

## Chapter 5

# Environmental Impact Assessment Identification

### 5.1 Possible Impacts in Planning/Construction Stage

Based on Chapter 2 Table 2.3.1 Scoping matrix and results of the survey for Chapter 4, it shows the effect prediction from MAHSRC Planning and Construction stage below.

#### 5.1.1 Anti-Pollution Measures

##### (1) Air pollution

As a result of measurement at the vicinity of 12 planned station locations along the planned route, although PM10 levels in urban areas such as Mumbai and Ahmedabad were under the annual standard levels, a high result of 60 µg/m<sup>3</sup> was observed. Levels for other particulates including PM2.5, SO<sub>2</sub>, NO<sub>x</sub>, and CO were all under India's standards. During construction, exposure of soil will occur due to foundation works for elevated bridges, Cutting, and Embankment. Although the specific details on the operation of construction machinery and number of construction vehicles is not yet determined, it is anticipated that topsoil in Deccan Traps contains a lot of dust and will be produced due to construction work (due to operation of construction machinery and running of construction vehicles). Dependent upon wind direction temporary and local impact to the surroundings can be expected.

##### (2) Water pollution

As a result of measurement at major 19 rivers the planned route will pass through, DO levels in 6 rivers, pH levels in 3 rivers, and BOD levels in 5 rivers exceed India's environmental standards.

##### Elevated Bridges, Embankment, Cutting Section

During construction, exposure of soil will occur due to foundation works for elevated bridges, Cutting, and Embankment.

The site of topsoil in Deccan Traps contains a lot of dust. Rainfall for exposed area will lead to the production of SS 200 mg/l muddy water, which if directly discharged into nearby bodies of water without treatment will cause water contamination.

##### Tunnel Section

If NATM is adopted for tunnel construction, mortar spraying will accompany tunnel lining works. With accompanying water seepage, waste water with high pH levels will be produced. If directly discharged into nearby bodies of water without treatment, water contamination will occur.

##### River Section



At large rivers, bridge pier construction will accompany work done inside the water. This will temporary to involve drilling the river bottom which will cause muddy water to spread within the river.

**Site Office / Workers' Camp**

Provision of site offices and workers' camps during construction will cause production of domestic sewage and waste water including urine and feces. If directly discharged into nearby bodies of water without treatment, water contamination will occur.

**(3) Soil pollution**

In India there are no standards for soil pollution, and soil pollution in the vicinity of the planned route could not be confirmed. Due to construction work, spillage during refueling and faulty maintenance of construction machinery among other factors may possibly pollute the soil.

**(4) Waste**

Due to construction work, production of construction waste such as surplus earth and scrap material or domestic waste from worker camps is anticipated. There are multiple waste disposal facilities in the vicinity, and disposal shall adhere to the standards of India, including the usage of such facilities. The specific amount is unconfirmed that construction detailed to plan has not been determined, If these appropriate processing measures are not taken, adverse effects to the surrounding environment may be incurred. Excavated soil is discharged during the tunnel excavation. The volume is estimated as approx. 2.4 million m<sup>3</sup> on Thane Creek Tunnel and approx. 0.7 million m<sup>3</sup> on mountainous tunnel. These tunnel emissions soils would be planned to re-use in the project site. If unavoidable, the surplus soils are planned to gather to quarry site near the planned HSR route. Therefore, it is expected that it does not cause new environmental impacts.

**(5) Noise and vibration**

**1) Noise**

As a result of measurement at the vicinity of 12 planned station locations along the planned route, near Mumbai station the LAeq during the daytime was 73dB which exceeded India's Area "B" (Commercial Area) noise standards of 65dB. It can be surmised that this is a result of mostly noise from automobiles due to the location being an urban area. Similarly, the LAeq near Ahmedabad station during the daytime was also high at 61dB. However, levels at other areas were mostly low at 40dB or less. Due to construction work, the operation of construction machinery and running of construction vehicles is expected, and noise will be produced as a result, and impact to residences in the vicinity is expected. Although the specific number of construction vehicles is not yet determined, the amount of noise from construction machinery shall be assumed per below. In India there are no standards for construction noise. Therefore, the U.S. Federal Transit Administration (FTA) standards shall be used as reference. Table 5.1.1 shows the FTA noise assessment criteria for construction. The last column applies to construction activities that extend



over 30 days near any given receiver. Day-night sound level,  $L_{dn}$ , is used to assess impacts in residential areas and 24-hr  $L_{eq}$  is used in commercial and industrial areas. The 8-hr  $L_{eq}$  and the 30-day average  $L_{dn}$  noise exposure from construction noise calculations use the noise emission levels of the construction equipment, their location, and operating hours. The construction noise limits are normally assessed at the noise-sensitive receiver property line edge.

**Table 5.1.1: Construction Noise Assessment Criteria**

Land Use	8-Hour $L_{eq}$ dBA		Noise Exposure, $L_{dn}$ dBA
	Day	Night	30-day Average
Residential	80	70	75*
Commercial	85	85	80**
Industrial	90	90	85**

\* In urban areas with very high ambient noise levels ( $L_{dn}$  greater than 65 dB),  $L_{dn}$  from construction operations should not exceed existing ambient noise levels + 10 dB.

\*\*Twenty-four-hour  $L_{eq}$ , not  $L_{dn}$ .

Source: FTA (2006).

By using the FTA criteria provided in Table 5.1.1 and the noise projections in Table 5.1.2, and assuming that construction noise reduces by 6 dB for each doubling of distance from the center of the site, it is possible to estimate the screening distances for potential construction noise impact. These estimates suggest that the potential for construction noise impact would be minimal for commercial and industrial land use, with impact screening distances of 79 feet and 45 feet, respectively. For residential land use, the potential for temporary construction noise impact would be limited to locations within approximately 141 feet of the alignment. When performing night time work, the distance will need to be expanded further, thus further considerations need to be taken.

**Table 5.1.2: Typical Equipment Noise for Rail Construction**

Equipment Item	Typical Maximum Sound Level at 50 Feet (dBA)	Equipment Utilization Factor (%)	$L_{eq}$ (dBA)
Air Compressor	81	50	78
Backhoe	80	40	76
Crane, Derrick	88	10	78
Bulldozer	85	40	81
Generator	81	80	80
Loader	85	40	81
Jackhammer	88	4	74
Shovel	82	40	78
Dump Truck	88	16	80
<b>Total Workday <math>L_{eq}</math> at 50 feet (8-hour workday)</b>			<b>89</b>

Source: (FRA 2012)

## 2) Vibration

Measurements were made at 12 locations where the stations are to be built along the planned route. The results were 74dB around Anand Station, 84dB around Ahmedabad Station and 75dB in the Sabarmati area, which are all very high. It can be surmised that these vibrations are produced by large vehicle traffic due to the location being an urban area. At other locations, vibration was mostly less than 55dB. During the construction work, operation of the construction machinery and traffic of heavy



duty trucks carrying construction material are expected, causing vibration and impact residences in the vicinity is expected. Although the specific number of construction vehicles is not yet determined, the amount of noise from different types of construction machinery shall be assumed per below. In India there are no standards for construction vibration. As with noise, standards are provided in the FTA guidance manual (FTA 2006) guidelines for construction machinery assessment. As shown in Table 5.1.3 criteria for vibration effects on buildings are provided in the manual.

**Table 5.1.3: Construction Vibration Damage Criteria**

<b>Building Category</b>	<b>PPV (inch/sec)</b>	<b>Approximate <math>L_v^a</math></b>
Reinforced concrete, steel, or timber (no plaster)	0.5	102
Engineered concrete and masonry (no plaster)	0.3	98
Non-engineered timber and masonry buildings	0.2	94
Buildings extremely susceptible to vibration damage	0.12	90

<sup>a</sup>: An RMS vibration velocity level in VdB relative to 1 micro-inch/second.

Source: FTA (2006).

In the manual, vibration criterion level by land use category is also provided, as shown in Table 5.1.4.

**Table 5.1.4: Approximate Distances to Vibration Criterion-Level Contours**

<b>Land Use Category</b>	<b>Vibration Criterion Level (VdB)</b>	<b>Approximate Vibration Contour Distance (feet)</b>
Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and National Historic Landmarks with significant outdoor use.	65	175
Residences and buildings where people normally sleep. This category includes homes and hospitals, where nighttime sensitivity to noise is of utmost importance.	72	130
Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls fall into this category, as well as places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.	75	70

Source: FTA (2006).



Construction activities have the potential to produce vibration levels that may be annoying or disturbing to humans living nearby. Blasting below the surface would produce lower vibration levels at a receptor due to additional attenuation provided by distance and transmission through soil and rock. Federal Transit Administration (FTA) has recommended the typical levels of vibration for construction equipment which are summarized in Table 5.1.5. In the table the values at 25 feet are based on the FTA 1995. On the basis of reference values of vibration at 25 feet, an impact at 75 feet, 100 feet and 150 feet are calculated. The ground borne vibration impacts may be somewhat perceptible to people who are outdoors, it is almost never annoying and does not cause a strong adverse human reaction.

**Table 5.1.5:  
Typical Levels of Vibration for Construction Equipments**

Sl	Construction Activity	VdB at 25 Feet	VdB at 75 Feet	VdB at 100 Feet	VdB PPV at 150 Feet
1	Rock drilling	115.9	101.6	97.9	94.3
2	Dump trucks	122.7	108.3	104.6	99.3
3	Bulldozer	124.0	109.7	106.0	100.7
4	Excavator 0.089, 106	124.0	109.7	106.0	100.7
5	Crane 0.808, 87	143.2	128.9	125.1	119.8

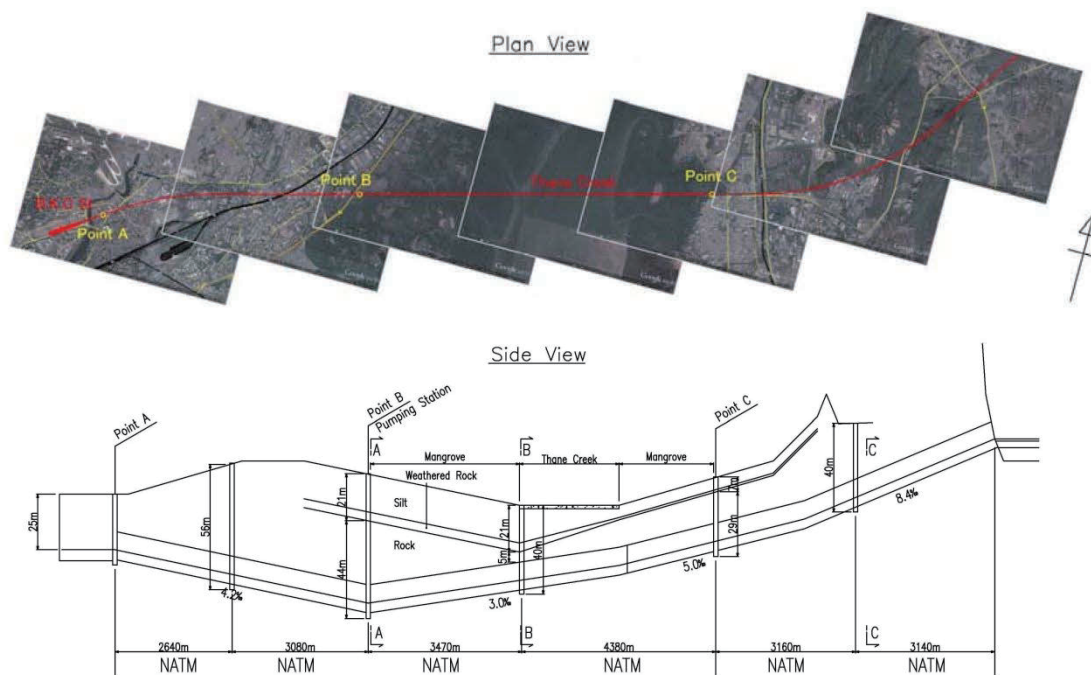
Source: Transit Noise and Vibration Impact Assessment, (FTA).

## **(6) Ground subsidence**

Several residences stand on both sides of Thane Creek where a tunnel will pass through.

The geology of this tunnel section topsoil is Silt, the subsoil is Weathered Rock containing water, Basalt contain almost no water in lower layer. MAHSRC is planning to bore through the tunnel for hard Basalt by NATM construction method 25m~60m below ground, therefore ground subsidence may be caused by drawdown the groundwater and although the possibility is low. Moreover, in several locations along the route, so-called "black cotton soil" which is a peculiar type of ground was confirmed to exist. Black cotton soil has an expansive characteristic when seeped with water; therefore ground transformation is anticipated if superstructures are built on top of embankments. The proposed map of around Thane Creek is shown in Figure 5.1.1.





Source: Study team

**Figure 5.1.1: Tunnel Plans around Thane Creek**

## **5.1.2 Natural Environment**

### **(1) Topography and geology**

Ground will be altered due to construction of tunnels, Cutting and embankment, and construction of elevated bridges, but no meaningful topographical or geological features exist in the vicinity of the route. Therefore impact to the topography and geology is neither expected during construction nor after commissioning. Safe operation at high speeds is a requirement for HSR and with the construction of stable structures being one of the major objectives of construction, topographical and geological instability will most likely not occur.

### **(2) Biota and ecosystem**

#### **General Section, Station and Depot**

Through document investigation, major fauna and flora habitats have not been confirmed along the planned route including the HSR station and depot. However, due to railway construction, there will be partial losses of fauna and flora habitats. On the other hand, due to the railway being a linear configuration and that it will pass mainly through agricultural land, effects will be limited. The railways construction is mostly Embankment and Viaduct structure. Installed nullah-box varies of the situation to keep the Embankment structural maintenance because there is a risk of disturbing the surface stream water. Viaduct is widely installing pile with a distance of 30m between and it will not interfere the groundwater flow. Therefore, the predictable repercussion



for impact of the ecosystem of inhibition to the riverine system and underground water is very few.

### **NP and WLS Section**

MAHSRC is planned to pass through the middle of Thane District of Maharashtra State, where SGNP and TWLS with the existence of various fauna and flora has been confirmed. However this place is not specified in the ESZ. SGNP is about 100m and TWLS is about 50m in minimum distance between the plan railways that will not give direct effect for it. Viaduct is widely installing pile with a distance of 30m between and it will not interfere the groundwater flow for this area. Planning in the vicinity of the railway have existing of planar structures including a national highway and railroad, noise and vibration even less away the distance, the area is not ecological system cycle surroundings human-induced land use for current status. Therefore, although construction of MAHSRC will accompany a possibility of some impact to the surrounding fauna and flora, the impact will be limited. The below contents are Sound and vibration Overview, Figure of positional relation for SGNP for Fig5.1.2, Figure of positional relation for TWLS and MAHSRC, and shows same area of the present state photo for Fig5.1.3.

### **Sound**

Table 5.1.2 shown using the following distance attenuation formula of 89dB at 50feet, below the large fall Table5.1.1 of reference criteria in 50m for 79dB and 100m for 73dB

Prediction formula is using propagation theory of the point sound source below.

$$Li = PWL - 20 \log_{10} r - 8$$

Li = : Noise level of construction work at sound receiving point (dB)

PWL : Noise power level of Constructing machine (dB)

r : Distance between constructing machine (sound source) and predict point (m)

In the results of 50feet (15.24m) at 89dB (LAeq) then back-calculated with the PWL = 121dB. And calculates the distance attenuation results in the case of a 50m away from the following formula based on this.

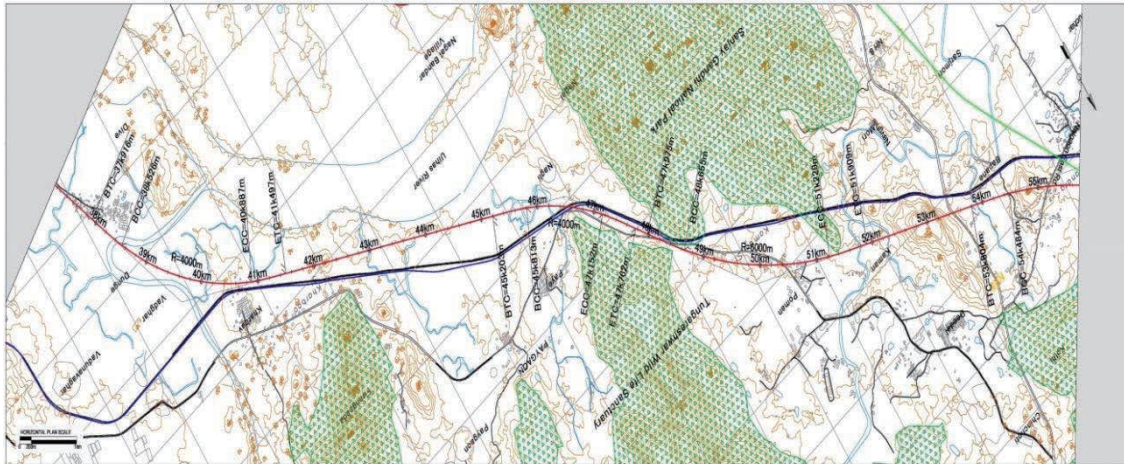
$$Li = 121 - 20 \log_{10} 50 - 8$$

The case of a 50m away distance attenuation result is Li=79dB (Leq)

### **Vibration**

Is 175feet = 53m at a maximum in Approximate Vibration Contour Distance of Table 5.1.4, it is predicted to be low level even at the edges of TWLS.





**Figure 5.1.2: Relative Locations of SGNP, TWLS and Planned Route**

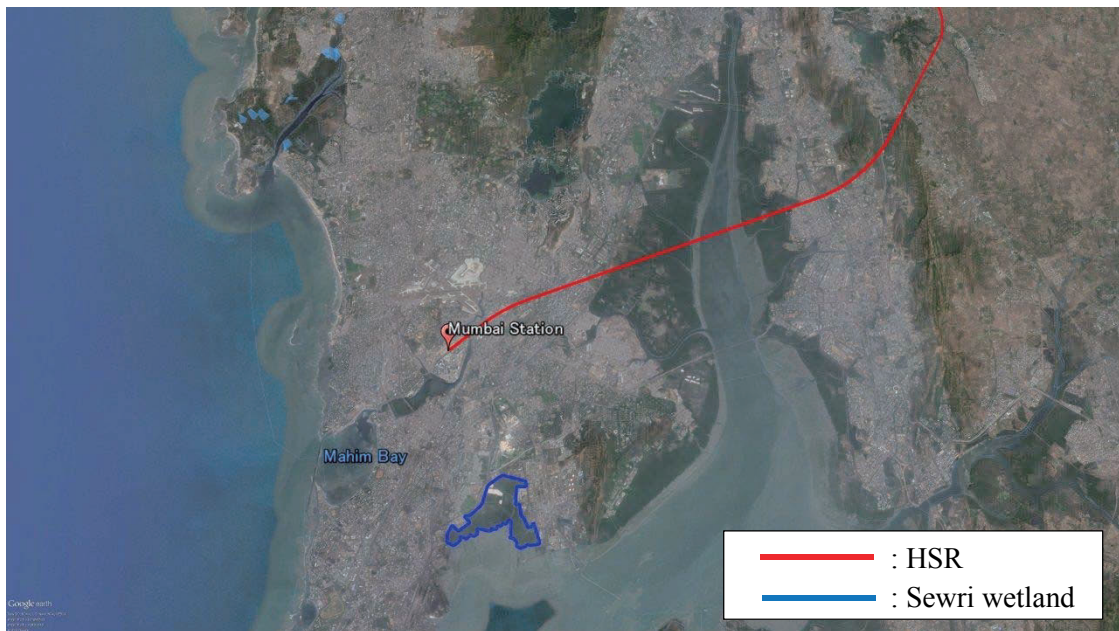


**Figure 5.1.3: Road conditions in the vicinity between the SGNP and TWLS**

### **Thane Creek Section**

As shown in Figure 5.1.4, Sewri which is located at the south end of Mumbai's Thane Creek is approximately 10km away from the railway and is famous as a visiting place for flamingos, which are specified as NT on IUCN's red list. In this manner, Thane Creek consists of many locations of abundant nature including mangrove forests and wetlands. For this project MAHSRC will pass through the Thane Creek section via tunnel structure. In planning for the tunnel construction in NATM method, plan to drill a hard Basalt layer that contains almost no water under the 30m ~ 60m from the ground in Thane Creek section according to "Ground subsidence". Therefore, low probability that the vibration of the tunnel excavation is propagated for the ground, also low probability to draw a lot of water by a tunnel excavation effect for the mangrove forest. Therefore it can be assumed that impact to the ecosystem will be very limited.





**Figure 5.1.4: Relationship between proposed route and Sewri wetland**

### **River Section**

The bridge piers will be constructed inside the water at large rivers that the MAHSRC will pass through. Roiling the sand of bottom of a river during these bridge piers fundamental construction will temporarily produce muddy water. This construction may affect the river ecosystem temporary. Moreover, bridge widths will only be about 12m, construction will require partial alterations to riparian forests on both sides of the river. Although there is a possibility that affect the ecosystem of the river, diminution is narrow.

### **Tree Transplanting**

In India, based on “The Forest Conservation Act, 1980” the removal of trees requires approval as well as transplanting to other locations. Moreover, in Mumbai and Ahmedabad respective states, laws are in place for tree removal and transplanting. In Maharashtra State, the Maharashtra Felling of Tree (Act 1964), and in Gujarat State the Saurashtra Felling of Trees (Infliction of Punishment) Act, 1951; Rules framed under the Act in 1961 are in place and adherence to these standards will also be required. Therefore, once the detailed route of the railway is determined, trees which will be subject to removal will be investigated and plantation of trees to an appropriate nearby location will be required. Also plantation for the number of trees is determined by consultation with the relevant organizations. The procedural flow will be shown in Appendix-I.

