

EXECUTIVE SUMMARY
FOR
“MATHERAN PASSENGER ROPEWAY”
AT

Village – Bhutivali, Tehsil: Karjat, District – Raigad, Maharashtra



(TOR vide letter no. 10-63/2016-IA.III dated 29-11-2016)

Land Area- 27720 sq m (2.772 Ha)

Elevation- 800 m

Alignment Length- 4489.39 m

Category- 7(g): 'A'

Cost of Project- Rs. 5000 Lakhs

Authorized Signatory- Dilip V Kothari

Contact no. - 022-22078292

Email- dilip@matheranropeways.com, dvk@ushascot.com

Being Developed By:

M/S MATHERAN ROPEWAY PVT LTD

Chartered House, 293/297. Dr. C H Street, Near Marine Lines Church, Mumbai - 400002

Prepared By:

M/S PERFECT ENVIRO SOLUTIONS PVT. LTD.

NABET Registered Vide List of accredited Consultants organization/ Rev 47/7th November 2016 at S.No.-110)

5th Floor, NN Mall, Manglam Place

Sector 3, Rohini, New Delhi

Email: info@perfectgroup.com; Phone: 011- 47528467

EXECUTIVE SUMMARY

INTRODUCTION

Matheran is a hill station having a municipal council, which falls in Tehsil Karjat, District Raigad in the Indian state of Maharashtra. It is also one of the smallest hill station in India. Transportation facilities for tourist, local people and other traveling to Matheran from the plains are poor. Railway was the only transport facility for reaching Matheran prior to 1974. However consequent strike by railway employees in 1974 disrupting the transportation of Matheran, temporary road from Neral to Matheran was constructed by local people. There are approx. 8 Lacs tourists visiting Matheran annually apart from local residents. Currently, tourists traveling to Matheran However, the existing modes of transportation remains is road travel which is inadequate and inconvenient.

The proposed ropeway shall be developed in two sections. The proposed ropeway to be installed will have Base Station at Bhutivali Village (near Bhivpuri Railway Station 50 AMSL), Intermediate Station at Garbat Plateau (545 AMSL) and Top station will be at Madhavji Point (approx. 800 AMSL)

PURPOSE

Presently the transportation facilities for tourist, local people and other traveling to Matheran from the plains are poor. Hence the proposed ropeway will provide better transportation facility.

LOCATION OF THE PROJECT

The proposed ropeway shall be developed in two sections. The length of proposed ropeway alignment of Section-I is 2745.39 m & alignment of Section-II is 1744m. Thus, total length is working out to be 4489.39 m. Ropeway alignment consists Base Terminal at Butivali, Intermediate Terminal at Garbut Plateau and Top terminal at Madhavji Point Matheran.

Site Location

Place : Village – Bhutivali
Tehsil : Karjat
District : Raigad
State : Maharashtra

