation	0.14
8	Waterbodies	1.18
	Total	100.00

A slope analysis was carried out using topographic and contour data obtained from the land use-land cover assessment. Matheran, Machiprabal and Haji-Malang plateau areas have a gradual slope of less than 5 percent while the western area especially the villages of Khairwadi, Tamsai, Dehrang, Gadhe and Wajapur have slope ranging from 5 to 10 per cent. Around 69 per cent of the MESZ area has steep slopes ranging from 15 per cent to 50 per cent. The ridge areas and especially the Matheran hill station, Prabalgad fort area, Peb and Chanderi fort area and Haji Malang area have a very steep slope of 35 per cent and more (refer Map No. 8).

2.3. Drainage Basins and Watersheds

The MESZ is a part of the Ulhas and Patalganga river basins. The watersheds have been delineated and subdivided by the Agriculture Department and the Groundwater Surveys & Development Agency (GSDA) of the Government of Maharashtra.

The Zone comprises a total of 6 watersheds of which 4 watersheds are in Raigad District and 2 in Thane District. The watersheds are subdivided into mini watersheds which are further subdivided into micro watersheds. Thane district of the MESZ has a total of 2 mini and 14 micro watersheds and the Raigad district side of the MESZ has a total of 6 mini and 18 micro watersheds (Map No. 9).

2.3.1. Drainage Pattern

Most of the drainage system originates from the Matheran Hill range. This drainage is of the 1st order system. The drainage pattern so formed is of radial nature. Even though the entire area receives high rainfall, most of these drains dry up in the summer months (source: data procured from GSDA).

2.3.2. Rivers

The Matheran-Malang Gad hill range acts as the drainage basin for a number of streams emerging from uphill in-turn draining into the various rivers and finally into the Arabian Sea. The following are the major rivers and water bodies flowing through and being fed by the MESZ.

- The Ulhas River:** The Ulhas River has its origin from the southern tip of the Karjat hill range (part of the Western Ghats) at southern side of the MESZ. The river flows through Badlapur, Ulhasnagar, Kalyan-Dombivili and through the Vasai Creek drains into the Arabian Sea. The eastern side of the Eco-sensitive zone is an important source of water for the Ulhas River which is also an important source of drinking water to a number of cities within the MMR including the Matheran Hill station.
- Lendi River:** Lendi River originates in Morbe village and flows downstream flowing into the Panvel River and draining into the Arabian Sea through Thane Creek. The river is a source of water to the neighbouring areas and also has a minor irrigation project at Morbe village.
- Navde River:** Navde River originates in Wangani Tarf Taloje village and merges with the Taloje River near Taloja MIDC. The River drains into the Arabian Sea through Panvel Creek.
- Gadhe River:** The Gadhe River originates in Maldunge village which is the central catchment area for the river. The river merges with Lendi River and drains into the Arabian Sea through Panvel Creek.



quantity of water during summer months. Deeper aquifers are also not promising in the area owing to the geological formation.

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- a) **Soil Type:** Matheran is characterised by its red soil or the lateritic soil. The laterite cap produces a poorer soil but when completely decomposed and well mixed with vegetable mould, can support large trees, especially at higher elevations like Matheran. The lateritic soil found in Matheran having low pH value of 4.5 and high percentage of Silica and Alumina is ideal to support semi-evergreen type of forest. The depth of topsoil rich in essential organic matter varies from 15 centimetres to 35 centimetres on the plateau.
- b) **Soil Texture:** The area is predominantly covered with gravelly sandy clay loam and the gravelly clay type both of which have very good drainage properties. These two soil types cover almost 95.45 % of the MESZ, of which 74% is covered by the gravelly sandy clay loam type (refer Map No. 4).
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- e) **Erosion:** Almost 53.87 % of the area of the MESZ is prone to moderate to severe erosion while 6.07 % area is prone to severe erosion. The ridge of the Matheran Hill Range is vulnerable to moderate to severe erosion which is also the origin of many streams and rivulets. As is observed from the MRSAC maps, the village of Khairwadi (at the foothills), parts of villages Kondap, Nitale, Vavanje, Mahodar, Wangani Tarf Taloje, Shiravali, Chinchavali Tarf Taloje and Dhodani of Panvel Taluka are severely erosion prone. Parts of Savaroli, Varade, Bhoj and Bendshil villages at the foothills of the forest zone in Ambarnath Taluka are also severely erosion prone. The development pressures and the very nature of the laterite soils to erode are making Matheran Town more prone to erosion. It is also observed that the area surrounding the Lendi Dam in village Karambeli Tarf Taloje and Bhoj Dam in village Bhoj are vulnerable to severe erosion. The area around the Gadhe Dam, Morbe Dam and Dam near Village Pali.T. Waredi is also prone to Moderate to severe and sever erosion. Similarly, the area along the Lendi and Gadhe rivers is also prone to severe erosion (refer Map No. 7).

2.2.5. Topography

The Eco-sensitive Zone consists of the Matheran-Malang Gad Hill Range as well as the area along the foothills of the range. The altitude ranges from 50 m to 800 m above the mean sea level. The highest point lies on the Matheran Hill at an altitude of 800 m. The hill-tops and slopes are mostly forested with deciduous forest while agricultural plantation and settlements are observed on the lower slopes and foothills. The higher elevation of the hills has faced much soil erosion due to the winds as a result of which exposed rock can be observed. Most of the hill region is covered by shrub and grassland covers.

The profile of Matheran Hill resembles the western edge of Sahyadri, which ends abruptly with an escarpment resembling a sheer wall at places. The escarpment of Matheran hill has a stepped profile as the trap constituting the body of the hill lies in several layers and each layer is separated from the other by a narrow terrace. Deep ravines or 'Daras' are formed at the junctions of the spurs with the main body of the hill and near the projected headlands. Ghogal Dara, Galt Dara, Ghabad Dara, Gijnai Dara



2.3.3. Springs and Waterfalls

During monsoons ground water gets recharged. Rate of percolation of water into the ground is also high due to the porous upper strata and large areas on the plateau being covered with forest or vegetation. High level of soil moisture has resulted in the evergreen nature of the crest top forest. The springs and waterfalls are found mostly on the Matheran Plateau from where they originate.

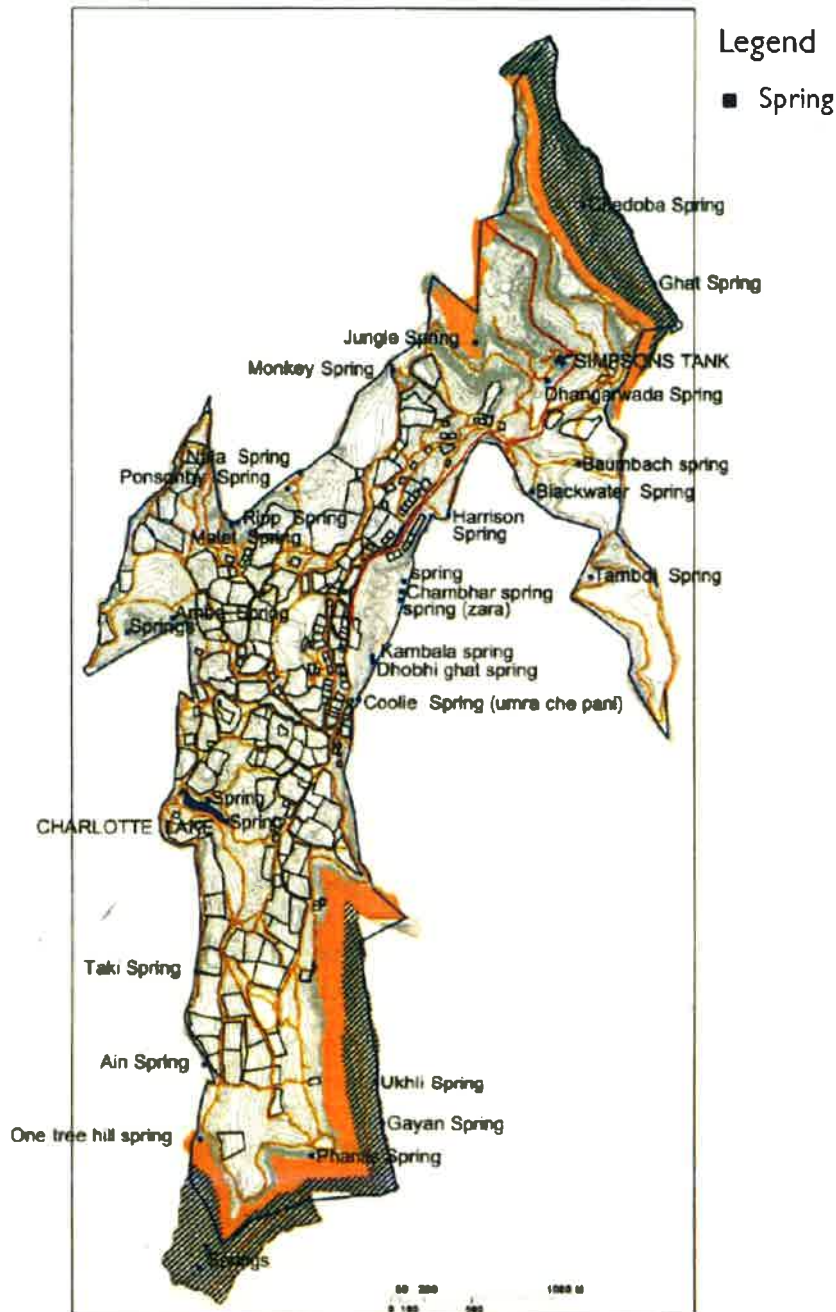


Figure 2: Perennial and non-perennial Springs In and around Matheran Town
 Source: Environmental Management Plan for Matheran Plateau, MMR-EIS,
 prepared by Grass Roots Research and Consultancy

Most of these springs are seasonal in nature. These springs generally ooze out at the contact of laterite and basalt. These springs are an important water source for the plateau and the surrounding region



(Source: (i) Environmental Management Plan for Matheran Plateau, Mumbai Metropolitan Region-Environment Improvement Society. (ii) GSDA. The details regarding these are furnished in Table 3:

Table 3: Status of the Springs in MESZ

No.	Name of the Spring	Perennial/Non-Perennial	Water flow	Potable/Non-potable	Uses
1	Jungle Spring	Perennial	Steady stream	Potable	Drinking
2	Monkey Spring	Perennial	Cascading	Potable	Drinking
3	Ponsonby Spring	Perennial	Steady stream	Potable	
4	Nala Spring	Perennial	Trickle	Potable	
5	Malet Spring	Perennial	Cascading	Potable	Drinking
6	Ripp Spring	Perennial	Trickle	Potable	Drinking
7	Ashachi Patti Spring	Non-Perennial	Trickle	Potable	Drinking
8	Amba Spring	Perennial	Trickle	Potable	Drinking
9	Near Charlotte	Perennial	Cascading	Non-potable	
10	Ain Spring	Non-Perennial	Trickle	Potable	Drinking
11	One Tree Hill Spring	Non-Perennial	Trickle	Potable	Drinking
12	Ukhli Spring	Perennial	Trickle	Potable	Drinking
13	Gayan Spring	Perennial	Trickle	Potable	Drinking
14	Ghat Spring	Non-Perennial	Trickle	Non-Potable	
15	Chambhar Pani	Non-Perennial	Trickle	Non-Potable	
16	Zara Spring	Non-Perennial	Trickle	Non-Potable	
17	Kamela Spring	Perennial	Trickle	Non-Potable	Domestic use
18	Dhobhighat spring	Perennial	Trickle	Non-Potable	Domestic use
19	Coolie Spring	Non-Perennial	Trickle	Non-Potable	
20	Harrison Spring	Perennial	Steady stream	Potable	Domestic use
21	Dhangarwada Spring	Perennial	Steady stream	Potable	Drinking
22	Blackwater Spring	Non-Perennial	Steady stream	Potable	Domestic use
23	Tambdi Spring	Non-Perennial	Trickle	Potable	Drinking

Source: Environmental Management Strategy for Matheran Plateau prepared by Grass Roots Research & Consultancy for MMR- EIS

Some of the above listed springs are an important water source for the local settlements/padas. Malet spring is an important source for wildlife such as monkeys, giant squirrels and honeybees. Chambhar Pani, spring near Charlotte lake, Coolie, Zara, Ghat springs are highly contaminated while Kamela, Dhobighat, Harrison, Dhangarwada and Blackwater springs are moderately contaminated. The high contamination is on account of the disposal of waste water into the streams. Dhangarwada spring has a lot of siltation and needs to be revived.

2.3.4. Ground water

Groundwater is an important and major source of water supply in the MESZ. Also, as mentioned in section 2.2.3, the water sources become dry during the summer season resulting in water scarcity. Therefore, qualitative as well as quantitate assessment of the groundwater is necessary. The Ground water analysis is based on 4 parameters viz., Post-Monsoon Water Level, Pre-Monsoon Water level, Fluctuation in water level due to draft (withdrawal of water) and Fluctuation in water level due to Recharge (Natural and artificial recharge). The various parameters influencing the groundwater level are spatial and temporal distribution of rainfall, topographical variations, geological formations, temperature (variation in water requirement), recharge and draft.



The data of groundwater level analysis for MESZ is obtained from the India WRIS (Water Resource Information System) Web GIS (4.1) portal. This project of India WRIS is a joint venture of the Central Water Commission (CWC), Ministry of Water Resources, Govt and Indian Space Research Organisation (ISRO), Department of Space, Govt. The database used by the current version-4.1 of India WRIS Web GIS is for the year 2015. The following Table 4 shows the groundwater level analysis. (Note: MESZ boundary in Table 4 is indicative)

Table 4: Post-Monsoon and Pre-Monsoon Groundwater level analysis in MESZ for the years 1996, 2002, 2006 and 2011.

Legend	Year 1996	Year 2002	Year 2006	Year 2011
Depth (m bgl) <2 2-5 5-10 10-20 20-40 >40	1. Post-Monsoon Water Level 			
2. Pre-Monsoon Water Level 				






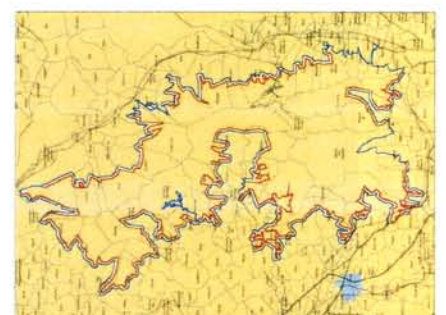

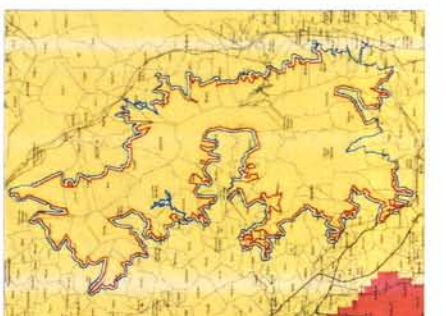



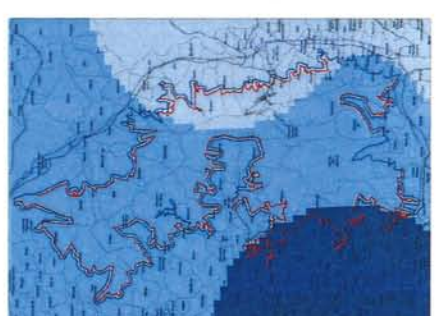
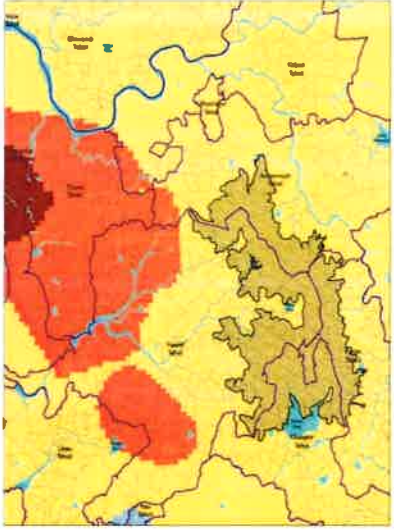
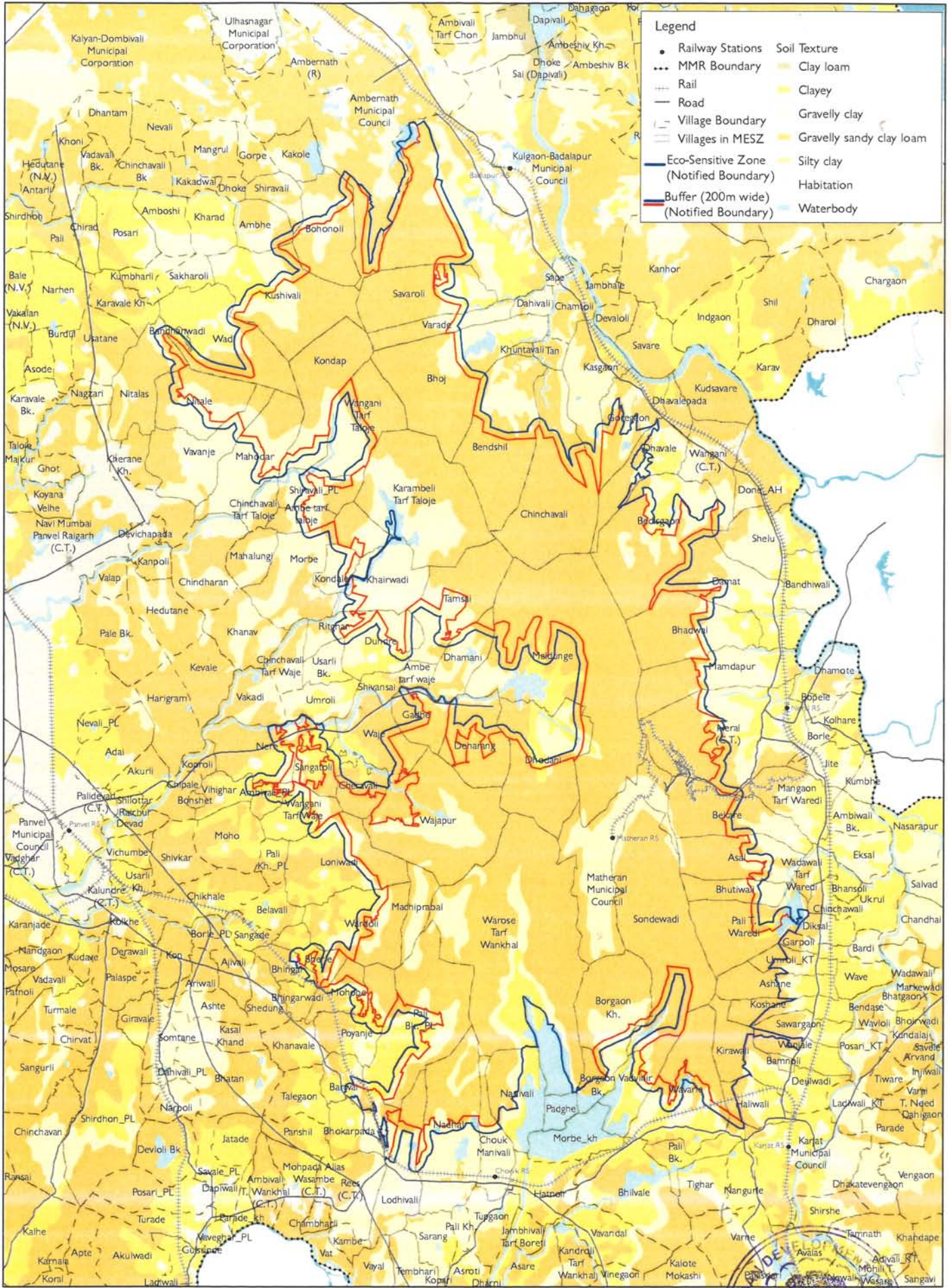
Year 1996	Year 2002	Year 2006	Year 2011
<p>3. Fluctuation in Water Level due to Draft</p> 			
<p>Fluctuation in Water Level due to Recharge</p> 			
			
			
			

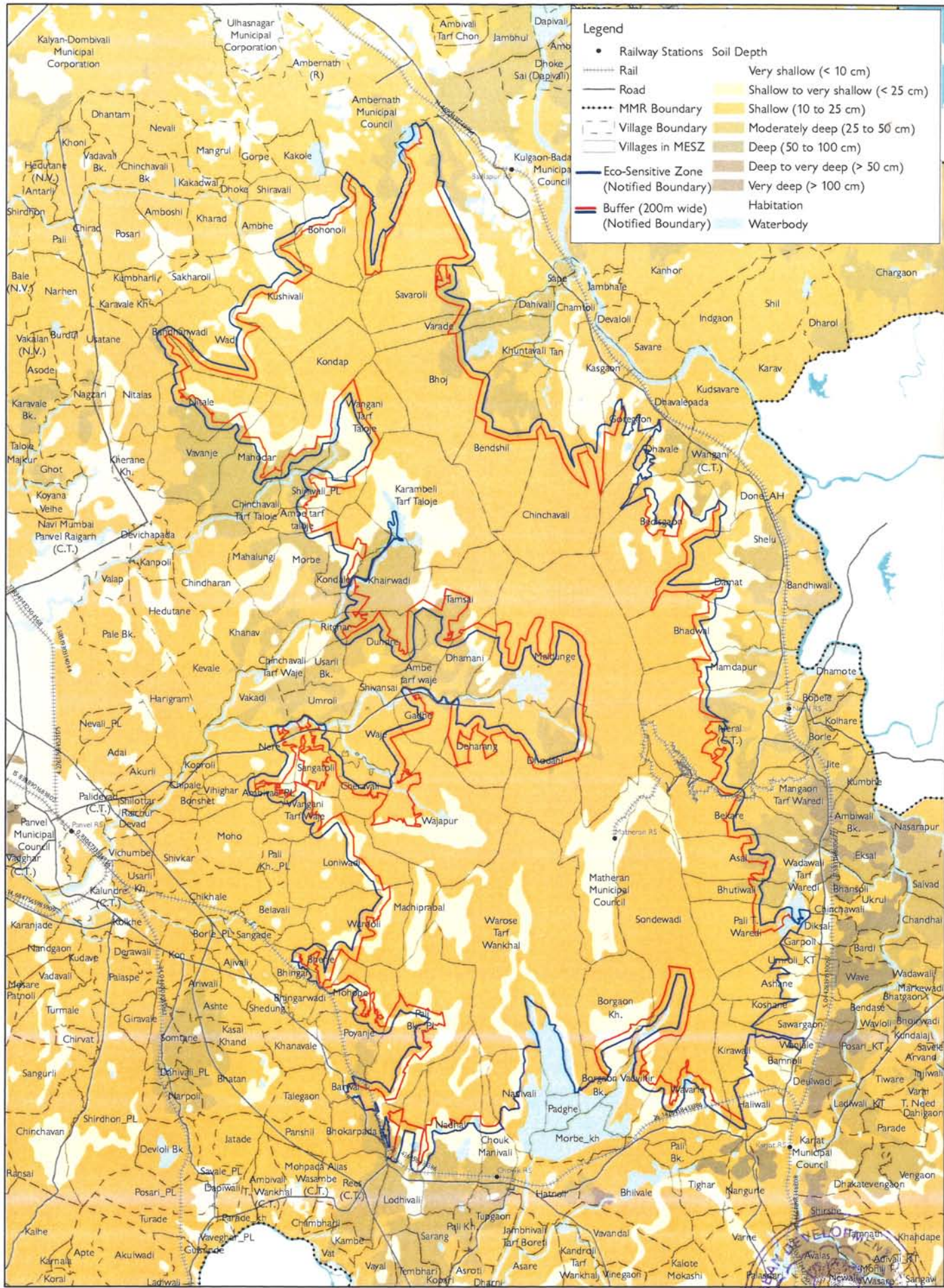


Table 5: Analysis of Post-Monsoon and Pre-Monsoon Groundwater level - Observations and Inferences

Sr. No	Observations	Analysis	Inferences
1	The coverage of post-monsoon water level (<2 m bgl) has increased from 1996 to 2006. A substantial drop in the ground water level (GWL) was observed in the year 2011. However, the rainfall has increased from 1996 to 2011 except in the year 2002 when it was lower than in the year 1996.	The decrease in the GWL may be attribute to - i. The hydrogeology, topography (slopes) in the MESZ. ii. Silting of existing Recharge Structures. iii. Improper maintenance and gaps in the number of requisite recharge structures.	i. De-silting or maintenance of Recharge Structures may be required for effective recharge of groundwater ii. Measures for groundwater recharge in urbanized areas may be considered on the western side of MESZ.
2	The Pre-monsoon GWL has increased from 1996 to 2011. Almost 100% villages in MESZ have the GWL of 2 to 5 m bgl.	iv. Increase in surface run-off coupled with the slope of the ESZ. v. Increase in fluctuation due to draft in 2011 can be attributed to the increase in population and urban sprawl on the western side of MESZ.	iii. Tree plantation of local species and water conservation measures may be considered to arrest surface run-off during monsoon. iv. The location of wells must be finalized only after appropriate and scientific study.
3	Fluctuation due to draft is almost constant from 1996 to 2011 i.e. <2 m Fall. In 2011, The fluctuation of 2-4 m fall and >4 m fall are observed in the western side of MESZ (Panvel Taluka , Navi Mumbai and MCGM). 		
4	The fluctuation due to Recharge has substantially decreased in 2011 with maximum settlements having <2 m rise. Earlier the fluctuation was 2-4 m rise in most of the settlements.	*Note: The Talukas Karjat, Khalapur, Panvel in Raigad District and Ambernath Taluka in Thane District fall under the 'SAFE' category in the stages of Ground Water Development. This is as per the report on the Dynamic Ground Water Resources on Maharashtra (2011-12) conducted by the Ground Water Surveys and Development Agency (GSDA) in collaboration with Central Ground Water Board (CGWB).	