## **(3) Hydrology**

Bridge piers will be built in wide river streams where many bridges of equivalent size exist surrounding the construction sites. Moreover, due to bridge construction portions of riparian forests will need to be removed. The railway will only be about 12m in width along with its linear configuration. Bridges will be such that piers placed at uniform intervals will most likely be pile foundation structures which will not impede the flow of riverbed water, therefore impact to the hydrology is not anticipated. And the box culvert shall be provided where inundation problems are anticipated. Indicate



the NH-8 across the Par river in Valsad for Figure 5.1.5 as an example of bridge piers construction to the river near MAHSRC.



**Figure 5.1.5: the bridge NH-8 across the Par River**

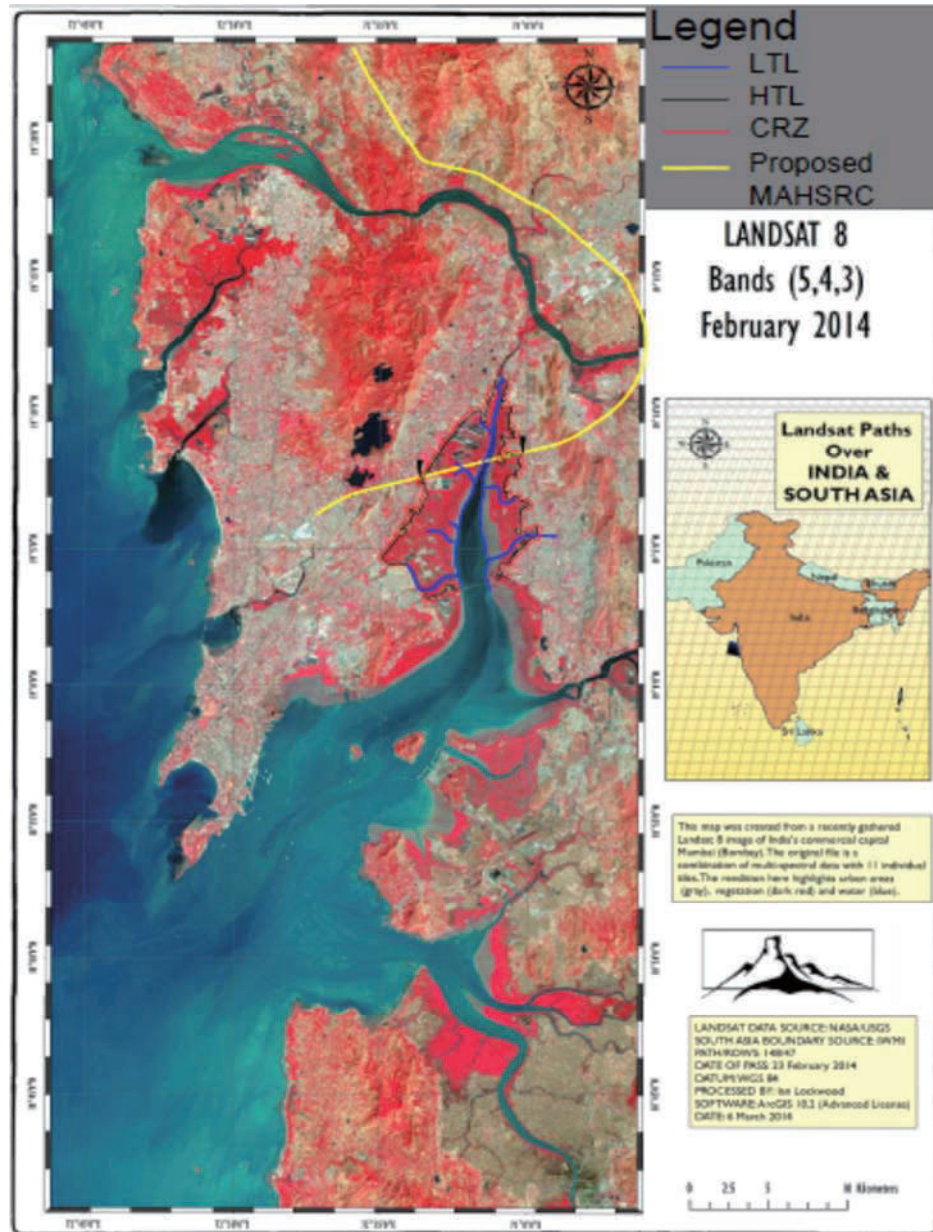
#### **(4) Protected area**

SGNP and TWSL which are designated as protected areas exist along the planned route. There is no plan for the HSR to run through either of them, but will run between the protected areas. Scope of ESZ is not set for both areas, but as the route is planned close to the protected areas, adequate care is necessary not to affect the environment during construction. However, as shown in Figure 5.1.2 SGNP is at a minimum distance of 100m away, and TWLS is at a minimum distance of 50m away and thus there will be no direct impact. Viaduct is widely installing pile with a distance of 30m between and it will not interfere the groundwater flow. As mention on "Biota and ecosystem", Planning in the vicinity of the railway have existing of planar structures including a national highway and railroad, noise and vibration even less away the distance, the area is not ecological system cycle surroundings human-induced land use for current status, little impact is anticipated in the provision of this project. The planned HSR route pass through the some Reserved Forests near Virar, however only taking a part of Reserved Forest as tunnel wellhead in Virar. In other areas, the planned HSR route only passes through a part of Reserved Forest. Therefore, it is predicted that the impacts are less.

In addition, the route passes through a mangrove forest in Thane as a CRZ, and the forest will be partly lost. There is no protected district except for two above mentioned areas. As shown in Figure 5.1.6 and Figure 5.1.7, two locations designated as a CRZ are on the route. One is Thane Creek, which a tunnel will pass through and therefore will not be directly altered. Mention about "Ground subsidence" the tunnel plan to drill a hard Basalt layer that contains almost no water under the 30m~60m from the ground low probability to draw a lot of water by a tunnel excavation effect for the mangrove forest.



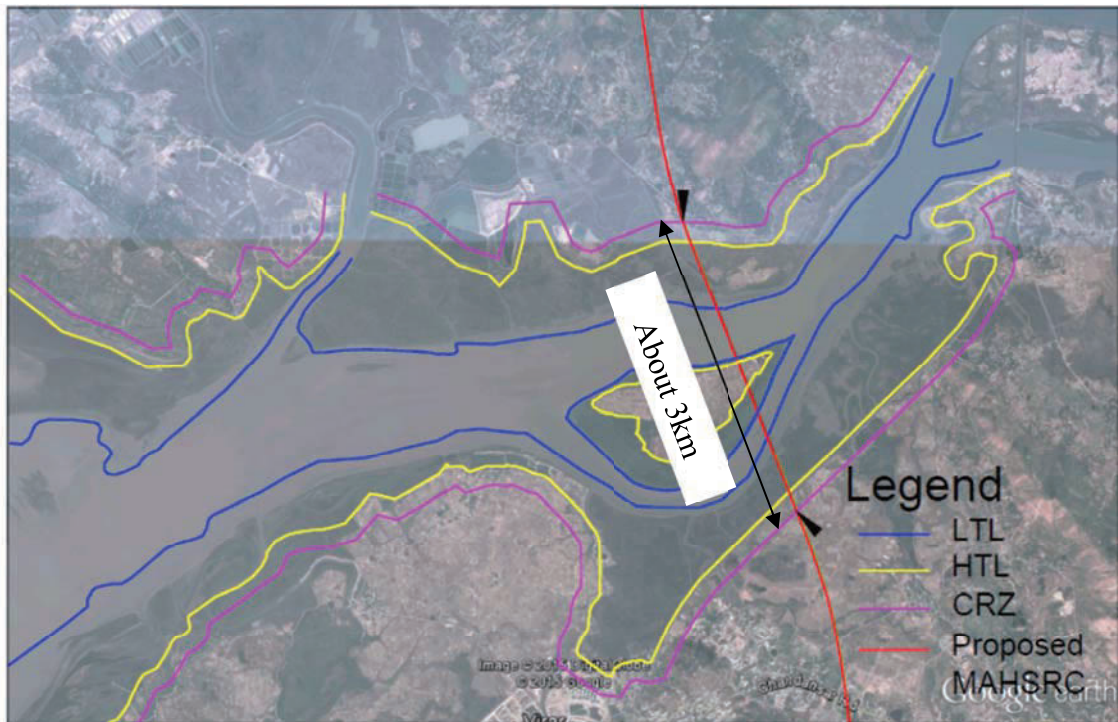
To limit the extent of alteration, bridges shall be constructed at the Vaitarna River CRZ area located to the north of Virar. However, approximately 0.64ha of mangrove will need to be removed. During the detailed design phase the exact area of removal shall be determined, and procedures for removal shall be followed in accordance with “CRZ Notification 2011.”



Source: NRSA, Nagpur

**Figure 5.1.6:**  
**CRZ Map of Mumbai Region with superimposed proposed Alignment**





Source: NRSA, Nagpur

**Figure 5.1.7: CRZ Map between Gaskopari and Tembhikhodave with superimposed proposed Alignment**

### **5.1.3 Social Environment**

#### **(1) Water use**

Water from rivers and wells is used as drinking and agricultural water in India. Approval is required whenever water is taken for the project, but huge water intake will not be necessary during construction.

#### **(2) Involuntary resettlement**

A total of 16,890 ha of land will need to be acquired. And, out of 2,761 households, 1,688 households are going to lose their housing or housing com structures.

#### **(3) Local economies, such as employment, livelihood, etc.**

A total of 539 PAPs who are wage earners and likely to lose existing employment opportunities. Out of 1,082 Households surveyed, 177 (16.4%) PAHs have business establishments falling under the direct project impact corridor. On the other hand, the creation of direct jobs and also indirect jobs are expected for large scale public project. Indian product is expected to catch up the same of advanced nations in several decades. For example, foreign portion of manufacturing rolling stock is dominant in initial stage, but the ratio of local manufacturing is expected to increase.



**(4) Land use and utilization of local resources**

Present land use, such as agriculture, grazing, manufacturing, commerce etc. will be affected due to the HSR project.

**(5) Social institutions, such as social infrastructure and local decision-making institutions Existing social infrastructures and services**

Out of the 1610 affected structures, 744 (46.2%) affected structures are electricity distribution poles followed by 358 (22.2%) roads, 76 (4.7%) electricity distribution lines/wires, 69 (4.3%) railway buildings, 60 (3.7%) places of worship and electricity transformers each, 56 (3.5%) government building.

**(6) Poor**

Impacts against the poor people living within proposed HSR alignment will be suffered significantly before/during construction stage.

**(7) Indigenous or ethnic minority people**

The IPs will be affected at villages of Valsad and Palghar Districts significantly before/during construction stage.

**(8) Misdistribution of benefits and damages**

Impacts are not clear at F/S stage, therefore further survey is required in Final Location Survey Stage.

**(9) Local conflicts of interest**

Impacts are not clear at F/S stage, therefore further survey is required in Final Location Survey Stage.

**(10) Gender**

Gender care in working environment is required in construction stage. However it will become little in operation stage.

**(11) Children's right**

One school at Palghar, three at Valsad, one at Bharuch and one at Kheda District will be relocated. It is assumed that opportunity of to go to school shall be hampered if relocation of schools have not done properly or their commuting time will become longer than present one.

**(12) Cultural heritage**



In both states there are multiple cultural heritages designated by the Government of India and other bodies. Even the closest cultural heritage is a distance of 1.2km away, and Chhatrapati Shivaji Terminus (formerly Victoria Terminus) designated as a World Heritage Site is approx. 14 km away from the planned HSR route, thus there is no possibility of alteration. Access to cultural heritages shall also not be affected. Therefore no impact is expected in the construction nor operation stages.

**Table 5.1.6: List of cultural heritage in Maharashtra**

No	Type	Name	Geocoding		Distance from Proposed Route
			Latitude	Longitude	
1	Fort	Bandra Fort	19° 2'38.07"N	72°49'2.27"E	5.43 km
2		Mahim Fort	19° 2'31.40"N	72°50'17.28"E	3.76 km
3	Historical Monument	August Kranti Maidan	18°57'45.26"N	72°48'37.59"E	13.1km
4		Gateway of India	18°55'13.94"N	72°50'6.22"E	16.7km
5	Station	Chhatrapati Shivaji Terminus (Formerly Victoria Terminus)	18°56'20.77"N	72°50'7.97"E	14.4km

Source: Study Team

**Table 5.1.7: List of cultural heritage in Gujarat**

No	Type	Name	Geocoding		Distance from Proposed Route
			Latitude	Longitude	
1	Fort	Dabhoi	22° 7'59.73"N	73°25'37.79"E	33.47 km
2		Surat Castle	21°11'45.84"N	72°49'3.98"E	5.42 km
3	Grave Site	Badshah no Hajiro	23°01'23.04"N	72°35'50.37"E	1.5km
4		Dutch Tomb	23°00'20.44"N	72°35'51.04"E	1.2km
5		Heritage Walk	23°01'42.84"N	72°34'34.55"E	2.7km
6		Qutbuddin Hajira	22°16'39.69"N	73°12'24.05"E	2.9km
7		Rani no Hajiro	23° 1'24.83"N	72°35'21.33"E	1.3km
8		Ancient Talav	23° 0'11.03"N	72°32'23.96"E	7.1km
9		Kabirvad	21°45'33.12"N	73° 8'35.54"E	20.4km
10		Vav (Step Well)	22°19'5.32"N	73° 9'11.08"E	3.4km
11		Vidyadhar Vav	22°19'1.00"N	73° 7'25.06"E	6.2km
12	Palace	Utelia Palace	22°30'6.82"N	72°12'22.92"E	85.7km
13	Pilgrim Place	Ancient Masjid (Mosque)	22°44'31.41"N	73°37'8.46"E	62.5km
14		Dakor	22°44'25.75"N	73° 8'58.08"E	24.5km
15		Kayavarohan	22° 4'25.76"N	73°14'56.73"E	19.3km
16		Malsar	21°53'16.13"N	73°18'51.07"E	34.7km



17		Shuklatirth	21°44'55.14"N	73° 7'22.16"E	18km
18		Udwada	20°28'54.74"N	72°52'20.81"E	9.8km
19	Temple / Sharine	Kirti Mandir	21°38'9.95"N	69°36'9.68"E	346km
20		Kund & Toran	22°16'55.06"N	70°47'42.59"E	246km
21		Nyaya Mandir	22°48'27.54"N	72°56'42.78"E	18.1km
22		Radhakrishan Temple	22°32'11.03"N	72°58'5.64"E	4km
23		Ranmukteshwar Temple	22°19'4.60"N	73°10'40.03"E	8km
24		Surya Narayan Temple	22°18'11.99"N	73°11'49.08"E	1.7km

Source: Study Team



**Figure 5.1.8: Chhatrapati Shivaji Terminus (World heritage)**

### **(13) Infectious diseases, such as HIV/AIDS**

Existing survey results indicate that HIV infection rates in rural areas are low in India. However, the number of people infected with HIV/AIDS in the whole of India is 2.39 million which is second most in the world. Thus, due to influx of construction workers during construction there will be a possibility of infections spreading.

### **(14) Working conditions**

It is necessary to secure the safety of workers, pedestrians and vehicular traffics in construction stage.

### **(15) Social consensus**



Local stakeholders meetings were conducted in two stages or phases. At the initial stage, in every bridge location the consultant disclosed about the goal, objective, different component of the project as a whole and narrated the tentative design of the proposed alignment. The Consultant disclosed the entitlements of the affected households and other stakeholders as designed in the RAP.

## **5.1.4 Other**

### **(1) Accident**

Due to operation of construction machinery and running of construction vehicles during construction, there is a possibility of accidents occurring.

## **5.2 Possible Impacts in Operation Stage**

Based on Chapter 2 Table 2.3.1 Scoping matrix and results of the survey for Chapter 4, it shows the effect prediction from MAHSRC Planning and Construction stage below.

### **5.2.1 Anti-Pollution Measures**

#### **(1) Air pollution**

After commissioning there is a possibility of improvement due to the modal shift. However, since details are unclear it shall be assumed that there will be no new impact.

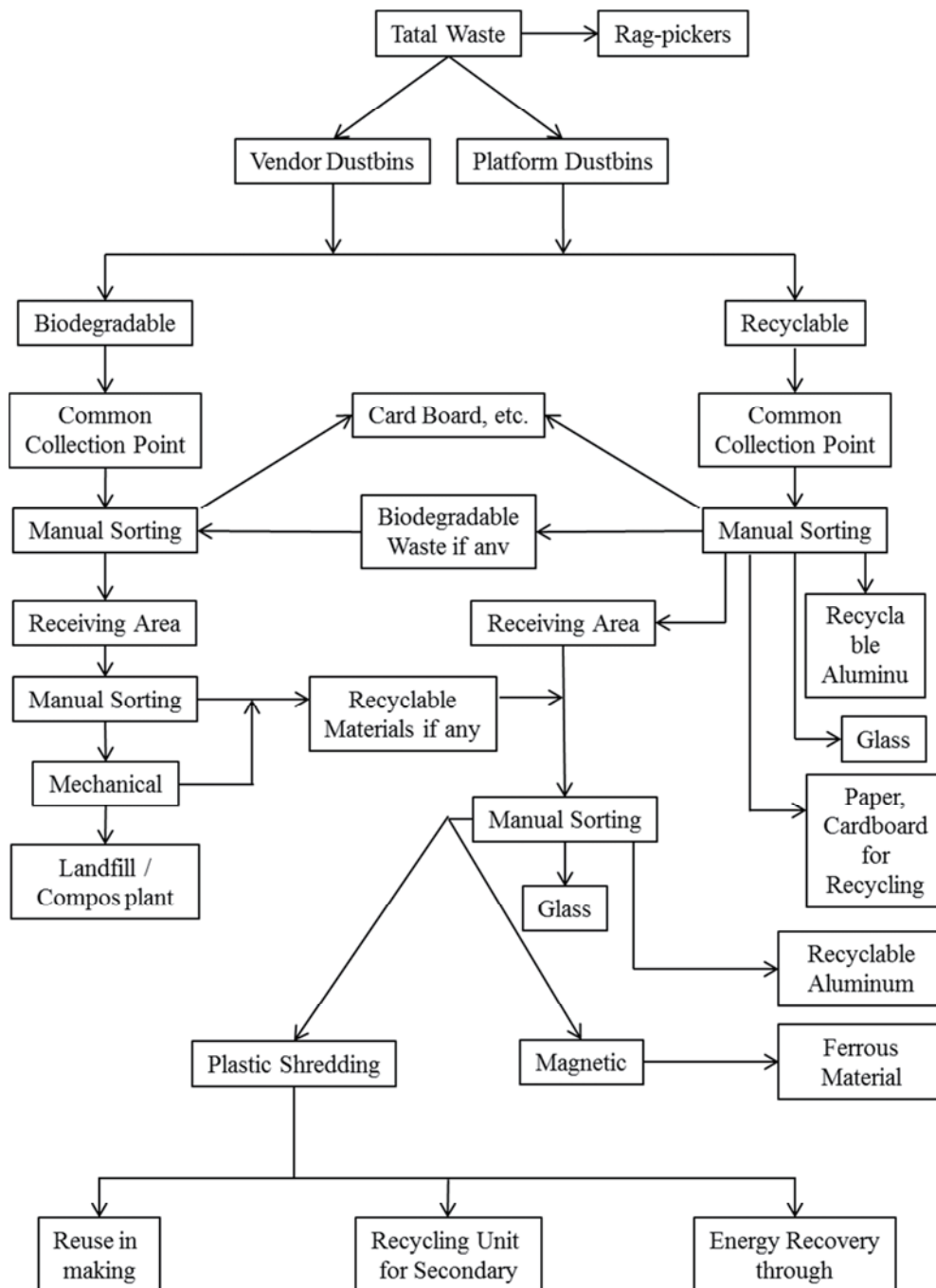
#### **(2) Water pollution**

After commissioning it is expected that waste water such as wash water will be produced from depot, and if directly discharged into rivers there will be possible impact. At this time the specific amount is undetermined expected waste water will be wash water from depot. Also, facilities such as lavatories at stations and depots are also expected to produce domestic waste.

#### **(3) Waste**

After commissioning it is expected that domestic waste will be produced from depots, and disposal in adherence to India's standards will be required. The Delhi Metro Phase I and II result, the waste generation from station is 0.5 – 1.0 cum/day and similar volume shall be expected that need to flow the country of Indian prescription for segregation or dispose in an appropriate manner. The processing flow the standards specified by the country of India shown in Figure 5.2.1. Moreover, industrial waste including scrap metal accompanying maintenance will be produced at depots, and shall also be processed / disposed of in accordance with the standards specified by the country of India.