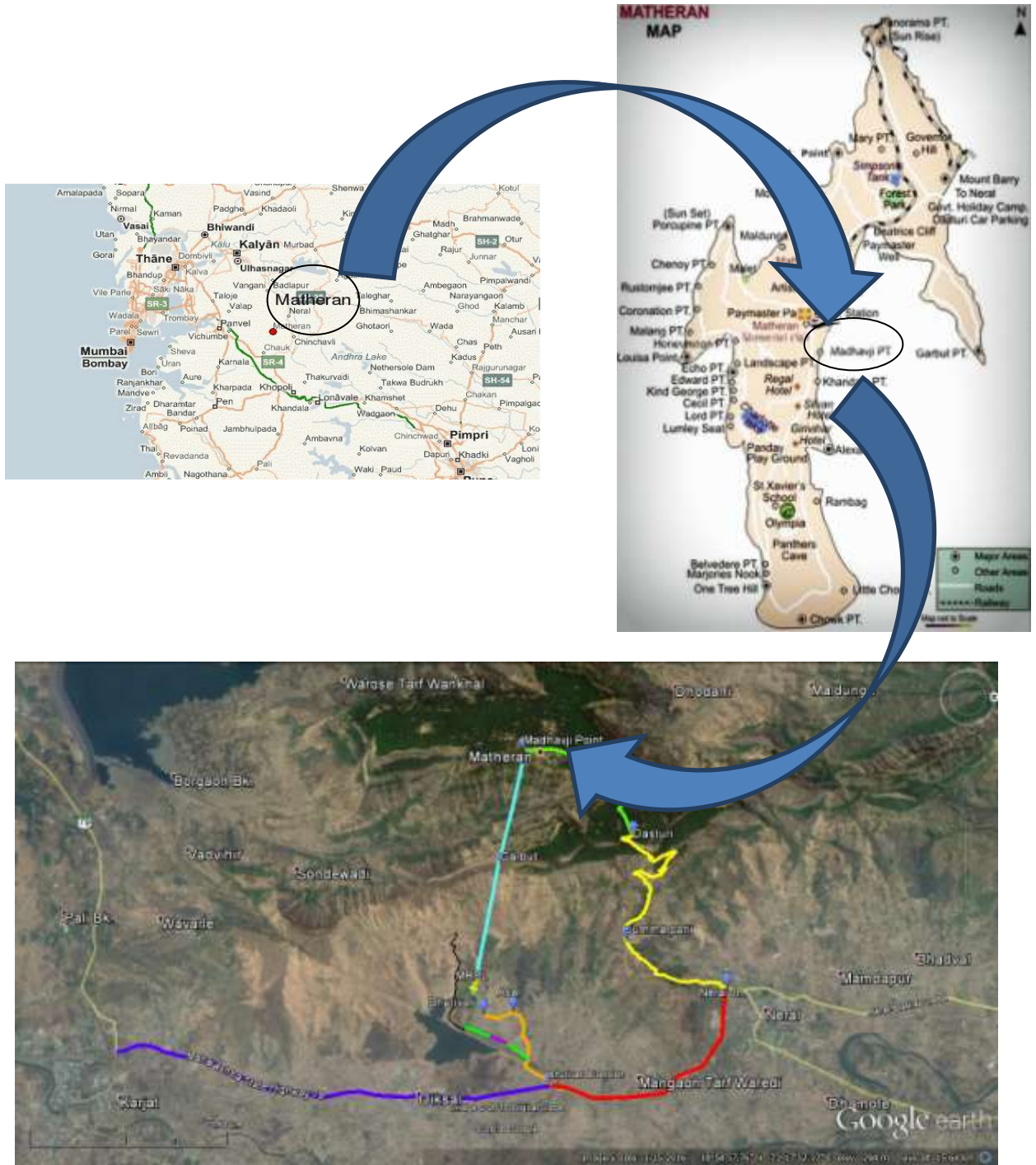


Fig 2.0 . Google Image of the project site

Latitude and longitude of base station and terminal station are as follows:

Latitude and longitude of lower terminal station, Intermediate Station and upper terminal station are as follows:

Station	Latitude	Longitude
Base Station (Bhutivali)	73° 18'58.63"E	18° 58'31.32"N

Intermediate Station (Garbut Plateau)	73° 17'11.66"E	18° 58'54.81"N
Top Station (Madhavji Plateau)	73°16'12.00"E	18° 59'08.10"N

Approach to Site

The nearest railway station is Karjat (6Km), Bhivpuri (3 km) & Neral Railway Station (6 km). The



nearest highway

is SH-79 at Approx 2 km. The State Highway connects the site to Mumbai. The nearest airport is Chatrapati Shivaji International Airport at approx 80 km.

Infrastructure

There is no habitat in the land allotted for construction of Ropeway.

- Approach Road: -

The nearest highway is SH-79 at Approx 2 km. The State Highway connects the site to Mumbai.

- Sanitary Facility: -

Toilets will be provided at LTP, MTP and UTP separately. 2 STPs will be installed to treat the waste water generated from the toilets.

- Water Supply: -

On peak days, total 68 KLD water and on off-peak days 23 KLD water shall be required during operation phase. The water shall be taken from Maharashtra Jeevan Pradhikaran

(MJP), local water supply body for Upper terminal and water from nearby Pali Bhutivali Dam at Bhutivali for lower terminal and middle terminal.

- Parking: -

The proposed site Bhutivali near Bhivpuri station is well approachable by road, length of ropeway reduces, private land was available, no much cutting of trees, enough parking space can be created.

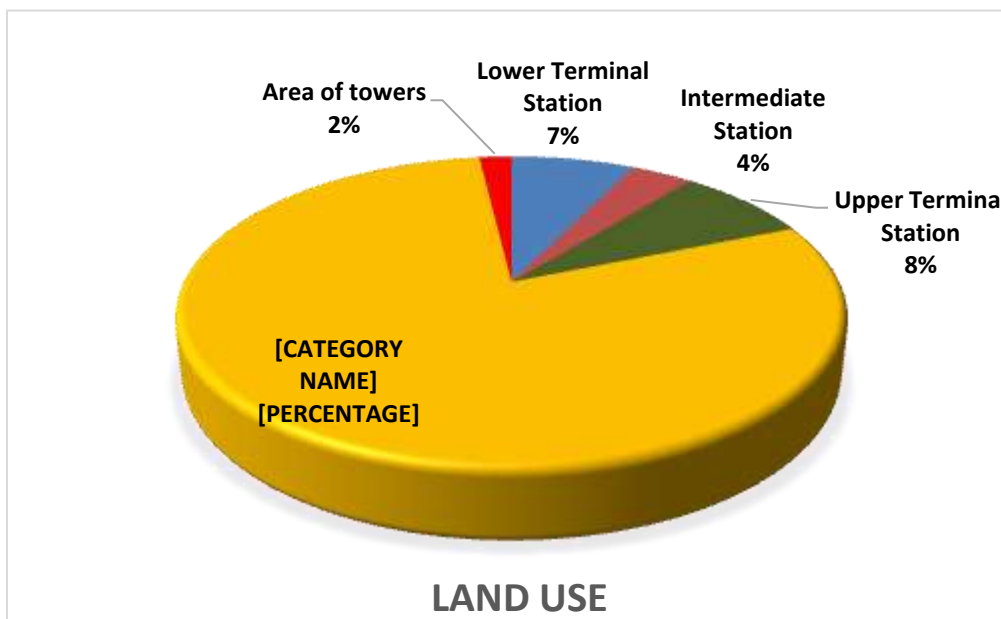
- MSW: -

No authorized Municipal Solid waste site is present nearby site; hence we are proposing organic waste converter to dispose solid waste generated from site and recyclable waste will be given to recycler.