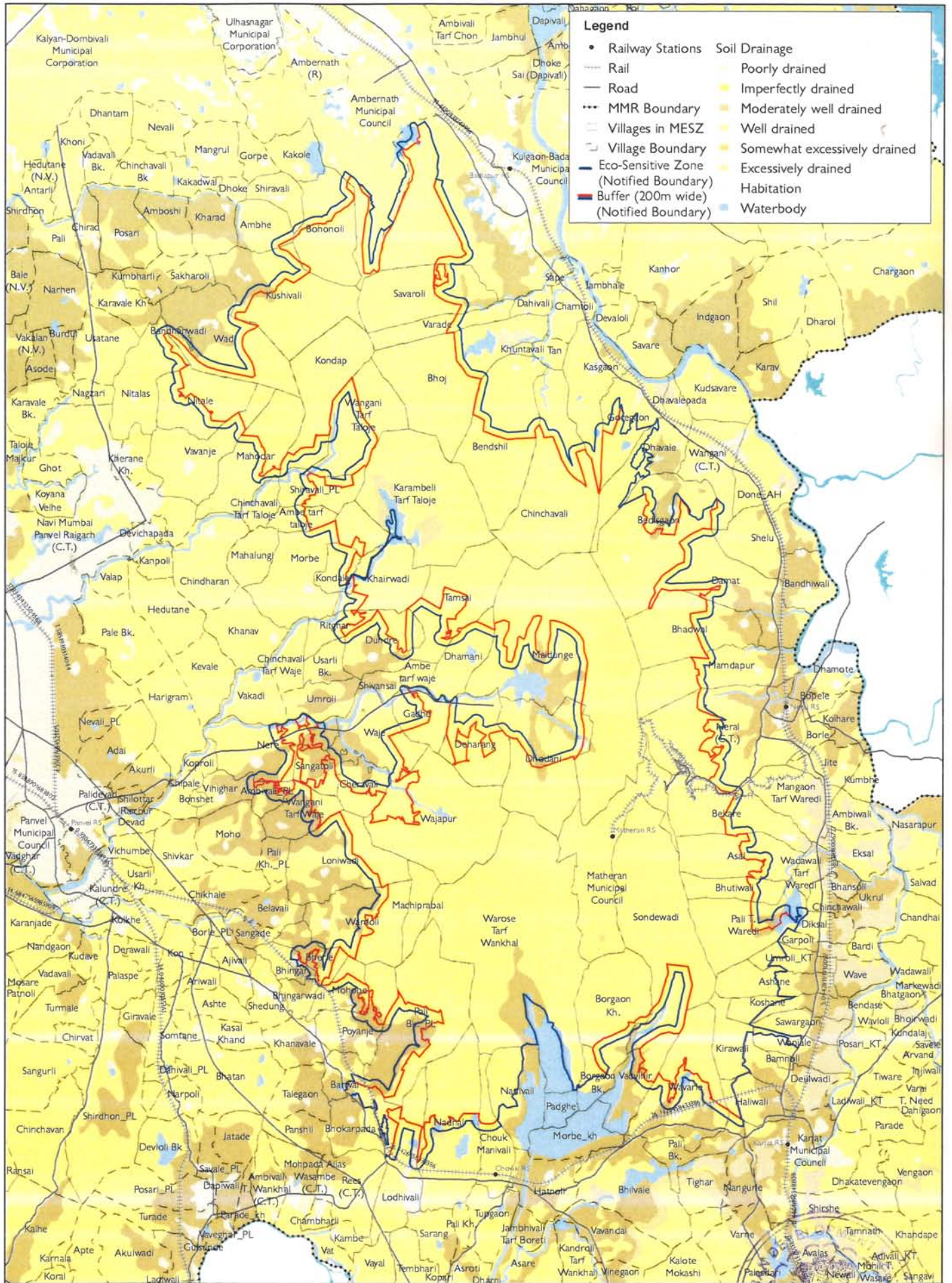


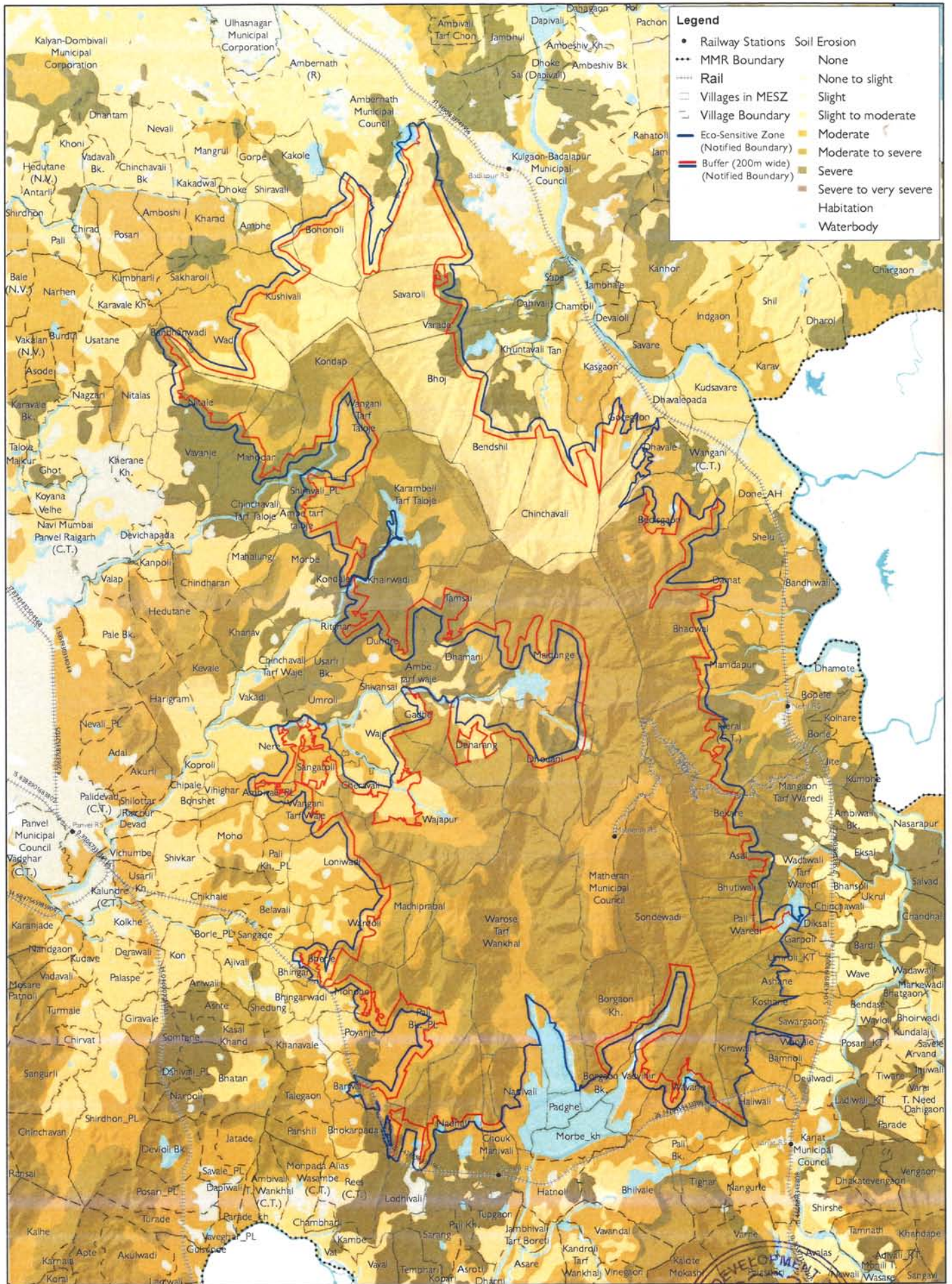
Legend

- Railway Stations
- Rail
- Road
- MMR Boundary
- - - - Village Boundary
- Villages in MESZ
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)

Soil Depth

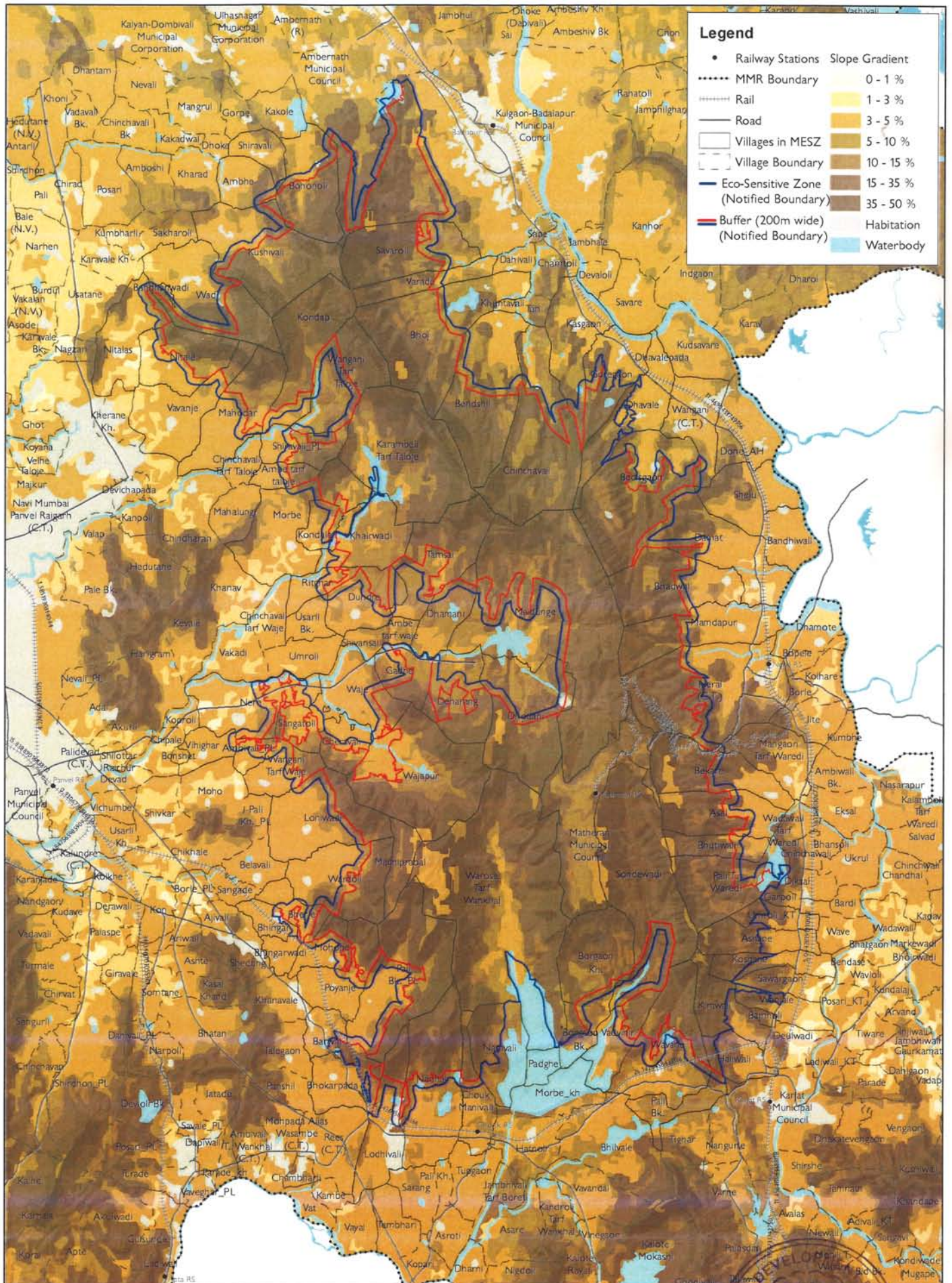
- Very shallow (< 10 cm)
- Shallow to very shallow (< 25 cm)
- Shallow (10 to 25 cm)
- Moderately deep (25 to 50 cm)
- Deep (50 to 100 cm)
- Deep to very deep (> 50 cm)
- Very deep (> 100 cm)
- Habitation
- Waterbody





Legend

- Railway Stations
- MMR Boundary
- Rail
- Villages in MESZ
- Village Boundary
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)
- Soil Erosion
- None
- None to slight
- Slight
- Slight to moderate
- Moderate
- Moderate to severe
- Severe
- Severe to very severe
- Habitatation
- Waterbody

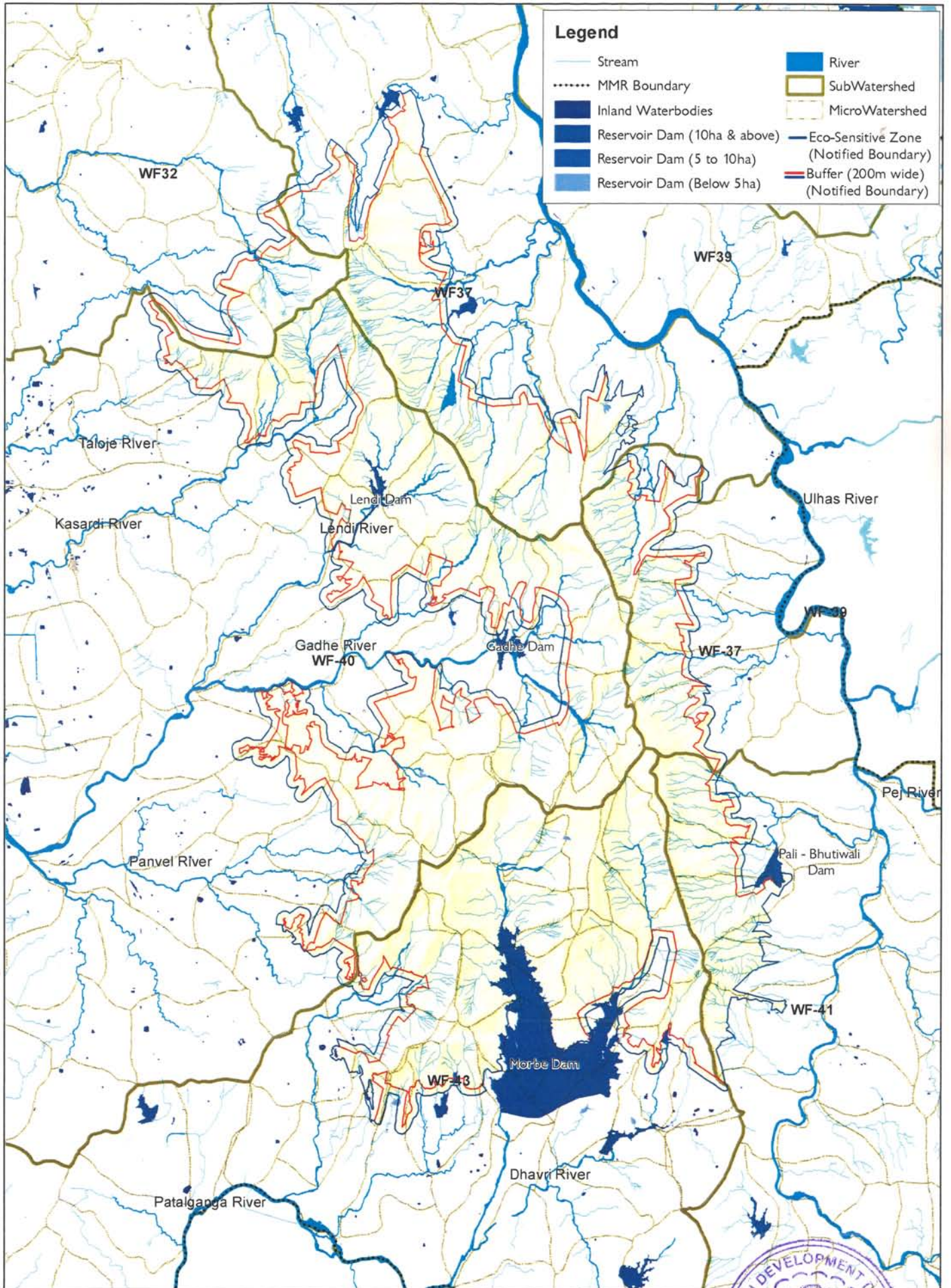


Legend

- Railway Stations
- MMR Boundary
- Rail
- Road
- Villages in MESZ
- Village Boundary
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)

Slope Gradient

- 0 - 1 %
- 1 - 3 %
- 3 - 5 %
- 5 - 10 %
- 10 - 15 %
- 15 - 35 %
- 35 - 50 %
- Habitation
- Waterbody



Legend

- Stream
- MMR Boundary
- Inland Waterbodies
- Reservoir Dam (10ha & above)
- Reservoir Dam (5 to 10ha)
- Reservoir Dam (Below 5ha)
- River
- SubWatershed
- MicroWatershed
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)



Drainage Pattern and Watershed
Matheran Eco-sensitive Zone

0 0.75 1.5 3 4.5 Km
Scale: - 1 : 1,50,000



Map No. **09**

Chapter 3

Demographic aspects pertaining to MESZ

3.1. Population Characteristics

3.1.1. Population Growth

As per Census-2011, the number of settlements in MESZ is 85 (Municipal Area of the Matheran Hill Station Municipal Council - fully within MESZ, part of Ambernath and Kulgaon-Badlapur Municipal Councils, 79 partial settlements and 6 entire settlements). The following table gives the details of the settlements falling in MESZ.

Table 6: Taluka-wise details of settlements falling in MESZ

Sr.no.	District	Taluka	Total no. of settlements	Total no. of Villages	Total no. of ULBs	Extent within MESZ Settlements	
						Fully within MESZ	Partially within MESZ
1	Raigad	Karjat	18	17	1	1	17
2	Raigad	Khalapur	10	10	0	1	9
3	Raigad	Panvel	40	40	0	4	36
4	Thane	Ambarnath	17	15 partial coverage	2 partial coverage	0	17
Total			85	82	3	6	79

The total resident population of the MESZ is 59,252 persons, of which 4,393 persons (19% of the total) reside within the Matheran Hill Station Municipal Council as per Census 2011. Nearly 27% (33,766 persons) of the population in MESZ is tribal.

Table 7: Taluka-wise Area and Population Details of villages partly/completely within MESZ, Census 2011

Sr. No.	Taluka	Area (sq. km.)	Population of settlements falling in MESZ
1	Raigad District	198.42	98,497
i	Karjat	43.89	44,009
ii	Khalapur	50.16	13,847
iii	Panvel	104.37	40,641
2	Thane District	50.36	27,129
i	Ambarnath	50.36	27,129
Total Area (1+2)		248.78	1,25,626

There are 13 Gaothans completely within MESZ. However, some villages that do not have a Gaothan but padas/wadis within MESZ are considered for calculation of population residing within MESZ as indicated in Census 2011. **Table 8** below gives the population of such 22 villages within the MESZ:



Table 8: Population residing in villages where Gaothan is partly/entirely within the MESZ, 1991-2011

Sr. No.	Name of Village/Council	Location of Gaothan	Name of Wadls/Padas within MESZ	Location of Wadls/Padas	Population of Village/Council		
					1991	2001	2011
A Ambernath Taluka							
1	Bohonoli	No Gaothan	Ughadewadi	Within MESZ	603	773	927
2	Savaroli	Within MESZ	-	-	188	245	320
Total (A)					791	1,018	1,247
B Karjat Taluka							
3	Bedisgaon	Within MESZ	Waghyachiwadi	Within MESZ	889	1,198	1,462
4	Matheran	Municipal Council within MESZ			4,708	5,139	4,393
5	Pali Tarf Waredi	Partly in MESZ	i. Thakurwadi ii. Bhutiwaliwadi iii. Sagachiwadi	Within MESZ	691	951	651
Total (B)					6,288	7,288	6,506
C Khalapur Taluka							
6	Sondewadi	Within MESZ	i. Pokharwad ii. Dhangarwada iii. Bosichiwadi iv. Changwadi v. Katwan	Within MESZ	507	675	885
7	Warose Tarf Wankhal	No Gaothan	i. Ambewadi ii. Arkaswadi iii. Pirkarwadi iv. Umbarne Wadi v. Navi Wadi vi. Hashyachipatti	Within MESZ	1,428	2,128	1,219
8	Wavarle	Partly in Buffer		-	1,055	1,305	1,361
Total (C)					2,990	4,108	3,465
D Panvel Taluka							
9	Ambivali	Within MESZ		-	302	345	398
10	Bhingar	Within MESZ	Bherle-Katkarwadi	Within MESZ	1,315	1,420	1,563
11	Dhodani	No Gaothan	i. Lobhachiwadi ii. Savachiwadi iii. Khadarwadi	On the Boundary of MESZ	1,191	1,462	1,653
12	Gadhe	Within MESZ		-	241	412	448
13	Karambeli Tarf Taloje	Within MESZ	Thakurwadi	Within MESZ	591	818	1,041
14	Khairwadi	No Gaothan	Phanaswadi	Within MESZ	339	379	523
15	Kondap	Within MESZ		-	72	70	114
16	Machiprabal	No Gaothan	i. Thakurwadi ii. Prabalmachi	Within MESZ	108	123	165
17	Mahodar	Within MESZ	Kathodi	Within MESZ	917	1,006	1,216
18	Maldunge	Within MESZ	i. Kelichiwadi ii. Habalwadi iii. Ughdyachiwadi iv. Ghurewadi	Within MESZ	888	1,067	1,339
19	Poyanje	Within MESZ	Vankariwadi	Within MESZ	1,850	2,114	2,231
20	Sangatoli	Within MESZ		-	212	464	321
21	Tamsai	No Gaothan	Bondarpada	Within MESZ	226	366	363
22	Wajapur	Within MESZ	Thakurwadi (2 nos.)	Within MESZ	241	319	419
Total (D)					8,493	10,365	11,794
Total Population residing in 22 Settlements (A+B+C+D)					18,562	22,779	23,012



Table 9: Villages partly or fully within MESZ where Gaothan is outside while Padas/Wadis/Gaothan Expansion is within MESZ

Sr. No.	Name of Village	Name of Wadis/Padas within MESZ	Location of Wadis/Padas	*Population of Village/Council		
				1991	2001	2011
A Ambernath Taluka						
1	Bhoj	Dhamatwadi	Within MESZ	535	627	711
2	Wadi	i. Haji Malang ii. Dargah/Malangwadi	Within MESZ	2,545	2,669	3,210
Total (A)				3,080	3,296	3,921
B Karjat Taluka						
3	Asal	i. Dhangarwada ii. Thakurwadi	Within MESZ	927	1,082	1,216
4	Bekare	i. Dhangarwadi ii. Bhutiwaliwadi	Within MESZ	925	1,097	1,171
5	Bhadwal	Tarachiwadi	Within MESZ	1,765	1,995	2,369
6	Kirawali	Thakurwadi	Within MESZ	1,884	1,885	1,260
7	Neral (CT)	i. Dhaswadi ii. Anandwadi iii. Ambewadi iv. Dhangarwadi v. Thakurwadi vi. Fanaswadi	Within MESZ	11,578	14,739	18,429
Total (B)				17,079	20,798	24,445
C Khalapur Taluka						
8	BorgaonKh.	i. Nigadichipatti ii. Chinchmal iii. Nimberwadi iv. Tepachiwadi v. Thakurwadi vi. Tadwadi vii. Burujwadi	Within MESZ	847	1,328	1,316
9	Chouk Manivali	Thakurwadi	Within MESZ	1,996	2,472	3,309
10	Nadhral	Thakurwadi	Within MESZ	837	900	1,911
Total (C)				3,680	4,700	6,536
D Panvel Taluka						
11	Loniwadi	Thakurwadi	On MESZ boundary	687	684	856
12	Nitale	Nitale Katkarwadi	Within MESZ	340	382	482
Total (D)				1,027	1,066	1,338
Total (A+B+C+D)				24,866	29,860	36,240

* Note: Population of the entire village is considered, as pada/wadi-wise population is not available.

Of the 85 settlements, only 34 have habitation within ESZ. Though the total population living in the settlements is 1,25,626 persons, the population residing within the MESZ and the buffer is merely 59,252 of which the tribal population is 12,135 persons (Refer Map No. 10 and 11). Ascertaining the actual population living in the padas/wadis based on the data obtained is difficult. Hence, population of all the 34 villages has been considered for assessing infrastructure availability (Table 8 and Table 9). The population of Ambernath Municipal Council and KBMC are however not considered here.

Though the population of Neral and Wangani Census Towns is 18,429 and 12,628 respectively, most of the built-up area is situated outside the MESZ boundary. And hence of the 83 settlements identified above, Matheran Hill Station Municipal Council with a population of 4,393 is the most significant settlement in the MESZ.

Since none of the settlements within MESZ has a population more than 5,000 there is no need to prepare the Area Development Plans as mentioned in the Notification of 2003.



3.1.2. Household Size

The average household size in MESZ settlements has decreased from 5.05 in 2001 to 4.72 in 2011, which follows the similar decreasing trend of household size in rural MMR.

3.1.3. Sex Ratio

The sex ratio (number of females per 1000 males) of MESZ population as per Census 2011 is 952 which is encouragingly better than the sex ratio of 937 in 2001. This is much better than the average sex ratio of MMR which is 862. Remarkably, the sex ratio in the MHSMC has drastically improved from 725 in 2001 to 954 in 2011.

3.1.4. Literacy Rate

The average literacy rate in the MESZ settlements has improved substantially over the last two decades from 44 per cent in 1991 to 66 per cent in 2011. The effective literacy rate (age 7 and above) in MESZ is 76.30 per cent which is close to the literacy rate of 77 per cent in rural Maharashtra. The female literacy rate in MESZ is 60 per cent which is less than 68.54 per cent for rural Maharashtra. The male literacy rate in MESZ is 72 per cent which is also less than the male literacy rate of 85 per cent for Maharashtra. The average literacy rate in MHSMC has also improved substantially from 59.5 per cent in 1991 to 80.2 per cent in 2011.

3.1.5. Workforce Participation Ratio (WPR)

The overall Workforce Participation Ratio of MESZ settlement is 38.94 per cent, while the female WPR is 27.32 per cent as per census 2011. The overall WPR is comparable to the overall WPR of 41 for rural MMR.

3.1.6. Tribal Settlements

Approximately 32 tribal settlements/wadis with an estimated Scheduled Tribes (ST) population of 7,687 persons are located within villages falling under MESZ as per the data obtained from the Integrated Tribal development Project Office, Raigad. Of the four Talukas under the MESZ, Panvel Taluka has the maximum number of tribal settlements.

3.2. Economy and Employment

Out of the total workers in MESZ, 81.18% are main workers. The summary of workforce distribution by category is mentioned in the table below:

Table 10: Categories of workers in MESZ and Matheran Town, 2001-2011

Sr. No.	Category	MESZ		Matheran Town	
		2001	2011	2001	2011
1	Total Population	1,06,597	1,25,626	5,139	4,393
2	Total Workers	43,053	48,914	2,345	1,647
3	Main Workers	31,226	39,713	2,043	1557
	i) Cultivators	6,980	6,313	1	4
	ii) Agricultural labourers	3,922	6,220	3	0
	iii) Household Industries	852	1,179	59	11
	iv) Others	19,472	26,001	1,980	1,542
4	Marginal Workers	11,827	9,201	302	90
	i) Cultivators	2,251	1,208	0	0
	ii) Agricultural labourers	4,747	3,050	0	0
	iii) Household Industries	367	332	5	1
	iv) Others	4,462	4,611	297	89

Source: Census 2011



The primary economic base of Matheran town is tourism and the employment is generated by tourism related activities like hotels, hawking, porters, horse keepers, shop keepers, guides etc. The tourist population in Matheran has more than doubled from 2.6 lakhs to 5.8 lakhs during the last decade (Source: Tourism Master Plan for MESZ prepared by MTDC). However, the number of workers has reduced during the corresponding period. This could be attributed to the overall decrease in population of Matheran town and also on account of people coming from surrounding padas such as Ambewadi, Tadwadi, Galpatti, Ashachipatti, Waghachipatti, Dhodni, Katwan, etc. for work.