**Figure 5.2.1: Flow chart for solid waste management plan at Station**

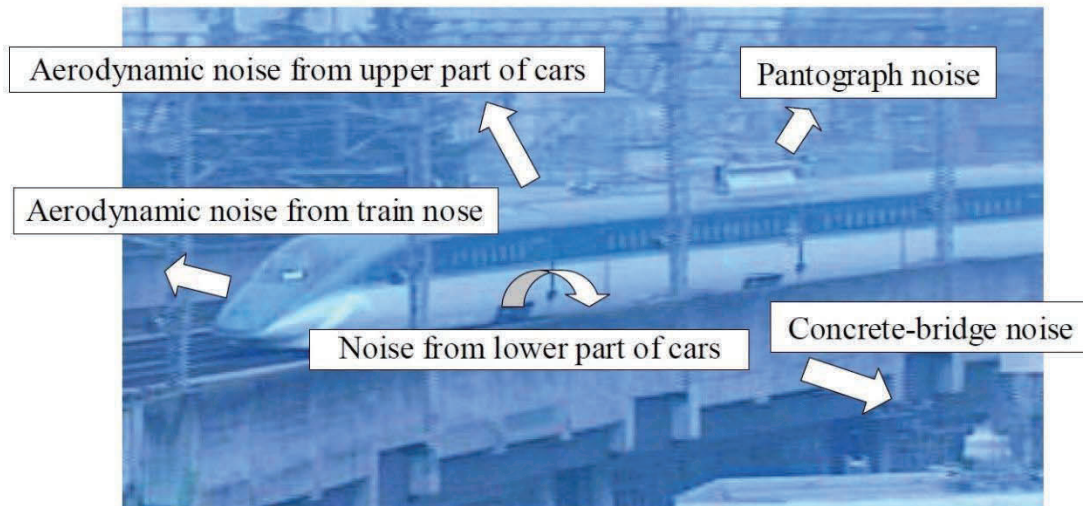
#### **(4) Noise and vibration**

##### **1) Noise**

###### **a. Overview of HSR Noise**

Normally train noises are considered to come from the lower part of cars caused by motor sounds and friction between wheels and rails, and from radiated sounds under concrete bridges, but additionally for this project due to trains operating at high speeds, aerodynamic noises from car bodies and pantographs will also be generated. Main noise sources and their locations are shown below.





Source: Development of External-Noise Reduction Technologies for Shinkansen High-Speed Trains

**Figure 5.2.2: Noise sources of Shinkansen**

**b. Shinkansen Noise Reduction Measures**

In the 50 years since its commissioning, Shinkansen have previously implemented various noise reduction measures. The main measures shall be listed below.

- Provision of Sound Insulating Wall  
Reduces generated noise through diffraction / attenuation.



Source: Sample Photo from Internet

**Figure 5.2.3:**

**E5 Series Running Through a Section with Sound Insulating Wall**

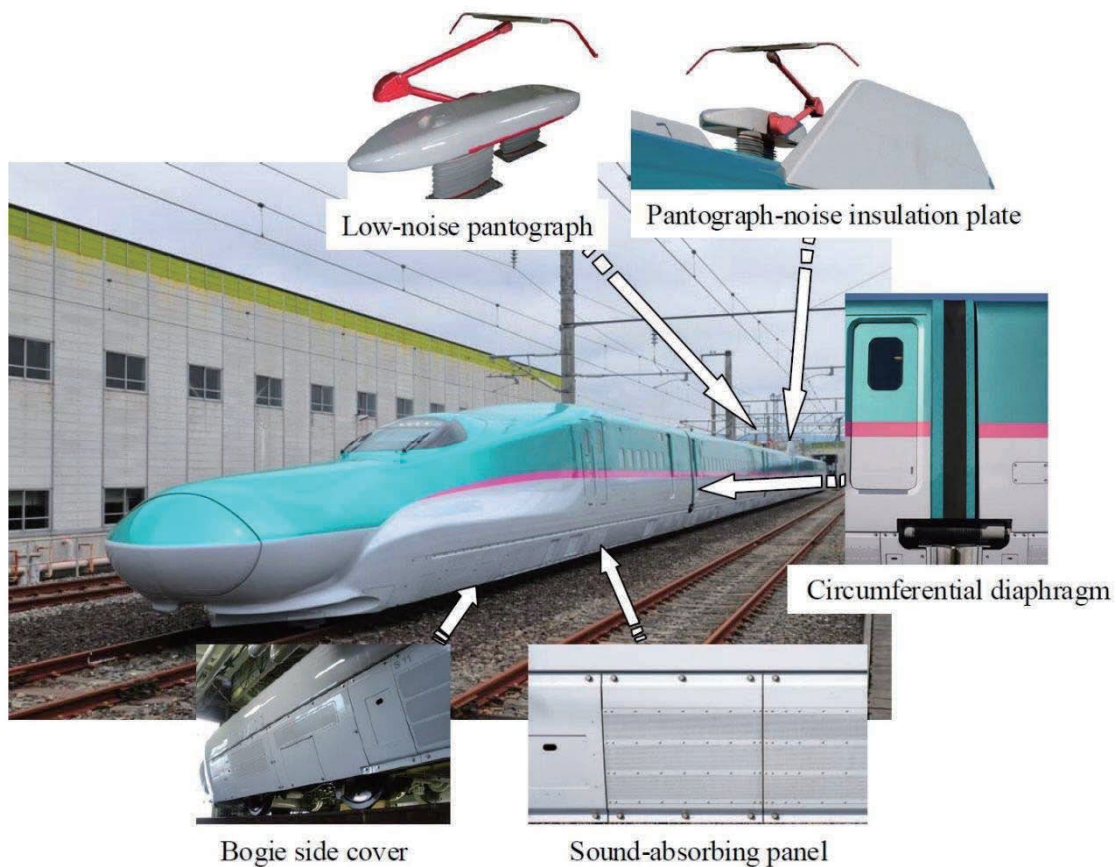
- Adoption of Long Rails  
Reduces percussive noises by reducing the number of rail joints.
- Track and Wheel Maintenance  
Reduces noise generated due to uneven wear through regular track and car (Wheel) maintenance.



Currently in Japan, new car developments aim to reduce noise at operational speeds of 320km/h. Noise reduction measures for the E5 series being considered in this study are listed below.

- Low-noise pantograph
- Pantograph-noise insulation plate
- Circumferential diaphragm
- Sound-absorbing panel
- Bogie side cover

Images for these measures are shown in Figure 5.2.4.



Source: Development of External-Noise Reduction Technologies for Shinkansen High-Speed Trains

**Figure 5.2.4: E5 Series Noise Reduction Measures**

Under an operational speed of 320km/h, these noise reduction measures effectively suppress the noise level at a location 25m from the track to under 70dB – 75dB (LA max).

### **c. Noise Prediction**

Although the detailed specifications of the cars are yet to be determined, it shall be assumed that an E5 series equivalent will be adopted, and noise prediction shall be made under that assumption.

In Japan, the E5 series operates at speed of 320km/h while satisfying the environmental quality standard for Shinkansen noise of 70dB – 75dB (LAmax) at a



location 25m from the nearest track center at a height of 1.2 meters above ground. Equivalent sound level ( $L_{Aeq}$ ) shall be calculated by assuming the amount of cars currently being considered.

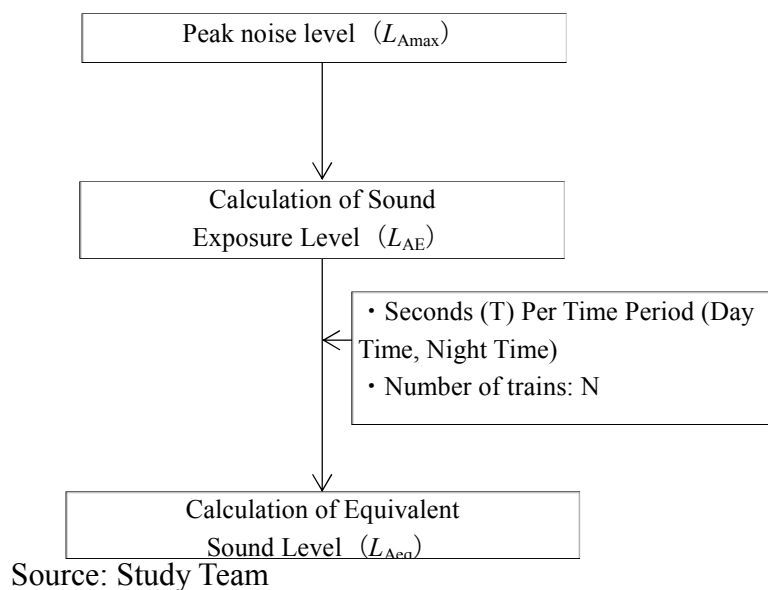
The following conditions are provided herewith.

**1) Basic noise conditions**

- Car to be Adopted: E5 Series (East Japan Railway Company)
- Car Arrangement: 10 cars (Train length 253m)
- Maximum Speed: 320km/h
- Sound Insulating Wall: R.L. + 2.0m (Viaduct)
- Rail: long rail

**2) Predicted Flow**

Predicted flow of railway noise is shown in Figure 5.2.5.



**Figure 5.2.5:  
Predicted Flow of Railway Noise**

**3) Prediction Equation**

(a) Peak noise level ( $L_{Amax}$ ) to Equivalent Sound Level ( $L_{AE}$ ) conversion equation

The following equation was used for converting  $L_{Amax}$  to  $L_{AE}$ .

$$L_{AE} \doteq L_{Amax} + 10 \log_{10} T$$

$L_{AE}$  : Equivalent Sound Level (dB)

$L_{Amax}$  : Peak noise level (dB)

$T$  : Time for train passing (Second)

(b) Equivalent continuous A-weighted sound pressure level ( $L_{Aeq}$ ) equation

The following prediction equation was used for determining Equivalent Sound Level ( $L_{Aeq}$ ) from Sound Exposure Level ( $L_{AE}$ )



$$L_{Aeq} = 10 \log_{10} \left( N \cdot 10^{\frac{L_{AE}}{10}} / T \right)$$

$L_{Aeq}$  : Equivalent Sound Level (dB)

$N$  : Number of trains

$L_{AE}$  : Sound Exposure Level (dB)

$T$  : Number of seconds stipulated by  $L_{Aeq}$  (day time and night time)

Day Time (16hr: 6AM to 10PM) = 57,600seconds

Night Time (8hr : 10PM to 6AM) = 28,800seconds

Whole day (24hr) = 86,400seconds

#### **4) Prediction Conditions**

Prediction shall be for residential areas where noise effects must especially be considered, and peak noise level at locations 25m horizontal distance from the nearest project track centerline shall be set to 70dB. Four cases shall be considered per below.

Case I – initial phase after 2023 commissioning where train length of 253m (10 cars), train speed of 320 km/h, number of trains (single side) of 35 (31 day time, 4 night time) per day is assumed.

Case II – 2053 peak train number period, where train length of 403m (16 cars), train speed of 320 km/h, number of trains (single side) of 105 (96 day time, 9 night time) per day is assumed.

**Table 5.2.1: Prediction Conditions for Train Operations**

Item	No. of Cars	Train Length (m)	Train Speed (km/h)		Number of Trains					
			Inbound	Outbound	Inbound			Outbound		
					Day Time	Night Time	Whole Day	Day Time	Night Time	Whole Day
Case I	10	253	320		31	4	35	31	4	35
Case II	16	403			96	9	105	96	9	105

Source: Study Team

Note: day time is 0600 – 2200, night time is 2200 – 0600 the following day

#### **5) Prediction Results**

Prediction results for locations 25m horizontal distance from the nearest track centerline of the project track shall be shown in Table 5.2.2.

**Table 5.2.2: Railway Noise Prediction Results**

No	Equivalent Sound Level (dB)		
	Day Time	Night Time	Whole Day
Case I	45	39	44
Case II	52	45	50

Source: Study Team



Although no noise level standards exist for conventional and high speed trains in India, in comparison to the general noise level standards prevailing in the country, noise levels will be below (d) Silence Zone level at the time of commissioning (2023). In 2053, although noise levels will exceed the (d) Silence Zone level, they will be below the (c) Residential Area level. In addition, using noise level standards of other countries as a reference, predicted noise levels will generally be equal to or less than those of any other country referenced. Therefore, we predict that noise will be of minimum impact to the project. However, it is necessary to determine the noise level standards for high-speed railway in future, since there is no regulation on railway noise level in India. (This report propose a reference value about the same level of Japan (Lmax:70dB) and overseas(LAeq:60dB)). Silence Zone does not exist such as schools and hospitals within along a MAHSRC line with 100m. We confirmed high noise level district at the time of field work, there is a need to perform additional examination of sound insulating walls at detailed design stage. The standards in India is shown in Table 5.2.3, and the standards in other countries are shown in Appendix-I. Noise standards in India are shown in Table 5.2.3 which is from “The Noise (Regulation and Control) Rules”.

**Table 5.2.3: Noise Standards in India**

Area Code	Category of Area/Zone	Limits in dB(A)Leq*	
		Day Time	Night Time
(a)	Industrial area	75	70
(b)	Commercial area	65	55
(c)	Residential area	55	45
(d)	Silence Zone	50	40

Note: 1. Day time shall mean from 6.00a.m.to 10.00p.m.

2. Night time shall mean from 10.00p.m.to 6.00am.

3. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority

4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

Source: Central Pollution Control Board

## **2) Vibration**

### **a. Overview of HSR Vibration**

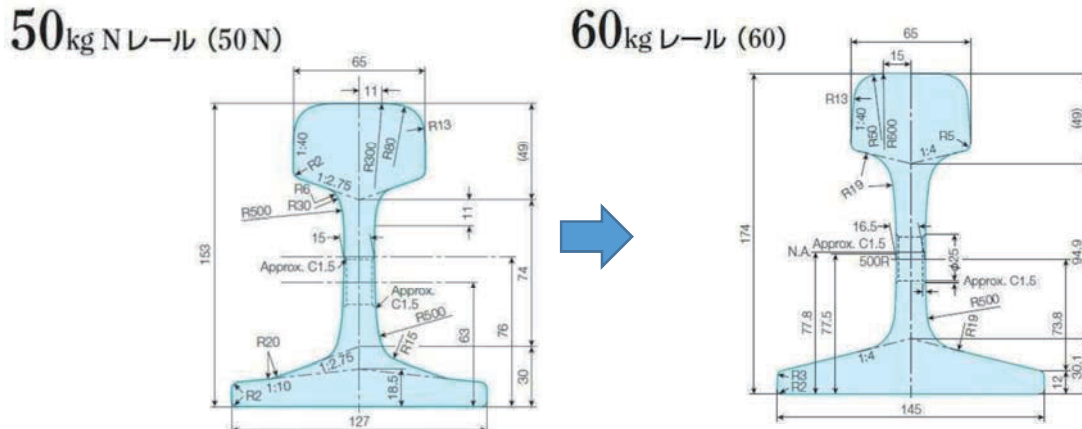
Vibration occurs when wheels roll over rails. Consequently it can be assumed that when the car weight and train speed increases, vibration will also increase. Conversely, when the rigidity of a structural element propagating vibration increases, vibration will decrease. However, vibration propagation will change according to geological conditions, making accurate predictions difficult.

### **b. Vibration Countermeasures for Shinkansen**

Currently in Japan, in order to ensure that impact from vibration is minimized at an operational speed of 320km/h, the following measures are being taken. Due to these measures, the vibration countermeasure target for Shinkansen of 70dB or less is being met.



- Weighting of Rails  
60kg/m rails are being adopted.



Source: Nippon Steel & Sumitomo Metal Corporation

**Figure 5.2.6: 50kg/m Rail & 60kg/m Rail**

### **Lightening of Cars**

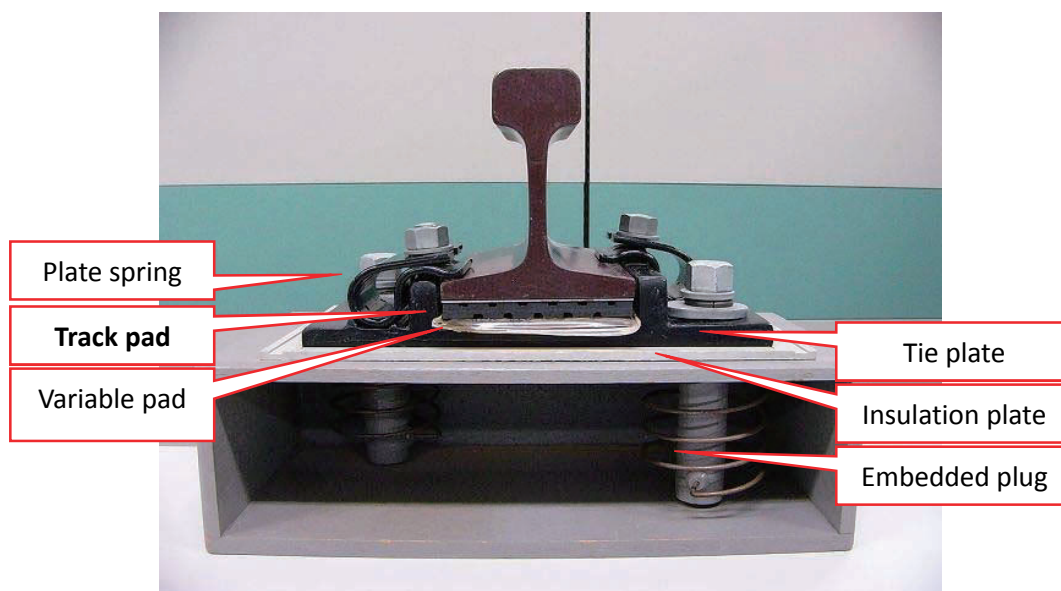
Early Shinkansen weighed 60t per car, whereas through lightening measures the latest E5 series weigh only 45t per car.

### **Adoption of Long Rails**

By adopting long rails which have less number of joints, vibration can be greatly reduced.

### **Track Pads**

With track pads inserted between rails and sleepers to absorb springiness, vibration propagation can be reduced.



**Figure 5.2.7: Track Strcuture (Track Pad)**

### **Track and Wheel Maintenance**

By striving to have constant smoothness through regular track and wheel



maintenance, the generation of unnecessary vibration can be prevented.



Source: Sample Photo from internet

**Figure 5.2.8: Rail grinding machine**

### **c. Vibration Prediction**

Although the detailed specifications of the cars are yet to be determined, it shall be assumed that an E5 series equivalent will be adopted, and vibration prediction shall be based on the citing of similar cases. In Japan, while the E5 series operate at maximum speed of 320km/h, they meet the recommended level for Shinkansen vibration of 70dB by implementing the various measures described above. Since similar measures are being proposed for this project, we predict that 70dB or less can be similarly achieved. However, it is necessary to determine the vibration level standards for high-speed railway in future, since there is no regulation on railway vibration level in India. (This report propose a reference value about the same level of Japan (70dB)). Silence Zone does not exist such as schools and hospitals within along a MAHSRC line with 100m. We confirmed high vibration level district at the time of field work, there is a need to perform additional examination of Track pads at detailed design stage. It is necessary to check the status of the vibration monitoring after the serviced, because there is uncertainty in the prediction. Shinkansen vibration level standards in Japan shall be listed below.

Measures for Environmental Quality Preservation to Deal with the Urgent Problem of Shinkansen Railway Vibration (Recommendation)

- (1) In areas that are affected by Shikansen railway with weighted acceleration level (vibration level) of over 70dB, the vibration source shall be urgently located and preventive measures, etc. shall be provided.
- (2) Areas with hospitals, schools and other facilities which especially require quietness shall be met with special consideration, and measures shall be provided as soon as possible.

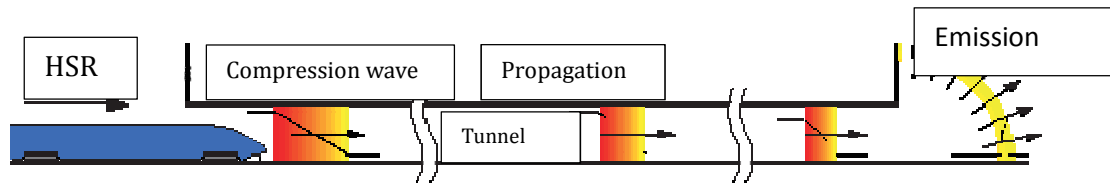
## **3) Tunnel boom**

### **a. Overview of Tunnel boom**

When a train enters into a tunnel, compressed air is transmitted in the tunnel at the speed of sound and compression noise (aerodynamic vibration) is generated at the opposite end of the tunnel, which causes trembling of windows and doors of



residences adjacent to the tunnel exit. The phenomenon is called Tunnel Boom with low frequency wave composition of 20Hz or less. The principle of tunnel boom is described in Figure 5.2.9 below.



Source: rtri HP

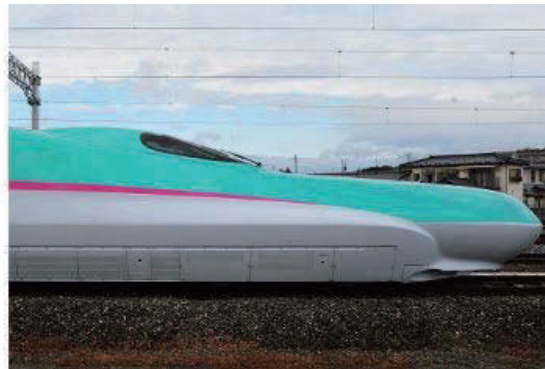
**Figure 5.2.9: Principle of Tunnel Boom**

The following are the features of Tunnel Boom (micro pressure wave) generation.

- Tunnel boom is correlated with train speed. The faster the train speed is, the bigger it is.
- The longer a tunnel is, the bigger the tunnel boom is.
- Tunnel boom is bigger with slab tracks than with ballast tracks.
- The larger the car – tunnel cross section ratio is, the bigger the tunnel boom is.