LANDISTRIBUTION AT SITE

The total project area is 27720 m². Out of which 2000 m² is private land and rest 25720 m² is forest land. Landuse at site is given

Area required for	Total Area (In sq. m)	Type of land
Lower Terminal Station-A	2000	Private Land
Intermediate Station -B	1000	Forest Land
Upper Terminal Station -C	2200	Forest Land
Ropeway Length-a	4400	-
Right of Way-b	5	-
Ropeway Corridor-D (a x b)	22000	Forest Land
Area of towers-E	520	Forest Land
Total (A+B+C+D+E) = F	27,720 sq. m	-



TERMS OF REFERENCE

This Environment Impact Assessment (EIA) study is based On:

- Presentation made to the Committee for grant of TOR on 22-09-2016.
- Terms of Reference issued by MOEF vide TOR no. **F. No.10-63/2016-IA-III.**

PROJECT DESCRIPTION

Area Details:

The total project area is 27720 m². Out of which 2000 m² is private land and rest 25720 m² is forest land, Land use at site is given:

Area required for	Total Area (In sq. m)	Type of land
Lower Terminal Station-A	2000	Private Land
Intermediate Station -B	1000	Forest Land
Upper Terminal Station -C	2200	Forest Land
Ropeway Length-a	4400	-
Right of Way-b	5	-
Ropeway Corridor-D (a x b)	22000	Forest Land
Area of towers-E	520	Forest Land
Total (A+B+C+D+E) = F	27,720 sq. m	-

Technical Details:

	SECTION –I (BASE STATION AT BHUTIVALI VILLAGE TO GARBUT PLATEAU)	SECTION –II (GARBUT PLATEAU TO MADHAVJI POINT)
TECHNOLOGY	DETACHABLE MONO-CABLE GONDOLA	AERIAL TRAMWAY
NUMBER OF CARRIERS	22 NO.	2 NO.
NUMBER OF OTHER CARRIERS (SERVICE & FREIGHT)	2 NO.	--
PASSENGERS PER CARRIER	8 NO.	60 NO.
HOURLY DESIGN CAPACITY	1000 PPH	1000 PPH
DAILY CAPACITY	6000 PPD	6000 PPD
TRIP TIME	~8.61MIN	~7.10MIN
TRIPS PER DAY	~34	~50
LENGTH	2745.39 m	1744 m
Vertical Rise	515.92 m	229 m

No. of Tower	10 to 15	-
TRIP TIME	~8.61min	~7.10min
POWER LOAD REQUIREMENT	350 KW	650 KW
DG SETS (BACK-UP POWER)	500 KVA x 2 (both at base station)	125 KVA x 2(each at intermediate and top station)
VISITORS (PEAK)	4000 (OF TOTAL 10,000-12,000 PERSONS COMING TO MATHERAN PER DAY)	
AVERAGE VISITORS (OFF-PEAK)	1000	
STAFF	70	
TOTAL POPULATION(PEAK)	4070	
TOTAL POPULATION(OFF-PEAK)	1070	

ENVIRONMENTAL SETTING

Study Period

Monitoring was carried out in the Post Monsoon Season from the October of December 2016. The EIA is based on baseline data collected during the monitoring season. The results of season October 2016 to December 2016 has been summarized below & is given in Baseline chapter, i.e., Chapter-4 of EIA report.

Study Area

As per the MoEF guidelines, the study area is defined as area within 10.0 Km radius from the proposed site. Air, Water, Soil, and Noise sample were collected within 10 km. Summarized study of the area is given below: -

Climatology

- The Maximum temperature of the area in twelve Years, was recorded as 39.5°C in March 2007 and November 2015, whereas the minimum temperature of the area was recorded as 11.8°C in February 2015
- From the data, the Maximum relative humidity was recorded as 96 % in July, August, September 2014. Minimum relative humidity was recorded as 53 % in December 2004 and January 2005

- The maximum rainfall was recorded in July (upto 1356.9 mm) in 2014. From data, it is clear that maximum time of year remain moist, the wet months exceed dry months. July, August & September are the wettest months and are considered as monsoon season. Average Annual rainfall is 591.7 mm.
- Wind speed normally was in the range of 0.5 km/hr in January 2005 to 14.3 km/hr in July 2006.
- The predominant wind direction of site is towards NW.

Ambient Air

Onsite core zone location at LTP & UTP has been selected. 4 Locations in buffer zone has been selected.

LTP of site & UTP of site: The mean value of PM2.5, PM10, SO₂ & NO_x are within the standard limits of National ambient air quality standards.

In Buffer zone the mean value of PM2.5 (25.9 µg/m³ - 32.8 µg/m³), PM10 (34.6 µg/m³ – 61.1 µg/m³), SO₂ (5.1 µg/m³ – 6.3 µg/m³) NO_x (20.6 µg/m³ – 27.8 µg/m³) are within the limits of National ambient air quality standards.

Noise

Onsite core zone location at LTP & UTP has been selected. 4 Locations in buffer zone has been selected.

Core Zone: The ambient noise level in the core zone was 50.3 dB (A) to 53.3 dB (A) which is within the standard of Commercial area are ~ 65 dB (A). During night, the noise level at the project site was observed to be 46.2 dB (A) to 47.8 dB (A) which is also within the night-time noise standards of Commercial Area 55.0.0 dB (A).

Buffer Zone: The ambient noise level of Matheran Village, Bhutivali and Diksal was seen to be in range of 56.2 dB (A)- 61.5 dB (A) which is slightly higher than the the standard of Residential area are ~ 55 dB (A) due to nearby village and road activities. During night, the noise at buffer zone was observed to be in range of 46.8 dB (A)- 48.7 dB (A) which is also slightly higher than the night-time noise standards of 45.0 dB (A) due to the nearby village and road activities.

The noise of Asal village is within the standard limits of commercial area ~ 65.0 dB(A) and 55 dB (A) at night.

The noise of Approach Road and SH-79 dB(A) is 65.7 dB(A) and 69.4 which is slightly higher

than the standard limits of commercial area are ~ 65.0 dB(A), During night the noise level is 57.5 dB(A) to 62.6 dB(A) which is also slightly higher than the standard limits of commercial area ~ 55.0 dB(A) due to vehicular movement on roads.

Water Environment

To assess the water quality of the proposed area, 11 stations (6 ground water & 5 surface water) were selected. In core zone water sample, has been collected from bore well nearby site. In buffer zone, the Ground water Bore well, Hand Pumps and supply water was collected from 5 locations. Matheran, Asal, Bhutivali, Diksal and Bekare. In present study, sources of surface water are Bhivpuri Dam, Asal Pond, Ulhas River, Carlotte Dam and Morbe Dam.