3.3. Agriculture

The Agriculture Department, GoM is implementing various agriculture related activities including Groundwater and Soil moisture conservation practices. Agricultural activity is mainly observed in villages Neral, Bekare, Asal, Bhutiwadi, Pali T. Waredi in Karjat Taluka, Sondewadi, Borgaon Kh. in Khalapur Taluka and Karambeli Tarf Taloje in Panvel Taluka (refer Map No. 12).

Crops and Horticultural Plantation: The major food crops produced in the villages in MESZ are rice, vegetables and there are also horticulture plantations. Table 11 gives the details of crops produced in the Talukas falling in MESZ.

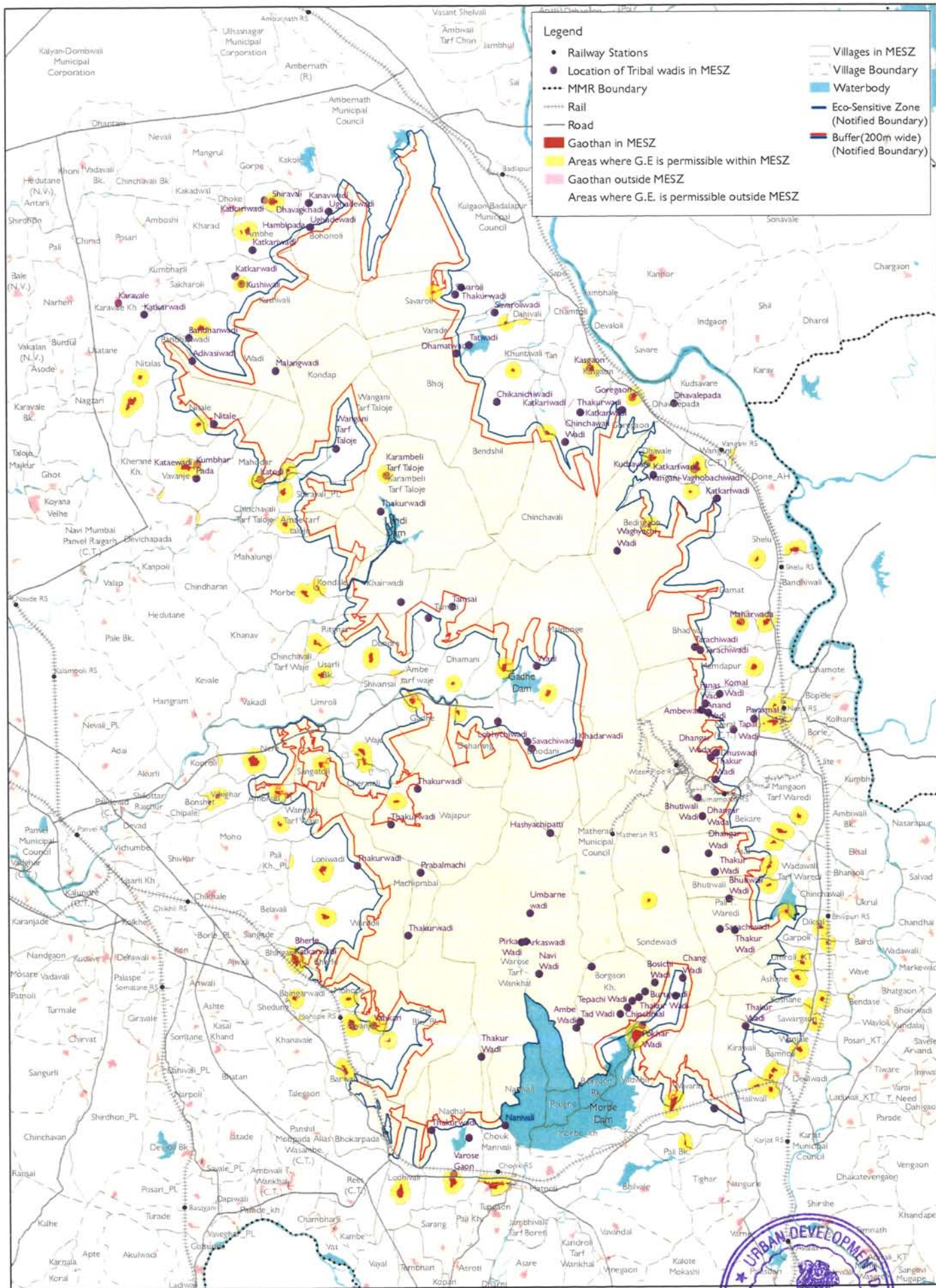
Table 11: Crops produced in the Talukas of MESZ

Sr. No	Taluka	Area in Hectares				
		Rice	Vegetables	Horticulture	Cereals	Others
1	Karjat	1032.54	57	196.44	74.59	Tree Plantation (40 Ha)
2	Khalapur	-	16.65	6.75	-	-
3	Panvel	3744.88	270.70	317.84	-	-
4	Ambernath	-	-	-	-	(Proposed)Teak Plantation (11 Ha)
5	Total	4777.42	344.35	521.03	74.59	51

Source: Taluka Agriculture office Karjat, Khalapur, Panvel and Thane District.

From the above table it is observed that Rice is the major food crop produced in the villages falling in and abutting MESZ.





Legend

- Railway Stations
- Location of Tribal wadis in MESZ
- MMR Boundary
- ==== Rail
- Road
- Gaothan in MESZ
- Areas where G.E. is permissible within MESZ
- Gaothan outside MESZ
- Areas where G.E. is permissible outside MESZ
- Villages in MESZ
- Village Boundary
- Waterbody
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)

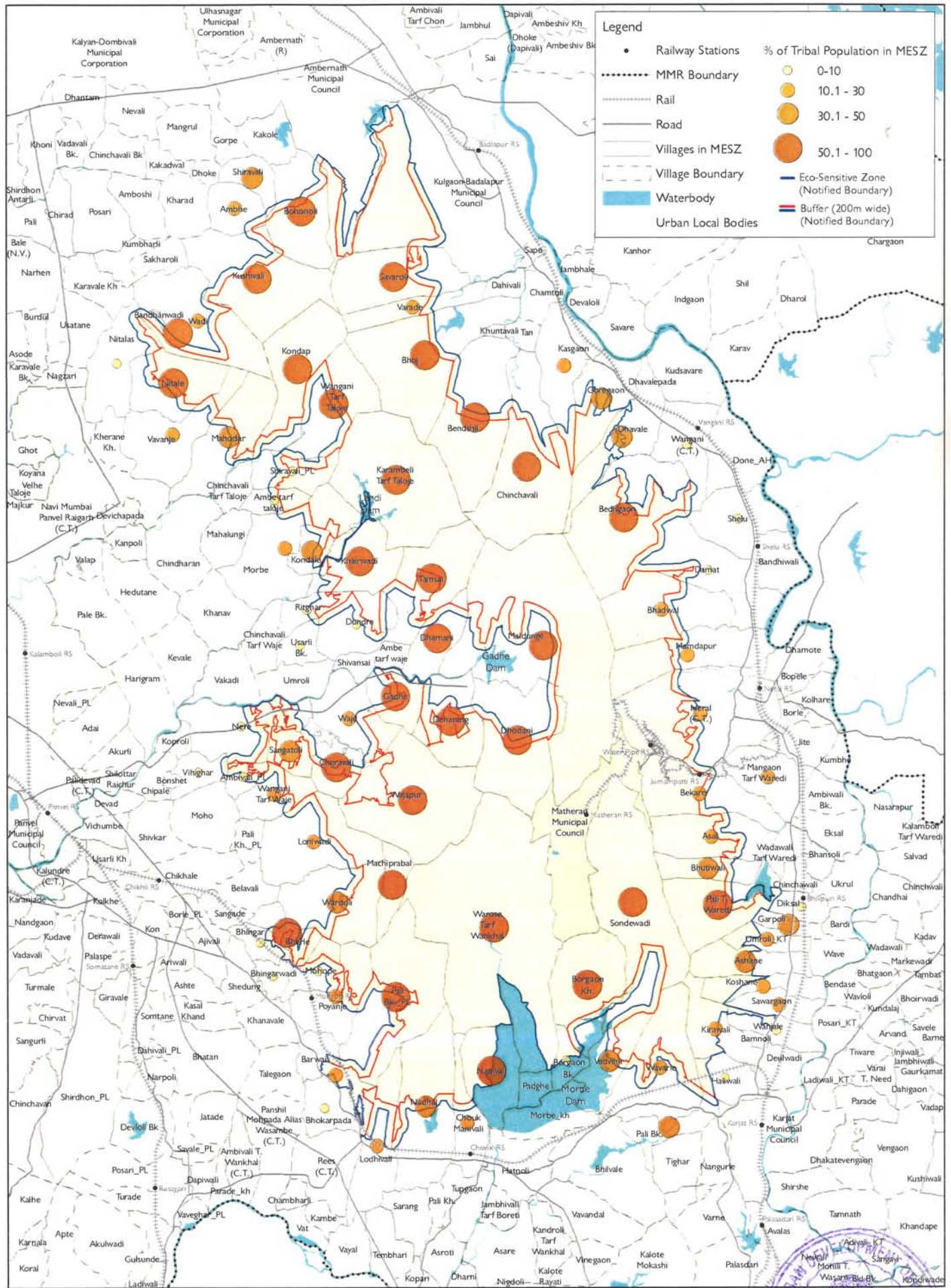
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Map No. 10



Settlements in and around MESZ
Matheran Eco-sensitive Zone



Chapter 4

Land Use pertaining to MESZ

4.1. Land Use Analysis

4.1.1. Zoning for MESZ as per Regional Plan, 1996-2011:

As per the Notification, the MESZ followed the zoning of Regional Plan of MMR, 1996-2011. Accordingly, the MESZ boundary was restricted upto the contiguous Forest zone plus a 200 meter buffer around it, except in the area under Urbanisable Zone in the Regional Plan, 1996-2011. The land-use within the buffer zone followed the land use zoning, i.e., Green Zone-1 and Green Zone-2 of the Regional Plan, 1996-2011 as per the notification.

4.1.2. Existing Land use in MESZ:

The existing land use for MESZ is extracted from the ELU of MMR (refer Map No. 12).

Table 12: Existing Land Use distribution in the MESZ, 2016

Sr. No.	Land Use	Area (Sq. Km.)	Percentage
1	Agriculture and other primary activities	14.96	6.02
2	Scrub/Grass/Wastelands	92.84	37.36
3	Forest Cover	133.70	53.80
4	Wetlands	0.05	0.02
5	Water bodies	4.19	1.69
6	Built-up	2.77	1.11
	Total	248.51	100.00

Source: Extracted from the Mumbai Metropolitan Regional Plan, 2016-36

The existing land use pattern of the MESZ broadly indicates that nearly 92 per cent of the area is under natural features like forests, hills, scrub/grass/wasteland and water bodies. The broad land use distribution is shown in Table 12.

It is important to note that notified forests are not the same as what the ELU identifies as forests. Forests in the Existing Land Use (ELU) only denote areas which have forest cover and are discernable as forests through interpretation of satellite images.





Legend

- Railway Stations
- Rail
- Road
- MMR Boundary
- Villages in MESZ
- Village_Boundary
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)

Existing Landuse

- Agriculture and Other Primary Activities
- Scrubland/Grassland and Wasteland
- Forest Cover
- Wetlands
- Water Bodies
- Industry
- Built-Up



 Mumbai Metropolitan Region Development Authority (MMRDA)

Existing Landuse, 2016
Matheran Eco-sensitive Zone

0 0.75 1.5 3 4.5 Kms.
Scale: 1 : 1,00,000
Source : Extracted from Draft RP for MMR, 2016-36

N

Map No. **12**

Infrastructure pertaining to MESZ

5.1. Scope

As mentioned earlier in section 3.1.1 of this report, only 34 villages with settlements either in the form of Gaathan or Pada/Wadi or Gaathan expansion or otherwise within the MESZ, are considered for assessment of infrastructure requirement. The data for infrastructure in relation to MESZ is reproduced from the draft Regional Plan for MMR, 2016-36.

5.2. Physical Infrastructure

5.2.1. Water Supply & Irrigation

The MESZ is catchment area to many rivers on the Western side of the hill range. The Morbe dam which is a major irrigation scheme, supplying water to the Navi Mumbai Municipal Corporation is located just outside the southern boundary of the MESZ. The Dehrang Scheme on the Gadhe River supplies water to the Panvel Municipal Corporation.

Details of various existing and proposed irrigation schemes are given in Table 13.

Table 13: Irrigation Schemes within and around the MESZ

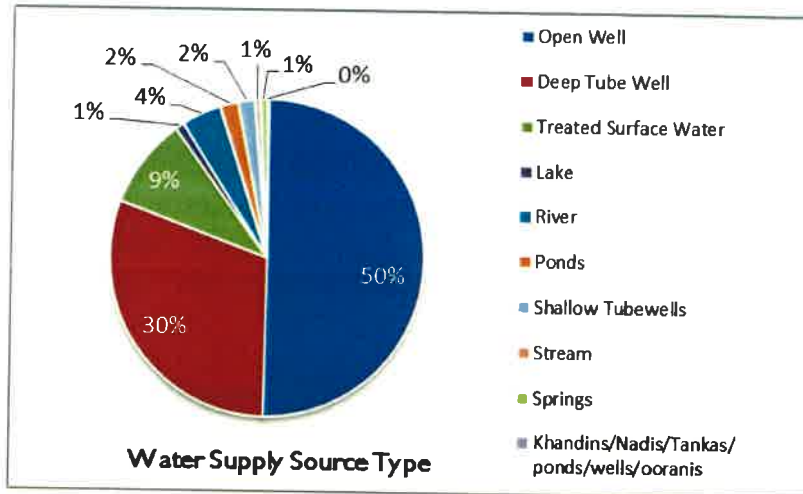
S.No	Scheme	Location	Storage (Mcum)		Catchment Area (Sqkm)	Command Area (Ha)	Status
			Gross	Live			
1	Morbe Dam	Dhavari River, Warosetar/Wankhal, Khalapur, Raigad	165.4	162.25	-	Supplies water to NMMC	Existing
2	Dehrang	Gadhe River Maldunge, Panvel, Raigad	3.63	-	-	Supplies water to PMC	Existing
3	Morbe Minor Irrigation Scheme	Lendi River, Morbe, Panvel, Raigad	-	3.55	6.096	364	Existing
4	PaliBhutavali	PaliBhutavali, Karjat, Raigad	-	13.07	5.26	1977	Existing
5	Kushiwali	Kushiwali, Ambernath, Thane	9.60	8.78	6.40	530	Proposed

Source: Water Resources Department, GoM

a. Proposed Measures for Protection of the Irrigation Schemes:

The irrigation schemes (major and minor) when analysed with the severity of soil erosion, indicate that the schemes are surrounded with areas vulnerable to moderate to severe soil erosion. Also, the land use surrounding the schemes is mainly scrubland and agriculture land. It is therefore proposed to flank such areas with plantation to arrest soil erosion and protect the water bodies.





b. Water Supply:

The large number of streams and rivers flowing in the area form the main source of water supply in the MESZ. The villages mostly rely upon rivers, dams, ponds, wells and springs most of which dry out in summer. The supply of water is adequate up to March, but

from April onwards the scarcity of water is observed in the forest areas. The Matheran plateau/Hill Station has a tap water supply system from Charlotte Lake.

Piped/tap water supply in all the settlements within MESZ is practically not possible on account of the undulating terrain of the area. However, all villages in MESZ have some source of water supply. 17 villages have treated tap water supply all round the year, while 3 villages have untreated tap water supply all round the year. Of the 14 villages with no tap water supply, 3 have hand pumps. As per Census 2011, the settlements in MESZ depend mainly on Wells/Tubewells for their water supply.

5.2.2. Road and Rail Connectivity

A. Road Connectivity

All the villages are accessible by all-weather roads as per Census, 2011 data.

The Eco-sensitive Zone does not include many major roads within. However, few Major District Roads namely, MDR-6, 7, 8 and 9, State highways SH-75, 38 and 102 and National Highway NH-4 are just outside the MESZ, creating a network of roads around the zone. The only roads which lie within the MESZ boundary are SH-102, MDR 8 and 9.

a) Connectivity on the southern side:

NH4: The national highway connecting Mumbai-Bangalore just passes outside the ESZ boundary through the villages Barwai, Bhokharpada, Lodhivali and Chouk Manivali which are partially included in the MESZ.

SH38: The State Highway - SH38 branches out from NH4 at Chouk Manivali and connects Karjat town in the southern part of the zone. This road runs parallel to the Panvel-Karjat rail link from Chouk station to Karjat.

b) Connectivity on the western side:

SH-102: The ESZ area can be approached from the west using SH-102 which connects Panvel town to Dodhani and Maldunge villages. The Deharang water supply scheme is located along this road. The PWD has proposed an extension to SH-102 thus, connecting Panvel to Bhimashankar by way of tunnel under the Matheran hills. This will boost the Panvel-Neral hinterland connection. However, considering



that it has to tunnel through the Matheran hill and the ESZ, proper study needs to be conducted before executing the same.

MDR 8: The MESZ can also be approached by MDR 8 on the western side which connects Nere, Vihigar and Ambivali villages. The rest of the villages on the western side are connected with MDR8.

c) Connectivity on the Northern side:

Pipeline Road: The northern villages of the MESZ can be approached from the Ambernath-Badlapur side through the Katai-Ambernath-Badlapur road. The Malang Gad which is a religious and tourist destination can be approached using this road via Kalyan-Malang road.

MDR 7: The MDR 7 just touches the boundary of MESZ in the north-west part of the zone in village Vavanje.

d) Connectivity on the Eastern side:

SH-75: The eastern part is connected with SH-75 which runs parallel to the eastern boundary of MESZ from Badlapur to Karjat. MDR-9 from this road connects Matheran town to the nearest town Neral which is at the foothills. However, the road connectivity for vehicular traffic is only upto Dasturi Naka.

e) Connectivity to Matheran Town:

Apart from the Neral-Matheran road, the only other way to reach Matheran town is by the narrow gauge train between Neral and Matheran.

B. Connectivity by Rail

The Neral-Matheran toy-train, also known as Matheran Light Railway (MLR) is under the jurisdiction of the Central Railway (CR) with a capacity of about 100 to 150 passengers per trip. The narrow-gauge train built by Sir Adamjee Peerbhoy has been in existence (construction began in 1904) and is operational since 1907. The train covers a distance of 19.97 km at a 1:10 gradient and gradually meanders as it negotiates the slopes to give a breath taking view of the hill range. The train runs four times a day from either side, making it difficult for everyone to get a ride on the train during the peak season. The line observed its centenary on April 15, 2007. In the last hundred years this toy train has remained operational in all the years except in 2005 due to landslides.

Issues in Travel by Narrow-gauge Train

- a) There is limited service for the tourist populations to come into Matheran by the train.
- b) The rail service does not operate in the Monsoon season due to the safety issues with respect to landslides and strength of the tracks.
- c) Augmentation of the tracks is necessary in order to make the transit smooth for the tourists.
- d) The railway station at Matheran needs upgradation/modernization with amenities in order to service the tourists as it serves as the gateway to the town
- e) There is no transitional parking space at Neral Station where the tourists can park their cars in Neral and take a train to Matheran instead of parking the cars at Dasturi Naka.

A rail shuttle service between Aman lodge and Matheran Town which runs shuttle services and freight vans is operated by the Central Railway. The railway stations which fall under ESZ are Matheran, Aman lodge, Water Pump Station and Jummapatti. Ensuring the smooth operation of the train throughout the year will ease out the problems faced by many tourists and residents (especially the aged and the handicapped) in reaching the town.



C. Public Transportation:

Bus service facility is available at the peripheral roads of the MESZ. The buses ply on SH-102 towards the west of the zone from Panvel town up to the Deharang village. On the south of the ESZ, many State Transport buses ply via Karjat-Chouk-Manivali village. Towards east, on the SH-38, State Transport buses ply from Karjat to Matheran via MDR-9. Apart from the public transport facility, auto rickshaws also play an important role in transporting people for short distances within villages.

In short, all the villages barring Ambivali, Dehrang, Kondap, Sangatoli, Nitale, Tamsai, Wajapur, Machiprabal and Savaroli have direct accessibility by bus. The nearest bus service for these villages is about 5 to 10 kms away.

5.2.3. Sewerage and Sanitation

There is no existing sewerage system within the Gaothans and the Tribal settlements which are located in the ESZ. The latrines if present are connected to septic tanks with soak pits. Open defecation is practiced in the areas which does not have toilet facilities. Only village Chowk Manivali has a community toilet excluding bath.

All the villages within the MESZ are covered under the Total Sanitation Campaign. However, 19 villages do not have drainage system and discharge their untreated drainage directly into the water bodies.

5.2.4. Power Supply and Telecommunication

All the villages within MESZ have access to power supply. However, barring 10 villages namely, Bohonoli, Bhadwal, Nadhal, Sondewadi, Wavarle, Ambivali, Khairwadi, Poyanje, sangatoli and wajapur all the other villages have less than eighteen hours of power supply.

5.3. Social Infrastructure

5.3.1. Educational Facilities

As per Census 2011, all the Gaothans in the MESZ have access to Primary School. Almost half the villages (17 nos.) do not have a middle school. 10 villages with no middle school have the nearest facility within 5 km, while 3 villages have it between 5-10 km and 4 villages have it at more than 10 km away (Refer Map No. 13).

9 villages have secondary schools. 9 villages with no secondary school have the nearest facility within 5 km, while 9 villages have it between 5-10 km and 7 villages have it at more than 10 km away.

The senior Secondary schools are however available in select few settlements such as Neral (CT), Mamdapur, Karjat Taluka and Chowk Manivali, Khalapur Taluka. 9 villages with no senior secondary school have the nearest facility within 5 km, while 8 villages have it between 5-10 km and 15 villages have it at more than 10 km away.

Neral Census Town has 1 Arts and Science college. Other than this, the residents have to travel to Panvel, Karjat, Ambarnath, Badlapur and other nearby areas for further education..

5.3.2. Health Facilities

The MESZ has Health Facilities such as Private Clinics, Primary Health Sub-Centre, Primary Health Centre and Dispensary.

As per Census data, 17 settlements within MESZ have Private clinics. 7 villages within MESZ have Primary Health Sub-centre. 6 villages with no Primary Health Sub-centre have the nearest facility within

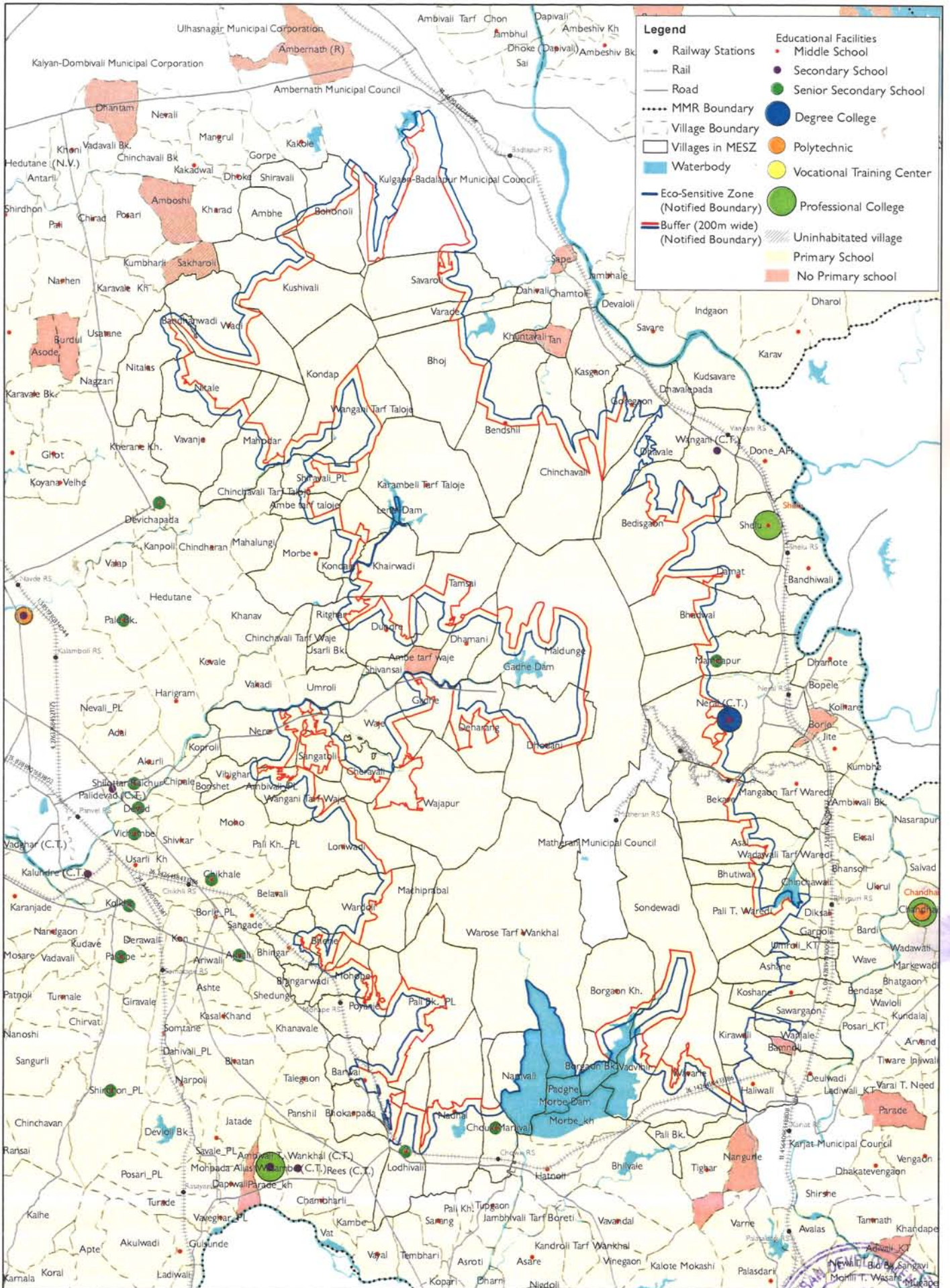


5 km, while 19 villages have it between 5-10 km and 1 village has it at more than 10 km away (Refer Map No. 14). Chowk Manivali has 1 Primary Health Centre.