#### **Micro Pressure Wave Standards and Countermeasures**

The target for tunnel boom reduction in Japan is set to 20Pa at a distance of 20m from the cars in case of existence of residential areas and 50Pa in case of non-existence of residential areas adjacent to the tunnel ends. In the efforts of attaining the targets, long nose design at the head portion and its figure optimization are made for cars, tunnel entrance hoods are installed for tunnels. These measures are effective in reducing tunnel boom.



Source: JR East HP

**Figure 5.2 10: E5 Series Head Car with Elongated Nose**





Source: JR East HP

**Figure 5.2.11: Examples of Tunnel Boom Insulation**

### **Study and Prediction of Tunnel Boom**

The following tunnels are designed for the project.

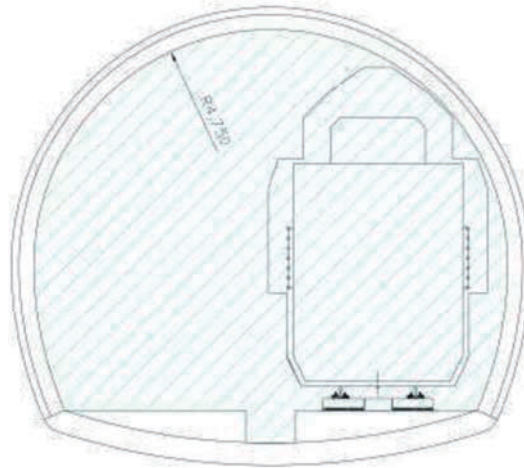
**Table 5.2.4: Location of the Tunnel List**

No.	Chainge from (km)	Chainge to (km)	Length (km)	Type of Tunnel	Remarks
1	0.6	5.77	5.17	Urban and Undersea tunnel	Mumbai area and Thane Creek
2	5.77	13.62	7.85		East side of Thane Creek
3	13.62	21.10	7.48		Navi Mumbai area
4	52.50	53.30	0.80	Mountain tunnel	Mori (Between Thane and Virar)
5	54.60	54.90	0.30		Bapane (Between Thane and Virar)
6	65.65	66.85	1.20		North side of Virar Station
7	67.10	68.00	0.90		North side of Virar Station
8	76.45	77.95	1.50		Saravali (Between Virar and Boisar)
9	125.45	125.90	0.45		Gaurwadi (Between Boisar and Vapi)
10	127.70	128.25	0.55		Jamshed (Between Boisar and Vapi)
11	130.90	131.50	0.60		Ambesari (Between Boisar and Vapi)
12	132.35	132.60	0.25		Ambesari (Between Boisar and Vapi)
13	148.15	148.35	0.20		Ambesari (Between Boisar and Vapi)
14	156.75	157.00	0.25		Ambesari (Between Boisar and Vapi)

Source: Study team

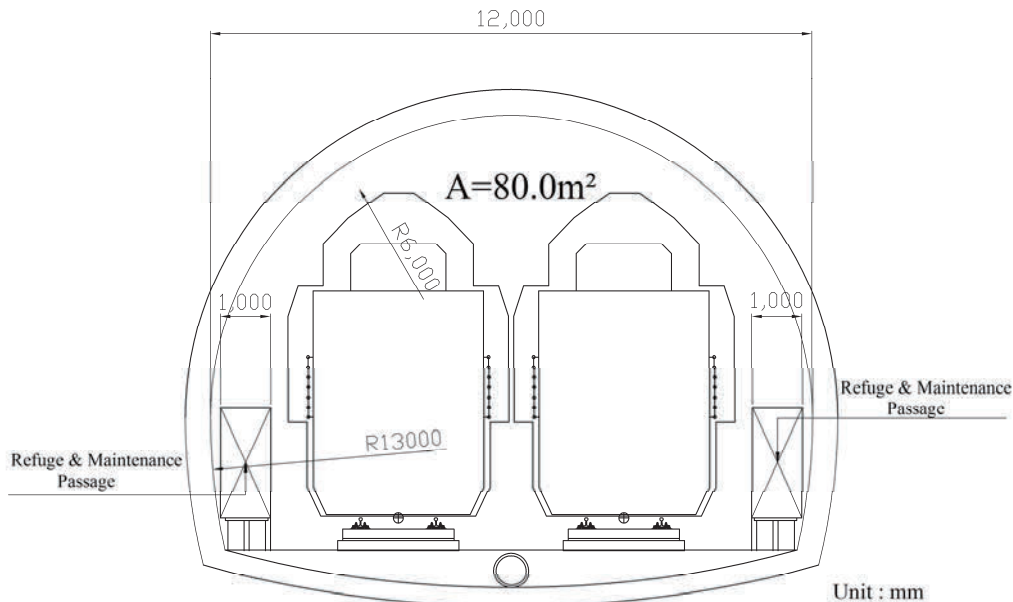
As aforementioned, tunnel boom is reduced in Japan by taking countermeasures with satisfactory results being attained, with 20 Pa in residential areas and 50Pa in non-residential at a distance of 20m from tunnels. Since there is no tunnel boom standards in India, if we set the same targets as those of Japan, and since the project will have similar cars and operational speeds as the E5 series, we predict that by installing tunnel entrance hoods, if there exist residences at a proximity to a tunnel exit impact will be minimized. In addition, as a larger tunnel cross section of 80m<sup>2</sup> is designed for this project than that of Japan (64m<sup>2</sup>), we can safely predict that tunnel boom will be smaller for this project than that in the standard Shinkansen tunnels of Japan.





Source: Study Team

**Figure 5.2.12: Cross Section (64 m<sup>2</sup>) of Standard Tunnel of Japan**



Source: Study team

**Figure 5.2.13: Tunnel Cross Section (80m<sup>2</sup>) of this project**

In the meantime, the proposal of defining tunnel boom standard will be presented at a later stage and monitoring as required shall be made to check the actual status of the tunnel boom.

## 5.2.2 Natural Environment

### (1) Biota and ecosystem

#### General Section, Station and Depot

In sections where elevated tracks will be built, the elevated structures shall provide paths of passage for wildlife. In sections with embankments and cutting, there is a possibility that highly mobile mammals may enter the tracks and be hit by trains.



### **NP and WLS Section**

MAHSRC shall run between SGNP and TWLS, and in order to not disturb wildlife movement elevated structures will be constructed. Moreover, noise and vibration can be expected to accompany the operation of HSR, but as shown in Construction Stage this railway is at a minimum distance of 100m away from SGNP, and a minimum distance of 50m away from TWLS, and as described in the Noise and Vibration section the possibility of generation of significant noise and vibration is low because the distance be shorter and further reduction is expected. Moreover, with a national highway with large vehicles running on it as well as an existing railroad line with numerous rail joints in the vicinity, the MAHSRC will comparatively have little impact. Therefore, the construction of MAHSRC is not expected to impact Biota and ecosystem.

### **River Section**

Although bridge piers shall be installed at major rivers, they will not be significant as to disrupt the flow of the rivers. Bridges approximately 12m wide shall be constructed across the rivers, and shall allow free movement of mammals, birds, and insects underneath. After commissioning, there will not be waste water discharge from the MAHSRC thus impact will be extremely limited.

## **(2) Protected area**

MAHSRC shall run between SGNP and TWLS, and in order to not disturb wildlife movement elevated structures will be constructed. Moreover, noise and vibration can be expected to accompany the operation of HSR, but as shown in "Biota and ecosystem" this railway is at a minimum distance of 100m away from SGNP, and a minimum distance of 50m away from TWLS, and as described in the Noise and Vibration section the possibility of generation of significant noise and vibration is low. Moreover, with a national highway with large vehicles running on it as well as an existing railroad line with numerous rail joints in the vicinity, the MAHSRC will comparatively have little impact. Therefore, the construction of MAHSRC is not expected to impact protected areas.

## **(3) Water use**

After commissioning, water will be used for drinking in the stations and for cleansing in the Depot. As water used for the project will always be subject to prior approval, no impact to water usage is anticipated.

## **5.2.3 Social Environment**

### **(1) Water Use**

After commissioning, water will be used for drinking in the stations and for cleansing in the depots. As water used for the project will always be subject to prior approval, no impact to water usage is anticipated.

### **(2) Involuntary resettlement**



Significant extent of impact is assumed due to the HSR Project, however impact is not assumed in operation stage.

**(3) Local economies, such as employment, livelihood, etc.**

A total of 539 PAPs who are wage earners and likely to lose existing employment opportunities. Out of 1,082 Households surveyed, 177 (16.4%) PAHs have business establishments falling under the direct project impact corridor.

**(4) Land use and utilization of local resources**

The HSR will require the minimum space compared with other ways of transportation (highway/airport) and effective urban/local development will be enhanced. Problems in large city, such as urban transportation/drinking water/waste those arisen especially in Mumbai will be mitigated by relocating some of its function near the HSR station.

**(5) Social institutions and local decision-making institutions and social service facilities**

Those infrastructures and facilities will be properly relocated prior to start the construction activities, therefore the impact will be small.

**(6) Poor**

Impacts against the poor people living within proposed HSR alignment will be suffered significantly before/during construction stage.

**(7) Indigenous or ethnic minority people**

The IPs will be affected at villages of Valsad and Palghar Districts significantly before/during construction stage.

**(8) Misdistribution of benefits and damages**

It is assumed that the impacts will still remain in operation stage.

**(9) Local conflicts of interest**

It is assumed the conflict will still remain in operation stage.

**(10) Infectious diseases, such as HIV/AIDS**

Due to HSR commissioning it is anticipated that increased movement of people between urban and rural areas will occur, thus increasing the possibility of infectious diseases spreading.



## **(11) Landscape**

HSR plan will mostly have embankments or structures around 10m and therefore will be similar height to the surrounding structures. Therefore the landscape will not be largely changed.

## **(12) Working conditions**

Impact to the workers those working at facilities of rolling stock inspection and repair is assumed.

## **(13) Social consensus**

Impact is not assumed in operation stage.

### **5.2.4 Other**

#### **(1) Accident**

As there have been several accident cases with regard to high speed trains in India and in overseas countries. Since this project will build a dedicated railway not connected to existing ones, the possibility of accidents comparable to previous cases is low.

#### **(2) Sun shading**

HSR is planned to run mostly on embankments or on elevated structures of approximately 10m high, which is similar to the height of surrounding buildings, and thus, possibility of sun shading is estimated to be low.

#### **(3) Radio disturbance**

HSR is planned to run mostly on embankments or on elevated structures of approximate 10m high, which is similar to the height of the surrounding buildings, and impact of sun shading is expected to be minimal.

#### **(4) Climate change, Global warming**

Currently global warming is in progress all over the world. In India, CO<sub>2</sub> emission increase due to industrial plant operation and motor traffic increase has become an issue. With regard to CO<sub>2</sub> emission by various transport means reported in 2014, 81% is produced by private cars and buses which is the highest, 10% by airplanes, and only 3% by railways, which is the lowest. If HSR were not to exist in the future, continual use of petroleum fuel and reduction of electric energy consumption is expected, which may result in CO<sub>2</sub> emission increase from 6,730,000t in 2014 to 8,120,000t in 2053, which will be a 20% increase. On the other hand, when the HSR project is realized, switching from petroleum fuel to electric energy and change of passengers means from automobiles and airplanes to the railway will contribute to the reduction of CO<sub>2</sub> emission, and is predicted to be 5,665,000t in 2053. An introduction of HSR cause increasing consumption of the electrical energy, however it is expected that it can



cover in existing power plants due to approx. 2 % of power supply capacity in both states. As mentioned above, the operation of HSR is expected to reduce CO2 emission.

## **5.3 Mitigation Measures**

### **5.3.1 Mitigation Measures of pre-construction/construction stage**

Mitigation measures are required for items which are expected to cause impact on the environment as described in article 4.3. By due execution of these mitigation measures, MAHSRC will be able to become an environmentally friendly mode of transportation. Mitigation measures at pre-construction/construction stages shall be proposed below.

#### **(1) Anti-Pollution Measures**

##### **1) Air pollution**

The high density level of PM10 is an issue in India, and it was determined to exist as a result of field surveys. Taking the location into consideration, care against dust is required. As surveys predict that dust will be produced during construction, preventive measures at dust sources to minimize dust production will be required first and foremost.

**Table 5.3.1: Mitigation Measures for Air Pollution**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Air pollution	<ul style="list-style-type: none"> <li>- Construction yards shall be located at a far distance from residential areas</li> <li>- Contractors are required to conduct daily routine equipment and machinery check-ups to ensure that these are in the optimum working conditions.</li> <li>- Regular preventive maintenance service of construction equipment and machineries will strictly comply with.</li> <li>- To reduce the dust, periodical water spray should be taken.</li> </ul>	Contractor	Project Implementation Unit (PIU)	Included in a Construction Cost

##### **2) Water pollution**

###### **Elevated Bridges, Embankment and Cutting Section**

In general sections, muddy water will be easily produced where soil is exposed. Measures are required to prevent it from happening and measures are also required not to discharge water without treatment to nearby bodies of water.

###### **Tunnel Section**

Measures are required to prevent discharge without treatment muddy water and



contaminated water with high pH levels generated in tunnel construction works to nearby bodies of water.

**River Section**

Measures are required to prevent muddy water from spreading during construction works inside rivers.

**Site Offices and Workers' Camps**

Hygiene control will be required.

**Table 5.3.2: Mitigation Measures for Water pollution**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Water pollution	<b><u>Elevated Bridges, Embankment, and Cutting Section</u></b> <ul style="list-style-type: none"> <li>- Sediment basins shall be prepared at construction sites, and muddy water shall not be directly discharged.</li> <li>- Locations with soil exposure shall be covered with sheets or with vegetation.</li> <li>- Sediment basins shall be built where muddy water is generated in huge volumes.</li> </ul>	Contractor	PIU	Included in a Construction Cost
	<b><u>Tunnel Section</u></b> <ul style="list-style-type: none"> <li>- Waste water from tunnels must be discharged after pH treatment.</li> <li>- Where muddy water is generated, it shall be discharged after being passed through a sediment basin or applied separation treatment or the like.</li> </ul>			
	<b><u>River Section</u></b> <ul style="list-style-type: none"> <li>- For work inside rivers, silk fences shall be prepared to prevent the propagation of muddy water.</li> </ul>			
	<b><u>Site Offices and Workers' Camps</u></b> <ul style="list-style-type: none"> <li>- Temporary sanitation facilities such as portable toilets and garbage bins will be provided by the contractors to ensure that the domestic wastes to be generated by the construction personals are properly handled and not thrown into the drainage to prevent further pollution.</li> </ul>			



### 3) Soil pollution

Surveys predict that earth contamination will be expected to occur due to human factors. Therefore, preventive measures will be required including safety training.

**Table 5.3.3: Mitigation Measures for Soil pollution**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Soil pollution	<ul style="list-style-type: none"> <li>- The operator of heavy equipment should pay attention to prevent fuel leakage when he feeds.</li> <li>- The contractor and consultant of supervision should monitor the manner of fuel feed.</li> <li>- Regular preventive maintenance service of construction equipment and machineries will strictly comply with.</li> </ul>	Contractor	PIU	Included in a Construction Cost

### 4) Waste

As construction waste during construction works and domestic waste from workers' camps will be produced, waste reduction and appropriate waste disposal will be required.

**Table 5.3.4: Mitigation Measures for Waste**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Waste	<ul style="list-style-type: none"> <li>- Contractors are required to facilitate proper disposal plan and manage the construction waste.</li> <li>- If around a waste disposal site is unavailable, we have to dispose them to right spot. The contractor must be the development and management under the laws of India.</li> <li>- Measures shall be taken to reuse as much as possible surplus earth and materials.</li> <li>- The consultant of supervision should monitor the waste disposal.</li> </ul>	Contractor	PIU	Included in a Construction Cost

### 5) Noise and vibration

It has been confirmed in field surveys that noise levels are high in the urban areas. As noise and vibration will be generated by construction machinery and construction vehicles, preventive measures will be required at generation sources as much as possible.



**Table 5.3.5: Mitigation Measures for Noise and vibration**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Noise and vibration	<ul style="list-style-type: none"> <li>- Construction yards shall be located far from residential areas.</li> <li>- Where construction work is carried out in the vicinity of residential areas, sound protection walls shall be installed.</li> <li>- Care shall be taken not to allow construction vehicles to pass through quiet residential streets.</li> <li>- Operators shall be trained so that they may not produce careless noises and vibrations in the vicinity of residences.</li> <li>- Drivers shall be trained so that they will drive construction vehicles at low speeds in the vicinity of residences.</li> <li>- Noise suppressors such as mufflers will be installed whenever deemed necessary to maintain the noise the noise generated by the various heavy equipment and other construction machinery within permissible limits.</li> <li>- Contractors are required to use low-noise equipped machinery whenever it is necessary.</li> </ul>	Contractor	PIU	Included in a Construction Cost

## 6) Ground subsidence

Once ground subsidence takes place, it is rather difficult for effective countermeasures to be made. Therefore, for tunnel construction works in areas where subsidence may be expected to occur, or for construction over black cotton soil ground, safeguards shall be applied beforehand to prevent or mitigate impact.

**Table 5.3.6: Mitigation Measures for Ground subsidence**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Ground subsidence	<ul style="list-style-type: none"> <li>- For tunnel sections construction method with high water sealing properties shall be adopted, and measures shall be taken to reduce ground subsidence.</li> <li>- Soil stabilization shall be performed before embankment construction for sections with black cotton soil.</li> </ul>	Contractor	PIU	Included in a Construction



## **(2) Natural Environment**

### **1) Biota and ecosystem**

#### **General Section**

As impact through land alteration is expected, alteration in areas of abundant nature shall be minimized at the latter detail design stage.

#### **NP and WLS section**

As the railway route is close to SGNP and WLS, it shall be considered at the latter detail design stage to further the distance of the railway away. In addition there should be attention that does not approach the both protected areas in the arrangement of and construction machine operation at construction yards.

#### **River Section**

As bridge piers will be constructed inside the water of large rivers over which MAHSRC runs, measures are required to reduce the generation of muddy water during construction.

**Table 5.3.7: Mitigation Measures for Biota and ecosystem**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Biota and ecosystem	<ul style="list-style-type: none"> <li>- Construction yards shall be planned to keep damages to trees and plants to a minimum.</li> <li>- Removed trees and plants shall be replanted at other locations as necessary.</li> <li>- Planting of trees commensurate to the number of removed trees shall be done in compliance with relevant laws and regulations.</li> <li>- For work inside rivers, silk fences shall be prepared to prevent the propagation of muddy water.</li> </ul>	Contractor	PIU	Included in a Construction Cost

### **2) Protected area**

No land alteration takes place within SGNP and TWSL. However, as construction work will be carried out in their vicinity, protective measures shall be taken to prevent or mitigate impact.



**Table 5.3.8: Mitigation Measures for Protected area**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Protected area	<ul style="list-style-type: none"> <li>- Construction yards shall be planned to keep damages to trees and plants to a minimum.</li> <li>- Construction yards shall be located as far as possible from SGNP and TWSL.</li> <li>- Contractors are required to use low-noise equipped machinery whenever it is necessary.</li> <li>- Proper clearance procedure shall be observed in accordance with regulations and standards to protect CRZ and reserved forests.</li> </ul>	Contractor RVNL/HSRC	PIU Related state organizations	<p>Included in a Construction Cost</p> <p>Shall be borne by RVNL/HSRC.</p>

### **(3) Social Environment**

MAHSRC is very extensive and has sections of very large curve radii to enable high speed train operation. Due to these factors, relocation of a large number of residences cannot be avoided. This will accompany involuntary resettlement. The impact shall be avoided and/or mitigated as much as possible.

The acquisition of land and private property shall be carried out in accordance with the RAP. Compensation and assistance package will be planned in RAP, separately from the EIA.