Ground water results:

The water results of all the sources collected from the core zone as well as the buffer zone are within the drinking water standards except the alkalinity of Diksal Village which is slightly higher.

Surface water results:

1. The Surface water quality of the Bhivpuri Dam shows that all the parameters are within the CPCB Water Quality Criteria Class of water 'A', 'B', 'C', 'D' & 'E'. BOD (1.4 mg/l) falls under CPCB Surface Water Quality Criteria Class of water 'A'; DO is acceptable as per CPCB Water Quality Criteria Class of water 'A'.
2. The Surface water quality of the Asal (Pond) shows that all the parameters are within the CPCB Water Quality Criteria Class of water 'A', 'B', 'C', 'D' & 'E'. BOD (2.4 mg/l) falls under the CPCB Surface Water Quality Criteria Class of water 'B'; DO is acceptable as per CPCB Water Quality Criteria Class of water 'A'.
3. The Surface water quality of the Ulhas River shows that all the parameters are within the CPCB Water Quality Criteria Class of water 'A', 'B', 'C', 'D' & 'E'. BOD (5.6 mg/l) falls under the CPCB Surface Water Quality Criteria Class of water 'C'; DO is acceptable as per CPCB Water Quality Criteria Class of water 'B'.
4. The Surface water quality of the Carlotte Dam shows that all the parameters are within the CPCB Water Quality Criteria Class of water 'A', 'B', 'C', 'D' & 'E'. BOD (1.8 mg/l) falls under the CPCB Surface Water Quality Criteria Class of water 'A'; DO is acceptable as per CPCB Water Quality Criteria Class of water 'B'.

5. The Surface water quality of the Morbe Dam shows that all the parameters are within the CPCB Water Quality Criteria Class of water 'A', 'B', 'C', 'D' & 'E'. BOD (2.2 mg/l) falls under the CPCB Surface Water Quality Criteria Class of water 'B'; DO is acceptable as per CPCB Water Quality Criteria Class of water 'A'.

Soil

To assess the soil quality of the proposed area, Soil profile and quality was studied at 6 different locations. The samples were collected for the season of October 2016 – December 2016 & Additional data for the season of Oct 2016- Dec 2016.

Core Zone: LTP of site: The result shows that Colour was Brown, pH is 7.1. Amount of primary nutrient like Organic matter 0.44%, the available nitrogen 67.2 mg/kg and available Potassium 24.0 mg/kg is lower in range while the available Phosphorus 47.2 mg/kg is in high range.

In UTP of site: The result shows that Colour was Reddish Brown, pH is 7.1. Amount of primary nutrient like Organic matter 0.72 %, the available nitrogen 70.0 mg/kg and available Potassium 18.4 mg/kg is lower in range while the available Phosphorus 32.4 mg/kg is in high range.

Buffer Zone:

The result shows that Colour was Light Brown to Blackish Brown, pH is 6.5 to 7.1. Amount of primary nutrient like Organic matter 0.54% to 0.67%, the available nitrogen 58.8 mg/kg to 84.0 mg/kg, available Potassium 13.4 mg/kg to 43.4 mg/kg is lower in range while the available Phosphorus 26.2 mg/kg to 41.6 mg/kg is in high range.

Primary nutrient profile of core zone & buffer zone shows that soil is low in fertility due to the availability of low amount of nitrogen, Potassium. Adding bio fertilizers can enhance the fertility of the soil.

Biological Environment

Flora studied in core zone

Core zone is the area where project is to be constructed. The proposed project is a Ropeway project located at Raigad, Maharashtra. Approx 20 trees at project site will be

cut. All the flora and fauna of core zone has been recorded during the survey.

Flora Study in Buffer Zone:

Varieties trees, shrubs, wild vegetables, flowering plants and medicinal plants such as Syzygium cumini (Jamun), Mangifera indica (Mango), Ficus racemosa (Gular), Garcinia indica (Kokum), Ficus religiosa (Peepal), Amyris elemifera (Torchwood Tree), Polyalthia longifolia (Pseudo Ashok) etc.

Fauna of core Zone:

During study, it was found that the faunal diversity in the core site was limited to Butterflies, insects, some species of mammals & reptile. The core site has avifauna species like crow, pigeon, sparrow parrot, etc.

TYPE	COMMON NAME	SCIENTIFIC NAME	SCHEDULE
Reptiles:			
1	Viper	<i>Vipera ruselli</i>	II
2	Krait	<i>Bungarus sp.</i>	IV
3	Cobra	<i>Naja naja</i>	II
Mammals:			
1	Three striped palm squirrel	<i>Funambulus palmarum</i>	IV
2	Rhesus Macaque	<i>Macaca mulatta</i>	II
2	Barking deer	<i>Muntiacus munrjak</i>	III
3	Grey Mongoose	<i>Herpestes edwardsii</i>	II
4	Common palm civet	<i>Paradoxurus hermaphroditus</i>	II
5	Indian porcupine	<i>Hystrix indica</i>	IV
6	Jungle cat	<i>Felis chaus</i>	II
Aves:			
1	Crow	<i>Corvus splendens</i>	V
2	Pigeon	<i>Columba livia</i>	IV
3	Bulbul	<i>Pycnonotus sp.</i>	IV
4	Kite	<i>Milvus sp</i>	IV
5	Black Drongo	<i>Dicrurus macrocercus</i>	IV
6	Indian blue robin	<i>Larvivora brunnea</i>	IV
7	Jungle Myna	<i>Acridotheres fuscus</i>	IV
8	Shikra	<i>Lanius excubitor</i>	IV
9	Sunbird	<i>Cinnyris asiaticus</i>	IV
10	White Browed Fantail	<i>Rhipidura aureola</i>	-
Insects:			
1	Butterflies	<i>Rhopalocera sp</i>	-
2	Wasps	<i>Vespa orientalis</i>	-