As per the data collected from Health Department, Zilla Parishad - Raigad, villages Chowk and Vavanje each have a Primary Health Clinic. Chowk also has a rural hospital, while Karjat has a 100 bedded sub-district hospital. The health facilities provided by ZP in the area are indicated on Map No. 14.

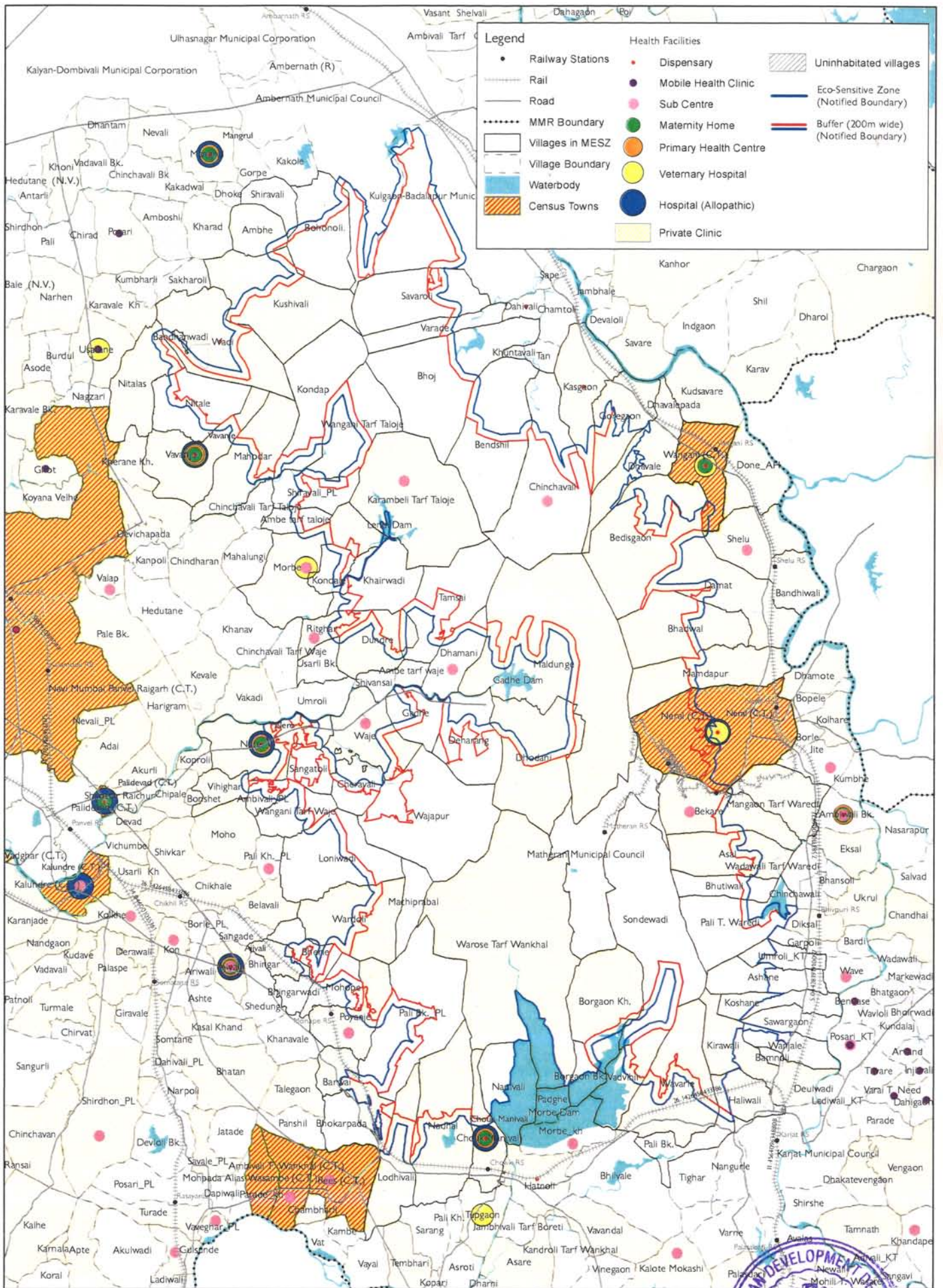
It is observed that even with difficult terrain none of the Gaothans within the MESZ have a mobile health clinic. 11 villages with no Primary Health Centre have the nearest facility within 5 km, while 13 villages have it between 5-10 km and 8 villages have it at more than 10 km away. There is no veterinary hospital facility available in the MESZ. It can be therefore concluded that the MESZ is poorly served in terms of Health Facilities due to the uneven terrain and therefore special attention is required for provision of these facilities. The settlements within the ESZ are sparse and scattered, hence providing health facility at each village may not be feasible. Providing more ambulances in the area could improve the accessibility to health facilities.





Legend

- Railway Stations
- Rail
- Road
- ⋯ MMR Boundary
- - - Village Boundary
- Villages in MESZ
- Waterbody
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)
- Educational Facilities
 - Middle School
 - Secondary School
 - Senior Secondary School
 - Degree College
 - Polytechnic
 - Vocational Training Center
 - Professional College
- Uninhabited village
- Primary School
- No Primary school



Tourism Master Plan

6.1. Tourism Master Plan for MESZ

As mandated in the said MOEFCC notification, a Tourism Master Plan for the MESZ is prepared by the Department of Tourism, GoM which is also a part of the Zonal Master Plan for MESZ.

The Tourism Master Plan has been included in this report in a concise form.

6.2. Summary of the Tourism Master Plan

The Tourism Master Plan shall be based on the detailed Tourist Carrying Capacity (TCC) of the region. Accordingly, the TCC is calculated and considered with emphasis on eco-tourism, eco-education and eco-development with a view to protect the fragile ecology of the area.

Places of Tourist Interest in MESZ: The popular tourist locations in the MESZ are Matheran Town, Malang Gad, Prabal Gad, Chanderi fort, Peb fort. Among these tourist spots Prabal Gad, Chanderi Fort and Peb Fort are trekking points mostly visited by trekkers; Malang Gad is a religious place and the Matheran Town is a Hill Station.

Malang Gad is one of the popular pilgrim spot in the MESZ with pilgrims visiting mainly from nearby areas like Kalyan, Bhwandi, Mumbra and Panvel. About 300 -500 pilgrims visit the 'Dargah' on Malang Gad daily with the numbers reaching upto 1000 on Friday, Saturday and Sunday. During the Urus (festival) in the month of February about 2,00,000 people visit the Dargah within the duration of ten days i.e. about 20,000 pilgrims per day. The flower merchants lend their houses as lodging facility to the pilgrims, thus accommodating only about 700 pilgrims. Thus a severe lack of infrastructure facility is present for the floating population. As Malang Gad is purely a pilgrim location, the carrying capacity of this location cannot be worked out.

Number of Tourists visiting Matheran: The Eco-Sensitive Zone is surrounded by highly urbanized areas, which has resulted in spurt of tourist influx in the region, especially Matheran Town. Tourism forms the major share of economy and the largest service industry in the Matheran Town. The annual tourist flow is about 5,00,000 persons with an average of 3,000-4,000 tourists per day. The tourist volume is at its maximum during festive days and peak seasons with an influx of about 7000 - 8000 tourists per day.

Tourist Carrying Capacity Calculation: One of the major parameter for the preparation of the Tourism Master Plan is the Tourist Carrying Capacity (TCC). The TCC was calculated based on the following parameters -

- i. Availability of water
- ii. Accommodation available for tourists
- iii. Population Density and total developable land
- iv. Parking demand and availability
- v. Hill Station development Policy, GoM.

The permissible number of tourists per day during peak season based on various parameters is summarized in Table 14.



Table 14: Permissible Number of Tourist per Day as per Tourist Carrying Capacity (TCC) parameters

Sr. No.	Parameter for TCC	TCC (Maximum tourists per day)
1	Availability of water	7,548
2	Accommodation available for tourists	5,947
3	Density of Population and total developable land	7,577
4	Parking demand and availability	6,173
5	Hill Station development Policy, GoM	4,070

Source: Tourism Master Plan for Matheran Eco-sensitive Zone, prepared by MTDC

The TCC thus ranges from 6,000 to 7,500 tourists per day. Therefore, an average TCC can be stated as 6,750 tourists per day. The present number of tourists per day during peak season (7,000 – 8,000 tourists) is almost the same as the TCC. Thus, Matheran has already reached its TCC of 6,000 to 7,500 tourists per day.

6.3. Recommendations of the Tourism Master Plan

In order to maintain the TCC of the zone, it is necessary to manage the number of tourists visiting the area especially during the peak season. Therefore, the following approach is recommended –

- A. Dispersal of tourists by developing new tourist destinations within MESZ.
- B. Promoting new tourist products which are eco-sensitive and sustainable.
- C. Promoting new developments to boost tourism in the 200 m wide buffer of MESZ.
- D. Dispersal of tourists within the week and throughout the year.

A ten year phase-wise tourism management plan is envisaged to achieve the objectives. The various activities recommended to maintain the TCC of the MESZ are summarised in the table below:

Table 15: Strategy for Maintaining the TCC

Sr. No	Recommendation	Strategy
1	Dispersal of tourists within MESZ	Identification of Uncommon points which are not frequently visited and making them attractive for tourists.
2	Promoting new tourist products	<ol style="list-style-type: none"> i. Eco-Tourism: Tribal villages with scenic beauty shall be identified. E.g. Hassyachipatti, Vetal Wadi, Burujachiwadi, etc. Similarly Agro-Tourism with Bed and Breakfast scheme can also be implemented. ii. Art and Cultural festivals: Local art of special significance can be displayed in these festivals. iii. Heritage Tourism: Heritage sites shall be identified, restored and maintained. iv. Adventure Tourism: Promoting trekking, rappelling, river crossing, sky watching activity at Wangani, etc. Identification of camp sites in nearby villages. Promotion of treks such as Prabal Gad, Peb Fort, Chanderi fort, Haji Malang, Asasne Waterfall, Gadheshwar.
3	Promoting new developments in the 200 m wide buffer of MESZ	<p>The activities mentioned in point 2 can be included in the buffer of the MESZ. The following Tourist Circuits are proposed to promote Eco-tourism, Adventure Tourism and Rural Tourism –</p> <ol style="list-style-type: none"> i. Matheran-Malang Gad-Morbe Dam ii. Matheran – Prabal Gad iii. Matheran – Peb Fort – Hasyachipatti. <p>The locals can be trained as Guides.</p>
4	Dispersal of tourists within the week and throughout the year.	Provision of Incentives during weekdays and off- season such as Minimal Entry Tax, reduced accommodation charges, etc. and vice versa during holidays and peak season maintaining the employment in all seasons.



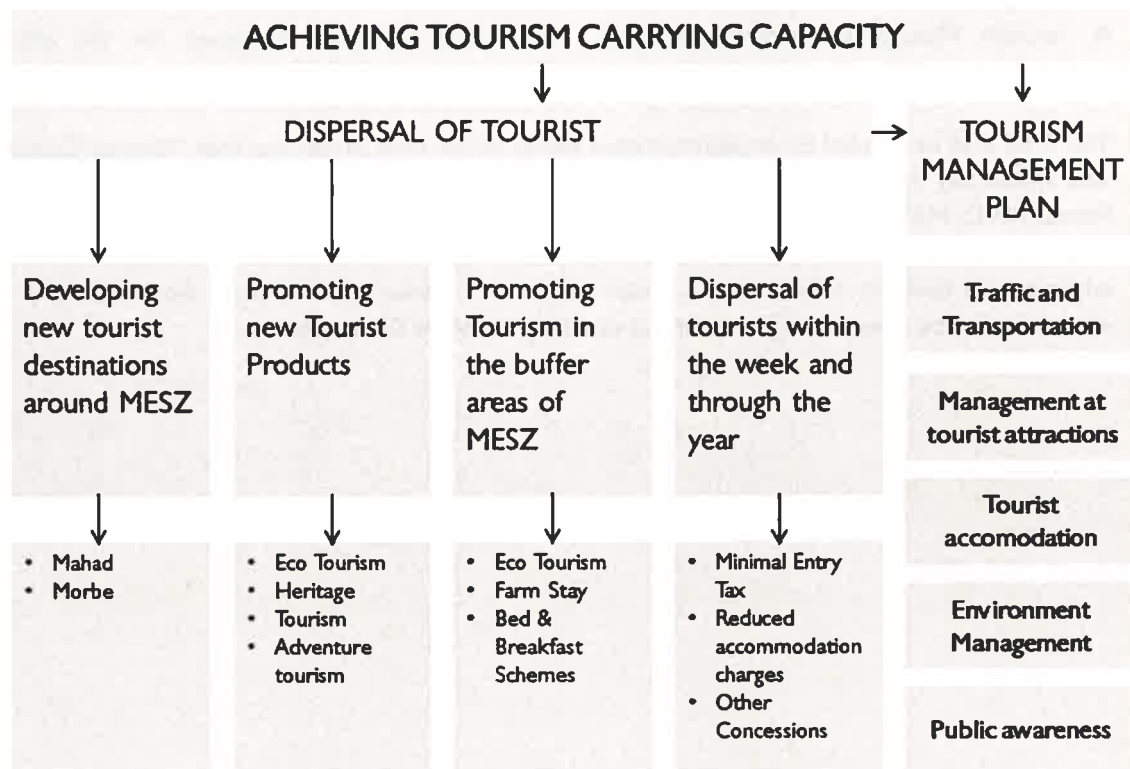


Figure 3: Strategies for Achieving Tourism Carrying Capacity
Source: Tourism Master Plan, prepared by MTDC

6.3.1. Tourism Management Plan

To implement the abovementioned recommendations effectively a strong management plan for various aspects of tourism is proposed. The Tourism Management Plan will include -

- a) Programs for traffic and transportation
- b) Programs for improvement of points of scenic beauty.
- c) Programs on tourist accommodation
- d) Programs for environment management
- e) Programs for training and awareness creation

The major recommendations of the Tourism Management Plan emphasizing the improvement of tourism experience are –

- i. Providing a parking base for vehicles at the entry point (Neral).
- ii. Operating Eco-friendly buses for travel from Neral to Dasturi Naka.
- iii. Segregation of pedestrians and horses from Dasturi Naka to Matheran Town.
- iv. Gradual reduction in number of horses.
- v. Effective horse-dung collection and disposal.
- vi. Improvement of pathways leading to various points of interest.
- vii. Removing unauthorized structures, food stalls, entertainment stalls and re-locating them at the entry of various tourist spots.
- viii. Implementing of Green Building Norms and rating system for buildings especially for Hotels.
- ix. Charting down behavioural guidelines for stakeholders
- x. Implementation of Zero Garbage and public carries waste principle.
- xi. Public awareness and participation in conservation of the Eco-Sensitive Zone.



6.3.2. Proposed Institutional framework for implementation

A Tourism Management Committee (TMC) for MESZ has been proposed for the effective implementation of the plan based on the opinion of the stakeholders.

The TMC shall be headed by an administrative officer of the rank of not less than “Deputy Collector” who would play the role of Chairperson of the Committee with various Government Departments like Forest, PWD, MJP, Zilla Parishad, Nagar Parishad, etc. reporting to the Chairperson in matters related to the MESZ. The technical assistance shall be provided by different committees on various aspects like environment, tourism, infrastructure, social welfare etc. consisting of experts from the field. The execution shall be done through the various departments of the Government.



Chapter 7

Development Plan for Matheran Hill Station Municipal Council (MHSMC) (Sub-Zonal Master Plan)

7.1. Sub-Zonal Master Plan for the Matheran Hill Station Municipal Council:

The Revised Development Plan of the Matheran Hill Station, under the provisions of the Maharashtra Regional and Town Planning (MR&TP) Act, 1966 was sanctioned and came into force from 1st March, 1987. MoEFCC, GoI, vide notification No. S.O.133(E) dated 04.02.2003 declared Matheran Plateau and its surrounding region as Matheran Eco-Sensitive Zone. According to the notification, a separate Sub-Zonal Master Plan shall be prepared for MHSMC. Thereafter, in pursuance of the MoEFCC's notification dated 04.02.2003, the Government of Maharashtra decided to consider the Development Plan of Matheran Hill Station Municipal Council (MHSMC) as Sub-Zonal Master Plan and accordingly, directed MHSMC to revise the sanctioned plan under the provisions of MR&TP Act, 1966.

The Development Plan (DP) for MHSMC so prepared has already been partly sanctioned by the GoM on 01.04.2013 and further by MoEFCC on 10.10.2018.

Man-made Heritage in Matheran:

The Matheran Municipal Council has finalised the list of heritage structures in Matheran Town along with Regulations for their conservation. A proposal to incorporate the list as well as Regulations in the Development Plan and Development Control Regulations under Section 37 of the MR&TP Act, 1966 is submitted to the GoM and is under consideration.



Chapter 8
**Proposals of the Mumbai Metropolitan Regional Plan, 2016-36 with
respect to MESZ**

8.1. Land use

Zoning principles for MESZ

The Land use proposals for the MESZ area have been framed keeping in mind the spirit of the Notification

1. The non-forest area within the buffer zone is zoned as Green Zone-2, which has the less development potential.
2. The non-forest pockets surrounded by forests within MESZ including in the buffer zone shall be treated as Green Zone-2.

The table below gives break-up of the proposed land use distribution in the MESZ:

Table 16: Proposed Land Use for MESZ area, 2016-36

Sl. No.	Land Use Zone	Area (Sq. Km.)	Percentage
1	Forest	210.58	84.74
2	Green Zone-2	33.07	13.31
3	Water Body	0.81	0.33
4	Urbanisable Zone	4.05	1.63
	Total	248.51	100.00

Source: Extracted from the Modified Draft Mumbai Metropolitan Regional Plan, 2016-36

8.2. Development Control Regulations for MESZ

Development Control Regulations for the area surrounding Matheran Municipal Council are discussed in Chapter 10.

8.3. Other Proposals of the Regional Plan, 2016-36

A. Tourism Related Proposals for MESZ

The zone attracts a number of trekkers, biologists and natural history enthusiasts and acts as a trekking and camping ground. The trails leading to Peb fort, Chenderi fort from Matheran, Neral to Peb, Dhodhani village to sunset point, and a trek to Malangad from Kalyan side are the most frequented trails by trekkers in this area.

a) Heritage in MESZ: Heritage sites such as Prabalgad, Irshalgad, Chanderi and Peb forts located in the area surrounding Matheran Town are identified and indicated on Map No. 17. The Map also indicates popular trekking trails, high footfall sites and natural scenic points.

b) Infrastructure at base villages: The tourist trails start from a base village. The popular trails along with the base villages are marked on Map No. 17. There is a need to provide the amenities required for trekkers such as rest areas, camps, shops, etc. by the Zilla Parishads. MTDC can implement the bed and breakfast scheme at these base villages. Adequate eco-friendly public toilets should be provided at proper locations along with first aid facilities.



c) Trekking infrastructure and community participation: The trekking trails lack basic infrastructure like safe ladders, rest areas, stabilization of trekking trails. For this purpose, trail keepers should be trained and hired from the tribal community in order to maintain the trails and provide guidance and information to the trekkers with respect to the region. This would help in increasing tourism, generating local livelihoods and creating and sensitizing the public towards the environment.

B. Other Proposals of modified draft Regional Plan abutting the MESZ

The proposals of the modified draft Regional Plan, 2016 in the vicinity of the MESZ are as follows:

1. **Neral-Mamdapur Municipal Council:** A new Municipal Council at Neral-Mamdapur comprising Neral (CT), Mamdapur, Bopele, Borle, Dhamote, Kolhare is proposed.
2. **Expansion of Karjat Municipal Council:** Expansion of the Karjat Municipal Council limit comprising villages Haliwali, Ladiwali and Deulwadi is proposed.
3. **Growth Centre at Shedung:** A Growth Centre at Shedung comprising villages Poyanje, Mohope, Barwai, Bhingarwadi and Bhingar which are a part of the MESZ is proposed.
4. **New Municipal Council of Rees-Mohapada:** A new Municipal Council at Rees-Mohapada comprising Rees (CT), Mohapada alias Wasambe (CT), Ambivali T. Wankhal (CT), Bhokarpada and Chambharli is proposed.
5. **Extension of Taloje Industrial Area:** A regional industrial area is proposed as an extension to the Taloje industrial area to the west of MESZ, comprising villages Chindharan, Mahodar, Kherne Kh., Nitalas and Vavanje. Of these, Mahodar, Nitalas and Vavanje are partly within the MESZ boundary.



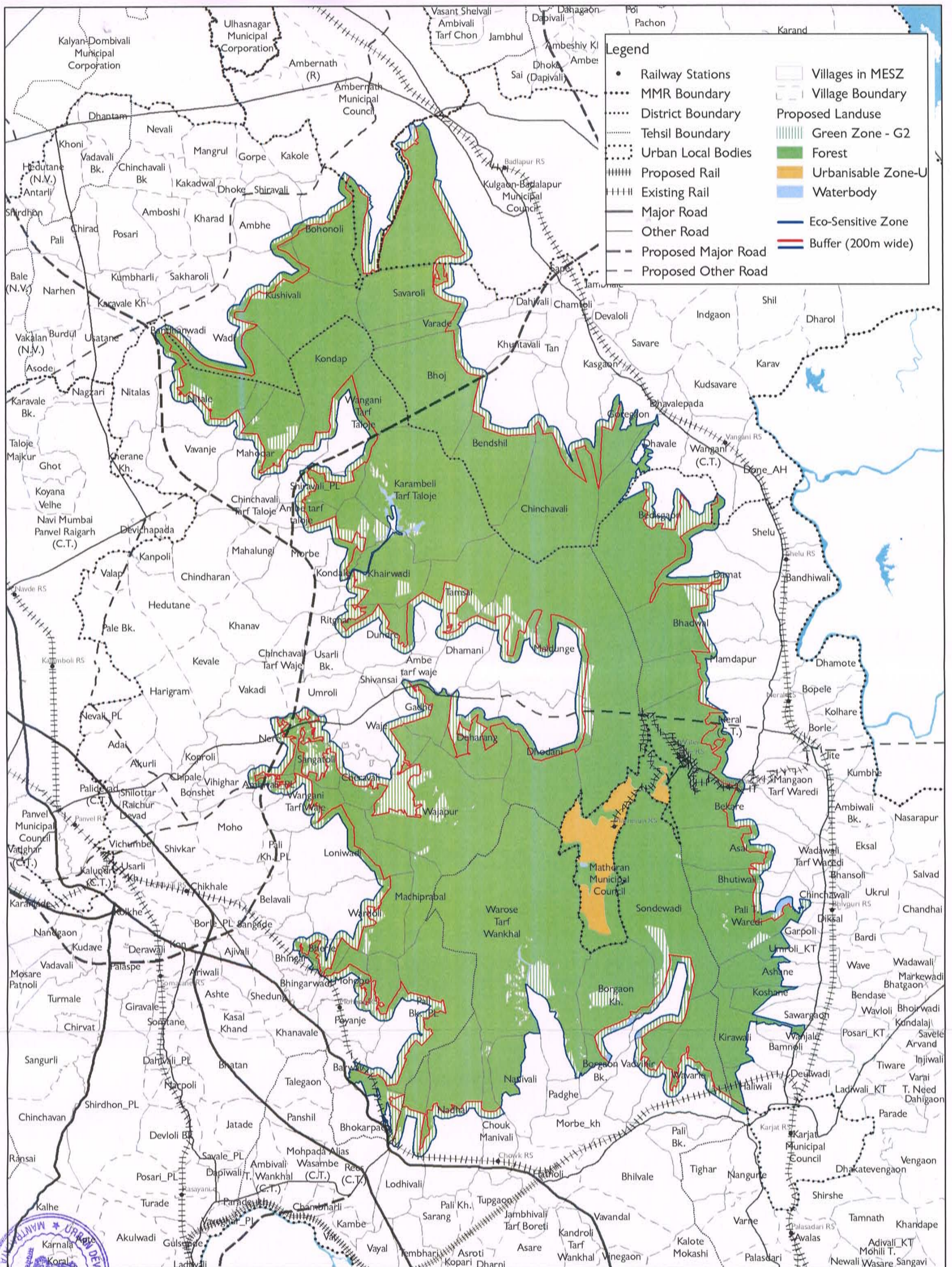
c) **Trekking infrastructure and community participation:** The trekking trails lack basic infrastructure like safe ladders, rest areas, stabilization of trekking trails. For this purpose, trail keepers should be trained and hired from the tribal community in order to maintain the trails and provide guidance and information to the trekkers with respect to the region. This would help in increasing tourism, generating local livelihoods and creating and sensitizing the public towards the environment.

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3. **Growth Centre at Shedung:** A Growth Centre at Shedung comprising villages Poyanje, Mohope, Barwai, Bhingarwadi and Bhingar which are a part of the MESZ is proposed.
4. **New Municipal Council of Rees-Mohapada:** A new Municipal Council at Rees-Mohapada comprising Rees (CT), Mohapada alias Wasambe (CT), Ambivali T. Wankhal (CT), Bhokarpada and Chambharli is proposed.
5. **Extension of Taloje Industrial Area:** A regional industrial area is proposed as an extension to the Taloje industrial area to the west of MESZ, comprising villages Chindharan, Mahodar, Kherne Kh., Nitalas and Vavanje. Of these, Mahodar, Nitalas and Vavanje are partly within the MESZ boundary.





Mumbai Metropolitan Region Development Authority (MMRDA)

Proposed Land Use for MESZ
(Part of Mumbai Metropolitan Regional Plan, 2016-36)

Matheran Eco-sensitive Zone



Scale:- 1 : 1,00,000

Source : Extracted from Modified Draft RP for MMR,2016-36



Map No.

15

Chapter 9 Other Proposals

9.1. Proposals of various agencies in MESZ

A number of agencies are working in the MESZ under various programmes on watershed management and afforestation as mandated by the Government of Maharashtra.

9.1.1. Various Agencies functioning in MESZ

Forest Department is the foremost agency working in the area as most of the land in the MESZ is designated forest and falls under the jurisdiction of this department. The Forest Department co-ordinates with the District Collector's office (Raigad and Thane Districts) and the Revenue Department and primarily works in the areas of Forest Protection, Afforestation, Soil Moisture Conservation and Eco-tourism.

The State Public Works Department (PWD), Zilla Parishads and Departments such as Agriculture, Irrigation and Social forestry are the other agencies working in this area.