**Table 5.3.9: Mitigation Measures for Social Environment**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Involuntary resettlement	<ul style="list-style-type: none"> <li>- Conduct census survey and local stakeholder meeting.</li> <li>- Prepare RAP involving the following measures.</li> <li>- PAPs must be acknowledged as an eligible for compensation.</li> <li>- Identify the eligibility of non-titled people at the census survey intended to PAPs and ensure the compensation and support.</li> <li>- Refer the previous/on-going projects by other donors, determine the requirement for social vulnerability and compensate to them.</li> <li>- Resettlement site must be prepared when PAPs need it.</li> <li>- Confirm if resettlement activities conform to RAP or not by internal monitoring etc.</li> <li>- Establish Grievance Redress Committee</li> <li>- Establish external monitoring committee consists of the third party.</li> </ul>	RVNL/HSRC	MOR	Shall be borne by MOR.
Local economies, such as employment, livelihood etc.	<ul style="list-style-type: none"> <li>- Prepare RAP involving the measure to restore PAPs' livelihood</li> </ul>	RVNL/HSRC	MOR	Shall be borne by MOR.
Land use and utilization of local resources	<ul style="list-style-type: none"> <li>- Provide urban planning to enhance appropriate development of the HSR corridor.</li> <li>- Utilise local materials and products human resources related to construction and operation.</li> </ul>	RVNL/HSRC	MOR	Shall be borne by MOR.
Social institutions, such as social infrastructure and local decision making institutions. Existing social infrastructure and services	<ul style="list-style-type: none"> <li>- Social utilities; such as power supply, drinking water, drainage and communication line are to be diverted before starting the construction activity.</li> </ul>	RVNL/HSRC	MOR	Included in a Construction Cost



Poor people	<ul style="list-style-type: none"> <li>- To minimize impact on present agricultural activities, the construction schedule should be disclosed to the PAPs at the earliest possible stage.</li> <li>- The proper compensation should be given to the PAPs.</li> </ul>	RVNL/HSRC	MOR	Shall be borne by MOR.
Indigenous or ethnic minority people	<ul style="list-style-type: none"> <li>- Prepare IPP involving the measure to restore STs' livelihood</li> </ul>	RVNL/HSRC	MOR	<p>Monetary compensation Shall be borne by MOR.</p> <p>In addition to the above,</p> <ol style="list-style-type: none"> <li>1) Loss of land for grazing</li> <li>2) Loss of water supply</li> <li>3) Loss of medical plants</li> <li>4) Loss of trees for fuel</li> </ol> <p>shall be discussed at SHM.</p>
Misdistribution of benefits and damages	<ul style="list-style-type: none"> <li>- Conduct a further SHMs and confirm a physical misdistribution</li> <li>- When issues will be settled by providing structures, it will be considered in D/D</li> </ul>	RVNL/HSRC	MOR	Included in a Construction Cost
Local conflicts of interest	<ul style="list-style-type: none"> <li>- Conduct a further SHMs and confirm a physical misdistribution</li> <li>- When issues will be settled by providing structures, it will be considered in D/D</li> </ul>	RVNL/HSRC	MOR	Included in a Construction Cost
Gender	<ul style="list-style-type: none"> <li>- When women group employed, provide their own toilet and rest station</li> </ul>	RVNL/HSRC	MOR	Included in a Construction Cost
Children's right	<ul style="list-style-type: none"> <li>- When the school is affected due to HSR Project, construct their new school prior to start the construction activity</li> <li>- Present commuting distance must be considered when prepare settlement site.</li> </ul>	RVNL/HSRC	MOR	Included in a Construction Cost
Infectious diseases such as HIV/AIDS	<ul style="list-style-type: none"> <li>- HIV/AIDS related workshops shall be provided for construction workers</li> <li>- Periodic health checks and HIV/AIDS tests shall be provided for construction workers</li> </ul>	Contractor	PIU	Included in a Construction Cost



Working conditions	<ul style="list-style-type: none"> <li>- Construction personnel provides with the necessary safety gears such as protective hard hat and safety belt as necessary.</li> <li>- Contractor/Owner of rolling stock inspection and repair must provide temporary scaffolding, temporary landslide protection wall etc. to protect workers.</li> </ul>	Contractor	PIU	Included in a Construction Cost
Social consensus	<ul style="list-style-type: none"> <li>- MOR has to hold local stakeholder meetings periodically, and release project information to neighbor villagers.</li> </ul>	RVNL/HSRC	MOR	Included in a Construction Cost

#### (4) Other

**Table 5.3.10: Mitigation Measures for Accident**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Accident	<ul style="list-style-type: none"> <li>- Workshops shall be organized for workers and provide safety management.</li> <li>- At construction sites, persons responsible for managing hazardous materials such as oil shall be appointed and trained to secure safety.</li> <li>- Traffic controllers shall be provided as necessary.</li> </ul>	Contractor	PIU	Included in a Construction Cost

### 5.3.2 Operation Stage

Mitigation measures are required for items which are expected to cause impact on the environment as described in the article 4.3. As the impact will remain perpetual in the operation stage, mitigation measures are required to be more effective and sustainable as compared with those of the construction stage. Mitigation measures for the operation stage shall be proposed as follows.

#### (1) Anti-Pollution Measures

##### 1) Water pollution

As drainage from stations and depots will be perpetual, appropriate treatment equipment shall be installed so that no drainage may be released directly into adjacent rivers without being treated.



**Table 5.3.11: Mitigation Measures for Water pollution**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Water pollution	<ul style="list-style-type: none"> <li>- Purification system for the type of waste water produced from Depot shall be provided.</li> <li>- Oil absorption mats shall be provided to remove oils from waste water.</li> </ul>	HSRC	RVNL	HSRC

## 2) Waste

As domestic waste is expected to be produced in stations, and domestic and industrial waste water in depots, proper treatment and disposal measures shall be established.

**Table 5.3.12: Mitigation Measures for Waste**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Waste	<ul style="list-style-type: none"> <li>- Treatment pools shall be installed for waste water from stations and depots. Waste water shall be discharged to adjacent rivers after being treated in accordance with the standards.</li> <li>- Prepare and implement a hazardous waste management plan for the disposal of waste oil, batteries and other hazardous materials.</li> </ul>	HSRC	RVNL	HSRC

## 3) Noise and vibration

### Noise

Noise will be generated through high speed operation of trains. It is important and necessary for noise to be suppressed at the source. The following two elements shall be considered for the purpose of providing protective measures.

- Noise reduction measures for car noise sources: manufacturing cost may become higher, but universal effect will be seen throughout the whole railway.
- Noise reduction measures for structure sources: in case car noise reduction measures are not effective enough, additional noise reduction measures shall be required for railway structures.

### Vibration

It is expected that impact will be minimized based on the assumption that proper measures will be taken for the tracks beforehand. Although this is a matter for the operation stage, track structure shall be designed at the planning stage to adopt protective measures against vibration.

In addition, vibration as well as noise will be produced during train operation. As vibration will be transmitted underground, preventive measures are difficult to put in place at the operation stage. Thus, for the operation stage measures shall be



considered not only at the source of vibration but also at points of vibration reception.

**Tunnel boom**

Measures against tunnel boom have been made clear through the experience of Japanese Shinkansen. Details shall be determined at the time when the train shape among other factors are finally decided.

**Table 5.3.13: Mitigation Measures for Noise and vibration**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Noise and vibration	<p><b><u>Noise and vibration</u></b></p> <ul style="list-style-type: none"> <li>- Introduction of low-noise cars <ul style="list-style-type: none"> <li>➤ Low-noise pantograph</li> <li>➤ Pantograph-noise insulation plate etc</li> </ul> </li> <li>- Adoption of Long Rails: Reduces percussive noises by reducing the number of rail joints</li> <li>- Track and Wheel Maintenance: Reduces noise generated due to uneven wear through regular track and car (Wheel) maintenance</li> <li>- Track Pads: With track pads inserted between rails and sleepers to absorb springiness, vibration propagation can be reduced.</li> <li>- Installation or elevation of sound barriers according to the situation of surrounding residences</li> <li>- Implementation of noise and vibration monitoring</li> <li>- In case that measures are difficult to provide at the source of vibration production, sound and vibration protection work shall be carried out on residences.</li> </ul> <p><b><u>Tunnel boom</u></b></p> <ul style="list-style-type: none"> <li>- Adoption of long nose for the front car.</li> <li>- Installing tunnel entrance hoods</li> </ul>	HSRC	RVNL	HSRC

## (2) Natural Environment

### 1) Biota and ecosystem

HSR must prevent wildlife intrusion to confirm safety. Also it is not possible to plant trees



around the area. On the property of the high-speed railway, it is necessary to consider that is not close to the HSR.

**Table 5.3.14: Mitigation Measures for Biota and ecosystem**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Biota and ecosystem	- Fences shall be installed at Embankment and Cutting sections in order to prevent animals from entering the railway tracks.	HSRC	RVNL	HSRC

### (3) Social Environment

The details with regard to involuntary resettlement will be presented in the RAP report.

**Table 5.3.15: Mitigation Measures for Social Environment**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Local economies, such as employment, livelihood etc.	- Conduct external monitoring and confirm the level of PAPs' livelihood is worsened or not.	HSRC	RVNL	Shall be borne by MOR, if necessary
Poor people	- Conduct external monitoring and confirm the level of PAPs' livelihood is worsened or not.	HSRC	RVNL	Shall be borne by MOR, if necessary
Misdistribution of benefits and damages	- Conduct external monitoring and confirm if the issue on misdistribution is arisen or not.	HSRC	RVNL	Shall be borne by MOR, if necessary
Local conflicts of interest	- Conduct external monitoring and confirm if the issue on misdistribution is arisen or not.	HSRC	RVNL	Shall be borne by MOR, if necessary
Infectious diseases such as HIV/AIDS	- Contactor will be required to conduct a periodical health education to his personnel. - Enhancement of community health activity for local people.	HSRC	RVNL	Shall be borne by HSRC at O&M sites. Local government shall be responsible for citizen.



Working conditions	<ul style="list-style-type: none"> <li>- Construction personnel provide with the necessary safety gears such as protective hard hat and safety belt at O&amp;M sites.</li> <li>- HSRC has to provide temporary scaffolding, temporary landslide protection wall etc. at rolling stock inspection and repair.</li> </ul>	HSRC	RVNL	HSRC
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#### **(4) Other**

##### **1) Accident**

As the purpose of the project is high speed train operation, safety measures must fully be observed.

**Table 5.3.16: Mitigation Measures for Accident**

Item of Impact	Mitigation Measures	Implementing Organization	Responsible organization	Budget
Accident	<ul style="list-style-type: none"> <li>- Operations system (such as signal system) with a safety track record shall be implemented, and reliable operations management procedures shall be observed.</li> <li>- Safety education and training shall be periodically provided to the drivers.</li> <li>- Guard fences shall be installed to prevent trespassing into the tracks.</li> </ul>	HSRC	RVNL	HSRC



## **Chapter 6**

# **Environmental Management Plan & Monitoring Programme**

### **6.1 Environmental Management Plan**

Environmental Management Plan (EMP) reviews the adequacy of various pollution control measures envisaged for the proposed Mumbai-Ahmedabad High Speed Railway Corridor (MAHSRC) (presented in 4.0) for mitigating various environmental impacts identified and assessed in Chapter 4.0. Additional mitigatory measures, if required to ensure sustainable transport sector development are also suggested. EMP has been prepared separately for construction and operation phases for all the environmental attributes. It describes administrative aspects of ensuring that mitigatory measures are implemented and their effectiveness is monitored. Environmental monitoring programme has also been presented in this Chapter. The development of the MAHSRC entails civil works including excavation, back filling, and construction of tunnels/RUBs/ROBs, elevated structures, bridges and cross drainage structures and utility shifting, which are likely to cause adverse impacts on the natural and social environment. The impacts cannot be fully avoided; however, appropriate mitigation measures are suggested to minimize and compensate for the potential adverse impacts and enhance the positive impacts. Environmental management plan has been delineated based on the potential impacts assessed for the project. Assessment of the potential impacts is made based on the review of secondary information and substantiated by field survey and measurements, public consultation, household survey and discussions with concerned authorities. The implementation of the EMP requires the following:

- Implementation of the mitigation measures;
- Monitoring the implementation program;
- Allocation of budget for the mitigation measures;
- Organizational structures for the implementation of the mitigation measures;
- Establishment of the EMP.

### **6.2 Basic Approach of Environmental Management Plan**

The environmental management plan (EMP) is designed based on the impact assessment which comprehensively covers all aspects of pollution control, natural environment and social environment so that adverse impacts if any are taken care of and the project does not create any hazard or affect the quality of life for present and future generations. The EMP often provides not only technical approach but also institutional and organizational arrangements and the financial outlay for all environmental related aspects, because detailing of the budgetary provisions for different activities is useful for the project authorities. The technical approach for the EMP includes technical, social, economic, cultural, public health and institutional components.



## **6.3 Institutional Framework**

### **6.3.1 Implementation of the mitigation measures**

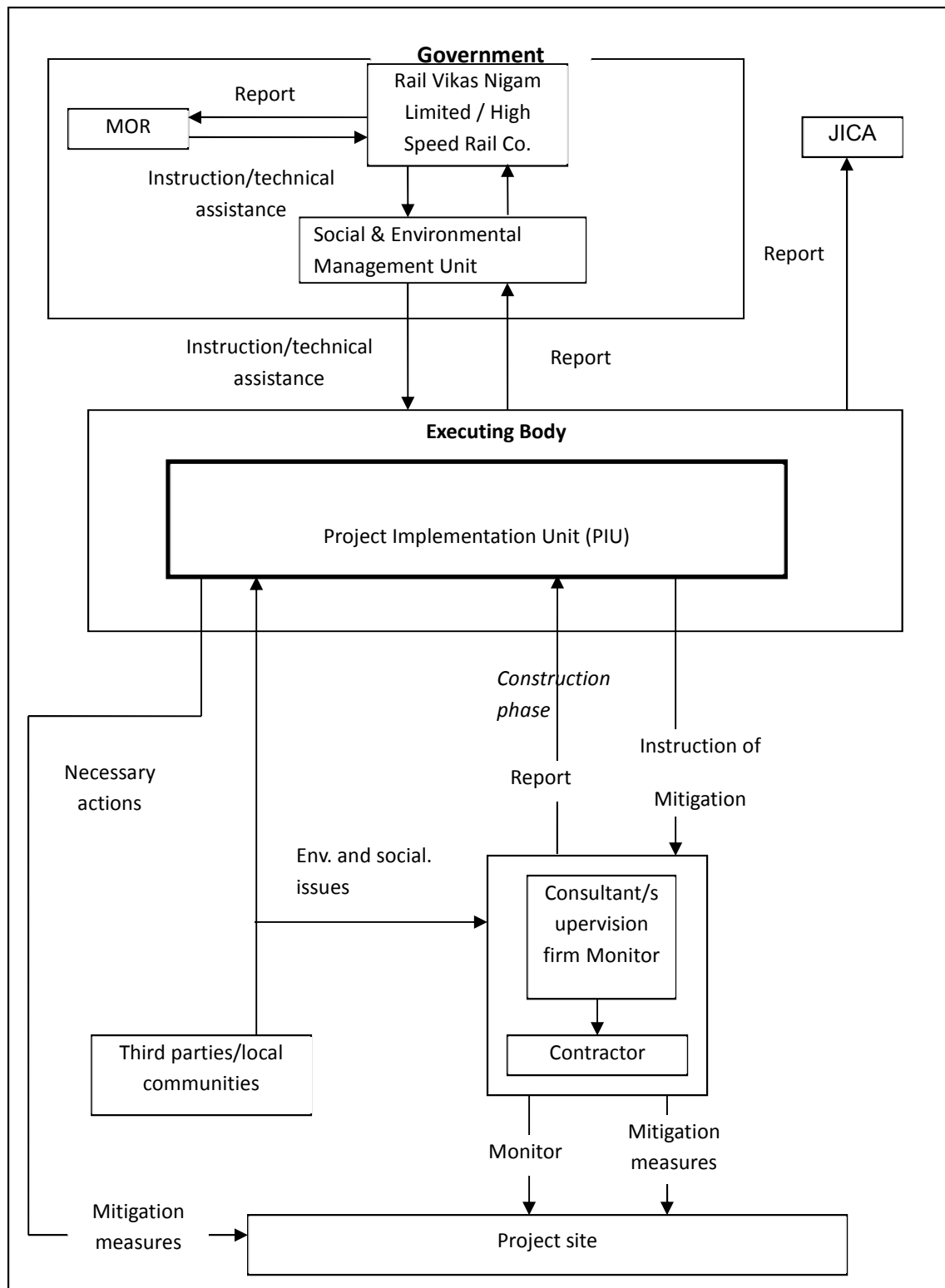
As a presumption that implements the EMP, It is necessary to perform certainly Mitigation Measures for construction stages and Operation Stage. In this construction stage is important to performed by Contractor and monitoring with PIU, it must be achieved sufficient cooperation with each other. Coordinate with stakeholders of local residents, cooperate the relationship with related organizations of the clearance.

In this Operation Stage reliably performed Mitigation measures by the operator RVNL / HSRC under the monitoring by MOR. At this time, we understand the problem that occurred in Constriction stage and consider the need for further Mitigation Measures. There are also needs to strive that maintains proper relationships with stakeholders along the railway line.

### **6.3.2 Institutional Framework**

The institutional framework for environmental management and monitoring is presented in Figure 6.3.1.





**Figure 6.3.1: Institutional Framework of EMP**

To ensure that the EMP produce acceptable outputs, it is important that the following parties fulfill their key responsibilities allocated as follows:



## **(1) Social and Environmental Management Unit (SEMU)**

The Social and Environmental Management Unit (SEMU) is the section of MOR that is responsible for managing environmental and social matters relating to the project, and ensuring compliance with the environmental and social safeguard policies of the Government and lender, and relevant national laws.

- All matters relating to environment, land acquisition, rehabilitation and resettlement with respect to the MAHSRC project;
- Internal MOR/JICA policy and guidelines on environmental and social issues;
- Responding to Parliamentary questions, public representations, court cases and Right To Information queries on environmental and social issues;
- Any other environmental and social matters or enquiries.

## **(2) Project Implementation Unit (PIU)**

The environmental and social experts of the Project Implementation Unit (PIU) are responsible for preparing the detail/up-dated Environmental Management and Monitoring Plan in the early stage of the Engineering Consultancy Service based on the EMP in the EIA Report, and carrying out monitoring on Contractor's compliance with the mitigation measures; and provide regular monitoring reports to SEMU/JICA in the stage of the construction supervision.

## **(3) Contractor**

The key responsibilities of the Contractor are based on the EMP and ensure the implementation of the environmental mitigation measures for the construction activities. Site-specific EMP has to be prepared based on the EMP in the EIA Report.

## **6.4 Environmental Monitoring Plan**

An Environmental Monitoring Plan (EMP) provides a basis for monitoring potentially adverse environmental impacts of the project during its execution. The information derived from environmental monitoring activities can be used to mitigate and reduce environmental impacts and enhance project benefits through adaptive management. The implementation of the EMP is adopted in all project works. An EMP is important as it provides useful information and helps to:

- Assist in detecting the development of any unexpected environmental or social situation and thus provides opportunities for adopting appropriate control, management or mitigation measures.
- Defines the responsibilities of the project proponents, site engineers, contractors and environmental monitors and provides means of effectively communicating environmental issues among them.
- Defines the monitoring mechanism and identifies monitoring indicators, methods and parameters.
- Provides information which allows for the evaluation of the performance and effectiveness of mitigation measures proposed in the EMP and enables managers to make improvements in management plan.



A monitoring plan normally involves two main types of activity:

**Routine Supervision of the Work:** Observation of the construction/operation work to ensure mitigation actions will be conducted during routine site inspections. This work will be conducted as general operation working/maintenance progress including daily work. Those contents are mention on Mitigation Measures Ch.4.4 that Monitoring must work on a routine basis by Contractor/Consultant of supervision.

**Environmental and Social Impact/Mitigation Monitoring:** The monitoring to be conducted to determine the actual and social impact.

Following tables are EMP in pre-construction/construction stage and operation stage, respectively.

**Table 6.4.1: EMP in Pre-construction/Construction Stage**

Environmental Indicator	Method/Parameters	Location, Quantity and Frequency	Responsible agency
1 Air quality monitoring	SO <sub>2</sub> , NO <sub>x</sub> and PM <sub>10</sub> or SPM, PM <sub>2.5</sub>	1 point of station construction site. (Total 12 points) 4 times / year (Total 24 times in 6 years)	Contractor/Consultant of supervision
2 Water quality monitoring (River water)	pH, SS, Temperature, Oil and Grease, Coliform bacteria	1 sample of 19 major rivers. 12 times / year (Total 72 times in 6 years)	Contractor/Consultant of supervision
3 Monitoring for tunnel drainage	pH, SS, Temperature, Oil and Grease	1 sample of 3 points (Urban and Under sea tunnel vents) 12 times / year (Total 72 times in 6 years)	Contractor/Consultant of supervision
4 Waste Management	Inventory record of waste disposal	Construction site as required	Contractor/Consultant of supervision
5 Noise Monitoring	Leq (dBA) 16 hours / day Measuring 3 times per hour	1 point of station construction sites*1. (Total 12 point) 4 times / year (Total 24 times in 6 years)	Contractor/Consultant of supervision
6 Vibration Monitoring	La (dB), Acceleration (m/s <sup>2</sup> ) 16 hours / day Measuring 3 times per hour	1 point of station construction sites*1 (Total 12 point) 4 times / year (Total 24 times in 6 years)	Contractor/Consultant of supervision
7 Biota and ecosystem	Monitoring whether impacts to wildlife around the construction site.	Construction site as required	Contractor/Consultant of supervision
8 Land Contamination monitoring	Check the maintenance of construction machine.	Construction site as required	Contractor/Consultant of supervision
9 Occupational Health Monitoring	Opinion or complaint of construction worker	Construction site 4 sessions / year (Total 24 sessions in 6 years)	Contractor/Consultant of supervision
10 Involuntary resettlement, Poor	Hiring implementation RAP	Whole through D/D stage.	RVNL/HSRC, local government. RAP Implementation



	Consultant (NGO) Monitoring by internal and external monitoring agency	Whole through construction stage.	Consultant (NGO)
11 Social Aspects	Opinion or complaint of residents near the construction site	Construction site as required	Contractor/Consultant of supervision
12 Misdistribution of benefits and damages	Opinion or complaint of residents near the construction site	Construction site as required	Contractor/Consultant of supervision
13 Local conflicts of interest	Opinion or complaint of residents near the construction site	Construction site as required	Contractor/Consultant of supervision

Note: \*1 The vicinity of the planned HSR station were selected as monitoring points because there are many habitants near planned HSR station and the areas could be judged as susceptible areas.