3	Dragonfly	<i>Agrian sp</i>	-
4	Honey Bee	<i>Apis indica</i>	-
5	House fly	<i>Musca domestica</i>	-

Fauna of Buffer Zone:

TYPE	COMMON NAME	SCIENTIFIC NAME	SCHEDULE
Mammals			
1	Leopard	<i>Panthera pardus</i>	I
2	Wild boar	<i>Sus scrofa</i>	III
3	Barking deer	<i>Muntiacus muntjak</i>	III
4	Pangolin	<i>Manis crassicaudata</i>	I
5	Rhesus macaque	<i>Macaca mulatta</i>	II
6	Monkey	<i>Presbytis entellus</i>	II
7	Indian giant squirrel	<i>Ratufa indica</i>	II
8	Rabbit	<i>Oryctolagus cuniculus</i>	IV
9	Fox	<i>Vulpes bengalensis</i>	II
10	Jungle cat	<i>Felis chaus</i>	II
11	Mongoose	<i>Herpestes edwardsii</i>	II
12	Bat	<i>Pteropodidae</i>	V
13	Mouse Deer	<i>Tragulus meminna</i>	I
14	Common palm civet	<i>Paradoxurus hermaphroditus</i>	II
15	Indian porcupine	<i>Hystrix indica</i>	IV
Reptiles:			
1	Viper	<i>Vipera russelli</i>	II
2	Krait	<i>Bungarus sp.</i>	IV
3	Cobra	<i>Naja naja</i>	II
Aves:			
1	Owl	<i>Strigiformes sps.</i>	IV
2	Crow	<i>Corvus brachyrhynchos</i>	IV
3	Rock pigeon	<i>Columba livia</i>	IV
4	Common myna	<i>Acridotheres tristis</i>	IV
5	Large Cuckoo shrike	<i>Coracina macei</i>	IV
6	White Breasted	<i>Halcyon smyrnensis</i>	IV
7	Kingfisher	<i>Alcedo atthis</i>	IV
8	Black winged kite	<i>Elanus caeruleus</i>	IV
9	Black Drongo	<i>Dicrurus macrocercus</i>	IV
10	Indian blue robin	<i>Larivora brunnea</i>	IV
11	Jungle Myna	<i>Acridotheres fuscus</i>	IV
12	Shikra	<i>Lanius excubitor</i>	IV
13	Sunbird	<i>Cinnyris asiaticus</i>	IV
14	White Browed Fantail	<i>Rhipidura aureola</i>	-

Endangered Species:

There are three schedule I Species found in buffer zone namely ***Panthera pardus*** (Leopard), ***Manis crassicaudata*** (Pangolin) & ***Tragulus meminna*** (Mouse Deer). Nine schedule II species were also reported in the buffer zone namely *Herpestes edwardsii*(Common Mongoose), *Macaca mulatta*(Rhesus macaque), *Ratufa indica* (Indian giant squirrel), *Vulpes bengalensis* (Fox), *Felis chaus* (Jungle cat), *Presbytis entellus* (Monkey), *Paradoxurus hermaphroditus* (Common palm civet), *Vipera ruselli* (Viper) & *Naja naja* (Cobra).

ENVIRONMENTAL IMPACT IDENTIFICATION, PREDICTION AND MITIGATION

Ambient Air

Construction Phase

During construction phase, impacts on ambient air would be mainly due to dust emissions due to construction activities and movement of vehicles. However, these impacts would be short term in nature and limited only to the construction period. Dust collection, raw material & construction debris covered transportation & storage, covering the terminal stations with green cloth and regular water sprinkling shall be done to avoid dust spread in air.

Operation Phase

The operation of the proposed ropeway will not involve major air emissions. Ropeway operation is an environment friendly non-polluting transport system. The source of air pollution are the emissions from diesel-operated mechanical equipments. The impact of pollutants such as SO₂, NO_x and CO mainly released from mechanical driven equipments will be very negligible and of short term duration. Adequate stack height of 2 m above roof of DG set room will be provided. Moreover, all plants shall be operated and maintained in such a manner so as to minimize the emissions of hydrocarbons and particulate.

Water Environment

Construction Phase

Slurry disposal or runoff from site during rainy days may impact the water quality which shall be for short term duration, however, collection of the runoff & covering of raw, stored or waste material shall be done to avoid slurry generation.

Waste water generated during construction phase would be mainly domestic waste water and waste water from ropeway development process. This would be disposed off through soak pits. The runoff shall be collected, treated & reused to the extent possible.

Operation Phase

Fresh water requirement of 19 KLD shall be fulfilled by Municipal/Borewell. There shall be a provision of Rain Water Harvesting pits to recharge the ground water. During the operation phase, proper toilets shall be made for the visitors at each terminal of the project. Total quantity of wastewater generation is 57 KLD. The generated sewage will be treated in STP of 30 KLD each at LTP and UTP.

Land / Soil

Construction Phase

Diversion of land will be the major impact on the site as a result of which soil erosion may occur. Total of 2.572 ha (25720 sqm) of forest land needs to be diverted for construction of ropeway. There will be no removal of the trees.

Excavation of site may cause erosion of base soil & generation of excess soil. The excavation shall only be done to provide foundation. The excavated soil shall be reused to the extent possible. The top soil shall be preserved for landscaping purposes. Drilling, Manual cutting shall be used during construction with proper measures to avoid change of slope & hence to avoid landslides.