9.1.2. Proposals in MESZ

The proposals of all these agencies as collected and compiled are listed below:

a) Soil Moisture and Water Conservation

MESZ receives the highest annual average rainfall in the MMR. As mentioned earlier under section 2.2.1, the hill gets an annual rainfall of 5167.5 mm while the lower altitudes receive 3267 mm to 3630 mm. The hydrogeology of the MESZ is such that most of the drains (springs/waterfalls) and wells dry up in the summer season. Also, about 50 per cent of the water flows away from the forest land as surface run off (Forest Working Plan). Therefore to protect the MESZ from the surface run off and soil erosion, soil moisture and water conservation measures need to be implemented. Both the Forest and Agriculture Departments are involved in planning and implementation of the soil moisture and water conservation measures.

The forest area in MESZ falls under the category of Reserved Forests notified under Sec. (4), Acquired Forest and Unclassed forests. The MESZ comes under the jurisdiction of two forest divisions viz. Alibag Forest Division and Thane Forest Division.

The Alibag Forest Division in their Forest Plan, sanctioned for the Period 2016-2017 to 2025-2026 has constituted a separate Matheran Hill Development Working Circle with objectives and requisite prescriptions to protect the Eco-fragile area. The Working Plan for Forests of Thane Division for the period 2009-10 to 2018-19 does not address the MESZ separately but has prescribed similar treatment for soil moisture and water conservation. Both these Plans have similar objectives as mentioned below:

1. To conserve the fragile eco-system of the notified area and maintain the ecological balance.
2. To ensure the aesthetic and climatic amenities of the notified eco-sensitive area as well as to minimize soil erosion and to regulate the water supply of lakes and springs.
3. To ensure the existence of forest by natural regeneration by seed by creating conducive conditions, and to identify the areas for planting of aesthetic and local economic species, & to carry out S.M.C works in suitable areas.
4. To meet the requirement of Fuel wood, Fodder, Non-Timber Forest Produce for rural and tribal population.



Both the Plans state that a Treatment Map of the area will be prepared indicating the Protection area, Understocked area, Old plantations and Well-stocked areas. This shall be done prior to the commencement of work by both the Forest Divisions. These components are briefly described below:

A. Protection Areas:

- i) All areas above 25° slope
- ii) Two chains wide strip (approximately 20.0 meters) on both sides of nalas, rivers and tanks
- iii) Eroded areas or areas liable to erosion

B. Under-stocked Areas: All the areas below 0.4 tree density

C. Old plantations: group of young poles

D. Well-stocked Areas: - Areas having tree crop of and above 0.4 density.

The plan recommends soil moisture conservation works like Gully Plugging, Nala Bunding, Brushwood Checkdams, etc. in the suitable blank areas, eroded areas, under-stocked areas, area under old plantations and well-stocked areas. Plantation is prescribed in the under-stocked areas, blank areas and areas susceptible to erosion in both the above mentioned plans.

The Agriculture Department is also involved in carrying out measures for soil moisture and water conservation depending on the demand of the village inhabitants and the availability of funds. The Agriculture Department implements these measures through various schemes such as Rashtriya Krishi Vikas Yojana (RKVY), Rashtriya Falotpadan Yojana (National Horticulture scheme), Pradhan Mantri Crop Insurance Scheme, Maagel Tyala Shet-tale (Farm Ponds) and Other Tribal Sub-Plan (OTSP). The treatment methods adopted for soil moisture and water conservation in the villages falling under MESZ are undertaken in the form of Farm Ponds, Tree plantation, Earthen dams, Loose Boulder Structure, Mazaghi (Paddy Pits), Continuous Contour Trench (CCT), Cement Nala Bandh (CNB) and the improvisation of the old paddy fields. Map No. 18 indicate the different measures for soil moisture and water conservation implemented by the Agriculture Department in the villages falling in MESZ.

b) Restoration of denuded Areas:

A. The Forest Department has identified the under-stocked, blank and eroded areas suitable for plantation in their respective Working Plans. These blank and eroded areas along with the under-stocked areas for afforestation will be taken up for plantation of locally available species. The yearly timetables have also been prepared as per the stock analysis. The plantation methodology for the same is devised, and is as follows:

i. Area:

- a) If the area admeasures less than 5 Ha, a provision of live hedge or barbed wire fencing has to be done before execution of afforestation work.
- b) Area if more than 5 Ha each may be clubbed together to make an administrative viable unit from protection point of view.

ii. Plants per Ha and Planting Technique: The spacing between two plants shall be 3m x 3m totalling 1,100 plants/Ha. Site specific plantation models are prepared and included in the Alibag and Thane Forest Division Plans, which can be referred to accordingly for plantation.

B. Joint Forest Management (Working Circle): Joint Forest Management (JFM) refers to the sharing of responsibilities, authority and usufructs between the Forest User Groups and the Forest Department on the basis of an agreement. One of the goals of the JFM is to conserve and manage the forest lands, thus including management of the degraded and denuded forest lands with the co-operation of the concerned Gram-Panchayat.



c) Forest Protection:

The forest areas in the MESZ are prone to illicit cutting, Fire, encroachment and excessive grazing. The following measures are proposed towards their prevention -

- i. Fire Protection: The plantation areas in the MESZ shall be rigidly fire traced and fire protected for the entire plantation period from the first year of its working. The dry and cut remains of bushes, leaves, etc. shall be cleared to avoid fire hazards.
- ii. Grazing: The area shall remain closed to grazing and will be strictly regulated according to the Grazing Policy and instructions issued from the Government from time to time. The grazing capacity of the forest and permissible number of cattle in each class of forest is proposed to be prepared by the DCF as per the Working Plans.
- iii. Encroachment: Boundaries shall be demarcated to prevent encroachment and will be maintained under a five year maintenance scheme. The land under encroachment must be evicted as mentioned under the Land Revenue Code.

d) Survey and Demarcation:

The forest area notified under Section (4) of the Forests Act is burdened with various rights of forest dwellers, granted on different occasions in the past. However, these lands are not demarcated and therefore, there is an urgent need for demarcating such lands.

e) Setting up of Fuel Wood Depot

The firewood requirement of the hill station is very large and Matheran forest can produce only firewood. Efforts were made in the past for creation of fuel depot at Matheran. The firewood in a limited scale is now rigidly controlled by the Matheran Environmental Protection Authority, created as per the directive issued by the H'ble Supreme Court, vide GR dated 4.2.2003 by imposing restrictions and by ensuring efforts of conservation.

f) Other proposed Interventions

- i. Silvicultural activities are not prescribed to protect the fragile eco-sensitive area.
- ii. No consideration is given to yield, as measures such as conservation, protection, demarcation and afforestation are proposed.
- iii. No felling of trees on the forest land is permitted without prior approval of the State Government.

g) Groundwater Management

The settlements (villages and padas/wadis) in the MESZ depend heavily on the water drawn from wells as the undulating nature of terrain makes it difficult to provide piped water supply. Also, as mentioned earlier in section 9.1.2 (a) of this report, hydrogeology of the Eco-Sensitive zone is such that most of the drainage (springs/waterfalls) and wells dry up in the months of summer season. Therefore, owing to the hydrogeology of the Eco-Sensitive Zone and the development pressures surrounding the Eco-sensitive Zone, it is of utmost importance to manage the groundwater.

The Ministry of Drinking Water and Sanitation, GoI has initiated the Rajiv Gandhi National Drinking Water Mission (RGNDWM) to accelerate the pace of coverage of drinking water supply in Rural Areas. Under this mission, a scientific groundwater database is created by the NRSC/ISRO. The data and analysis is generated by a scientific study using various parameters regarding Groundwater Recharge Priority study and Groundwater Prospects under the RGNDW Mission. Relevant parts of the study pertaining to the MESZ have been interpreted under section 2.3.4 of this report.



i) Groundwater Recharge

To provide sufficient and sustainable water supply to the settlements in the MESZ, it is important to improve the groundwater condition which is the major source of water supply for these settlements. As these wells/bore wells tap the younger basalts which have low weathering and fracturing, they yield less quantity of water during summer months, leading to water scarcity. Therefore the requirement of the groundwater needs to be met through artificial recharge.

The artificial groundwater recharge maps generated under the RGNDW mission were obtained from GSDA's website and studied. Priority areas are identified for artificial recharge and guidelines are laid down regarding the techniques that can be used for artificial recharge in these maps (Refer Map No. 19). The maps were available in PDF and were digitised for assessment; hence the data may not be very accurate.

It is inferred from the map that the area under High Priority is negligible, while 38% is under Moderate priority, 21% area is under Low priority and 29% area has limited scope for recharge. Data for the remaining 3% could not be ascertained. The following table gives Taluka-wise break-up of the priority for Artificial Recharge:

Table 17: Taluka-wise Priority for Artificial Recharge (Area in Percentage)

Taluka Name	Low Priority	Moderate Priority	Limited Scope	Percentage
Ambarnath	73	22	5	100
Karjat	35	19	46	100
Khalapur	24	11	56	91*
Panvel	32	49	18	99**

Note:





*No data available for 9% area in Khalapur Taluka

**0.5% area in Panvel is under high priority, data is not available for the remaining 0.5%

Source: GSDA's website

Guidelines for the artificial recharge based on the priority are as follows:

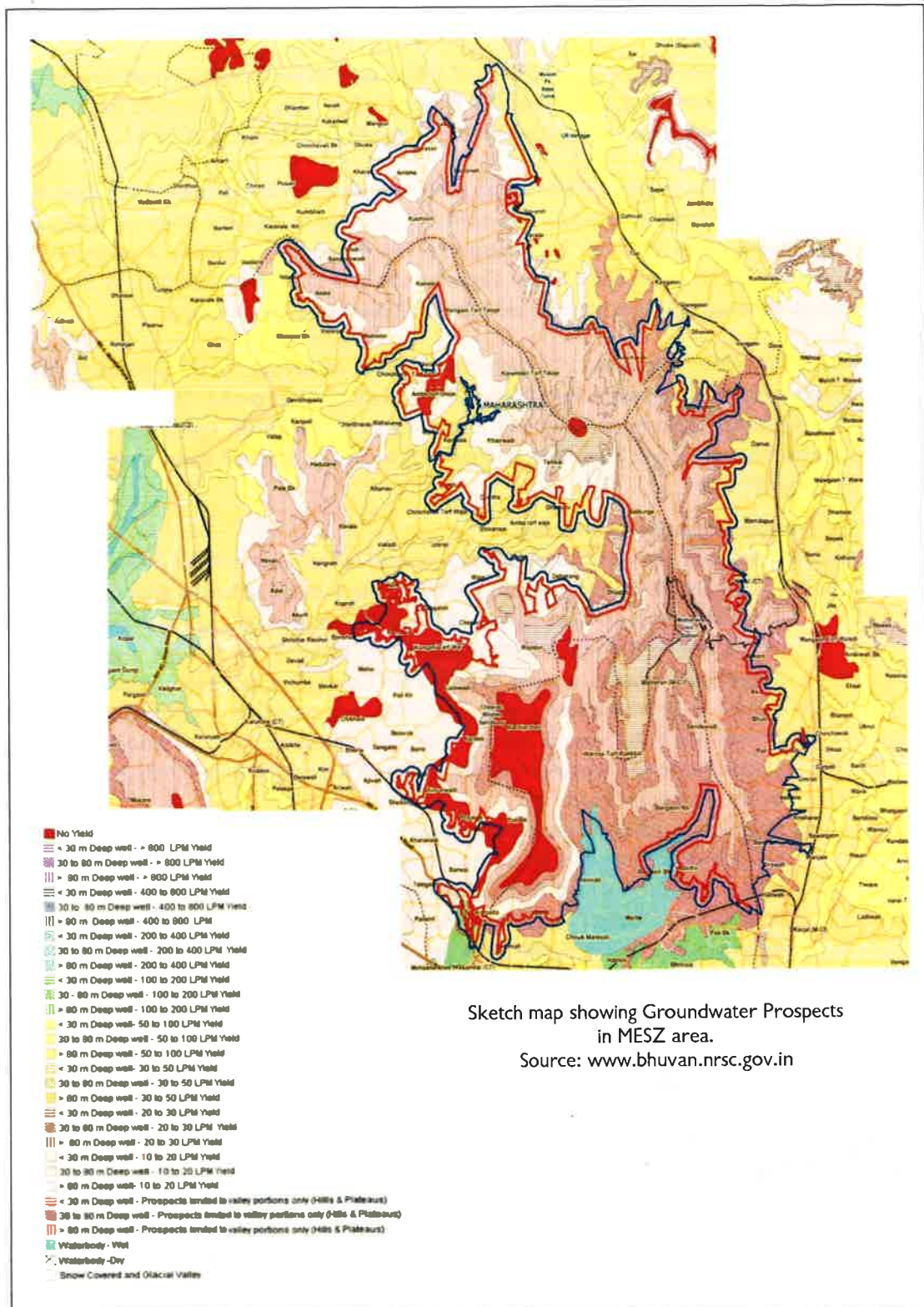
Table 18: Guidelines for Artificial Groundwater Recharge

Sr.no	Priority for Artificial Recharge	Guidelines for Recharge Techniques
1	High Priority 	Nala Bund, Check Dam, Recharge Well, Recharge Shaft, Underground Bandhara, etc.
2	Moderate Priority 	Farm Pond, Percolation Tank, Farm bunding, Nala Bund, Check Dam, Recharge Well, Recharge Shaft, Underground Bandhara, etc.
3	Low Priority 	Continuous Contour Trench(CCT), Loose Boulder Structures
4	Limited Scope 	Continuous Contour Trench (1m x 1m), water Absorbing Trench

ii) Groundwater Prospects

The Groundwater Prospect maps, generated under the RGNDW mission were obtained from ISRO's geoportal - Bhuvan. The groundwater prospect is a good database for aquifer mapping and one of the inputs for resource estimation for future groundwater development for any selected area. This database mainly helps in identification of prospective locations for narrowing down target zones for hydrogeological and geophysical surveys at appropriate places for drilling. The study is based on the analysis of hydrogeological characteristics and the variables (lithology, climate, recharge, discharge/draft, etc) influencing the occurrence and movement of groundwater along with the data from observation wells. These ground water prospects of the aquifers are estimated in the form of type of well, its depth and expected yield. The sketch map below indicates the groundwater prospects for MESZ.





Sketch map showing Groundwater Prospects in MESZ area.

Source: www.bhuvan.nrsc.gov.in

The Eastern and Southern side of the MESZ has potential for 30 to 80 m Deep Well – Prospects are limited to valley portions (Hills and Plateaus). The northern and Western Side of the MESZ has potential for 30 to 80 m Deep well with 10 to 20 LPM Yield. Also, some villages like Machiprabal, Sangatoli has No Yield Areas.



h) Interventions under the Integrated Tribal Development Project (ITDP)

Different schemes for the development of tribals such as water supply, road connectivity, power supply are implemented under the ITD Project. As per the data obtained from the ITDP-Pen, various schemes have been proposed for the period from 2011-12 to 2016-17.

Under the Minor Irrigation water supply scheme a Nala Bandh is proposed in village Maldunge of Taluka Panvel. Similarly, a bund is proposed in Katkarwadi in Wavarle village of Khalapur Taluka. In Thakurwadi, village Wavarle, Tal. Khalapur, a Tap Water Supply scheme is proposed. To provide power supply to these tribal areas, electrification is proposed by MSEDCL in Yermalwadi, Tal. Panvel, Irsalwadi in Village Nanivali and Katvan Thakurwadi in Tal. Khalapur.

The PWD, Alibag is involved in construction of roads connecting the tribal padas/wadis. In Panvel Taluka roads are proposed from Haltep Thakurwadi to Machiprabal, Dodhani Thakurwadi road, Waghachiwadi Thakurwadi Road and repair works of Karambeli Tarf Taloja road. In Khalapur taluka road is proposed from Borgaon Fata to Pokharwadi, Vadvihir Katkarvadi road and Wavarle Katkarwadi road.

i) Transportation related Proposals

Following is the list of major transportation proposals in and around MESZ (Refer Map No. 20):

- i) **SPUR:** The NHAI has proposed a SPUR to the Vadodara-Mumbai Expressway from Shirsat Phata near Virar through Nashik Highway to Badlapur and then to Panvel and JNPT. This SPUR alignment enters the Matheran Eco-Sensitive Zone through a proposed tunnel at village Bhoj and exits at village Wangani tarf Taloje (Source: NHAI's Report on SPUR).
- ii) **Panvel to Bhimashankar route:** The PWD has proposed a connection from Panvel to Bhimashankar by way of tunnel under the Matheran Hills, to boost the Panvel-Neral Hinterland connection. Accordingly, the draft Regional Plan of MMR, 2016-36 also shows this as a proposed road.
- iii) **Ropeway:** A ropeway project is proposed by M/s Matheran Ropeways Pvt. Ltd (MRPL) to provide direct connectivity to the Hill Station of Matheran. The proposed route of the ropeway is from Village Bhutivali (base station; near Bhivpuri railway station) to Garbat Plateau (Intermediate Station) to Madhavji point (Top Station in Matheran Town). This proposed ropeway is 4,489.39 m long and is planned to be developed in two sections, where Section I is 2,745.39 m and Section II is 1,744 m in length.

The following map indicates the proposed ropeway along with the connectivity to Bhutivali base station.



Legend	
	State Highway - 79
	Neral-Dasturi Road (Current Route - 3m wide)
	Pathway to Matheran (on Foot)
	Proposed Ropeway Alignment
	Village Kaccha Road - 2 m wide
	Proposed Road
Source: M/s Matheran Ropeways Pvt. Ltd (MRPL)	

Details of the Ropeway project as procured from MRPL are as given below:



- Approach to the Site: There are three railway stations in the vicinity of the site namely - Bhivpuri (3 km), Karjat (6 km), and Neral (6 km). The nearest highway is SH-79 at approximately 2 km from the site, which connects to Mumbai.

9.2. Proposals of the Report

This report has incorporated the Extract of modified draft Regional Plan of MMR, 2016-36 as submitted to the GoM for sanctioning, for the area outside Matheran Town along with additional provisions for Zonal Master Plan of MESZ as per notification and summary of Tourism Master Plan for Matheran prepared by MTDC.

An overall view of the MESZ was taken and the following proposals are framed:

9.2.1. Environment related:

1. **Groundwater Management:** The overall water level in and around the MESZ area has declined as is evident from the maps generated by GSDA included under section 3.3.4 of this report. With the extent of development that is expected to come up around the MESZ, it is very important to take appropriate measures for conservation of groundwater. The following measures are suggested to be adopted by the respective agencies:
 - i) Considering the water scarcity faced by certain areas within the ESZ during summer time and their dependence on groundwater, it is necessary to construct more water recharge structures at appropriate locations. Priority areas are identified for artificial recharge and guidelines are laid down regarding the techniques that can be used for artificial recharge in these maps in the study carried out under the RGNDW mission that is available on GSDA's website.
 - ii) A detailed study of the groundwater prospects has already been carried out under the Rajiv Gandhi National Drinking Water Mission (RGNDW) mission and is available on ISRO's geoportal - Bhuvan. This study should be referred to before deciding on the location of new wells.
 - iii) De-silting or maintenance of Recharge Structures may be carried out for effective recharge of groundwater
 - iv) Tree plantation of local species and water conservation measures may be considered to arrest surface run-off during monsoon.
 - v) Appropriate groundwater recharge methods may be employed in the urbanized/urbanizable areas abutting the MESZ, especially on the western side of MESZ. Regulations to maintain a certain percentage of developed land as a pervious surface need to be incorporated in the respective DCRs.
2. **Erosion Mitigation:** Almost 53.87 percent of the area of the MESZ is prone to moderate to severe erosion while 6.07% area is prone to severe erosion as is mentioned earlier in section 2.2.4 (e) of this report. The area around Gadhe Dam, Morbe Dam, Lendi Dam in village Karambeli Tarf Taloje, Bhoj Dam in village Bhoj and the Dam in village Pali. T. Waredi that is prone to 'moderate to severe' and 'severe' erosion need to be conserved through plantation of indigenous species of trees that are suitable to arrest erosion. Similarly, land along rivers Lendi and Gadhe is also prone to severe erosion and hence tree plantation should be carried out along these rivers and other water bodies within MESZ. In addition, other appropriate measures may also be adopted.
These measures will also help prevent landslides.



3. Conservation of Highly Sensitive Areas (HSA):

The MoEFCC's notification mandates that no construction activity shall be permitted on steep slopes or slopes with high degree of erosion. As mentioned in chapter 3, 30% area in MESZ has steep slopes (35-50%) and 6% of the area is vulnerable to severe soil erosion. Two important parameters namely, severely erosion prone areas and steep slopes were considered as Highly Sensitive Areas (HSA) in the ESZ. These pockets, specifically marked on the Map No. 21, need to be conserved as any intervention in the land form will harm the area.

HSA substantially extends over Forest Zone and is therefore well protected. However, it is the HSA pockets under Green Zone 2 (area-90.03 sq. km. , which is 36.16% of the MESZ) that need to be specially conserved. The Green Zone 2 in itself is a low intensity zone with 0.1 FSI where limited activities are permitted, which are further restricted in the MESZ. However, activities such as Gaothans (FSI-1.0) and Gaothan Expansion (FSI-0.4) are permissible within the MESZ.

Gaothans, Gaothan Expansion and Padas/Wadis of some villages partly/completely fall under the HSA. The Gaothan of villages Mahodar and Kondap in Panvel taluka are completely under the HSA; while those of Asal (karjat Taluka) and Savaroli (Ambernath Taluka) fall partly under the said HSA. The Gaothan expansion of some villages namely, Mahodar, Kondap, Nitale, Karambeli T. Taloje, Gadhe, Deharang, Maldunge and Barwai in Panvel Taluka; Villages Asal and Bedisgaon in Karjat Taluka; Villages Savaroli and Sondewadi in Ambernath and Khalapur Taluka respectively partly come under the HSA. The Wadis/Padas coming under the HSA are a) Dhamatwadi in vill. Bhoj, Tal. Ambernath; Anandwadi and Ambewadi in Neral (C.T.), Thakurwadi in vill. Pali T. Waredi, Tal. Karjat; Thakurwadi in Vill. Nadhal, a pada/wadi in vill. Bargaon Kh., a pada/wadi in vill. Sondewadi, Tal. Khalapur; wadi in Vill. Nitale, Kondap, Tamsai, khairwadi, katodi wadi in vill. Mahodar, Thalurwadi in vill. Karambeli T. Taloje in Tal. Panvel.

It is therefore proposed to prohibit the following within HSA:

1. Gaothan Expansion Scheme
2. Activities such as Golf courses that would need training the ground and usage of turf grass
3. Any major interference with the topography

Tree plantation is proposed as one of the measures for erosion control. The HSA should be accorded first priority for afforestation.

4. Resource Mobilisation: Adequate resources should be made available to the concerned departments to carry out daily range operations. The forest management plan has identified the required manpower to man the different beats within the zone. The plan has also identified specific locations where watch towers need to be erected. This should be done on priority.

In addition to these measures it is necessary that technology augmentation like the use of GPS devices, GIS and remote sensing technology be incorporated for the day to day monitoring for preventing forest fires and any illegal activities in the area. CCTV cameras should also be installed and regularly monitored at important locations.

9.2.2. Digital data Repository for data updation:

Developing a geospatial data repository system with periodic updates will be beneficial in consolidating the activities of various agencies working in MESZ. This will also be useful for taking informed decisions by the concerned agencies.



Centres can be set up with broadband connectivity either in the Grampanchayat office, or local school/post office where locals can post their suggestions/needs/grievances that can be immediately uploaded on the portal and forwarded to the concerned agency for appropriate action.

9.2.3. Transportation and Traffic Management to reach Matheran:

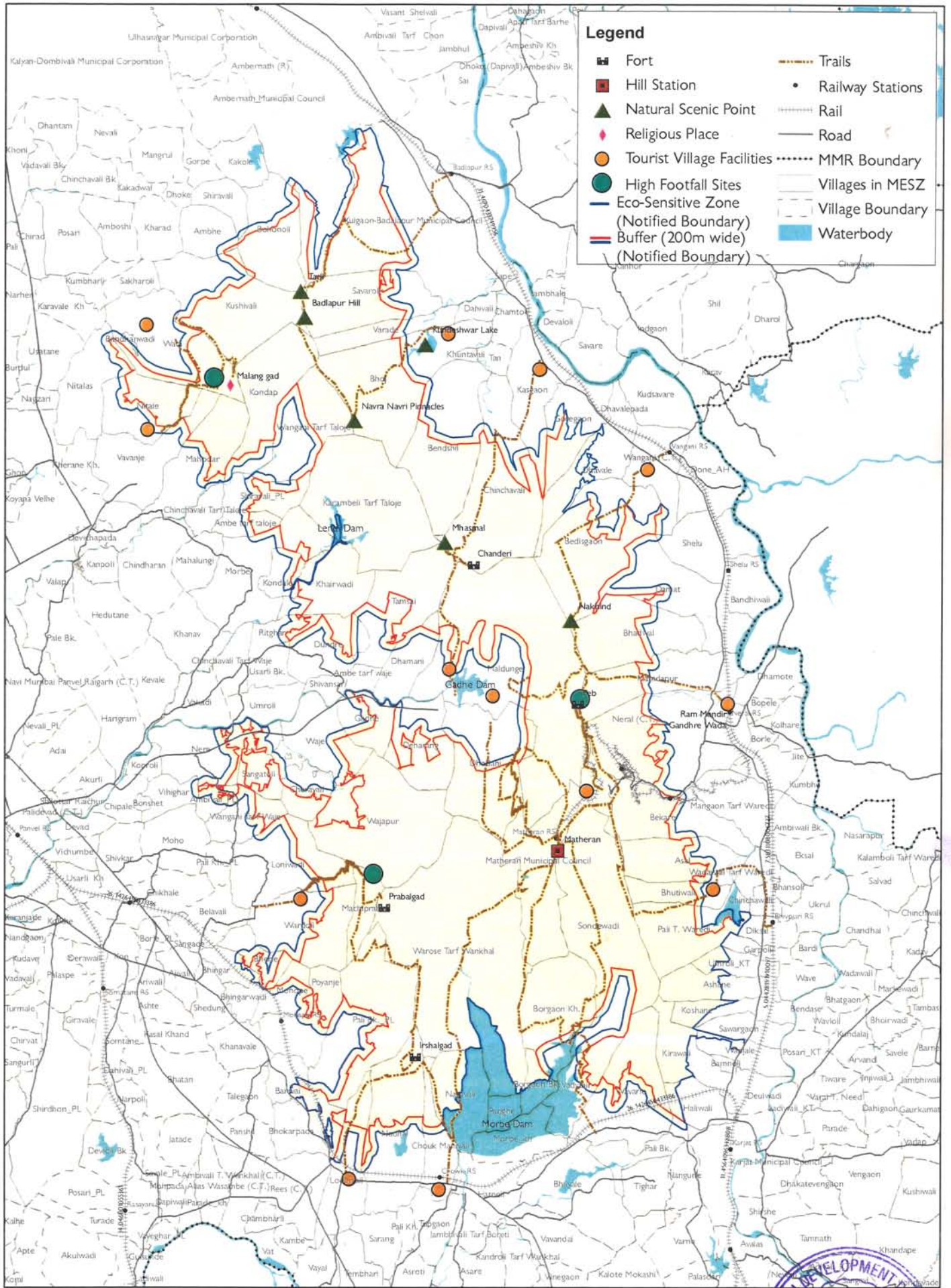
Accessibility is one of the critical issues that the hill station faces as only one PWD road (MDR9) and a narrow gauge train connect Neral and Matheran Town. It is important that the focus should be transporting larger number of people from Neral to Matheran by various modes. A large number of floating population flocks to the town mostly by road (as the capacity and frequency of the narrow gauge train cannot accommodate the same) due to which the parking area at Dasturi Naka is under pressure. An area of about 2.23 Ha has been earmarked in the Draft Development plan for Matheran Town for parking, a Bus Stand and a Logistic Hub. However due to increased inflow of vehicular traffic especially during weekends, the parking area extends illegally into the forest areas.