Source: Study Team

**Table 6.4.2: EMP in Operation Stage**

Environmental Indicator	Method/Parameters	Location, Quantity and Frequency	Responsible agency
1 Noise Monitoring	Leq ,Lmax(dBA) 16 hours / day	1 point of station site <sup>*1</sup> . (Total 12 point) 2 time / ( Commissioning / after opening )	HSRC
2 Vibration Monitoring	La (dB), Acceleration (m/s <sup>2</sup> ) 16 hours / day	1 point of station site <sup>*1</sup> . (Total 12 point) 2 time / ( Commissioning / after opening )	HSRC
3 Waste Management	Inventory record of waste disposal	Every stations and Depot	HSRC
4 Biota and ecosystem	1. Monitoring whether impacts to wildlife around the construction site or not. 2. Implementation of regular monitoring of transplanted trees.	1. Arbitrarily around the planned HSR route 2. Site of transplanted	HSRC
5 Restoration of Livelihood	Monitoring by external monitoring agency	1 <sup>st</sup> monitoring: within 6 months after resettlement is completed. 2 <sup>nd</sup> monitoring: within 1 year from 1 <sup>st</sup> monitoring 3 <sup>rd</sup> monitoring: within 2 years from 3 <sup>rd</sup> monitoring	External monitoring consultant
6 Social Institutions	Monitoring by external monitoring agency	1st monitoring: within 6 months after resettlement is completed. 2nd monitoring: within 1 year from 1st monitoring 3rd monitoring: within 2 years from 3rd monitoring	External monitoring consultant



7 Indigenous or ethnic minority	Monitoring by external monitoring agency	1st monitoring: within 6 months after resettlement is completed. 2nd monitoring: within 1 year from 1st monitoring 3rd monitoring: within 2 years from 3rd monitoring	External monitoring consultant
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Note: \*1 The vicinity of the planned HSR station were selected as monitoring points because there are many habitants near planned HSR station and the areas could be judged as susceptible areas.

Source: Study Team

The Site Engineer (SE) shall report regarding compliance of the EMP and other environment related issues by concerned stakeholders to SEMU in his periodic progress report for reviewed by SEMU during the construction stage. Periodic one in a month report of the SE shall indicate clearly regarding the compliance of environmental provisions by Contractor. Contractor's failures to implement the environmental provisions are to be reported to SEMU regularly with request for action. Incidents of contamination or pollution due to Contractor's activities whether due to negligence or otherwise are to be mentioned in periodic reports.

## 6.5 Cost for Implementation of EMP

Table 6.5.1 and Table 6.5.2 show approximate costs for implementation of the EMP. Detailed cost should be estimated in preparation of the Environmental Management and Monitoring Plan in the Engineering Consultancy Service stage.

**Table 6.5.1: EMP Costs in Pre-construction/Construction Stage**

Monitoring Item	Tentative Unit Cost (INR)	Unit	Quantity	Methodology	Cost (INR million)
1 Air quality monitoring	10000	location	288	4 times x 6 years x 12 locations (Station construction site)	2.88
2 Water quality monitoring (River water)	20000	location	1368	12 times x 6 years x 19 locations (Major river)	27.36
3 Monitoring for tunnel drainage	20000	location	216	12 times x 6 years x 3 locations (Urban and Under sea tunnel vents)	4.32
4 Noise Monitoring	5000	location	288	4 times x 6 years x 12 locations (Station construction site)	1.44
5 Vibration Monitoring	15000	location	288	4 times x 6 years x 12 locations (Station construction site)	4.32
6 Occupational Health Monitoring	100000	session	24	4 sessions a year x 6 years	2.40
7 Involuntary resettlement, base line data survey etc.		lump sum	1	15 % of Resettlement & Rehabilitation cost: 725.315 x 15%	108.80
Sub-Total					128.96

**Table 6.5.2: EMP Costs in Operation Stage**



Monitoring Item	Tentative Unit Cost (INR)	Unit	Quantity	Methodology	Cost (INR million)
1 Noise Monitoring	5000	location	24	2 time x 12 locations	0.12
2 Vibration Monitoring	15000	location	24	2 time x 12 locations	0.36
Sub-Total					0.48

## 6.6 Approvals/Clearances Requirement

On the basis of baseline study and identified negative impacts, issues like tree cutting, Construction in the CRZ etc needs necessary approvals/clearance from the relevant concerned authorities. PMU will ensure that all necessary approvals/clearances are in place before implementation. Before commencement of the construction the necessary permission required for the project is given in Table 6.6.1. Incidentally, several approvals flowed on Chapter 2 approval schedule is shown on Table 6.6.2.

**Table 6.6.1: List of Place necessary to clearance**

No.	Clearance	Name of Place	Chainage (in km)	State/District
1	CRZ	Thane Creek*1	6.98-15.22	Maharashtra/Mumbai
2		between Gaskopari and Tembhikhodave	71.20-75.40	Maharashtra/Mumbai
3	RF	Vadghar Reserved (Forest & Open Jungle)	35.43-45.35	Maharashtra/ Thane
4		Sarjmori Reseved (Forest & Open Jungle)	50.67-54.61	Maharashtra/ Thane
5		Sativli (Reserve Forest)	55.20-59.00	Maharashtra/ Thane
6		Khairpada (Forest & Open Jungle)	65.54-67.26	Maharashtra/ Thane
7		Kasarali (Forest & Open Jungle)	69-64-71.31	Maharashtra/ Thane
8	Permission for felling of trees*2	Along Alignment Around the station planned construction site Depot	0.00-507.9	All district proposed route passes

Note: \*1 Relevant section will not be modified in order to adopt the tunnel structure.

\*2 The required total area of forest cutting is expected to be approx. 115 ha.

Source: Study Team



[illegible]



## **6.7 Form of Monitoring**

The monitoring form proposed that use in the EMP reporte below.

The reference standard is based on Indian law but there is no reference for noise and vibration in India, the "Referred International Standards" is provide as a reference standards. However it is necessary to determine the standard for noise and vibration of HSR after-service in future India.



The latest results of the below monitoring items shall be submitted to the PIU as a part of Monthly Progress Report throughout the construction phase.

1. Response/Actions to Comments and Guidance from Governmental Agencies and Public

Monitoring Item	Monitoring Result during Report Period
Number and contents of formal comments made by the public	
Number of contents of responses from Government agencies	

2. Air Quality

Item	Unit	Measured Value (Mean)	Measured Value (Max)	Indian Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method)
SO <sub>2</sub>	µg/m <sup>3</sup>			80 (24h)		
NO <sub>2</sub>	µg/m <sup>3</sup>			80 (24h)		
PM <sub>10</sub>	µg/m <sup>3</sup>			100 (24h)		

3. Water Quality

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Indian Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method)
pH	-			5.5 to 9.0		Discharge to a river
SS	mg/l			100		Ditto
Oil and Grease	mg/l			10		Ditto
Total Coliform	MPN /100ml				Should not be detected during 100ml	Ditto
Temperature						Ditto

4. Waste

Monitoring Item	Monitoring Result during Report Period
Inventory record of waste disposal (volume, methodology )	

5. Noise/Vibrations



# EIA Study for Mumbai-Ahmedabad High Speed Railway Corridor



Item	Unit	Measure Value (Mean)	Measure Value (Max.)	Indian Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method)
Noise level	dB(Leq)			50 to 75 (day)		General house measured near by the site location The baseline will decide by each land usage.
Vibration level	dB					Receive all complaints

## 6. Land Contamination monitoring

Monitoring Item	Monitoring Results during Reporting Period					
Check the maintenance of construction machine						

## 7. Occupational Health Monitoring

Monitoring Item	Monitoring Results during Reporting Period					
Opinion or complaint of construction worker						

## 8. Involuntary resettlement, Poor

Monitoring Item	Monitoring Results during Reporting Period					
Hiring RAP implementation Consultant (NGO) Monitoring by internal and external monitoring agency						

## 9. Social Aspects

Monitoring Item	Monitoring Results during Reporting Period					
Opinion or complaint of residents near the construction site						

The latest results of the below monitoring items shall be submitted to the PIU / HSRC as a part of Monthly Progress Report throughout the operation phase.

## 1. Response/Actions to Comments and Guidance from Governmental Agencies and Public

Monitoring Item	Monitoring Result during Report Period
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# *EIA Study for Mumbai-Ahmedabad High Speed Railway Corridor*



Number and contents of formal comments made by the public	
Number of contents of responses from Government agencies	

## 2. Noise/Vibrations

Item	Unit	Measure Value (Mean)	Measure Value (Max.)	Indian Standards	Referred International Standards	Remarks (Measurement Point, Frequency, Method)
Noise level	dB (Lmax, LAeq)				70 (Lmax) 60 (LAeq)	25m from the nearest track center, above the ground 1.2m Lmax is referring to the Japanese standard, LAeq is overseas HSR reference standards
Vibration level	dB				70 (Lmax)	25m from the nearest track center The reference to the Japan standard

## 3. Restoration of Livelihood

Monitoring Item	Monitoring Results during Reporting Period
Monitoring by external monitoring agency	



## Chapter 7

# Public Consultation & Disclosure

### 7.1 Introduction

Public consultation meetings offer an opportunity to people to participate in the decision making process leading to project design, development and its implementation. It provides a platform for the project affected persons and different stakeholders to express their views on possible impact of the proposed intervention on environmental and social parameters. Public and other stakeholder consultation has to be a continuous process throughout development of any infrastructure project, *i.e.*, during project preparation, implementation, and monitoring stages. Participatory planning in which public consultation plays a major role has a bearing on the sustainability of any infrastructure development project. Involuntary resettlement generally causes numerous problems for the affected population which can be reduced to a great extent if people are properly informed and consulted about the project and allowed to make meaningful choices or preferences. This serves to reduce the insecurity and opposition to the project which otherwise are likely to occur during project implementation. Keeping in mind the significance of consultation and participation of the people likely to be affected or displaced due to the proposed project, such activities were carried out during the entire socio-economic assessment process and preparation of this preliminary RAP draft. Public consultations are proposed to be held in two rounds; first during the primary socio-economic assessment or census and Inventory of Loss survey phase and the second upon preparation of the RAP document for disclosure purposes. Both formal and informal discussions were conducted with stakeholders during field visits from 04/12/2014 to 18/12/2014. During field visits consultations with key stakeholders were held to inform and discuss issues regarding nature of project and its features, impacts on account of land acquisition, loss of structures and policy frameworks governing project implementation, mitigation measures and related suggestions.

### 7.2 Project Stakeholders

The proposed High Speed Rail project has multiple stakeholders including the MOR, Govt. of India to Project Affected Families and Project Affected Persons. Relevant to stakeholder consultations, the following constitute the key stakeholders:

- Project Affected Persons/families<sup>1</sup>
- NGOs/CBOs: that are active and operational in the project affected area and may have opinion about the project and its impact on community
- Media: print and visual media that covers and reports in the project affected area and District Level Officials from revenue department, agriculture department, forest department, tribal development department, *etc.*

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<sup>1</sup>Refers to all those who stand to lose all or part of their physical and non-physical assets including homes, productive land, community resources, commercial properties; livelihood; and socio-cultural network and includes categories such as land losers, squatters and encroachers



Project affected persons/families are the primary stakeholders in the context of public consultations as they remain to be most affected by the project. Other stakeholders like the local media and the NGO/CBOs also hold significance as they may be the repositories and representative of collective knowledge and voice of the affected communities. The district level officials for this project are from various line departments that exercise its official jurisdiction over matters such as land and property, livelihoods, natural resources such as forest etc. and that which will be impacted by project implementation. Departments of land and revenue, agriculture, forest, tribal welfare are relevant departments in this instance. Consultations with these departments are also significant as it would provide critical inputs on aspects of availability of land, land acquisition and R&R processes and policies that can be integrated to develop an appropriate RAP. Hence, public consultations held for this project invariably sought participation from all the above four stakeholder categories.

### **7.3 Approach, Methodology of Consultation**

Detailed and extensive consultations were carried out during base-line and socioeconomic survey stage held with various sections of affected persons such as traders, women, squatters, kiosks and other inhabitants. These consultations were held at all level with representation from prospective Project Affected Persons (PAP) and officials from key Government department. Objective of such consultations were to inform affected persons about the project, its features (such as nature of physical constructions, alignment etc.), expected impacts, policies that govern project related land acquisitions and R&R benefits such as compensation, income restoration, employment generation, information flow, grievance redress etc. This report incorporates all issues raised during public consultation and recommends institutional strengthening measures in response to issues raised. The following methods were adopted for conducting public consultation:

- Informal individual/group consultation during the course of census and IOL survey by the field surveyors that informed the PAPs about the project, purpose of survey and clarifications on their queries
- In-depth individual interviews/discussion with key informants from community, opinion leaders and from the government departments
- District level stakeholders meetings with the affected families and district officials

While the first two of the approaches qualify more of an informal approach, the district level public consultations were organized in a more formal setting. Formal stakeholder meetings were held at district level. One such meeting was organized in each of the project affected districts, keeping in view that the project is still at its feasibility assessment stage. A more detailed exercise will be taken up at later stage, once the project is conceptualized and formal go ahead is given by the Ministry of Railways, inviting all PAPs and the event organized at village/taluka level or as per directions from the project proponents. The methodology adopted for conducting district level consultations included the following sequence of activities:

- **Informing all PAPs in advance** (during the census survey) about proposed stakeholder meeting at district level. The PAPs were informed about the purpose of such meetings; in a way also ensuring the proposed SHMs



- observed the principle of Free, Prior and Informed Consultation.
- **Identifying suitable venues** for the meeting. These venues (at district headquarters) were chosen in a way so that they can be easily traced and reached by the district officials and the PAPs/PAFs coming from various villages.
  - **Formal Invitation to participants** for the meeting. Participants included both the project affected persons and district officials from key line departments such as revenue, agriculture, forest, social welfare and tribal welfare. Invitation to district officials was sent through formal letter and sent in about 5-6 days in advance. Further follow up was done either through direct physical visit to their offices or over phone calls on day (or a day prior to) of the meeting. Such visits also provided the opportunity to brief district officials about the project and the objective of the proposed public consultations.

Keeping in view the stage (*i.e.* project feasibility study) that this project is in, public consultation was conducted on a limited scale<sup>2</sup>; involving a sample representative of project affected persons. Participants were identified and invited from randomly selected affected households from at least 8-10 villages spread along the proposed alignment in the district. On an average 50-60 participants were approached both over phone (contact number were collected during and through direct communication (by visiting to village/households), with 20-35 persons turning up on the event day. The procedure followed ensured that participants represented the geography and socio-economic strata of the project affected population.

- **Stakeholder Consultation/Meeting** at district level that included formal power point presentation before the participants followed by open discussion and clarifications around queries and concerns raised by event participants. The event on average lasted for 2 hours (11 AM to 1 PM).

Proceedings of the stakeholder meetings were recorded both on paper. In addition, video recordings of all events have also been prepared. In addition to the public consultations (discussed above), separate discussions (outcomes discussed later in this chapter) were done with district officials to get further insight on their perception and recommendations on various aspects related to project implementation.

Following sections summarizes outcomes of various stakeholder consultations held, inputs obtained from participants.

## **7.4 Disclosure and Public Consultation**

Detailed and extensive consultations were carried out during base-line and socioeconomic survey stage held with various sections of affected persons such as traders, women, squatters, kiosks and other inhabitants. These consultations were held at all level with representation from prospective PAPs and officials from key Government department. Objective of such consultations were to inform affected persons about the project, its features (such as nature of physical constructions, alignment etc), expected impacts, policies that govern project related land acquisitions

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<sup>2</sup>A more detailed exercise will be taken up post submission of feasibility report and upon finalization of the alignment and formal sanctioning of the project by the government. Such an event would invite participation from all affected households and be organized at village/taluka level (or as per directions from project proponents).



and R&R benefits such as compensation, income restoration, employment generation, information flow, grievance redress etc. This report incorporates all issues raised during public consultation and recommends institutional strengthening measures in response to issues raised. The following methods were adopted for conducting public consultation.

- Informal individual/group consultation during the course of census and IOL survey by the field surveyors that informed the PAPs about the project, purpose of survey and clarifications on their queries
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While the first two of the approaches qualify more of an informal approach, the district level public consultations were organized in a more formal setting. Formal stakeholder meetings were held at district level. One such meeting was organized in each of the project affected districts, keeping in view that the project is still at its feasibility assessment stage. A more detailed exercise will be taken up at later stage, once the project is conceptualized and formal go ahead is given by the MOR, inviting all PAPs and the event organized at village/taluka level or as per directions from the project proponents. The meetings witnessed participation from project affected persons, representatives from district level departments and local NGOs, details of which are provided in the table below:

**Table 7.1: Primary Details of District Level Consultations**

S. No	Date	District	No. of Participants*	Representation from District Department**
1	04.12.14	Navsari	20 (5)	Deputy Collector (Land Acquisition), Navsari
2	05.12.14	Surat	15 (1)	Mamlatdar, Surat City, Head Clerk, District Agriculture Office
3	06.12.14	Valsad	30 (0)	Deputy Collector, Valsad
4	06.12.14	Dadar and Nagar Haveli	6 (0)	
5	08.12.14	Palghar	22 (3)	SDO&SDM, Palghar
6	10.12.14	Thane	28 (0)	
7	12.12.14	Vadodara	18 (2)	Special Land Acquisition Officer and Deputy Mamlatdar
8	15.12.14	Bharuch	15 (0)	
9	16.12.14	Anand	21 (0)	
10	17.12.14	Kheda	27 (0)	District Agriculture Office
11	18.12.14	Ahmedabad	96 (21)	

Source: Stakeholder Meetings Attendance Register, 2014

\* No. in parenthesis denote female participants present in the meeting

\*\* In addition to the above, in 2 districts there was representation from local NGOs (Adivasi Ekta Parishad, Palghar, Conservation Action Trust, and Mumbai. Local Media presence was also observed in Navsari stakeholder consultation



For the purpose of consultations, conscious effort was made to ensure higher representation of women, amongst the project affected persons. Parallel to the district level stakeholder consultations, meetings were also held with various department officials in their offices in each of the districts. The objective of these meetings was to seek valuable inputs from relevant district offices on issues around land acquisition and R&R policies and practices and their perception vis-à-vis HSRC, likely challenges and suggestions in these respects. The table below mentions list of officials met for discussion during the consultation exercise.

These consultations were used as the platform for dissemination and disclosure of key information on the project such as the proposed route alignment, affected villages, brief on infrastructures to be constructed, applicable laws and policies on land acquisition and R&R activities etc. It also provided a snapshot of affected population perception about, project, concerns and suggestions with respect to proposed alignment and existing policies and practices on land acquisition and R&R. The box below presents outline of a typical consultation event held in one of the project districts.

**Stakeholder Meeting: Content Outline**

1. Welcome and Registration of the participants
2. Sharing of objective of the meeting that were
  - To brief potential stakeholders about proposed High Speed Passenger Railway
    - About track route
    - Type of construction
  - Brief about various stages/processes associated with an infrastructure project of such nature
  - To collect stakeholder perception, concerns, opinion and suggestion and share with project proponents
    - About Impacts and its mitigation
    - About possible land acquisition process
    - About R&R policy and process
3. Brief about the project: Sharing the proposed alignment (on google earth), list of major towns, villages etc. falling along the alignment, types of construction involved (bridges, viaducts, tunnel etc.)- *participants were informed that project is currently at feasibility assessment stage*
4. Project Cycle: Briefing on various stages/milestones associated with infrastructure projects of this nature. Informing on various stages that this project will pass through till its closure. These typically include project conceptualization, pre-feasibility and feasibility studies, project finalization and DPRs, Detailed SIA and EIA, systematic R&R and Land Acquisition related activities, project construction and subsequent closure activities- *Participants were informed that JICA/World Bank policies would influence R&R activities under this project.*
5. Current project status: Progress status of the project in the chain of activities/millstones
6. Key features of R&R policies of JICA (including concept of cut-off date)
7. Project related opinions/suggestions and concerns
  - About Impacts and its mitigation
    - What are these (positive and negative) and how?



- Who will be most impacted if they are?
  - How best these can be mitigated considering project significance
  - About applicable land acquisition process
  - Opinion and suggestions
  - About R&R policy and processes
  - Suggestions on type of assistance and support (besides compensation)
  - Institutional and implementation arrangements
  - Any other suggestions?
8. Thanks and Meeting Closure (with refreshment and tea)

The consultative meeting has brought forth viewpoints and suggestions from the stakeholders relating to change of proposed alignment to minimize impact, use of existing surplus of land with railways, aligning it with DFC alignment and proposed road express ways, construction of over bridges, compensating loss with prevailing market rates, minimizing impact on livelihoods, barricading of the proposed line to avoid tress-passing, possible places for construction of over bridges, railway gates, and most importantly the need for greater engagement and participation of affected families in decision making processes specifically the HSR alignment. The detailed outcome of the meeting is discussed in the section following.

## 7.5 Outcome of Stakeholders Meeting

As discussed in the previous section 11 district level meetings have been organized to understand perceptions, concerns and suggestions of affected persons and the local officials. In this section we are presenting the summary of outcome from these meetings. Table 7.2 summarizes the discussion held at various district level consultations.