Operation Phase

As the ropeway will start from LTP & end at UTP and no connection of visitors with land will be there in between the stretch, hence, land contamination will be less due to operation of the ropeway. Manual level difference will be maintained for the natural flow of drainage. All treatment and disposal options shall comply with all relevant guidelines and legislation. Due to increase in visitor influx, infrastructural development will occur.

Noise Levels

Construction Phase

During the construction phase, source of noise will be the construction activities & equipment's, vehicles for transportation of raw material and DG sets. Although, noise during this phase would be only for specific period of construction, Standard methods and machineries will be used. Also, noise barriers shall be installed around the construction area to suppress the noise.

Operation Phase

During operation phase, the source of noise will be operation of Ropeway, DG sets and transportation. Standard Ropeway machineries will be used & will be maintained timely. Proper maintenance of the ropeway will be done to ensure low or no noise and environmental impacts. DG sets will be bought with acoustic enclosures.

Solid Waste

Construction Phase

The solid waste during construction phase will be mainly excess soil, construction materials, garbage/ biodegradable waste. The excavated soil shall be reused to the extent possible. The top soil generated during excavation will be used for landscaping. Muck and slurry generated will be used as backfilling material to raise soil levels in nearby areas. Approx. 8 Kg/day which will be given to MSW vendor. Recyclable waste shall be given to authorized vendor.

Operation Phase

Municipal Solid Waste: The total solid waste 600 kg/day will be generated by ropeway users, employee, etc. Bio-degradable waste of 430 kg/ day will be treated in Organic Waste Converter. Recyclable Waste of 170 kg/ day will be collected and given to approved recycler.

Used Oil: Used oil from ropeway machineries & DG sets can cause contamination of soil, water bodies nearby and ultimately can cause health risks to animals, birds and humans. The waste oil generated from D.G sets (2-3 ltr/month) and other machineries during construction as well as operation phase will be stored in leak proof containers and will be sent to registered recyclers for hazardous waste authorized by CPCB.

Flora and fauna

Construction Phase

The proposed Ropeway project involves the diversion of the forest land. There will be no felling of trees. Hence there will negligible impact on flora during construction. Moreover, to enhance our terrestrial ecology plantation will be provided along the terminal stations and line towers. The alignment has been selected by keeping in sight that no infringement to habitation will be caused. No migratory route has been observed at sections of this alignment.

Operation Phase

Potential impacts of project operation include increased noise and disturbance from the operation of the cable car including maintenance, glare/lighting impact of structures (towers and cables) on bird species. Efforts will be made to ensure minimum or no disturbance to the ecology of the area, however, Ropeway is an Environment Friendly & Noise free mode of transportation. Plantation will be done along the terminal stations and line towers.

Socio-economic environment

Construction Phase

There will be no displacement or immigration of the human population due to the proposed project. Impact on labour during construction will include health problems due to dust emissions and Unhygienic site sanitation conditions. Personal Protective Equipment (PPE) like hard hats, safety boots, eye and ear protection, and snug fitting gloves, etc. will be made mandatory for the workers. Hygienic conditions shall be maintained like proper storage facilities for raw material, safe drinking water facility, waste material; proper disposal of waste water, etc.

Operation Phase

During Operation Phase, the ropeway will provide convenience to the elderly, children and disabled people, who may face difficulty to trek the path to reach Matheran. Also there will be generation of direct or indirect employment for the local or affected people as the ropeway management will require skilled & semi-skilled staff.

ENVIRONMENTAL MONITORING PLAN

An Environment Monitoring Plan is prepared for construction as well as the operation phase which will provide a delivery mechanism to address the adverse environmental impacts of a project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works.

Regular monitoring of pollutants will be undertaken during the operational phase of the project and the monitoring locations will be finalized in consultation with the SPCB. An internal monitoring team shall be constituted for implementing the Monitoring plan.

RISK ASSESSMENT

Ropeways are liable to suffer from environmentally induced threats, risks and hazards as well as human -caused occurrences. Natural disasters include earthquakes, landslides, cyclone, rock falls, storms, lightening etc. and human caused occurrences include fire, electrical faults, security threat, technical failures may include rope with broken wires in service, drive / return sheave shaft failure / tension system failure, mount assembly parts failure, over speeding of ropeway / brake failure, rollback, slippage / fall of cabin, entanglement of cabin, swinging of cabin resulting in fall of passengers outside cabin, cabin derailment at station etc.

Risk Analysis

Natural Occurrences- The project site is located in seismic zone III which indicates moderate danger-risk zone. The project falls in the Raigad district which is a low risk zone. Landslides may occur at the project site, if, slope stability is not maintained. As per Flood Hazard map, The project does not fall under flood risk area.

Human Caused Occurrences- Fire can mainly cause due to electric spark in electrical room, fire in the surrounding forest area, fire in fuel storage places, etc. The ropeway will run on electricity & hence electrical current can pass through cable cars & wires due to inadequate insulation or accidently. The technical failures can cause risks to people working in the area during construction phase & people who will travel through the ropeway in operation phase. Consequences of the discussed hazards may result into accident. War, crisis & terrorists can cause panic among public and staff.

General safety measures

- Suitable Information & sign boards will be displayed in prominent places to help and instruct the public.
- Operating procedures shall ensure the safety of staff involved in operation, inspection, examination, testing, maintenance & repair work and in emergency procedures.
- Proper operation manuals, design verification, test certificates (necessary to establish that the ropeway has been designed & installed in accordance with relevant IS codes) shall be obtained from the manufacturers.
- Every specified activity of the passenger ropeway should be supervised by the competent person.
- The safety related components should be regularly examined.
- Before the operation of the ropeway the ropeway should be thoroughly inspected by chief ropeway inspector, GoU to ensure the ropeway project is safe for public use.
- Proper maintenance records should be kept.