It is therefore important that the narrow gauge train be maintained immaculately throughout the year and parcel vans be operated independently as attached to the train to ferry goods.

9.2.4. Needs of the Local Community:

- 1. Provision of Mobile Health Facilities:** It was observed that out of the 34 villages that are within the MESZ (listed under Table 8), 12 villages have to travel somewhere between 5-10 km and 8 villages have to travel more than 10 km to access the nearest health facility. Accessibility from some of these villages is difficult due to the undulating terrain. The provision of mobile health clinics may be beneficial for such villages.
- 2. Identifying non-conventional energy sources:** Alternative sources of energy for lighting and cooking that is appropriate to the scale of the settlement should be identified. This could be in the form of a biogas plant like the Nisarga Run Plant at Matheran.

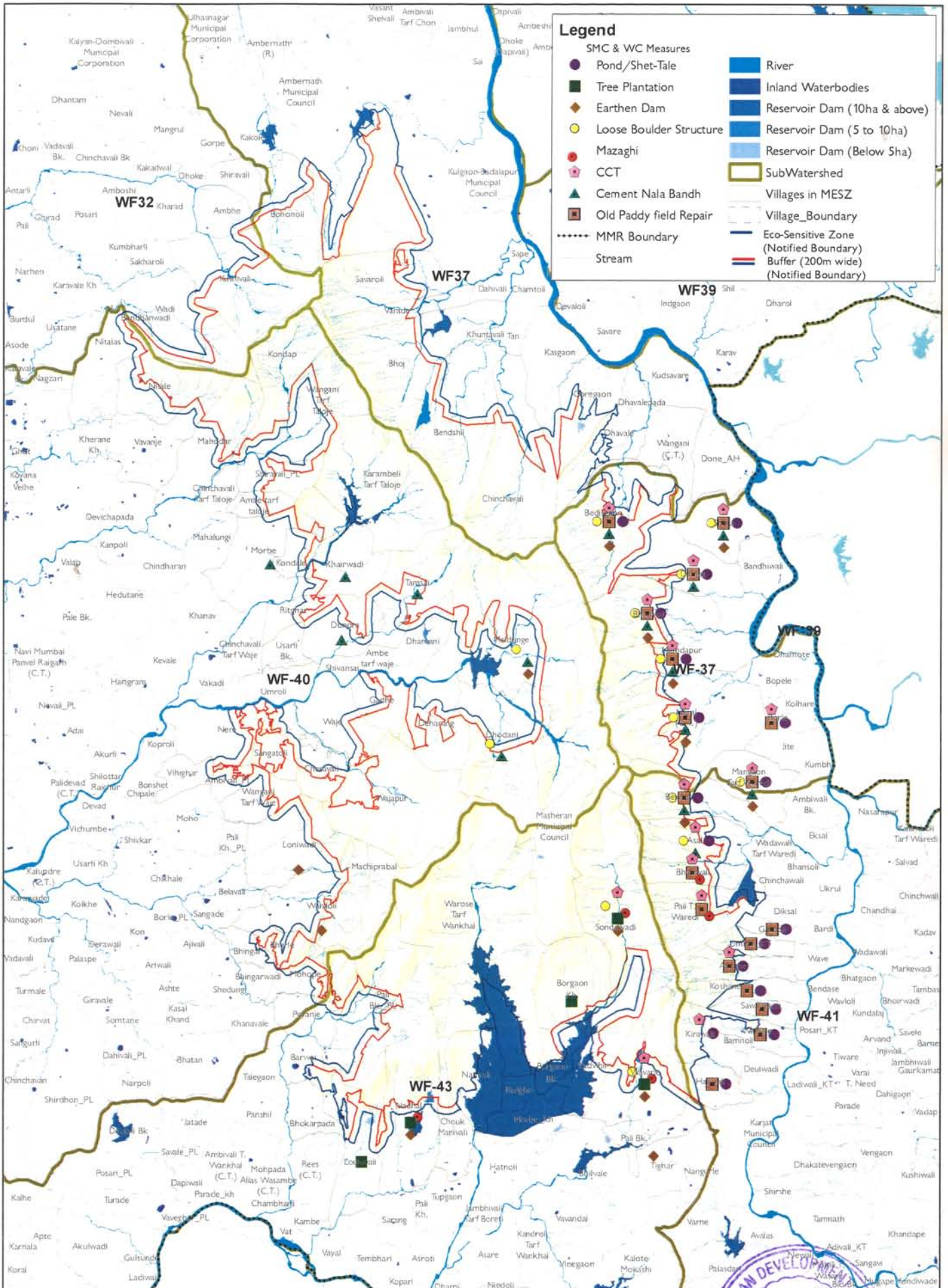


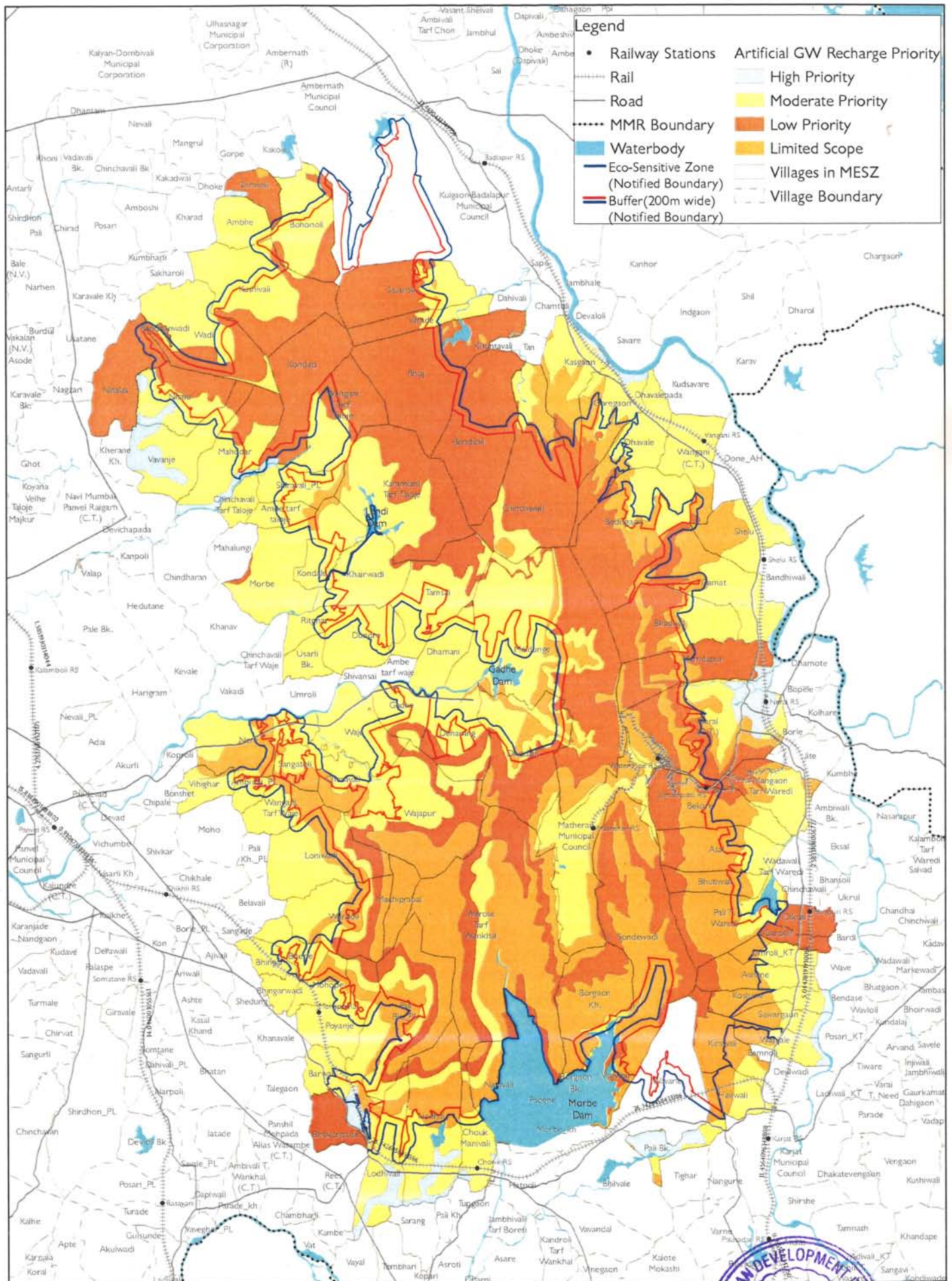


Legend

- Fort
- Hill Station
- Natural Scenic Point
- Religious Place
- Tourist Village Facilities
- High Footfall Sites
- Eco-Sensitive Zone (Notified Boundary)
- Buffer (200m wide) (Notified Boundary)
- Trails
- Railway Stations
- Rail
- Road
- MMR Boundary
- Villages in MESZ
- Village Boundary
- Waterbody

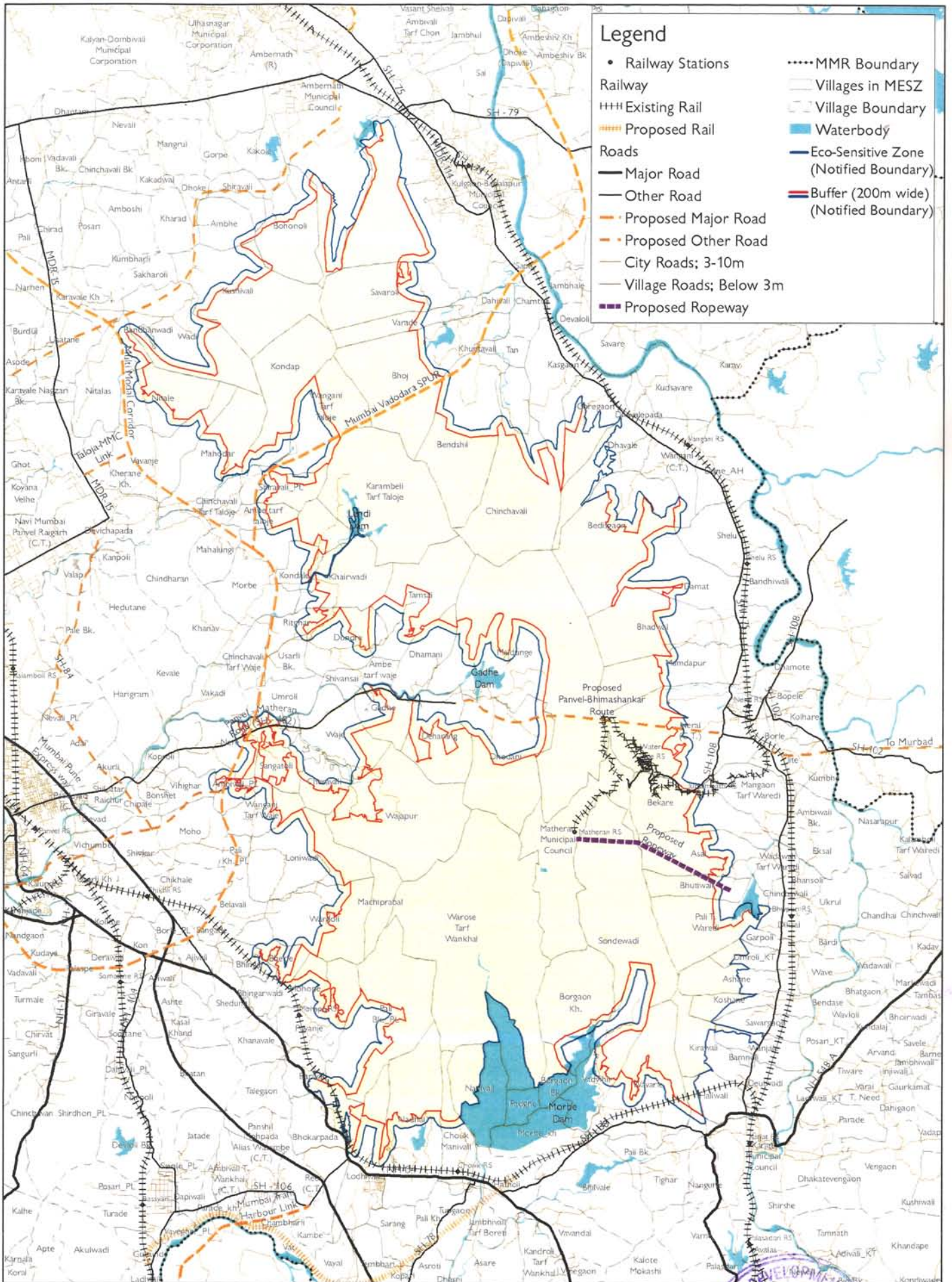






Legend

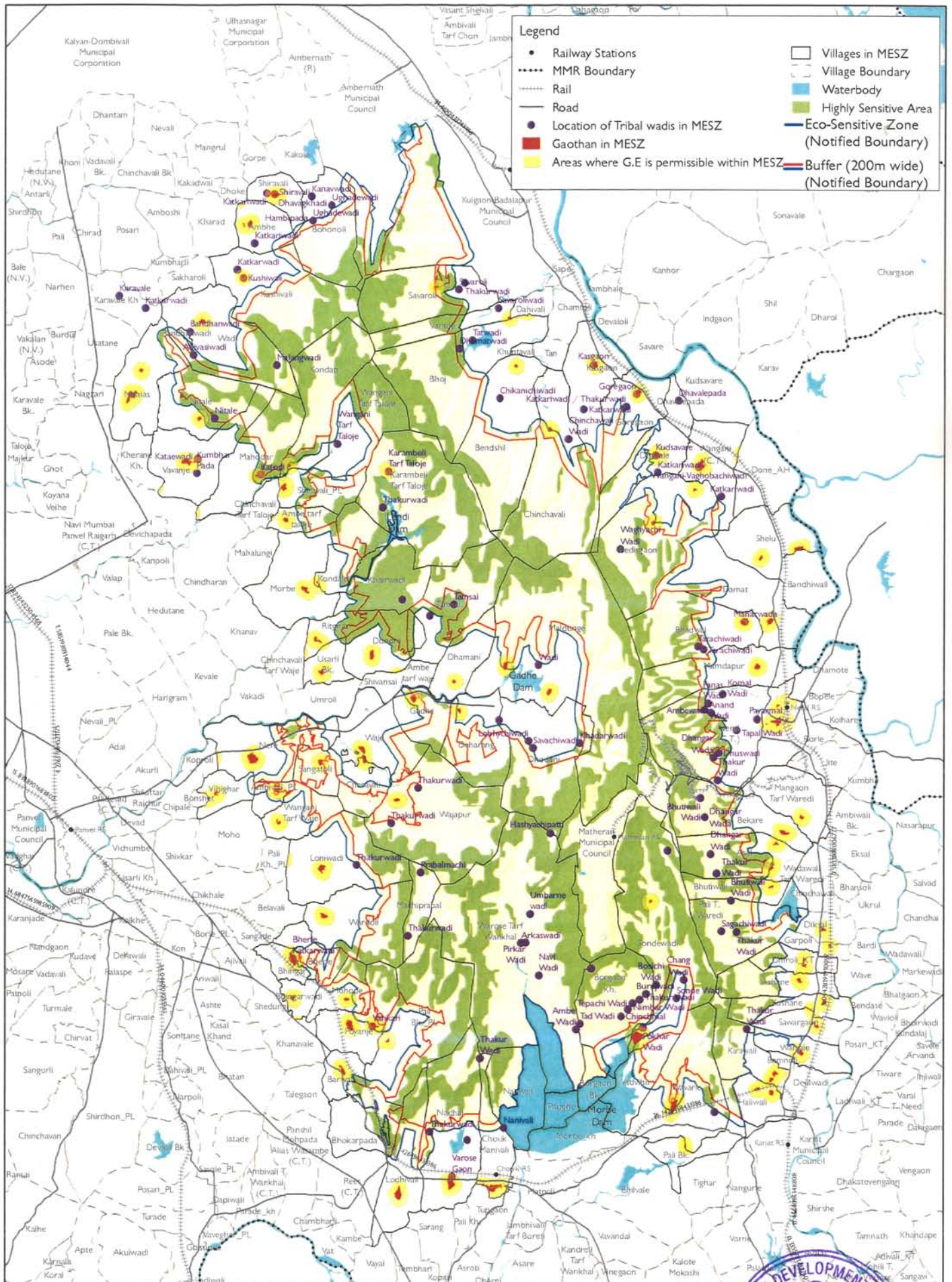
- Railway Stations
- Rail
- Road
- MMR Boundary
- Waterbody
- Eco-Sensitive Zone (Notified Boundary)
- Buffer(200m wide) (Notified Boundary)
- Artificial GW Recharge Priority
- High Priority
- Moderate Priority
- Low Priority
- Limited Scope
- Villages in MESZ
- Village Boundary



Legend

- Railway Stations
- MMR Boundary
- Railway
- ==== Existing Rail
- Villages in MESZ
- Proposed Rail
- Village Boundary
- Roads
- Waterbody
- Major Road
- Eco-Sensitive Zone (Notified Boundary)
- Other Road
- Buffer (200m wide) (Notified Boundary)
- Proposed Major Road
- Proposed Other Road
- City Roads; 3-10m
- Village Roads; Below 3m
- Proposed Ropeway





Chapter 10

Regulatory Framework for MESZ

10.1. Regulatory framework for the management of MESZ

The regulatory framework pertaining to MESZ discussed in this chapter is reproduced from the Modified Draft Development Control Regulations for MMR, 2016-36.

The area surrounding MESZ has high development potential and therefore, it is imperative to have a regulatory framework for development control and environmental management. The MoEFCC's Notification and its amendment dated February 4, 2003 and 16th January 2004 respectively, describe permissible activities within the Matheran Eco-Sensitive zone according to the zones described in the Sanctioned Regional Plan, 1996-2011. As per the MoEFCC's notification, there are four land use zones of Forest Zone, Green zone-2, Green zone-1 and Urbanisable Zone in the MESZ.

However, as mentioned earlier in chapter 8 of this Report, the entire buffer of MESZ is zoned as Green Zone-2 and the non-forest pockets surrounded by forest are zoned as Green zone -2 in the Draft Regional Plan for MMR, 2016-2036. Thus, only two land use Zones are proposed in the MESZ viz. Forest Zone and Green Zone-2.

10.1.1. Development Control Regulations for Matheran Municipal Council Area:

The Land Use and DCRs of the Matheran Hill Station Municipal Council area shall be applicable to the Matheran Town.

10.1.2. Development Control Regulations for Areas outside the Matheran Municipal Council Area:

The DCRs of draft RP, 2016-36 are applicable for the areas in MMR outside the jurisdiction of Municipal and Special Planning Authority areas. Thus, for MESZ outside the MHSMC area, these DCRs apply. The DCRs of draft RP, 2016-36 have specific provision for MESZ area, the details of which are given below:

1. Forest Zone

Where any land is situated outside Reserve Forest, Protected Forest, Acquired Forest or Forest as defined as per the Supreme Court's Order dated 12th December 1996, the development of such land shall be regulated in accordance with the provisions for Green Zone-2.

2. Green Zone 2

- A. A maximum FSI of 0.1 and building height up to 9.0 m shall be permissible in Green Zone 2. The minimum plot size shall be 4,000 sq. m.
- B. The following activities shall be permissible on lands zoned as Green Zone-2:
 - (i) Agriculture and Allied Activities:
 - a) Agriculture, Plantation and allied activities of rice and poha mill, poultry farms, cattle sheds, piggeries and sheep farms
 - b) Horticulture & Floriculture and allied activities
 - (ii) Residential:



- a) Farm buildings as permissible under Section 41 of the Maharashtra Land Revenue Code, 1966;
 - b) Gaothan and Gaothan Expansion Scheme with development in the nature of expansion of existing gaothan on lands within 200 m from the gaothan boundary.
- (iii) Public and Semi-public Uses:
- a) Educational Institutions up to Secondary Schools, Primary Health Institutions and Welfare Institutions serving the aged, orphans, differently abled and other disadvantaged sections of the society on land not less than 2.5 Ha in area and pre-primary school, primary school and health centre on land not less than 0.4 Ha
 - b) Recreation: Parks, Regional Parks, Playgrounds, Golf courses and Camping grounds with public convenience
- (iv) Public Utilities:
- a) Highway Amenities and Services such as Petrol Pump, Small Shops, Service Stations including emergency repair services, Small eating places, Parking lots, Police check Post
 - b) Roads, Bridges and Ropeways
 - c) Public Utilities and Services - Dams, Railway lines and related facilities, Pipelines, Water Tanks, Electricity Transmission Lines, Communication Towers, Petrol Pumps, Servicing and Repair, Public Toilets etc.
Public Amenities - Water Treatment, Sewage Treatment, Solid Waste
 - d) Treatment and Disposal Facilities along with essential support activities, Gas works, Fire Brigade, Police Station, Telephone Exchange, Cemeteries and Crematoria

3. Gaothan and Gaothan Expansion Scheme in MESZ

- A. The following provisions shall regulate Gaothan and Gaothan Expansion Scheme in Green Zone 2 of MESZ:
- B. For the purpose of these Regulations, the boundary of the existing gaothan shall be as shown in the Revenue Maps or as notified under the provisions of Maharashtra Land Revenue Code, 1966 from time to time.
- C. Gaothan Expansion may be permitted by the Monitoring Committee based on needs and requirements of and for existing gaothan for the local residents only.
- D. The lands in Gaothan and Gaothan Expansion may be used for any of the following purposes:
 - (i) Agriculture and Allied Activities
 - a) Agriculture, Plantation and Allied Activities including Stables/cattle sheds for domestic animals, Storage of crop, fodder, manure, agricultural implements and other similar needs;
 - b) Storage of fuels for domestic and commercial uses
 - (ii) Residential
 - a) Detached/semi-detached houses, row-houses and walk-up apartments
 - (iii) Commercial
 - a) Traditional home based economic activities which do not involve use of intensive mechanical equipment or machinery and do not cause nuisance to the neighbours
 - b) Public convenience and retail shops, Small eating places, Banks and Post office Offices of the Government, Local Authorities, Public Utility Concerns and



- Offices of Professionals
- c) Personal service establishments and repair service establishments
- (iv) Public and Semi-Public Uses
- a) Educational, Social, Medical, Religious and Welfare institutions
- b) Recreation: Parks, Gardens and Playground;
- (v) Public Utility
- a) Highway Amenities and Services such as Petrol Pump, Small Shops, Service Stations including emergency repair services, Small eating places, Parking lots, Police check Post
- b) Roads, Bridges and Ropeways
- c) Public Utilities and Services - Small check dams for water shed management, Railway lines and related facilities, Pipelines, Water Tanks, Electricity Transmission Lines, Communication Towers, Petrol Pumps, Servicing and Repair, Public Toilets etc.
- d) Public Amenities - Water Treatment, Sewage Treatment, Solid Waste Treatment and Disposal Facilities along with essential support activities, Fire Brigade, Police Station, Telephone Exchange, Cemeteries and Crematoria
- (vi) Maximum permissible FSI, Ground Coverage and Building Height:

Table 19: Maximum permissible FSI,-Ground Coverage and Building Height in Gaothan and Gaothan Expansion Scheme in MESZ

Area	FSI	Ground Coverage	Building Height
Gaothan	1.00		9.0 m
Gaothan Expansion	0.40	40%	9.0 m

10.1.3. Other Special Regulations for MESZ:

10.1.3.1. Quarrying and Mining:

Quarrying and Mining activities shall be banned in the Eco-sensitive Zone and no fresh mining lease shall be granted. However, the Monitoring Committee shall be the authority to grant special permission for limited quarrying of materials required for the construction of local residential housing and traditional road making and maintenance work in Matheran Municipal Council area based on site evaluation. No quarrying shall be permitted on steep hill slopes, with a gradient of 20 degrees or more or areas with a high degree of erosion or on forestlands.

10.1.3.2. Felling of trees:

There shall be no felling of trees whether on Forest, Government, Revenue or private lands, without the prior permission of the State Government in case of forest land, and the respective District Collector in case of Government, Revenue and private land, as per procedure which shall be laid down by the State Government.

10.1.3.3. Tree Plantation and Landscaping:

- (i) Planting of trees conducive to growing in degraded areas shall be carried out where natural regeneration is absent. Trees wherever required to be planted, shall be of local, endemic and indigenous species only. Monoculture shall not be permitted.



- (ii) There shall be no removal of natural ground cover, soil, rocks, vegetation or grass for the purpose of growing lawns or exotic ground covers.
- (iii) Hard paving shall not be permitted in the MESZ except for walking paths, which shall be of porous paving material.

10.1.3.4. Extraction of Groundwater:

Extraction of ground water for the bona-fide agricultural and domestic consumption of the occupier of the plot is allowed. Extraction of ground water for industrial, commercial or residential complexes shall require prior written permission, including the amount that can be extracted, from the State Ground Water Board. No sale of ground water shall be permitted except with the prior approval of the Monitoring Committee constituted under paragraph 4 of the MOEFCC's notification dated 04.02.2003. All steps shall be taken to prevent contamination or pollution of water, including from agriculture activities.

10.1.3.5. Use of plastic:

No person shall use plastic bags within Matheran Municipal Council area. The use of plastics, laminates and tetra-packs within the Eco-sensitive Zone shall be regulated by the Monitoring Committee.

10.1.3.6. Protection of hill slopes:

- (i) Existing slopes shall be maintained and the topography of the land shall not be disturbed while developing the land, except for soil moisture conservation activities.
- (ii) No construction shall be permitted on hill slopes above 20°.