**Table 7.2: Summary of District Level Consultations**

Sl No	Districts	Key Outcomes/Concerns/Suggestions from Meeting
1	Navsari	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ Alignment should consider avoidance of impact to religious structures, open/dug wells, to the extent possible; Participants also identified a school in Manekpur village, having historical importance and requested for route alignment in a manner that avoids damage to it.</li> </ul> <p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ Most of the participants belong to farming communities and hence acquisition of their farm land will impact their livelihoods. Government should therefore consider land against land for compensation</li> </ul> <p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Compensation for land acquisition should be done at more than the market rate.</li> <li>➤ Disbursement of compensation should be done within a reasonable time;</li> <li>➤ Sufficient advance notice should be served to affected families to enable them to shift affected structures.</li> <li>➤ People have already lost their land under various government projects in the past. Further, they have not received adequate compensation for their losses hence requested for minimizing land acquisition.</li> </ul> <p><i>Others</i></p> <ul style="list-style-type: none"> <li>➤ The ADM present in the meeting summed it up saying that people would not object to land acquisition, if proper and adequate compensation is provided to them. The participants, most of them agreed to the statement made!</li> </ul>



2	Surat	<p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ Safety should be the first priority during construction and operation of the project.</li> </ul> <p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ Width of land for HSR Track should be reduced to minimize land acquisition.</li> <li>➤ Flyovers / under passes should be constructed near important crossing especially near school and temples.</li> </ul> <p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Compensation for affected land and structures should be provided more than the prevailing market rates. Market rates should not be decided as per the circle rate/stamp duty register (<i>Jantri rate</i>) and fresh market value assessment should be done by the government before acquiring land.</li> <li>➤ In addition to the compensation for loss of land and assets, MOR/GOI should give priority to affected households for jobs in government departments in accordance with the qualification of the candidate.</li> <li>➤ All shop keepers should be rehabilitated by constructing market complex in nearby area. Compensation should be given for loss of land and structures.</li> <li>➤ Most of the business persons of village Chhedcha and Antroli were of the view that they would prefer to relocate their shops at Surat for which adequate support shall be provided by the project.</li> <li>➤ Disbursement of money should be done before the commencement of civil works; advance notice period should be served to the PAF.</li> </ul>
3	Valsad and Dadra and Nagar Haveli	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ Participants suggested that alignment should be redesigned or should be underground to avoid dismantling of any structures or acquisition of land so as to minimize impact on their livelihoods.</li> <li>➤ Existing vacant land at Valsad District should be used for station instead of commercial and residential land of local people.</li> </ul> <p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ Majority of the villagers are dependent on agriculture for their livelihood and hence loss of agriculture land will have adverse impacts on their livelihood.</li> </ul> <p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Affected persons should be duly consulted before finalization of options for rehabilitation and resettlement.</li> </ul> <p><i>Others</i></p> <ul style="list-style-type: none"> <li>➤ Participants also strongly recommended for organizing meetings at village level rather than at the district level for ensuring larger participation. Some of the stakeholders resisted the proceeding in the consultation and remarked all affected people should be invited for consultation about the project and allowed to make meaningful choices or preferences. It was though explained to them such an exercise will be conducted once the project gets finalized.</li> <li>➤ Participants also asked for presence of MOR representative in such consultations in future</li> </ul>
4	Palghar	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ Participants opposed the proposed route alignment as it will result in considerable damage to residential structures (particularly in Vasai taluka in Mumbai suburbs) and homestead land and requested re-consideration of the same.</li> <li>➤ Existing vacant land should be used for infrastructure creation rather than acquiring additional commercial and residential land.</li> </ul> <p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ Project area (specifically in Talasari and Dahanu taluka) is mainly inhabited by tribal population. Most of the participants (from tribal community) vehemently shared their opposition to the project saying that they solely depend on farming for livelihoods and hence any acquisition of their farm land will impact their livelihoods. Alternatively they should be provided land against land.</li> </ul> <p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Participants requested for similar consultations to be held at village level, allowing all affected persons to participate in the meeting.</li> </ul>



		<ul style="list-style-type: none"> <li>➤ One of the PTGs named Katkari is living in the area, so their needs and livelihood security need to be protected.</li> <li>➤ People expressed the view that most of the area of Palghar district is coming under PESA rule wherein panchayat's written permission is required to take up any kind of work.</li> <li>➤ Participants believe that there are separate rights for indigenous people who protect them from projects that may have adverse impact and such an eventuality the projects cannot come up.</li> </ul> <p><i>Others</i></p> <ul style="list-style-type: none"> <li>➤ They fear that many other industrial and infrastructure projects are coming up in future in this district and most of the people from this area will be relocated which is not a sustainable way of development. The participants also shared that people have already given them land for ongoing Expressway (Road) in the district.</li> <li>➤ One of the participants also expressed his displeasure, recalling a past instance where 4000-6000 acre of land was acquired in Dabtari village for dairy project, resulting in massive displacement. Later the project failed and the land instead of being returned to farmers was sold for some other project at a higher price.</li> </ul>
5	Thane/ Mumbai	<p><i>On Alignment and Structure and Impact</i></p> <ul style="list-style-type: none"> <li>➤ Rajiv Puri (Territory Manager, BPCL) - BPCL has started a company owned petrol pump at BKC which caters to around 2600 vehicles with 8000 lt. petrol/diesel per day. Hence any relocation of the petrol pump will also affect the local population. Company representative also shared that many of their petrol pumps have been closed due to litigation and finding a suitable place in such places is extremely difficult.</li> <li>➤ Indian Corporation, a private company has warehouse structures in 754 acre and 117 acre plots in Bhiwandi and requested for minor realignment of the track to spare the infrastructure. The affected parties are willing to allow viaducts to pass over vacant land parcel owned by them however, a minor realignment will spare damage to the physical infrastructure</li> <li>➤ In Vasai common ground for large residential areas is being affected by the prospective alignment and hence realignment is requested.</li> <li>➤ In Kaman proposed track alignment is cutting the infrastructure of Siddhi Press diagonally which will result in loss of structure and livelihoods. Shall be compensated appropriately at market rate.</li> <li>➤ In Shilphata, Datta Mandir, a 200 year old temple is being affected by the proposed alignment. Also a lot of residential structure will be affected if the proposed alignment is finalized. Participants have suggested an alternative line to avoid this loss- The proposed route can be via Nilgegaon and Daighar which will minimize the impact and thus save government's money on compensation</li> </ul> <p><i>Others</i></p> <ul style="list-style-type: none"> <li>➤ Sufficient land has already been acquired for the proposed express highway between Mumbai – Ahmedabad. Participants requested if the proposed high speed railway line can use this already acquired land.</li> </ul>
6	Vadodara	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ Proposed track alignment should be parallel and along the Dedicated Freight Corridor.</li> <li>➤ Inverted “S” shape alignment near Chhani (on northern outskirts of Vadodara) is very sharp, which may not be technically feasible.</li> <li>➤ Major physical structures (Rajpath Club hotel, Lalita Tower, etc.) around the Baroda railway station may be damaged if the proposed alignment is approved. Alternate option of underground track and station (tunnel structures) should be considered within the city should be considered.</li> </ul> <p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ There are many villages such as Sihor, Ikhriya, Berpur, Mezat, Khusipur and Kotwada which will face water inundation problem if the line is constructed as it would interfere with existing drainage pattern. Appropriate measures should be taken avoid such problems.</li> </ul>



		<p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Replacement cost should be given to PAFs including costs for both land and infrastructure. Acquisition benefits should also be given prior to land acquisition.</li> <li>➤ Large part of Ambika Vijaya Society near Chani, where 48 families are residing, will be affected. These families are living in row house tenement. Most of them have business within 2 km of radius of their place of living. Hence any involuntary relocation should provide them resettlement site around their business locations only. Similar issue was raised by residents of Shilalekh society.</li> <li>➤ All the acquisition should be done under the supervision of court.</li> </ul>
7	Bharuch	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ The proposed track alignment should be along the DFC line or the national highway as sufficient land has already been acquired for creation of these infrastructures, much of which remain unused.</li> </ul> <p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ Talkeswar Mahadev Temple in Telod village will be affected by the project. The temple is highly revered and place of high importance to the locals, as evident from the fact that village of its location too derives its name from the temple. Hence, the participants suggested that alignment would require to be changed, in absence of which the project will face vehement opposition from villagers and the matter would become sensitive. The villagers will also object to shifting of the temple as they consider the temple deity origin to be of natural creation and not manmade.</li> <li>➤ There is no land (of converted land use for residential purpose) available for constructing houses apart from their farmland and existing residential houses, the families would find it difficult to get new residential plot and construct their houses</li> <li>➤ People will also face difficulty in getting electricity connection for their farm bore wells which may be affected by the proposed project.</li> </ul> <p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Monetary compensation has to be provided at market value to people whose properties/assets are being affected by the proposed track.</li> <li>➤ Many of the affected are living in joint families while the ownership is with one person. Hence compensation should consider these complexities also and provide benefits to individual family units.</li> </ul>
8	Anand	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ Participants recognized the benefits and significance of the project. They however, suggested the alignment to be shifted along the express highway for expansion of which sufficient land has already been acquired.</li> <li>➤ Three over bridges will be required in Boriavi only as the proposed track is passing through 3 state highways- Chandra Nagar – Chaklasi, Samarkha – Sakti Nagar, Jivapara – Samarkha</li> </ul> <p><i>On LA and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ There are several commercial establishments (shops, marriage plots, etc.) that draw and depend on location advantage. These affected people should be compensated with equally sized land parcels and the cost of construction/ land development (at market value) and within 2 km of their existing structure.</li> <li>➤ People whose 60 percent or more land is likely to be acquired would prefer the entire land parcel to be acquired by the government.</li> <li>➤ Participants also wanted to know about the fate of wells (irrigation resource) if the line passes between the well and agriculture land, making the irrigation source redundant.</li> </ul>
9	Kheda	<p><i>On Alignment and Structure and Impact</i></p> <ul style="list-style-type: none"> <li>➤ Participants suggested that the track should be shifted and taken along the express highway which has surplus land (acquired) by its side.</li> <li>➤ In Malataj (Also Sandra, Sanket, and Nenpur) village, the proposed track is passing between houses of the village and their farms. This will make it</li> </ul>



		<p>difficult for people to approach their farms. Hence foot Over Bridges should be provided at appropriate places.</p> <ul style="list-style-type: none"> <li>➤ The proposed track is crossing a number of important connecting roads such as Nenpur-Malataj, Memdabad-Kheda, Bavra-Kakatpura-Memdabad, Kheda-Mahuda, etc. As per the alignment as shown on the google earth imagery, the proposed track is an embankment type structure. The participants therefore suggested for bridges over these road crossings.</li> <li>➤ In Bavra village, the school and the dairy cooperative society will fall on the other side of the proposed track. These two places are frequently visited by the villagers and children and hence the proposed track will create lot of inconvenience. Further, there is no government land available in the village where the school can be relocated. Hence acceptable solutions and consideration must be made by government while executing this project.</li> <li>➤ In Degam village too, government school is being affected by the line and there are no alternative government land for its relocation.</li> <li>➤ Fencing of the line is suggested by the villagers to avoid accidents as this is high speed railway line and the response time (during crossing of the track) will be less.</li> </ul> <p><i>On Land and R&amp;R Policy, Process and Measures</i></p> <ul style="list-style-type: none"> <li>➤ Villagers of Bavra said that they should be given land and construction cost (as per market rate) should be given as compensation to the people whose house will be affected.</li> </ul>
10	Ahmedabad	<p><i>On Alignment and Structure</i></p> <ul style="list-style-type: none"> <li>➤ The track alignment should be such designed that it minimizes impact on residential and commercial structures.</li> </ul> <p><i>On Impact</i></p> <ul style="list-style-type: none"> <li>➤ Participants from Shahibaug area opined that both house (slum) and livelihoods will be affected.</li> <li>➤ People from Asarva Bridge/Fatwa Masjid said the affected people are mostly Muslims with poor economic status</li> </ul> <p><i>On Land and R&amp;R Policy and Process and Measures</i></p> <p>Shahibaugh area:</p> <ul style="list-style-type: none"> <li>➤ People in this area are mostly earning their livelihoods within a radius of 2 km therefore any relocation plan shall consider this fact so that their livelihoods are protected.</li> <li>➤ These people have been paying taxes for the places where they have been living, however they are not the owner of these houses rather their status in the receipt are shown as secondary occupant.</li> <li>➤ All the affected families from same locality shall be shifted to same place which is near to their present location.</li> <li>➤ They shall be given house against house not money and or land as relocation benefit.</li> </ul> <p>Asarva Bridge/Fatwa Masjid area</p> <ul style="list-style-type: none"> <li>• Families residing in houses that may be affected by the proposed line will be interested in cash compensation (at market rate) only as they fear that in case of relocation they may not be relocated in adjacent locality/preferred location.</li> <li>➤ There are a few people who have purchased houses recently but they do not have legal documents for ownership. Compensation and R&amp;R benefits should factor in these complexities as well</li> <li>➤ Most of the affected are slum dwellers whose livelihood activities/operations are based out in nearby areas only. Hence any relocation and resettlement should be done in areas in vicinity of their current residence only.</li> </ul>
<b>Source:</b> SHM December 2014		

### **Discussion with District Level Officials**



In addition to the public meetings held at district level, discussions were held with various district department officials. Discussions were focused on the existing policy and practices on land acquisition pertaining to projects of the nature of HSRC, challenges faced, suggestions and recommendations, perceived project impacts etc. Key discussion outcomes are summarized below:

**Key Challenges (as reported by district level department officials):**

- One of the key problems faced by the district implementing authority is the lengthy time frame in processing of proposals / issuance of notifications and disbursement of payment.
- Another important problem is non-availability of proper land records / very old records with land revenue department, resulting in challenges in establishing land ownership etc.
- Inadequate manpower at Block / District level to implement the land acquisition plan is another problem.
- Absence of policy for dealing with encroachers/squatters who have encroached/settled recently, establishing their period of occupation and estimation of compensation.
- Other expected challenges are on account of local resistance and subsequent law & order situation; non-standardization of procedures – varying with projects and state boundaries.

**Suggestions/Remarks**

- Alignment of the track should be shared with the district administration as soon as possible so that land can be earmarked by the town planning authority / development authority for this project purpose (opinion expressed in Bharuch).
- Specialized land acquisition department / agencies by State Governments may facilitate land acquisition process.
- Uniform R&R Policy in the country will be of immense help for infrastructure projects such as these that involve multiple States.
- Regular updating of land records, digitization, Data bank of land for public purposes, Maintenance of comprehensive and intelligent map database, Instant production of Cadastral maps of any scales, themes and sizes, etc. will be helpful in proper and smooth implementation of the RAP.
- MMRDA in Mumbai area has land reserve and related development plans of its own. Hence due consultation should be done before finalizing the alignment.

**Key SHM Outcomes and Its Reflection in RAP**

This RAP document has incorporated the viewpoints of participants from the SHMs and the State Department Officials. These are reflected in the entitlement matrix prepared and other R&R policy recommendations and the implementation arrangements suggested. Few important considerations in this context may be noted as:

- Preference will be given to ‘land for land’ based compensation approach ensuring that land parcel provided is of equal productivity/value.
- In cases where cash based compensation is adopted, replacement cost will be given to affected families.



- Relocation sites will consider preferences of affected families.
- Acquiring authority will acquire the whole of land parcel, in cases where a portion of affected land is orphaned because of acquisition.
- Land alignment will be reconsidered, in order to minimize project impact (physical structures in particular and sensitive receptors like temples, schools etc.). Adequate provision of foot over bridge, under passes or viaducts will be made to minimize impacts.
- Advance sharing of project alignment will be done with state administration for updating of land records. Grievance Redress Mechanism will also be set up timely to assist affected persons to resolve land record and ownership claim issues.
- Special consideration and assistance and consultation will be done with tribal communities in Palghar and Valsad and alternate design option/change may be considered to minimize land acquisition in these areas.
- Adequate advance notice will be given to affected families to allow them to salvage materials from affected structures and reorganize themselves.

## **7.6 Mechanism for Stakeholders Participation**

Consultations at this stage have clearly brought out the existing demand among the affected persons for greater participation and consultation during the design stage of the project. Such needs are recognized and recommended to be brought in to practice during the project roll out stage. Similar exercise will be carried out at a later stage for disclosure of RAP. It may be noted that this RAP document incorporates inputs received from public consultations held. Such public consultations are one of various options available to encourage stakeholder participation under the project.

Besides, the stakeholder consultations held for the RAP preparation and the one proposed for its disclosure, there will be several other mechanisms available for stakeholder participation. The list (but not limited to) enumerated in Table 7.3 identifies these.

**Table 7.3: Mechanism of Stakeholders Participation**

<b>Mechanisms/ Opportunities of Stakeholder Participation</b>	<b>Responsible Agency/ Stakeholder Agencies</b>
Census and SES (with queries on PAF perception and preferences for R&R options)	RAP preparation agency
Public Consultations (for RAP preparation)	RAP preparation agency
GRM	RAP Implementation Agency/ Local NGO/CBOs as vigilantes
Public Hearings (for environmental clearance purposes)	EIA preparation/Designated Agency
M&E related interface with Community	M&E agency
Additional Public Consultations (for further strengthening of existing RAP with information/ input from land losers, not included in this RAP)	Designated External Consultant



## **7.7 Disclosure of the RAP**

As discussed above, public/stakeholder consultations also provide the platform for disclosure of the RAP. This RAP document will be shared with stakeholders through district level meetings, post its finalization and approval. The purpose of the disclosure will be to inform project affected persons about the applicable policy and process of land acquisition and resettlement and rehabilitation under MAHSRC project, invite suggestions if any before finalization of the document. Local consultant will organize district level meeting for RAP disclosure where key elements of the RAP document will be shared through presentation, aided by a brochure, developed in local language.

## **7.8 Eligibility of Cut-Off Date**

The JICA policy recommends for declaring census survey date as the cut-off date for compensation and other R&R benefit claim purposes, projects where the host country does not have its own policy in place. In this project's context, the GOI and MOR have a policy in force as per which date of government notification issued under the RAA 2008 will be designated as the cut-off date for all purposes. All persons/families found to be residing or identified to be affected by the project as on or prior to cut-off date (to be established through census survey) will be eligible for compensation and R&R benefits as per the entitlement matrix developed.

## **7.9 Grievance Redressal Mechanism**

Efficient Grievance Redress Mechanism (GRM) will be developed to assist the PAPs resolve their queries and complaints that may pertain to issues around compensation, R&R benefits, project construction *etc.* All complaints will first be addressed to the filed level GR committee, and in unresolved cases, these may be taken forward to the committee setup at project level.







**Figure 7.1: Photographs of the Stakeholders Meeting**

The list of officials contacted during the field survey is presented in Table 7.4.

**Table 7.4: List of Officials Contacted**

Designation	District
Deputy Collector and Sub Divisional Magistrate	Navsari
Mamlatdar, Navsari City	Navsari
District Agriculture Officer	Navsari
Dy. Conservator of Forest	Navsari
Additional Collector (Land Reforms)	Surat
Dy. Conservator of Forest	Surat
District Agriculture Officer	Surat
District Statistical Officer	Surat
Collector & District Magistrate	Valsad
Resident Additional Collector & Additional District Magistrate	Valsad
Dy. Conservator of Forest	Valsad
District Agriculture Officer	Valsad
District Tribal Welfare Officer	Valsad
Collector & District Magistrate	Palghar
Resident Deputy Collector (Land Reforms)	Palghar
Dy. Conservator of Forest	Dahanu, Palghar
District Agriculture Officer	Palghar
District Tribal Welfare Officer	Dahanu, Palghar
Collector	Palghar
Sub Divisional Officer	Palghar
Tehsildar	Thane



Nayab Tehsildar	Thane
Resident Additional Collector (R.A.C.)	Thane
Additional District Magistrate	Vadodara
Deputy Mamlatdar and Special Land Acquisition Officer	Vadodara
District Agriculture Officer	Vadodara
Resident Additional Collector (R.A.C.)	Bharuch
District Agriculture Officer	Nadiad
Resident Additional Collector (R.A.C.)	Nadiad
Nayab Tehsildar	Nadiad
District Agriculture Officer	Anand
Resident Additional Collector (R.A.C.)	Anand



## **Appendix -I**



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## **A1-1 Guideline for declaration of Eco-Sensitive Zones around National Parks and Wildlife Sanctuaries**



Government of India  
Ministry of Environment and Forests  
(Wildlife Division)

Paryavaran Bhawan,  
CGO Complex, Lodi Road,  
New Delhi -110003.

F. No. 1-9/2007 WL-I(pt)  
Dated: 9<sup>th</sup> February, 2011

To,  
The Chief Wildlife Warden  
All States/Union Territories

Sub: Guidelines for Declaration of Eco-Sensitive Zones around National Parks and Wildlife Sanctuaries.

Sir

In pursuance to the decision taken by the National Board for Wildlife, all the States/Union Territory, Governments were requested for forwarding site specific proposals for declaration of Eco Sensitive Zones around National Parks and Wildlife Sanctuaries. Several reminders in this connection were also sent. Hon'ble Supreme Court had also take note of this decision had directed States/ Union Territory, Governments to forward proposals this Ministry. However, only very few States have forwarded proposals in this regard.

This Ministry after careful consideration, has therefore, decided to frame guidelines to facilitate the States/Union Territory, Governments for declaration of Eco-Sensitive Zones around National Parks and Wildlife Sanctuaries. Kindly find enclosed a copy of the said Guidelines. It is requested to kindly take necessary action in this regard at the earliest

Yours faithfully,



(Prakriti Srivastava)

Deputy Inspector General (WL)

Telefax: 01-24360704

E-mail: [digwl-mef@nic.in](mailto:digwl-mef@nic.in)

Encl: As above

Copy to:

1. Principal Secretary (Forests), all States/Union Territories.
2. Principal Chief Conservator of Forests, all States/ Union Territories.
3. NIC Cell- with a request to upload the enclosed guidelines on the official website of MoEF.