Preventive Measures

- Special attention shall be given to the structural design of foundation, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete, and structural steel. All applicable guidelines will also be followed in this regard to ensure safety of the building.
- The project shall be provided with anemometers to monitor the wind speed and to provide trip signals to main drive in case wind speed exceeds a pre-determined set speed.
- Each station will have a first-aid medical facility.
- For fire safety, hydrants should be strategically placed with adequate hoses.
- Emergency push buttons will be provided at stations to stop the ropeway, if required.
- Rope catcher will be provided on mount beams on line trestle, P.F. and Stations to arrest/ support the hauling rope in case of de-ropement.

- The carriages will be provided with door lock which cannot be opened by the passengers.
- Carriage of each cabin shall be provided with 2 nos. detachable rope grips.
- Structures shall be built in such a way that no harm occurs to the people & structures due to flooding due to natural calamities.

Rescue Arrangement

- Ladder rescue can generally be adopted for cabins which are stranded close to the ground.
- Other rescue arrangement is the Rope Rescue System which involves a winch and lowering rope.
- Diesel engine with independent drive, so that the ropeway system can be operated at reduced speed to bring stranded cabins to the terminal stations in case of failure of electrical power supply or main motor.
- The Auxiliary Drive with diesel engine enables the passengers to be evacuated in the event of power failure.
- Helicopter facility for evacuation shall be arranged.

Disaster management Plan

A four-tier security plan will be designed for the project. The ropeway manager will establish and draw up any special instructions necessary to be observed by staff to ensure the safety of children and elderly persons riding the ropeway, and shall ensure that such instructions are implemented and enforced by the staff. Assembly points and evacuation routes for workers and general public in case of emergency shall be demarcated. No ropeway shall be operated without a functioning dedicated communication system.

Direct contact with district administration and District Disaster Management Authority (DDMA) shall be established for any update on forecast (warning). An in-house rescue team, first aid team shall be made. Regular training & mock drills shall be practiced to the staff & personnel involved. A Central Control Room shall be established for communication with Government agencies in case of emergency. A Disaster Management Cell shall be developed to monitor and act against the emergency situations.

PROJECT BENEFITS

- Environment friendly alternative transport to Matheran as it is noise free and would work on grid electricity.
- Reduction in the pressure on existing ghat road transport, thereby, reducing air pollution.
- Saving on travel time.
- Safe transport.
- Direct transportation to vicinity of Matheran market thus avoiding strenuous walking and road journey.
- Local people would be provided with affordable means of travel/transport to access facilities such as education, medical and markets etc. in nearby town.
- It would create development and upliftment of the nearby areas due to increased tourism, ease of travel etc.
- Safety & Comfort: Ropeways provide more safe and comfortable journey. Elderly, children and disabled persons which may not be able to take-up the arduous trek, would be able to take up the journey to Lakshman Temple.
- Local Employment: The project would require local people, who are accustomed of living under the existing conditions, for skilled / unskilled activities in course of construction and operations of the project. The project will provide direct and indirect employment opportunities to the local people & hence improving their status of living.
- Infrastructure development or facilities like toilets, drinking water, sewage treatment, solid waste management, medical facilities, etc. will be helpful in maintaining the beauty as well as ecology of such alluring place. And, the medical facilities will help the casualties caused to be addressed on time & in proper way.

ENVIRONMENTAL MANAGEMENT PLAN

Environment management cell will be created and specific responsibilities will be assigned to various members. Environment will be managed as described below:

Land Environment

Construction Phase

The diversion of forest land will be carried out as per the guidelines of the Forest (Conservation) Act, 1980. Total of 2.572 ha (25720 sqm) of forest land needs to be diverted for construction of ropeway and 20 trees are required to cut. No blasting will be done, instead, the foundation will be with the help of drillers & manual stone cutting to avoid landslides. The excess soil generated shall be used as a raw material in construction & top soil shall be preserved for landscaping purposes. Raw material & Waste shall be stored at separate & covered places.

Operation Phase

To avoid spread of waste on land, proper collection bins will be provided at the terminal stations & along the route. Raw oil & waste oil shall be collected properly in leak proof containers to avoid leakage & spillage of oil on ground. Recharge of rainwater & proper channelization of runoff shall be done to avoid soil erosion & weakening of pillars.

Atmospheric Emissions

Construction Phase

There will be fugitive emission like particulate matter etc. due to construction activities on small scale. Covering of material & constructed structures, collection of dust & water sprinkling shall be done regularly. Raw material, construction debris & Excavated soil shall be kept covered.

Operation phase

The operation of the proposed ropeway will not involve major air emissions. The emissions will be mainly be due to ropeway machineries & the dust emissions due to human traffic.

2 m above roof of DG set room will be provided at lower terminal to discharge the effluent gases at a certain height. Regular sprinkling of water shall be done for dust suppression.

The proposed ropeway operation will not cause any significant impact on the ambient air environment.

Water Management

Water requirement during construction as well as operation phase shall be met by municipal water supply.

Construction Phase

Total 5 KLD water will be required during the construction Phase mainly used for curing, domestic, sprinkling & other construction purposes. Domestic wastewater of 3 KLD from 50 labors shall be discharged to septic tank followed by soak pit.

Runoff shall be collected & reuse in sprinkling & curing purposes, to minimize the utilization of fresh water.

Operation Phase

Total water requirement has been estimated as 68 KLD (during peak days) & 23 KLD (during off-peak days) and it will be met Maharashtra Jeevan Pradhikaran (MJP), local water supply body for Upper terminal and water from nearby Pali Bhutivali Dam at Bhutivali for Lower terminal and Middle terminal. Water shall be used mainly for flushing, drinking, hand washing & horticulture purposes. Wastewater generation is 57 KLD (during peak days) & 17 KLD (during off-peak days). The waste water will be treated in STP and reused in gardening, flushing and miscellaneous purposes and excess treated water will be used in irrigation purposes.