10.1.3.7. Discharge of effluents:

- (i) The discharge of any untreated effluent is prohibited within the Eco-Sensitive Zone.
- (ii) No effluent, either treated or untreated, shall be permitted to be discharged into any water body or water source within the Eco-sensitive Zone.
- (iii) Eco-friendly Community/Public Toilet shall only be installed at Tourist locations where required

10.1.3.8. Solid Wastes:

- (i) The local authorities shall draw up plans for the segregation of solid wastes including domestic, industrial, commercial and garden wastes into biodegradable and non-biodegradable components.
- (ii) The biodegradable material may be recycled preferably through composting or vermiculture and the inorganic material may be disposed of at environmentally acceptable locations.
- (iii) No burning or incineration of solid wastes shall be permitted.

10.1.3.9. Buffer along water courses and water bodies:

No construction shall be permissible along water courses and water bodies indicated in the Revenue map or in the Regional Plan up to:

- a) the blue line as prescribed by the Irrigation Department for rivers and nallas as and when finalised, subject to the provisions of the sanctioned Coastal Zone Management Plan (CZMP)
- b) 9.0 m and 15.0 m for minor and major water courses respectively, where such flood line is not available. Blue line shall prevail over the 9.0 m and 15.0 m buffer as and when finalised by the Government.
- c) 9.0 m around ponds and in case of Dams, as specified by the Irrigation Department

10.1.3.10. Vehicular Traffic:

No vehicular traffic shall be permitted within the Matheran Municipal limits, except one ambulance and one fire engine and in addition to one ambulance and one fire engine as standby.



10.1.3.11. Infrastructure projects

Infrastructure projects including transportation related, must be considered only after cumulative impacts are studied and assessed.

10.1.4. Western Ghats Eco-sensitive Zone Notification:

The DCRs for MESZ were reviewed and it was concluded that these are more stringent than the regulations for Western Ghats eco-sensitive zone.

10.2. Implementation of the Zonal Master Plan

As mentioned at the beginning of Chapter 9, a number of agencies are actively playing a role in various capacities within the ESZ. The Matheran Monitoring Committee constituted under the MOEFCC's notification of 2003, currently monitors and ensures the compliance with the provisions of the said Notification. However, it is important to identify the agency in-charge of implementing each aspect of the Zonal Master Plan. A matrix to that effect is prepared and presented below:

Sr No	Tasks	Name of Agency											
		Central Govt./ MoEFCC	Environment Dept., GoM	Forest Dept., GoM	Agri. Dept.	Irrigation Dept.	MTDC	District Collector	Zilla Parishad	PWD	MHSMC	MEDA	Central Railways
1	Resource Mobilization												
2	Granting Development Permissions												
3	Groundwater Management Measures												
4	Erosion Mitigation Measures												
5	Soil Moisture and Water Conservation												
6	Restoration of denuded areas												
7	Conservation measures for HSA												
8	Stabilisation/Management of Trekking Trail												
9	Up gradation and Management of Roads												
10	Management of Matheran Mini Train												
11	Provision of Mobile Health Care Facilities												
12	Tourism related proposals												
13	Non-Conventional Energy Sources												
14	Digital Data Repository												
15	Environmental Awareness												



Additional Information as suggested by MoEFCC

11.1. Biodiversity, Value and Conservation of Matheran Eco-Sensitive Zone

11.1.1. Introduction

The Matheran Hill station and its surrounding environment are known for its scenic beauty, diverse forest types and wide number of Avian and reptilian fauna. Traditionally these areas were managed under prescriptions of Matheran Working Circle, with basic objective of maintenance and development of Matheran Hill station and to meet its requirements of firewood and forest produce. However due to its fragile ecosystem and for the purpose of its conservation an area of about 214.73 sq.kms, comprising Matheran municipal council and its surroundings were declared as Eco-sensitive Zone in the year 2003. Its geographical boundary extends in Raigad and Thane districts.

11.1.2. Floral and Faunal composition of Matheran ESZ

A. Characteristics of Vegetation

The majority of the forest in Matheran ESZ falls under "Southern Moist Mixed Deciduous Forest". On higher elevation the vegetation tends to become evergreen and belongs to type "Western Sub-Tropical Hill Forest". The floral species met with at higher altitude are parajambul, Jambul, Amba, Mala, UMBER and Waras in top canopy and Phansad, Asana, Pisa, Anjan in the understory. The remaining area is a mixed forest with Teak, Ain, Kinjal, Sawar, Beheda, Dhavada, Siras, Nana, Sisham, Kakad, Dhaman etc. (*Matheran Hill Working Circle, Working Plan of Alibag Forest Division, Khaire and Rahurkar*). The details of the floristic species found in the area along with their scientific names is given in Table 1 (*Source: wildlife management plan of Sudhagadh WLS*)

Table 20: Floristic composition of the Forest in Matheran ESZ

S.N.	Local Name	Botanical (Latin) name
<i>Trees</i>		
1	Ain	<i>Terminalia tomentosa</i>
2	Alu	<i>Vangueria spinosa</i>
3	Al or Ashi	<i>Morinda tinctoria</i>
4	Amba	<i>Mangifera indica</i>
5	Ambeda	<i>Spondias mangifera (Syn. Spondia spinnata)</i>
6	Amati (Wavding)	<i>Embelia robusta</i>
7	Anjani	<i>Meme cylonedule</i>
8	Apta	<i>Bauhinia racemosa</i>
9	Asana	<i>Bridelia retusa</i>
10	Arjunsadada	<i>Terminalia arjuna</i>
11	Athoon (Tambat)	<i>Flacourtia ramontchi (Syn.Flacoutia indica)</i>
12	Avli	<i>Phyllanthus emblica (Syn. Emblica officinalis)</i>
13	Babul	<i>Acacia arabica</i>
14	Bel	<i>Aegle marmelos</i>
15	Bakula	<i>Mimusop selengi</i>
16	Bava (Bhava)	<i>Cassia fistula</i>
17	Behada (Yella)	<i>Terminalia belerica</i>
18	Bhendi	<i>Thespesia populnea</i>
19	Bhoma	<i>Glochidion lanceolarium</i>
20	Bhokar (Shelute)	<i>Cordia myxa</i>
21	Bhorjambhul	<i>Ammania baccifera</i>
22	Bhutkesh (Lawsat)	<i>Mussa endafrondosa</i>
23	Bhittia (Alan or Bhutaksha)	<i>Elaeo dendronglaucum</i>
24	Biba	<i>Semicarpus anacardium</i>



S.N.	Local Name	Botanical (Latin) name
25	Bibla	<i>Pterocarpus marsupium</i>
26	Bondara	<i>Lagerstroemia parviflora</i>
27	Bor	<i>Zizyphus jujuba (Syn.Zizyphus Mauritiana)</i>
28	Chambuli	<i>Bauhinia vahlii</i>
29	Chanda, Chandava	<i>Macaranga roxburghii</i>
30	Char, Charoli	<i>Buchanania latifolia</i>
31	Chera	<i>Erinocarpus nimmoanus</i>
32	Chinch	<i>Tamarindus indica</i>
33	Dandoshi	<i>Dalbergia lanceolaria</i>
34	Daiwas (Dahivel)	<i>Cordia macleodii</i>
35	Datir	<i>Ficus heterophylla</i>
36	Dhaman	<i>Grevia tiliaefolia</i>
37	Dhavda	<i>Anogeissus latifolia</i>
38	Dikemali	<i>Gardenia lucida</i>
39	Gela &Gehla	<i>Randia dumetorum</i>
40	Gol	<i>Trema orientalis</i>
41	Ghatbor,Guti	<i>Zizyphus xylopyra</i>
42	Hed, Hedu	<i>Adina cordifolia</i>
43	Hirda	<i>Terminalia chebula</i>
44	Jamba	<i>Xylia xylocarpa</i>
45	Jambul	<i>Eugenia jambolana (Syn.Syzygium cuminii)</i>
46	Kalamb	<i>Stephegyne parvifolia (Syn.Mitragyna parvifolia)</i>
47	Kadvai	<i>Hymenodictyo nexcelsum</i>
48	Kakad	<i>Garuga pinnata</i>
49	Kandol	<i>Sterculia urens</i>
50	Karmbel	<i>Dillenia pentagyna</i>
51	Karlilimb (Kadilimb)	<i>Murraya koenigii</i>
52	Karanj	<i>Pongamia glabra (Syn.Pongamia pinnata)</i>
53	Karavati	<i>Ficus asperriama</i>
54	Kaju	<i>Anacardium occidentale</i>
55	Katekumbal	<i>Sideroxylonto mentosum</i>
56	Kavath	<i>Feronia elephantum</i>
57	Khair	<i>Acacia catechu</i>
58	Kharshing	<i>Sterospermum xylocarpum</i>
59	Khavas	<i>Sterculia colorata</i>
60	Kinhai	<i>Albizzia procera</i>
61	Kirmira	<i>Casaria tomentosa (Syn.Glycosmis pentaphylla)</i>
62	Kokam (Ratambi)	<i>Garcinia indica</i>
63	Kuda	<i>Holarrhena antidysenterica</i>
64	Kuda (Kala)	<i>Wrightia tomentosa</i>
65	Kudi	<i>Wrightia tomentosa</i>
66	Kumbhi	<i>Careya arborea</i>
67	Kusumb (Koshinb)	<i>Schleicher atrijuga (Syn. Schleicher aoleosa)</i>
68	Karal or Ambli	<i>Bauhinia malabarica</i>
69	Kura	<i>Ixora parviflora (Syn.Ixora arborea)</i>
70	Kukeri	<i>Sterculia guttata</i>
71	Lokhandi	<i>Ixora nigricans</i>
72	Maraudi	<i>Acanthus ilicifolius</i>
73	Medhshing	<i>Dolichandrone falcta</i>
74	Moha or Mowhra	<i>Bassia latifolia (Syn.Madhuka latifolia)</i>
75	Mokha	<i>Schrebera swietenoides</i>
76	Nana	<i>Lagerstroemia microcarpa</i>
77	Nandruk	<i>Ficus retusa</i>
78	Nimbara	<i>Melia dubia</i>
79	Niwar (Samudraphal)	<i>Barringtonia acutangula</i>
80	Padal	<i>Stereospermum heloniodies (SynStereospermum passion)</i>
81	Pair	<i>Ficus arnottiana</i>
82	Palas	<i>Butea frondosa (Syn. Butea monosperma)</i>



S.N.	Local Name	Botanical (Latin) name
83	Nagkudapandarakuda	<i>Tabernaemontana heyneana</i>
84	Pandhrakhair (Kanti)	<i>Acacia ferruginea (Syn. Murraya paniculata)</i>
85	Pandhari	<i>Murraya exotica</i>
86	Pangara	<i>Erythrina indica (Syn. Erythrina variegata)</i>
87	Per Jambhul	<i>Olea dioica</i>
88	Pendharun	<i>Gardenia turgid</i>
89	Petari	<i>Trewia nudiflora</i>
90	Phasi	<i>Dalbergia paniculata</i>
91	Pharadi	<i>Albizia chinensis</i>
92	Phungali	<i>Excoecaria agallocha</i>
93	Pimpal	<i>Ficus religiosa</i>
94	Pipar	<i>Ficus tsiela</i>
95	Ranlimbu	<i>Atlantia racemosa</i>
96	Raktarohida	<i>Maba nigrescens</i>
97	Ranjan (Rayankhirni)	<i>Mimus opshexandra</i>
98	Ritha	<i>Sapindus emarginata</i>
99	Sag (Teak)	<i>Tectona grandis</i>
100	Satvin	<i>Alstonia scholaris</i>
101	Sawar	<i>Bombax malabarica (Syn. Salmalia malaberica)</i>
102	Shemat	<i>Odina wodier (Syn. Lannea grandis)</i>
103	Shenkhair	<i>Acacia suma (Syn. Lanneacoro mandellica)</i>
104	Shendri or Kamala	<i>Mallotus philippinensis</i>
105	Shindi	<i>Phoenix sylvestris</i>
106	Shiras	<i>Albizza lebbek</i>
107	Shiras (Kala)	<i>Alibissia odoratissima</i>
108	Shivan	<i>Gmelina arborea</i>
109	Shisham	<i>Dalbergia latifolia</i>
110	Suru	<i>Casuarina equisetifolia</i>
111	Tembhurni	<i>Diospyros melanoxylon</i>
112	Tiwas	<i>Ougeinia dalbergioides (Syn. Ougeinia cojeinensis)</i>
113	Tetu	<i>Oroxylum indicum</i>
114	Tiwar	<i>Avicennia alba</i>
115	Toddy palm	<i>Borassus flabellifer</i>
116	Umbar	<i>Ficus glomerata</i>
117	Undi	<i>Calophyllum inophyllum</i>
118	Vad	<i>Ficus bengalensis</i>
119	Warang	<i>Kydia calycina</i>
120	Waras	<i>Heterophragma roxburghii (Syn. Heterophragma quadriculata)</i>
121	Wawali or Papara	<i>Holoptelea integrifolia</i>

Shrubs

S.N.	Name of species	Botanical name
1	Adulsa	<i>Adhatoda vasica</i>
2	Dhaiti	<i>Woodfordia floribunda (Syn. Woodfordia fruticosa)</i>
3	Ghaneri	<i>Lantana camara</i>
4	Ghayapat	<i>Agave americana</i>
5	Gultora	<i>Lantana alba</i>
6	Kanfuti	<i>Moghania strobelifera</i>
7	Karvi	<i>Strobilanthus callosus</i>
8	Kaladhotra	<i>Datura fastuosa</i>
9	Karawandi	<i>Carissa carandas</i>
10	Kalsunda or Pivlikoranti	<i>Balrleria prionities</i>
11	Kevani (Muradsheng)	<i>Helicteres isora</i>
12	Khulkhula	<i>Crotolaria retusa</i>
13	Mogli or Rangerand	<i>Jatropha curcas</i>
14	Nirguidi	<i>Vitex negundo</i>
15	Nivdung (Prickly pear)	<i>Opuntia dillenii</i>
16	Phangala (Phangali)	<i>Pongostemon purpuria</i>
17	Rantur	<i>Moghania species</i>



<i>S.N.</i>	<i>Local Name</i>	<i>Botanical (Latin) name</i>
18	Rmetha	Lasiosiphonero cephalus
19	Ranbhendi	Thespesia lampas
20	Rui	Calotropis gigantea
21	Shikekai	Acacia concinna
22	Suran	Amorphophalla scampanulatus
23	Thor	Euphorbia ligularia
24	Toran	Zizyphus rugosa
25	Ukshi	Calycopteris floribunda
Herbs		
<i>S.N.</i>	<i>Name of species</i>	<i>Botanical name</i>
1	AnantMul (Upalasari or Indian Sarsaparila)	Hemidesmus indicus
2	Bhingulia	Indigo feraenneaphylla
3	Burada	Blumea lacera
4	Chikara	Desmodium pulchellum
5	Dindi	Leea macrophylla
6	Kajra (Kuchla)	Strychnosnux-vomica
7	Litchi	Urena lobata
8	Papadi	Pavetta tomentosa
9	Rankel	Musa superba
10	Ranhalad or Sholi	Curcuma aromatica
11	Rankanda	Scilla indica
12	Sarpmukha	Tephrosia purpurea
13	Sonki	Senecio grahami
14	Tarota or Takala	Cassia tora
15	VikharaTalimkhana	Astera canthalongifolia
Climbers		
<i>S.N.</i>	<i>Name of species</i>	<i>Botanical name</i>
1	Alsi	Dalbergia volubilis
2	Bhuikohala	Ipomea digitata
3	Chilhari	Caesalpinia sepiaria
4	Gunj	Abrus precatorius
5	Gulvel (Amarvel)	Tinospora cordifolia
6	Kanguni	Celasatrus paniculata
7	Kantharyel	Capparis sepiaria
8	Kuhili	Mucuna Pruiens (Syn. Mucunapruriata)
9	Kusari	Jasminum arborescens
10	Madvel/Modvel/Bokadvel	Combretum ovalifolium
11	Mastod	Capparia spinosa (Zizyphusoenopia)
12	Marvel or Ranjai	Clematis triloba
13	Nandanvel	Vitis rapanda
14	Palasvel	Butea superba
15	Phulsum	Spatholobus roxburghii
16	Sakalvel	Ventilago madraspatana
17	Ukshi	Calycopteris floribunda
18	Valbiwla	Millettia racemosa
19	Watvel	Cocculus macrocarpus
20	Wagati	Wagatea spicata
21	Wag,Gowindi	Capparishorrida (Syn. CapparisZeylanica) (Syn. Capparisroxburghid)
Bamboos		
<i>S.N.</i>	<i>Name of Species</i>	<i>Botanical name</i>
1	Bundi or Cher	Oxytenanthera monostigma
2	Manvel	Dendrocalamus strictus
3	Padhai or Katas	Bambusa arundinacea
4	Senesibambo	Bambusa vulgaris
Grasses		
<i>S.N.</i>	<i>Name of species</i>	<i>Botanical name of species</i>
1	Ber	Ischaemum rugosus



S.N.	Local Name	Botanical (Latin) name
2	BhaleKusal	Andropogon triticus
3	Bhaongrut (Phulera, Phul)	Anthistiriaciliata (Syn. Thermneda quadrivalvis)
4	Bhuri	Aristida paniculata
5	Boru	Andropogonhalepensis (Syn.Sorghumhlepense)
6	Chirka	Eragrosti stremula
7	Dongarigavat	Andropogon monticola
8	Ghanya, Marvel	Andropogon pertusus
9	Gondval	Andropogon pumilis
10	Harali (Durva)	Cynodon dectylon
11	Kunda	Ischae mumpilosum
12	Kother	Woodrowia diandra
13	Kusali	Andropogon contortus (Syn.Hetropogon contotus)
14	Lavhala	Rottboollia perforate
15	Marvel	Andropogon annulatus(Syn. Dichanthium annulatum)
16	Pavnya	Ischae mumsulcatun
17	Phool	Themeda triandra
18	Rosha	Andropogon schoenanthus
19	Sheda	Ischae mumlaxum

B. Characteristics of Fauna

The Matheran ESZ falls in the Western Ghats and is bestowed with rich faunal diversity. This includes diverse groups of insects, reptiles and birds. Innumerable species, most of which are unexplored, of Grass hoppers, mosquitoes, beetles, termites, mantis, bees, hornets, wasps, cockroaches, cicads, aphids, moths and butterflies are found inside the forest.

i) Mammals:

The forest supports a number of species of herbivores, carnivores and omnivores. Panther is the only big cat found in this area. Other species which are found, though spotted rarely, are Jungle cat, Small India Civet, Common palm Civet, rusty spotted cat, fox and striped hyena. Among herbivores, wild boar and barking deer are found in abundance, besides black naped hare, crested porcupine and bonnet macaque. The checklist of mammals is given in table 2. (Source: wildlife management plan of Sudhagadh WLS)

Table 21: Checklist of mammals

S. No	Order	Family	Scientific Name	Common English Name
1	Primates	Cercopithecidae	<i>Macaca radiata</i>	Bonnet Macaque
			<i>Macaca mulata</i>	Rhesus Macaque
			<i>Presbytis entellus</i>	Common Langur
2	Carnivora	Canidae	<i>Canis aureus</i>	Jackal
		Viverridae	<i>Viverricula indica</i>	Small Indian Civet
			<i>Paradoxurus hermaphroditus</i>	Toddy Cat or Palm Civet
			<i>Herpestes edwardsi</i>	Indian Grey Mongoose
		Hyaenidae	<i>Hyaena hyaena</i>	Striped Hyaena
		Felidae	<i>Felis chaus</i>	Jungle cat
			<i>Panthera pardus</i>	Leopard
<i>Felis rubiginosa</i>	Rusty Spotted Cat			
3	Artiodactyla	Suidae	<i>Sus scrofa</i>	Wild Boar
		Cervidae	<i>Muntiacus muntjac</i>	Barking Deer or Muntjac
4	Lagomorpha	Leoporidae	<i>Lepus nigricollis</i>	Indian Black Naped Hare
5	Rodentia	Sciuridae	<i>Funambulus palmarum</i>	Three Stripped Palm Squirrel
			<i>Funambulus pennanti</i>	Five striped Palm Squirrel
			<i>Hystrix indica</i>	Indian Crested Porcupine



ii) Avifauna

A number of local and migratory birds are found in this region, the details of which are given in table 3 (Source: wildlife management plan of Sudhagadh WLS).

Table 22: Check list of Birds

N	Order	Family	Scientific Name	Common English Name
1	Peicaniiformes	Phalacrocoracidae	<i>Phalacrocorax niger</i>	Little or Pigmy cormorant
2	Cicomipormes	Ardeidae	<i>Ardeola - gray</i>	Pond Heron or paddy bird
			<i>Bubulcus ibis, Coromandus</i>	Cattle Egret
			<i>Egretta alub modesta</i>	Large Egret
			<i>Elgretta intermedia intermedia</i>	Median or Smaller Egret
			<i>Egretta gazzetta gazzetta</i>	Little Egret
3	Falconiformes	Accipitridae	<i>Elanus caeruleus vociferus</i>	Black winged kite
			<i>Haliastur indus indus</i>	Brahminy Kite
			<i>Accipiter badius dussumieri</i>	Indian Shikra
			<i>Ictinactis Malayensis Perniger</i>	Black Eagle
			<i>Spilornis cheela melanotis</i>	Crested Serpent Eagle
4	Galliformes	Phasianidae	<i>Coturnix coturnix coturnix</i>	Common Grey Quail
			<i>Perdica asiatica asiatica</i>	Jungle Bush Quail
			<i>Gallus sonneratti</i>	Grey Jungle Fowl
			<i>Pavo cristatus</i>	Common Peafowl
5	Charadriiformes	Jacanidae	<i>Venellus indicus indicus</i>	Red wattled lapwing
			<i>Venellus malbaricus</i>	Yellow wattled lapwing
			<i>Tringa hypoleucos hypoleucos</i>	Common sand piper
6	Columbiformes	Columbidae	<i>Streptopelia decaocto</i>	Indian Ring Dove
			<i>Streptopelia chinensis surantensis</i>	Spotted Dove
7	Psittaciformes	Psittacidae	<i>Psittacula krameri Manillensis</i>	Roseringed Parakeet
8	Cuculiformes	Cuculidae	<i>Cuculus varius varius</i>	Common Hawk, Cuckoo or Brain Fever Bird
			<i>Cuculus Micropterus Micropterus</i>	Indian Cuckoo
			<i>Cuculus canorus</i>	Cuckoo
			<i>Eudynamys scolopacea scolopacea</i>	Koel
9	Strigiformes	Strigidae	<i>Tyto alba stertens</i>	Barn Owl
			<i>Bubo zeyionensis</i>	Brown Fish Owl
			<i>Glaucidium radiatum radiatum</i>	Barred Jungle Owlet
			<i>Athene brama brama</i>	Spotted Owlet
10	Coractiformes	Alcedinidae	<i>Alcedo atthis taprobana</i>	Small Blue or Common Kingfisher
			<i>Halcyon smyrnensis fusca</i>	White Breasted Kingfisher
		Meropidae	<i>Merops Orientails Orientails</i>	Green Bee-eater
		Coracidae	<i>Coracias benghalensis indica</i>	Indian Roller or Blue Jay
11	Pictiformes	Picidae	<i>Tockus griseus</i>	Malabar Indian Grey Hornbill
			<i>Micropternus brachyurus jerdoni</i>	Rufous Wood Pecker
			<i>Hemicircus canente</i>	Heart Spotted Wood Pecker
12	Passeroiformes	Pittidae	<i>Chrysocolaptes lucidus</i>	Large Golden Backed Wood Pecker
			<i>Pitta brachyura brachyura</i>	Indian Pitta
			<i>Oriolus oriolus</i>	Golden Oriole
		Dicruridae	<i>Dicrurus adsimilies macrocercus</i>	Black Drongo or king Crow
			<i>Dicrurus leucophaeus longicaudatus</i>	Grey or Ashy Drongo
			<i>Dicrurus aeneus aeneus</i>	Bronzed Drongo
			<i>Dicrurus hottentottus hottentottus</i>	Haircrested Drongo
			<i>Dicrurus paradiseus paradiseus</i>	Large Racket tailed Drongo
		Sturnidae	<i>Acridotheres tristis tristis</i>	Common Myna
			<i>Acridotheres fuscus maharattensis</i>	Jungle Myna
<i>Gracula religiosa indica</i>	Grackle or Hill Myna			
Corvidae	<i>Dendrocitta vagabunda vagabunda</i>	Indian Tree Pie		
	<i>Corvus splendens splendens</i>	House Crow		



N	Order	Family	Scientific Name	Common English Name	
	Passeroformes	Corvidae	<i>Corvus macrorhynchos culminates</i>	Jungle Crow	
		Campehagidae	<i>Pericrocotus flammeus</i>	Scarlet minivet	
		Pycononotidae	<i>Pycononofus jocosus fuscicaudatus</i>	Redwhiskered Bulbul	
			<i>Pycononotus cafer cafer</i>	Redvented Bulbul	
		Muscicapidae	<i>Pellorneum ruficeps ruficeps</i>	Spotted Babbler	
		Sub-family	-	<i>Turdoies strlatus</i>	Jungle Blabber
		Timalinae		<i>Terpsiphorie paradisi paradisi</i>	Paradise flycatcher
		Sub-family	-	<i>Copsychus saularis saularis</i>	Magpie Robin
		Musciapinae		<i>Saxicoloides fulicata intermedia</i>	Indian Robin
		Family – Ploceidae		<i>Passer domesticus indicus</i>	House Sparrow
Sub-family	-	<i>Ploceus philippinus philippinus</i>	Baya or weaver Bird		
		Ploceinae			

iii) Reptiles

The area hosts a diverse species of reptiles of which few are endangered. The details of the reptiles area given in table 4 (Source: wildlife management plan of Sudhagadh WLS).

Table 23: Checklist of reptiles

S.N.	Order	Family	Scientific Name	Common English Name
1	Sub-order - Sauria	Agamidae	<i>Calotes versicolor</i>	Common Garden Lizard or Blood sucker
			<i>Psmmophilus blanfordanus</i>	Rock Lizard
		Chamreleonidae	<i>Chamaeleon zeylanicus</i>	Indian Chamaeleon
		Varanidae	<i>Varanus monitor</i>	Common monitor
2	Sub-order - Serpents	Boidae	<i>Python moluxu</i>	Indian Python
			<i>Eryx conicus</i>	Russel's Sand Boa
			<i>Ptyas mucosus</i>	Dhaman or Common Rat Snake
		Elapidae	<i>Bungarus caeruleus</i>	Common Indian Krait
			<i>Naja naja</i>	Indian Cobra
		Viperidae	<i>Vipera russelli</i>	Russell's Viper
			<i>Trimeresurus malabaricus</i>	Malbar Pit Viper

11.1.3. Biodiversity Value of Matheran ESZ

A. Biodiversity and its types

Biodiversity means the variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable. It refers to the variability in living organism at various levels.

As per the World Research Institute (1992) there are three levels of biodiversity.

- i) **Genetic Diversity:** It represents the variation within and between populations of the organisms. It arises due to genetic and chromosomal mutations. Differential selection leads to changes in frequency of the gene in gene pool leading to evolution.
- ii) **Species Diversity:** It refers to species richness or number of species available in a site or habitat.
- iii) **Ecosystem Diversity:** It is defined as variability of habitat found within the area. It is determined by climatic and edaphic factors.

B. Biodiversity in Matheran Eco-sensitive Zone and its value

The use and non use values of the area forms the framework of the total biodiversity value of the landscape.



Use Value:

- a. Direct Value
All food, timber, medicines derived from this area. It includes sustainable harvesting of NTFPs, fuel wood, gene harvesting, recreation activities like ecotourism and education and research activities like preparation of the local Peoples Biodiversity Register with the help of Maharashtra Biodiversity Board.
- b. Indirect Value
All ecosystem services like climate stabilization, watershed protection activities like water conservation and ground water recharge, carbon sequestration, habitat enrichment, nutrient retention and environmental protection methods and processes in existence in the area leading to natural disaster prevention and safeguards in the area.
- c. Option Use Value
All potential future knowledge and use of the known and yet unknown resources in that area

Non Use Value:

- a. Existence value
It is the passive use value of the area and includes the value of some endemic resources and rituals of cultural interest and heritage whose absence would only be felt acutely if and when they are not present in the area.
- b. Bequest Value
All the benefits, arising from ensuring that biodiversity and ecosystem services from that area, will be preserved in perpetuity for future generations too.

The biodiversity value of Matheran ESZ can be summarized into following categories.

- i) **Consumptive Use value:** It refers to the value placed on the forest on account of it being a source of food, medicine, fuel etc. The forest in Matheran ESZ has been a regular source of fuelwood for a number of tribal villages which are located in and around the vicinity of the ESZ. The exhaustive list of all medicinal plants are in the process of being documented as a part of Peoples Biodiversity Register of that area, however, a number of plants are currently used by local people and tribals to cure various ailments and occupy important position in socio cultural and religious life. The list of these medicinal plants found in the forest tract has been compiled in table 5 (source: "Biodiversity in Western ghats Districts of Maharashtra and Goa", Forestry and Environment Division, Space Application Centre (ISRO), Ahmedabad).

Table 24: Trees and their Medicinal Value

S.N.	Species name	Plant part utilized	Medicinal value
1	<i>Acacia catechu</i>	Bark	Used as astringent, digestive, useful in cough and diarrhoea
2	<i>Anogeissus latifolia</i>	Ghati gum	It is good substitute for acaia gum in pharmacy
3	<i>Butea monosperma</i>	Seeds, gum	Seeds are internally administered as an antihelminthic in treatment of roundworm, pounded seeds with lemon when applied to skin acts as rubefacient. Gum is used in treatment of diarrhoea
4	<i>Glycosmis mauritiana</i>	Leaves	Infusion of dried leaves given as a tonic and appetizer
5	<i>Heterophragma quadriculata</i>	Roots	Roots are prescribed as drink in viper-bite



S.N.	Species name	Plant part utilized	Medicinal value
6	<i>Madhuca latifolia</i>	Bark, flowers	Decoction of bark is used in curing bleeding gum and ulcers. Flowers are used in cough and bronchitis
7	<i>Emblica officinalis</i>	Fruit	Used as diuretic and laxatives; in dried form in diarrhoea and dysentery. Phyllembin, obtained from fruit pulp has mild depressant action on central nervous system and spasmolytic action. Fruits also have antibiotic effect.. Rich in Vitamin C
8	<i>Pongamia glabra</i>	Seeds	Seed oil is used treatment of skin disease and rheumatism
9	<i>Schleichera oleosa</i>	Seeds	Powdered seeds are applied to ulcers of animals for removing maggots
10	<i>Syzygium cumini</i>	Bark, seed	Bark decoction and seeds are useful in diarrhoea and dysentery. Alcoholic extracts of seeds has been reported to reduce level of blood sugar in diabetic patients
11	<i>Terminalia bellerica</i>	Fruit, fruit pulp	Fruit pulp is used in dropsy, diarrhoea and leprosy, and half ripe fruits as purgative. Fruits has antibiotic activity against a wide variety of microorganisms
12	<i>Callicarpa lanata</i>	Root	Used in cutaneous infection
13	<i>Holarrhena antidysentrica</i>	Bark, leaf, seed	Used to cure dysentery and diarrhoea
14	<i>Memecylon umbellatum</i>	Leaves, root	Leaves are given in leucorrhoea and gonorrhoea. Decoction of root is useful in excessive menstrual discharge
15	<i>Oroxylum indicum</i>	Root, leaf, fruit, seed	Root bark used in diarrhoea, dysentery and rheumatism, tender fruits are stomachic and seeds are purgative. Leaves are used externally for enlarged spleen headache and ulcers
16	<i>Pterocarpus marsupium</i>	Gum, leaf	Gum used in diarrhoea and for toothache. Bruised leaves are applied on sores and boils
17	<i>Schleichera oleosa</i>	Seeds	Powdered seeds are applied to ulcers of animals for removing maggots
18	<i>Tamarindus indica</i>	Fruits	Fruit pulp is used as refrigerant, carminative and laxative, also recommended in febrile disease and bilious disorder
19	<i>Tetrameles nudiflora</i>	Bark	Bark decoction is given for rheumatism, dropsy and jaundice
20	<i>Actinodaphne angustifolia</i>	Leaf	Infusion of leaves used in urinary disorder and diabetes
21	<i>Olea dioica</i>	Bark	Used as febrifuse
22	<i>Rawolfia serpentina</i>	Root, leaves	Drug rauwolfia from leaves is used as antihypertensives and as sedatives; also employed for relief of various central nervous system disorders; extracts of roots are valued for treatment of intestinal disorders, cholera, colic and fever. Leaf juice used as remedy for opacity of cornea.

A checklist of important plants of medicinal value is provided in table 6 (source: Working plan of Alibag division by Khaire and Rahurkar).

Table 25: Checklist of medicinal plants

Sr. No.	Local Name	Botanical Name	Family
1	Gunja	Abrus precatorius	Fabaceae
2	Khair	Acacia catechu	Mimosaceae
3	Chirali, Chilar	Acacia torta	Mimosaceae
4	Haldu	Adina cordifolia	Rubiaceae
5	Bel	Aegle marmelos	Rutaceae
6	Kinhai	Albizia procera	Mimosaceae
7	Kalmegh, Chirait	Andragraphis paniculata	Acanthaceae
8	Shatawari	Asparagus recimosa	Liliaceae
9	Neem	Azadirachta indica	Meliaceae
10	Danti, dati	Baliospermum montanum	Euphorbiaceae



Sr. No.	Local Name	Botanical Name	Family
11	Moha (flower)	Bassicalatifolia	Sapotaceae
12	Aapta	Bauhinia racemosa	Caesalpiniaceae
13	Sawar	Bombax insigne	Bombacaceae
14	Salai	Boswilliasterrata	Burseraceae
15	Aasan	Brideliaretusa	Euphorbiaceae
16	Tabor Charoli.	Buchananialanzen	Anacardiaceae
17	Palas	Buteamonosperma	Fabaceae
18	Palaswel	Buteasuperba	Fabaceae
19	Ukshi	Calycopteris floribunda	Combrataceae
20	Wagoti	Cappariszeylanica	Capparidaceae
21	Kumbhi	Careyaarborea	Lecythidaceae
22	Karwanda	Carissa carandas	Apocynaceae
23	Bhokada	Caseariagraveolens	Flacourtiaceae
24	Chaksoo	Cassia absus	Caesalpiniaceae
25	Senna, Sonamukhi	Cassia angustifolia	Caesalpiniaceae
26	Bahawa	Cassia fistula	Caesalpiniaceae
27	Takla/ Tarota	Cassia tora	Caesalpiniaceae
28	Takala	Cassineglauca	Celastraceae
29	Kombadtura	Celosia argentea	Amaranthaceae
30	SafedMusli	Chlorophytumtuberosum	Liliaceae
31	Raktarohida	Chukrassiatubularis	Meliaceae
32	Kachni	Cichoriumintybus	Asteraceae
33	Wasanwel	Cocculushirsutus	Menispermaceae
34	Joomgoli	Cocculushirsutus	Menispermaceae
35	Bakulwel	Combretumovalifolium	Combrataceae
36	Gugal	Coomiphoramukul	Burseraceae
37	Bhokrun, bhokar	Cordiadihotoma	Cordiaceae
38	Peva	Costusspeciosus	Zinziberaceae
39	Jamal Gota	Croton tiglium	Eyphorbiaceae
40	Gauriche hat	Curcuma montana	Zinziberaceae
41	Bandgul	Dendrophthoeifulcata	Loranthaceae
42	Karwel, Karmal	Dilleniapentagyna	Dilleniaceae
43	Kadukand	Dioscoreabulbifera	Dioscoriaceae
44	Tembhurni	Diospyrosmelanoxylon	Ebenaceae
45	Medshing	Dolichondronefalcata	Bignoniaceae
46	Aawala	Emblicaoofficiaelis	Euphorbiaceae
47	Paringa	Erythrinastricta	Fabaceae
48	Mendhkut	Euphorbia nerifolia	Euphorbiaceae
49	Kajli	Excoecariaagallocha	Myrcinaceae
50	Wad	Ficusbengalensis	Moraceae
51	Umber	Ficusglomarata	Moraceae
52	Gandya umber	Ficushispida	Moraceae
53	Pimpal	Ficusreligiosa	Moraceae
54	Khawas	Firmianacorolata	Sterculiaceae
55	Kokam	Garciniaindica	Cluciaceae
56	Dikamali	Gardenia resinifera	Rubiaceae
57	Kakad	Garugapinnata	Bursaraceae
58	Shivan	Gmelinaarborea	Verbinaceae
59	Gudmar, Bedaki	Gymnemasylvestre	Asclepiadacea
60	Kewan	Helicteresisora	Sterculiaceae
61	Murud-Sheng	Helictusisora	Sterculceae
62	Anantmul	Hemidimusinducus	Asclepiadaceae
63	Waras	Heterophragmaquadriocularae	Bignoniaceae
64	Ran bhendi	Hibiscus furcatus	Malvaceae
65	Gokshur, Talimkhana	Hoigrophilaspinoso	Acanthaceae
66	Kuda	Holarrhenaantidysenterica	Apocynaceae
67	Papdi, wavla	Holopteleaintegrifolia	Urticaceae
68	Brahmi	Hydrocotyleasaitica	Apiaceae



Sr. No.	Local Name	Botanical Name	Family
69	Terda	Impatiens balsamina	Balasaminaceae
70	Hardwickiabinnata	Ixora brachiata	Rubiaceae
71	Kusarwel	Jasminummalabaricum	Oleaceae
72	Nana	Lagestroemiamicarpa	Lythraceae
73	Heena	Lawsoniainerrnis	Lythraceae
74	Gadbeej	Litseaebifeza	Lauraceae
75	Moha	Madhucalongifolia	Sapotaceae
76	Shendri	Mallotusphilipinensis	Euphorbiaceae
77	Amba	Mangiferaindica	Anacardiaceae
78	Aalav, aalu	Meynaspinosa	Rubiaceae
79	Shatal	Microspaniculata	Tiliaceae
80	Humb	Miliusatomentosa	Annonaceae
81	Kalamb	Mitragynaparviflora	Rubiaceae
82	Kartoli	Momordicadioica	Cucurbitaceae
83	Ukshi	Morindatinctoria	Rubiaceae
84	Shevga	Moringapterygosperma	Moringaceae
85	Tulas	Ocimumsanctam	Bignoniaceae
86	Tetu	Oroxylumindicum	Bignoniaceae
87	Dagadphool	Parmeliapeblata	Paemeriaceae
88	BhuiAwala	Phyllanthusfrateznus	Euphorbiaceae
89	LendiPimpali	Piper longum	Piperaceae
90	Barachi	Psoreliacarylifolia	Fabaceae
91	Bija, Bibla	Ptetocaprusmarsupium	Fabaceae
92	Tajawi	Putranjivaroxburgii	Euphorbiaceae
93	Sarpgandha	Rauvolfiasezpentina	Apocynaceae
94	Ringani	Sapinduslaurifolius	Sapindaceae
95	Kusum	Schleicheraleosa	Sapindaceae
96	Biba	Semicarpusanacardium	Anacardiaceae
97	Shevri	Sesbaniaaegyptiaca	Fabaceae
98	Bala	Sidacardifolia	Malvaceae
99	Ghotwel	Smilax zeylanica	Smilacaceae
100	Gorakhmundi	Sphaeranthusindicus	Asteraceae
101	Narakya	Sterculiafoetida	Sterculaceae
102	Kokeri	Sterculiaguttata	Sterculiaceae
103	Jambhool	Syzygiumcumini	Myrtaceae
104	Sag	Tectonagrandis	Verbenaceae
105	Hirda	Terinaliachebula	Combretaceae
106	Ghol	Termaorientals	Ulmaceae
107	Arjun	Terminaliaarjuna	Combrataceae
108	Behada	Terminaliabelerica	Combrataceae
109	Gulwel	Tinosporacardifolia	Menispermaceae
110	Petari	Trewianudiflora	Euphorbiaceae
111	Nirgudi	Vitexnegando	Verbinaceae
112	Ashwagandha	Withaniasomnifera	Solanacea
113	Dhawriphol	Woodfordia floribunda	Lythraceae
114	Indrajaw	Wrightiatinctoria	Apocynaceae
115	Toran	Ziziphusrugosa	Rhamnaceae

- ii) **Productive Use value:** This includes value of the products that are of commercial importance.eg. Timber, NTFP (Non timber forest produce) etc. These forests have a fair reserve of commercially viable timber species like teak and haldu, however commercial exploitation of forest for timber has long been discontinued in forests comprising Matheran ESZ and the surrounding area. Besides a number of NTFPs are available in the forest. Their list is compiled in table 7. (*Source: working plan of Alibag division by Khaire and Rahurkar*).



Table 26: List of Non Timber Forest Produce (NTFP)

Sr. No.	Name of NTFP	Sr. No.	Name of NTFP
1	Grasses	14	Moha flowers and seeds
2	Palas leaves and flowers	15	Rankle leaves
3	Apta leaves	16	Honey
4	Tembhurni leaves	17	Karaya gum
5	Bamboo	18	Gunj pala
6	Kadhipatta leaves	19	Karvi
7	Myrobalans	20	Beheda fruits
8	Chilhar bark	21	Aonla fruits
9	Ain bark	22	Palas fruits
10	Wavding	23	Rannakhi
11	Agave leaves	24	Dukkar kandh
12	Adulsa	25	Shikekai pods
13	Shatavari		

- iii) **Existence Value:** It refers to the value of the life forms that are supported by the forest. The forest in Matheran ESZ serves as a habitat to a wide variety of mammals, reptiles, birds and insects. Their details have been given in section 2.2.
- iv) **Aesthetic value:** It means the willingness of people to pay for the aesthetic beauty of the forest. Matheran is one of the tourism hotspots in the state of Maharashtra. The scenic beauty of the hills, seasonal streams and waterfalls and a pleasant climate attracts large number of tourists and trekkers from state as well as other parts of the country. The bustling tourism industry supports livelihood and economy of the people residing in this area.
- v) **Ecosystem services value:** It means the services provided by the ecosystem. The dense forest cover in the Matheran ESZ acts as a bulwark against soil erosion and denudation. Several streams source their origin from these forests which acts as a watershed. The tree and vegetation stands in the area serves as a major carbon sink.
- vi) **Option Value:** It refers to potential of biodiversity for future use which are presently not known. It is well known that honourable Supreme court has fixed NPV(Net present value) for all the classes of forest that are meant for diversion. Such kind of valuation is nothing but option value of the forest biodiversity.

11.1.4. Conservation of Flora and Fauna

The Matheran ESZ has rich biodiversity and supports a large number of flora and fauna and needs to be preserved and protected. A holistic approach is therefore needed with objective of -

- Conservation of Biodiversity
- Protection of watershed and catchments
- Protection against encroachments
- Management of tourism activities

A. Challenges and Threats

The major challenges faced by the area under ESZ are summarized as below

- i) **Encroachments to forest land:** The entire area ESZ, particularly area under forest are subject to tremendous pressure from encroachment. Tendency of land grabbing by taking undue advantage of government policies is widely prevalent. In view of this there is urgent need for permanent demarcation of government forest areas and all such sensitive zones.
- ii) **Forest fire:** The hilly topography with underlying rocky strata supports tall grasses which die down by the advent of winter season. It serves as potential fuel for fire incidents that



predominantly occurs in the months of December to April, causing severe damage to forest, particularly in its regeneration. Quite often these fires are difficult to control due to hilly topography.

- iii) **Landslides and Soil Erosion:** The Matheran hills receive very heavy rainfall. Owing to its geology and steep topography, there posed a risk of severe erosion and landslides during monsoon season if preventive measure were not in place.

B. Bio-Diversity Conservation

The details about the flora and fauna have been incorporated in earlier paras. For conserving flora and fauna, necessary measures shall be undertaken and implemented in consultation with State Biodiversity Board.

The biodiversity conservation plan shall be prepared as per the guidelines of State Biodiversity Board and effectively implemented.

11.1.5. Strategies and Measures against threats to this zone

The conservation strategies banks upon minimal disturbance to fragile ecosystem to augment habitat protection, with slew of measures for soil conservation and prevention of forest fire incidences. These measures are to be taken up primarily by forest department with participation of local people, and if necessary, other line agencies like PWD should be roped in, particularly when large structures for checking of soil erosion is needed to be undertaken. The prescriptions for the conservation are as below.

A. Forest and Wildlife protection

The Forest of Matheran ESZ should be managed under Matheran Hill Working Circle as prescribed by working plan Alibag Forest Division. The survey and demarcation should be carried out as per the recommendations of the working plan in a phased manner.

No commercial tree felling should be carried out on hill slopes. Blanks occurring in the ESZ area should be planted with locally available species.

Fire control measures should be taken up by preparing suitable fire management plan by Forest department with annual calendar of operation. Fire lines should be cleared by the end of November. During Fire season fire watchers should be deployed and fire protection huts should be erected at strategic locations to report any fire outbreak well in advance. Fire fighting teams should be stationed at base camps and should be put to use as soon as incidence of fire outbreak comes to notice. They should be equipped with fire blowers, grass cutter machines and other fire fighting tools along with safety equipment. At the advent of fire season a campaign should be undertaken to create awareness about hazards of fire, among public and local villagers.

- i) **Soil moisture conservation works:** Soil moisture conservation (SMC) works are important both for preservation of catchments in the watersheds and habitat improvement. It should be done extensively as recommendations of Watershed management plan and as far as resources permits. Area treatment like loose boulder structures and CCT, creation of perennial waterholes, regular de silting and cleaning of natural and artificial water reservoirs should be undertaken. Earthen dams and cement concrete dams should be constructed at suitable locations to ensure water availability to the animals during peak summer season.



- ii) **Wildlife management:** Matheran ESZ harbors a number of avian fauna, reptiles, insects and few carnivores. The management strategy should focus on protection of their natural habitat from destruction. Exotic weeds such as lantana, eupatorium etc. should be removed to facilitate development of grasslands. The dead fallen wood should not be removed as it harbors variety of herpetofauna. Special niche habitats like snags, den trees, termitarium, coarse wood, debris etc. should be preserved for their ecological value.
- iii) **Regulation of tourism:** The area under ESZ receives heavy footfall of tourists. Their number and activities should be monitored and regulated in order to minimize adverse impact on the forest and threat it possess for the biodiversity. Littering by plastics is a major hazard in this area. Despite ban on plastics in state of Maharashtra, Matheran witnesses littering of plastic bottles and empty cans in almost all view points and trekking sites. Proper exhibits and signboards should be displayed at these places to sensitize against grave consequence of plastic littering and persuade the visitors against their disposal inside forest. Heavy fines should be levied against the violators. Proper system of collection and disposal of such waste be put into place by the Municipal Council and Village Gram Panchayats.

11.2. Water Conservation Measures

MESZ area primarily consists of forest areas and the development activities are concentrated in the municipal area. However, the construction permissible in this area is very meagre and only to the extent of 0.1 FSI and therefore most of the municipal area is also available for water percolation. Also, the topography of the town is sloping. As such Rain Water Harvesting is not a major issue in MESZ. Moreover, The Government in Urban Development Department has sanctioned Development Control Regulations for the Council area vide Notification dated 1.04.2013. The said regulations have provisions for 'Rain Water Harvesting' under Regulation No. 8.81 which will be applicable for new developments and redevelopments in the municipal town.

The possibility of rain water harvesting in the existing buildings in Matheran Town shall be explored keeping in view of the water requirements.

The information about streams, springs and water bodies, etc. is given elaborately in Chapter No. 2. As mentioned in Chapter -2 of this report, water in some of the springs is contaminated. Therefore, the Water Resources Department of the State Government shall draw proper plan for monitoring the restoring good water quality in the springs. Also, the Municipality has proposed sewage treatment which will help in reducing the contamination of water in the springs.

A specific plan for revival of springs and water bodies shall be prepared to avoid contamination of water in Matheran.

11.3. Management plan for horse droppings/dung waste

In the Matheran Hill Station Municipal Council (MHSMC), horse dung was being processed along with other organic wastes to produce bio-gas, which was supplied to various hotels. The residual solid waste is being used as manure for gardens. The Main digester of the biogas plant was damaged and it is proposed by the Municipal Council to use stainless steel module pre-digester in order to reduce damage caused by horse dung.

The following additional measures are also proposed for Horse dung management:



1. As per the Sub Zonal Master Plan for MHSMC area, plot no. MP93 is reserved for Bus Stand, Logistic Hub and Parking lot. Currently, horses trespass this land and the horse dung dumped here has contaminated the Simson tank. The Matheran Municipal Council jointly with the Police Dept. and Revenue Dept. will evict the horses and shift them to designated place so as organize horse droppings.
2. Byelaws would be introduced by Municipal Council to penalize horse owners for failure to manage horse dung and for tying horses to trees in the forest area thus causing de-fertilization and detrimental effect on forest area for better dung management.
3. The possibility of plying E-rickshaws may be explored in Matheran town as an alternative to horses.

11.4. Sewage and Solid Waste Disposal Plan keeping in view the growing number of Tourists

Matheran Hill Station Municipal Council has appointed an agency for sewage treatment.

Landfill site is not permitted within the Eco-sensitive zone. The Council has already been segregating wet and dry waste. Organic waste is processed to produce biogas. As approved by the State Govt. a separate stainless steel modular pre-digester will soon be installed for handling horse dung along with other improvements such as Bio-mining and Bailing Machine. The same shall be purchased and installed shortly.

The dry waste is transported on the mini-train from Matheran town to Aman Lodge. The Council has taken initiatives for material recovery from dry waste and handing over to Vendors at Aman Lodge. The Municipal Council shall implement Zero Waste Disposal Policy for solid waste by March 2021.

11.5. Facilities for providing primary health and medical check-up in the ESZ area

MHSMC has a population of 4,393 persons. The Council has a 12 bedded hospital, Zilla Parishad Veterinary clinic and two private clinics. The Hospital currently has a Maternity ward, minor Operation Theatre and facilities for basic health treatment.

The hill station however, has a large number of tourists visiting every day. The number of Tourists is as high as 7,000 to 8,000 tourists per day during peak season. In view of the large number of visitors, the Council has plans to upgrade the facilities at the existing Hospital.

In other areas within the ESZ, the settlements are small in size and scattered. The health facilities available in the surrounding settlements just outside the ESZ are accessible to the local inhabitants. The Sub-District Hospital at Karjat has ambulance facility for emergency.

11.6. Plans for proper transportation of the ageing and ailing in the ESZ

Matheran Town with a population of 4,393 persons is the single largest settlement in the ESZ. MOEFCC vide their Notification dated 04.02.2003, banned all vehicular traffic within Matheran Town. Hence the problem of proper transportation of the ageing and ailing is limited to the MHSMC area.

The old and ageing people have the option of mini-train and hand pulled carts. The amended Notification dated 16.01.2004 stipulated that one Ambulance and one standby shall be permitted in Matheran Town. Hence, the aged and ailing can be transported using the Ambulance.



11.7. Measures to prevent pollution of air and water

1. MOEFCC's Notification dated 04.02.2003 has imposed restrictions on certain activities that may have a detrimental effect on the environment such as industries, mining, use of plastic, etc. These restrictions have been retained in the Zonal Master Plan for MESZ (Chapter 10).
2. The Notification has already banned vehicular traffic within the town. Vehicular traffic and industries which are the two major causes of pollution are not permitted within the town.
3. The MESZ primarily consists of Forest area, a 200 m. wide buffer and the Matheran town. The Forest area is protected under the Forest Acts.
4. Non-forest lands falling within the 200 m. wide buffer as well as other non-forest pockets within the ESZ boundary are categorized as Green Zone 2 which is the most restrictive zone of the Mumbai Metropolitan Regional Plan of which MESZ is a part. The permissible activities in Green Zone 2 lying within MESZ are restricted as per following:
 - a) Projects such as Integrated Township (ITP) are not permitted.
 - b) There are restrictions on quarrying, extraction of ground water, discharge of effluents, use of plastic, etc.
 - c) Industries are not permitted within the ESZ.
5. MTDC in their 'Tourism Master Plan' have laid down guidelines for environment protection.
6. Adding parcel vans to the mini train services from Neral to Matheran town and increasing shuttle train services from Aman Lodge to Matheran town helps reducing air pollution.
7. The vehicular traffic caused due to tourist movement upto Dasturi Naka is a major cause of air pollution. The option of allowing only 'Clean Fuel Vehicles' upto Dasturi Naka would be explored.
8. As mentioned in para 11.3(1), banning trespassing on the land adjacent to Simson tank, will improve the quality of water in Simson tank.
9. Both the Municipal Council and Pollution Control Board should regularly monitor water quality and suggest improvement measures for implementation.

Note:-

- i) For any clarification/ additional information, the provisions of Mumbai Metropolitan Regional Plan may be referred.
- ii) All Authorities shall strictly abide all the provisions of the Matheran ESZ Notification.



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