Storm Water management

Construction Phase

Storm water runoff from the construction site shall not be allowed to flow down the hill. The runoff shall be collected to the maximum extent possible & shall be treated for reuse in sprinkling & curing activities.

During Operation Phase

Storm water shall be channelized to rain water harvesting pits which shall have oil and

grease trap. Garland drains are proposed around the pillars/towers to ensure the proper drainage of the storm water and to prevent disturbance to the drainage pattern of the area.

Noise & Vibrations Management

Construction phase

The noise emission sources include construction machineries / equipments, other construction activities like hammering, drilling, etc. & traffic. Standard methods and machinery shall be used and shall be installed on anti-vibration pads. Manual cutting & drilling operations may be followed. The construction activities shall be done during the day time only. Temporary noise barriers shall be provided around the construction area. Job rotation and provision of earmuffs to the workers will be provided.

Operation Phase

Source of Noise & vibrations will be the DG sets, ropeway machineries and traffic movement in the area. Total Power requirement will be 350 Kw for Section I and 650 Kw for Section-II. DG set of capacity 2 X 500 kVA and 2 X 125 kVA is proposed for backup power supply. Acoustically enclosed DG Sets will be bought and installed. Similarly, other ropeway machineries will be kept in closed rooms & will be installed over anti vibration pads. Proper maintenance of the ropeway will be done to ensure low or no noise and environmental impacts.

Solid and Hazardous Waste

Construction Phase

Solid waste during construction includes Construction Waste & Debris, Excavated materials, Municipal Waste and Hazardous Waste. The waste shall be properly collected. Approx 8 Kg/day which will be given to MSW vendor. Recyclable waste shall be given to authorized vendor. Excavated soil shall be used in leveling & backfilling purposes. Top soil will be used for landscaping near UTP and LTP & along the corridor, wherever possible. The hazardous waste will be stored in leak proof containers & will be given to authorized vendors.

Operation phase

Solid waste will be generated by ropeway users, employee, etc. The total solid waste 600 kg/day will be generated by ropeway users, employee, etc. Bio-degradable waste of 430 kg/ day will be treated in Organic Waste Converter. Recyclable Waste of 170 kg/ day will be collected and given to approved recycler.

Hazardous waste will be the used oil & other oil leakages from DG sets and other machineries, which is calculated to be approximately 2-3 lt/ month. The waste oil generated from D.G sets and other machineries shall be stored in HDPE containers and will be given to recycler authorized.

Ecological Environment

Construction Phase

For the proposed ropeway project, construction activities will involve site clearance for construction of terminals. Total of 2.572 ha (25720 sqm) of forest land needs to be diverted for construction of ropeway and 20 trees are required to be cut.

Operation Phase

Plantation is proposed around the LTP, UTP, under the corridor of ropeway & in other open spaces, to enhance the terrestrial ecology of the area. Ropeway is an environment friendly transportation method, efforts shall be made to ensure minimum or no disturbance to the ecology of the area.

The alignment has been selected by keeping in sight that no infringement to habitation will be caused.

Corporate Social Responsibility

The Companies Act, 2013 encourages companies to spend at-least 2% of their average net profit in the last three years on CSR activities under a Corporate Social Responsibility Program, if applicable. The Ropeway project being developed under a private sector company, would result in spending the stipulated percentage of net-profit under the following activities, for the betterment of the project area & its people:

Matheran

- Contributing 5% of the profit will be given to Matheran municipal council for overall development of Matheran Village.
- Special concessional rate to local resident to travel through ropeway.
- Priority to Medical emergencies and accidental case.
- Preference in employment to local resident after skilled training for operation and maintainance and related field as per their skill within the project.

Garbut Plateau

- Bio-gas plant (for management of cow dung and bio-degradable waste) will be installed for villagers of Garbut plateau.
- Special concessional rate to local resident to travel through ropeway.
- Priority to Medical emergencies and accidental case during operational hours.
- Provision of water storage tank for different uses.
- Preference in employment to local resident after skilled training for operation and maintainance and related field as per their skill within the project.
- Dedicated Cost for above said project will be approx Rs. 8 lakhs.

Bhutivali and Nearby Tribal Villages

- Special concessional rate to local resident to travel through ropeway.
- Priority to Medical emergencies and accidental case.
- Preference in employment to local resident after skilled training for operation and maintainance and related field as per their skill within the project.
- Dedicated Cost for above said project will be approx Rs. 5 lakhs.

COST OF EMP

The cost of project is estimated to be about Rs. 5000 lakhs.

Rs. 150 lacs of capital cost & **Rs.15 lacs/year** of recurring cost shall be spent on Environment Management Plan.

CONCLUSIONS

The study brings out the following points:

- Existing ambient air quality, water quality and noise levels are within acceptable norms and will continue to remain so and will help in reduction of pollution load, upon implementation of the proposed mitigation measures.
- Risk to flora, fauna and soil is negligible due to effective implementation of EMP.
- Socio-economic benefits are envisaged due to creation of direct/indirect employment and benefits to visitors by ease of the transportation way to Temple.

Thus, it can be concluded on a positive note that after the implementation of the mitigation measures and Environmental Management Plan, the normal operation of the project will have negligible impact on environment. Moreover, it can act as an evacuation measure at the time of bad weather & emergency situations. Also, it would increase the tourism in the area and hence the economy of the state. Hence, it will benefit the locals (in the form of employment), the visitors of the place (in the form of convenience & comfort), state (in the form of economy) and the environment (preservation of its pleasant nature).