# **GUIDELINES FOR DECLARATION OF ECO- SENSITIVE ZONES AROUND NATIONAL PARKS AND WILDLIFE SANCTUARIES**



**GOVERNMENT OF INDIA  
MINISTRY OF ENVIRONMENT AND FORESTS**

1



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**GUIDELINES FOR DECLARATION OF ECO-SENSITIVE ZONES AROUND  
NATIONAL PARKS AND WILDLIFE SANCTUARIES**

\*\*\*\*\*

**1. Background:**

**1.1. IBWL Decision:**

**1.1.1** During the XXI meeting of the Indian Board for Wildlife held on 21<sup>st</sup> January 2002, a 'Wildlife Conservation Strategy-2002' was adopted wherein point no.9 envisaged that "lands falling within 10 Kms of the boundaries of National Parks and Sanctuaries should be notified as eco-fragile zones under section 3 (v) of the Environment (Protection) Act and Rule 5 Sub rule (viii) & (x) of the Environment (Protection) Rules."

**1.1.2** The Additional Director General of Forests (WL), vide letter dated 6<sup>th</sup> February 2002, had requested all the Chief Wildlife Wardens for listing out such areas within 10 Kms of the boundaries of National Parks and Sanctuaries and furnish detailed proposals for their notification as eco-sensitive areas under the Environment (Protection) Act, 1986.

**1.1.3** In response, some of the State Governments had raised concern over applicability of the 10 Kms range from the Protected Area boundary and informed that most of the human habitation and other areas including important cities in these States would come under the purview of eco-sensitive zone and will adversely affect the development.

**1.2. National Wildlife Action Plan (2002-2016)**

**1.2.1** The National Wildlife Action Plan (NWAP) 2002-2016 indicates that *"Areas outside the protected area network are often vital ecological corridor links and must be protected to prevent isolation of fragments of biodiversity which will not survive in the long run. Land and water use policies will need to accept the imperative of strictly protecting ecologically fragile habitats and regulating use elsewhere."*

**1.2.2** The Action Plan also indicates that *"All identified areas around Protected Areas and wildlife corridors to be declared as ecologically fragile under the Environment (Protection) Act, 1986."*

**1.3. Decision of National Board for Wildlife:**

**1.3.1** Considering the constraints communicated by the states, the proposal was re-examined by the National Board for Wildlife in its 2<sup>nd</sup> meeting held on 17<sup>th</sup> March 2005 and it was decided that the '**delineation of eco-sensitive**



zones would have to be site specific and relate to regulation, rather than prohibition, of specific activities'. The decision was communicated to all the State Governments for compliance vide letter dated 27<sup>th</sup> May 2005. Thereafter, it was further communicated with subsequent reminders.

#### **1.4. Hon'ble Supreme Court's decision:**

1.4.1 A Public Interest Litigation was also filed by the Goa Foundation vide their Writ Petition No. 460/2004 before the Hon'ble Supreme Court regarding the issue of declaration of eco-sensitive zones.

1.4.2 Vide their order dated 4<sup>th</sup> December 2006, Hon'ble Supreme Court had directed the Ministry of Environment & Forests to give a final opportunity to all States/Union territories to respond to the letter dated 27.5.2005 and that the State Governments send their proposals within four weeks, to the Ministry. It was also directed that all cases where environmental clearances were granted where activities are within 10 Kms zone, be referred to Standing Committee of NBWL.

## **2. Statutory Provisions**

2.1 *Section 5 C(1) of the Wildlife (Protection) Act, 1972 states that it shall be the duty of the National Board for Wildlife to promote the conservation and development of Wildlife and forests by such measures as it thinks fit.*

2.2 *Section 3 of the Environment (Protection) Act 1986 (EPA) gives power to the Central Government i.e. the Union Ministry of Environment and Forests to take all measures that it feels are necessary for protecting and improving the quality of the environment and to prevent and control environmental pollution. To meet this objective, the Central Government can restrict areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards [Section 3(2)(v)]*

2.3 *Section 5(1) of the Environment (Protection) Rules, 1986 (EPR), states that the central government can prohibit or restrict the location of industries and carrying on certain operations or processes on the basis of considerations like the biological diversity of an area (clause v) maximum allowable limits of concentration of pollutants for an area (clause ii) environmentally compatible land use (clause vi) proximity to protected areas (clause viii).*



### **3. Purpose for declaring Eco-Sensitive Zones:**

The purpose of declaring Eco-sensitive Zones around National Parks and Sanctuaries is to create some kind of “Shock Absorber” for the Protected Areas. They would also act as a transition zone from areas of high protection to areas involving lesser protection. As has been decided by the National Board for Wildlife, the activities in the Eco-sensitive zones would be of a regulatory nature rather than prohibitive nature, unless and otherwise so required.

### **4. Extent of Eco-Sensitive Zones:**

**4.1** Many of the existing Protected Areas have already undergone tremendous development in close vicinity to their boundaries. Some of the Protected Areas actually lying in the urban setup (Eg. Guindy National Park, Tamil Nadu, Sanjay Gandhi National Park, Maharashtra, etc). Therefore, defining the extent of eco-sensitive zones around Protected Areas will have to be kept flexible and Protected Area specific. The width of the Eco-sensitive Zone and type of regulations will differ from Protected Area to Protected Area. However, as a general principle the width of the Eco-sensitive Zone could go upto 10 Kms around a Protected Area as provided in the Wildlife Conservation Strategy-2002.

**4.2** In case where sensitive corridors, connectivity and ecologically important patches, crucial for landscape linkage, are even beyond 10 kms width, these should be included in the Eco-sensitive Zone.

**4.3** Further, even in context of a particular Protected Area, the distribution of an area of Eco-sensitive Zone and the extent of regulation may not be uniform all around and it could be of variable width and extent.

### **5. Need for guidelines:**

**5.1** As has been indicated vide para 1.4 above, Hon'ble Supreme Court has vide their order dated 4<sup>th</sup> December 2006 directed all the State/Union Territory Governments to forward proposals for declaration of eco-sensitive zones around its Protected Areas. However, only States like Haryana, Gujarat, Mizoram, Meghalaya, Assam, Goa have forwarded proposals. However, several other States/Union Territories have not come forward, perhaps for want of guidelines in this regard.

**5.2** In this context, it is pertinent to note here that Hon'ble Supreme Court vide their judgment dated 3<sup>rd</sup> December 2010 in the case relating to the construction of park at NOIDA near Okhla Bird Sanctuary filed by Shri Anand Arya & Anr vs. Union of India (I.A. Nos 2609-2610 of 2009) in Writ Petition (Civil) No. 202/1995, had noted that the State Government of Uttar Pradesh had not

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declared Eco-sensitive zones around its Protected Areas as the Government of India had not issued any guidelines in this regard.

**5.3** The Ministry of Environment & Forests had set up a committee under the Chairmanship of Shri Pronab Sen for identifying parameters for designating Ecologically Sensitive Areas in India. The said Committee had identified parameters for declaration of specific units of land/water etc as Ecologically Sensitive Zones based on parameters like richness of flora& fauna; slope; rarity & endemism of species in the area; origins of rivers etc. However, these parameters do not basically apply to the Eco-sensitive zones in the instant context, i.e around Protected Areas. In the instant case, the Eco-sensitive zones are meant to act as a “Shock absorbers”/ “transition zone” to the Protected Areas by regulating and managing the activities around such Protected Areas.

#### **6. The procedure to be adopted :**

**6.1** As has been indicated in the forgoing paras, the basic aim is to regulate certain activities around National Park and Wildlife Sanctuary so as to minimize the negative impacts of such activities on the fragile ecosystem encompassing the Protected Area. As a first step towards achieving this goal, it is a pre-requisite that an inventory of the different land use patterns and the different types of activities, types and number of industries operating around each of the Protected Area (National Parks, Sanctuaries) as well as important Corridors be made. The inventory could be done by the concerned Range Officers, who can take a stock of activities within 10 km of his range.

**6.2** For the above purpose, a small committee comprising the concerned Wildlife Warden, an Ecologist, an official from the Local Self Government and an official of the Revenue Department of the concerned area, could be formed. The said committee could suggest the:

- (i) Extent of eco-sensitive zones for the Protected Area being considered.*
- (ii) The requirement of such a zone to act as a shock absorber*
- (iii) To suggest the best methods for management of the eco-sensitive zones, so suggested.*
- (iv) To suggest broad based thematic activities to be included in the Master Plan for the region.*

**6.3** Based on the above, the Chief Wildlife Warden could group the activities under the following categories (an indicative list of such activities is attached as **ANNEXURE-1**):-

- (i) Prohibited*
- (ii) Restricted with safeguards.*
- (iii) Permissible*



6.4 Once the proposal for Eco-sensitive zones has been finalized, the same may be forwarded to the Ministry of Environment and Forests for further processing and notification. Here, it may be noted that, the State/Union Territory Forest Department could forward the proposals to the respective authority in the State Government with copy to the Ministry of Environment and Forests, as and when the proposals (even if it is for single Protected Area) are complete. An indicative list of details that need to be submitted along with the proposals is at **ANNEXURE-2**.

6.5 It is to mention here that in cases where the boundary of a Protected Area abuts the boundary of another State/Union Territory where it does not form part of any Protected Area, it shall be the endeavour of both the State/Union Territory Governments to have a mutual consultation and decide upon the width of the eco-sensitive zone around the Protected Area in question.

6.6 The State Government should endeavour to convey a very strong message to the public that ESZ are not meant to hamper their day to day activities, but instead, is meant to protect the precious forests/Protected Areas in their locality from any negative impact, and also to refine the environment around the Protected Areas. A copy of the notification of the Sultanpur Eco-sensitive Zone issued by the Ministry is attached herewith at **ANNEXURE-3** for reference and guidance.

7. These guidelines are indicative in nature and the State / Union Territory Governments may use these as basic framework to develop specific guidelines applicable in the context of their National Parks, Wildlife Sanctuaries, important corridors, etc. with a view to minimizing and preferably eliminating any negative impact on protected areas.

\*\*\*\*\*



**ANNEXURE-1**

**Identification of Activities**

While some of the activities could be allowed in all the eco-sensitive areas, others will need to be regulated / prohibited. However, which activity can be regulated or prohibited and to what extent, would have to be PA specific. A broad list of activities (this may need supplementation) which could be allowed, promoted, regulated or prohibited is given in the table below:

Sl. No.	Activity	Prohibited	Regulated	Permitted	Remarks
1.	Commercial Mining	Y			Regulation will not prohibit the digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing for personal consumption
2.	Felling of trees		Y		With permission from appropriate authority
3.	Setting of saw mills	Y			
4.	Setting of industries causing pollution (Water, Air, Soil, Noise, etc.)	Y			
5.	Establishment of hotels and resorts		Y		As per approved master plan, which takes care of habitats allowing no restriction on movement of wild animals
6.	Commercial use of firewood	Y			For hotels and other business related establishment

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7.	Drastic change of agriculture systems		Y		
8.	Commercial use of natural water resources including ground water harvesting		Y		As per approved master plan, which takes care of habitats allowing no restriction on movement of wild animals.
9.	Establishment of major hydroelectric projects	Y			
10.	Erection of electrical cables		Y		Promote underground cabling
11.	Ongoing agriculture and horticulture practices by local communities			Y	However, excessive expansion of some of these activities should be regulated as per the master plan
12.	Rain Water harvesting			Y	Should be actively promoted
13.	Fencing of premises of hotels and lodges		Y		
14.	Organic farming			Y	Should be actively promoted
15.	Use of polythene bags by shopkeepers		Y		
16.	Use of renewable energy sources			Y	Should be actively promoted
17.	Widening of roads		Y		This should be done with proper EIA



					and mitigation measures
18.	Movement of vehicular traffic at night		Y		For commercial purpose
19.	Introduction of exotic species		Y		
20.	Use or production of any hazardous substances	Y			
21.	Undertaking activities related to tourism like over-flying the National Park area by any aircraft, hot-air balloons	Y			
22.	Protection of hill slopes and river banks		Y		As per the master plan
23.	Discharge of effluents and solid waste in natural water bodies or terrestrial area	Y			
24.	Air and vehicular pollution		Y		
25.	Sign boards & hoardings		Y		As per the master plan
26.	Adoption of green technology for all activities			Y	Should be actively promoted.



**ANNEXURE-2**

**GENERIC INFORMATION TO BE INCORPORATED IN THE  
PROPOSALS FOR DECLARATION OF ECO-SENSITIVE ZONE  
AROUND PROTECTED AREAS**

**\*\*\*\*\***

- (i) Delineation of the physical boundaries on a topo-sheet with precise description in geographic terms together with a description of the significant features/attributes that would potentially qualify the area as eco-sensitive zone. A description of the boundaries along with the list of villages with exception and exemption in the delineated buffer zone area.
- (ii) An inventory of the existing legal status of rights, entitlements, privileges and obligations of the local communities.
- (iii) A description of bio-diversity values including bio-geographical representatives, endemism, species richness, geo-morphological characteristics, and unique land use practices including aesthetic and cultural values.
- (iv) A description of the resource base indicating the economic potential and livelihood implication for the people residing in and around the proposed eco-sensitive area.
- (v) An inventory of activities to be regulated and/ or prohibited in the proposed eco-sensitive zone.
- (vi) List of the protected areas for declaring eco-sensitive zone.

**\*\*\*\*\***



## **A1-2 Guidance document for taking up non forestry activities in wildlife habitat**

**Government of India  
Ministry of Environment and Forests  
Wildlife Division**

**Paryavaran Bhawan,  
CGO Complex, Lodhi Road,  
New Delhi-110003**

**F. No. 6-10/2011 WL  
Dated: 19 December 2012**

**Sub: Guidance document for taking up non forestry activities in wildlife habitats.**

Reference is invited to this Ministry's letter of even no. dated 15<sup>th</sup> March 2011 regarding the above mentioned subject. In this context, the undersigned is directed to mention that the matter has been discussed in great detail in the Ministry of Environment and Forests and the old guidelines have been reviewed in light of the existing provisions of laws and rules. It has been highlighted in the review that unless there is a clear legal delineation of elephant habitats and corridors, the implementation of the guidelines with respect to Elephant Reserves and corridors becomes very difficult. Therefore, the Wildlife Department is to work out a process by which these habitats acquire legal status. In the meanwhile, the revised guidelines, **annexed** to this letter, will be used as guidance for NBWL clearance for non-forestry activities are to be taken up in wildlife area.

2. It is clarified that while project proponents may simultaneously apply for Environment, Forest and NBWL clearances, in order to complete the formalities without undue delay, no rights will vest in or accrue to them unless all clearances are obtained. In other words, project proponents cannot rely upon the concept of *fait accompli*, if they have already received any of the clearances. The Environmental, Forest and NBWL clearances will all be processed on their respective merits, and the clearance of one aspect will not confer any right upon the project proponent. Complete clearance is obtained only when all the requisite clearances have been obtained by the Project Proponent. This approach would protect the integrity of the flora and fauna of the country, as well as bring in clarity and transparency in the issue of Environmental, Forest and NBWL clearance.

3. This is in supersession of the orders of even no. dated 15th March 2011, and any communication related to this document thereafter.

4. This issues with the approval of Hon'ble Minister of State (Independent Charge) for Environment and Forests.

  
(Vivek Saxena)

**Deputy Inspector General of Forests (WL)**

**Encl: Revised guidelines**

**Distribution:**

1. The Secretary, all Ministries/Departments of Government of India, New Delhi
2. The Chief Secretary, all States/Union Territories
3. The Pr. Chief Conservator of Forests, all States/Union Territories
4. The Chief Wildlife Warden, all States/Union Territories.

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**Copy to:**

1. PS to Hon'ble MEF
2. PPS to Secretary (E&F), MoEF
3. PPS to DGF & SS, MoEF
4. PPS to Addl. DGF(WL)/PPS to Addl. DGF(FC)/PPS to Member Secretary, NTCA
5. PPS to JS (I.A Division)/ PPS to IGF (WL)/PPS to IGF& Director, PE/PPS to IGF (FC)
6. The NIC Cell- with a request to kindly upload the same on the official website of the Ministry.



## **GUIDELINES FOR TAKING NON-FORESTRY ACTIVITIES IN WILDLIFE HABITATS**

**\*\*\*\*\***

### **1. General Policy:**

National Parks, Sanctuaries and Conservation Reserves are notified under the Wildlife Protection Act, 1972 as dedicated areas rich in, and representing the unique biodiversity of a place. Such protected areas are considered very important for conservation of biodiversity, and for ensuring the healthy populations of its floral and faunal components, for the present and future generations alike. However, the rising human population and its growing demands for socio-economic development put increasing stress on forests including protected areas both directly and indirectly. This calls for a balance that has to be struck between development and conservation implying that any activity involving use or diversion of any part of a notified protected area may be considered only under **most exceptional** circumstances, taking fully into account its impending impact on the biodiversity of the area, and consequently on the management of the Protected Area. A critical part of this balanced approach is to spell out the feasibility of mitigation to address the impacts without compromising the management objectives of the Protected Area. The activities to be taken up in the identified wildlife habitats also need to comply with the orders of the Hon'ble Supreme Court in addition to the statutory requirements as provided in the Wild Life (Protection) Act, 1972.

### **2. Scope:**

Measures to protect the wildlife and biodiversity in general include *inter alia*, notification of suitable wildlife habitats as Protected Areas (National Parks, sanctuaries etc.) under the Wild Life (Protection) Act (WLPA), 1972. Recommendations of the National Board for Wildlife (NBWL) are prescribed in the Act for regulating any activity inside such areas. Hon'ble Supreme Court through a number of orders has further made it essential to seek the recommendations of this advisory body for regulating activities in the adjoining areas to the Protected Areas. Protection of other forests is ensured through the Forest (Conservation) Act 1980 wherein, recommendations of the Forest Advisory Committee are prescribed for this purpose. Protected areas cover generally the known habitats of wildlife including important flagship species. Tiger Reserves represent specifically notified areas under the WLPA focusing on conservation of the charismatic big cat under the Project Tiger in view of the specially threatened status of this national animal. With a view to

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ensuring conservation of elephants, the national heritage animal, 'Project Elephant' is operational. Technical and financial assistance is provided by the Central Government for conservation of elephants in the designated elephant habitats in the country. But presently such habitats are not legal entities. Though many existing elephant habitats are part of the existing Protected Areas, a proposal for enabling notification of such important habitats as elephant reserves under appropriate legal provisions is also under consideration of the government in the Ministry of Environment and Forests. It is expected that once the legal provisions for declaration of elephant reserves is in place, such areas will also be included under the regulatory regime under Wild Life (Protection) Act 1972 as proper legal entities.

These guidelines prescribe the process of obtaining recommendations of the Standing Committee of NBWL under the Wild Life (Protection) Act 1972 with respect to the areas, for which this process is mandatory under the law, and also in compliance to relevant Hon'ble Supreme Court orders. These guidelines replace the guidelines dated 15.03.2011 issued earlier in this regard, along with all amendments made therein.

### **3. Activities inside Protected Areas:**

The process of consideration of any proposal for use of areas inside the protected areas, as a mandatory requirement under the present statutes, involves consideration and recommendation of the **National Board for Wildlife**. However, as the **Standing Committee of National Board for Wildlife** has been delegated the powers of the National Board for Wildlife, such cases are to be referred to the Standing Committee of National Board for Wildlife for consideration and recommendation. Details of such situations where such reference is warranted are described below:

#### **3.1 Activities inside Wildlife Sanctuaries:**

Section 29 of the Wild Life (Protection) Act, 1972 provides for the seeking the recommendation of the **State Board for Wildlife** (*a Board chaired by the State Chief Minister*) for any diversion of land or produce including water, etc. from a Sanctuary.

A per the proviso under Section 33 (a), no construction of commercial tourist lodges, hotels, zoos and safari parks can be undertaken inside a sanctuary except with prior approval of the Standing Committee of NBWL.

Further, in view of the directions dated 9<sup>th</sup> May 2002 of Hon'ble Supreme Court in Writ Petition (Civil) No. 337/1995, all such proposals in respect of a

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Sanctuary or a National Park also require Supreme Court's approval based on the recommendation of the **Standing Committee of National Board for Wildlife** (*a Committee chaired by the Minister in charge of the Ministry of Environment and Forests*).

### **3.2 Activities inside National Parks:**

Section 35 (6) of the Wild Life (Protection) Act, 1972 provides that the recommendation of the **National Board for Wildlife** (*a Board chaired by the Prime Minister*) is essential for any use or diversion of the habitat of any wild animal, or produce including water, etc. in a National Park.

This proviso is also applicable with respect to National Parks in view of Section 35(8) of the Act.

In the circumstances, any activity proposed within the boundaries of a National Park or Wildlife Sanctuary shall require the recommendation of the Standing Committee of NBWL, and the approval of the Hon'ble Supreme Court.

Section 33 (8) of the Wild Life Protection Act, 1972 provides that no construction of commercial tourist lodges, hotels, zoos and safari parks can be undertaken inside a National Park except with prior approval of the Standing Committee of NBWL.

### **3.3 Activities inside a Tiger Reserve:**

A Tiger Reserve notified under the provisions 38V (1) of WLPA may include an existing Protected Area or other forests (as the buffer areas). The Tiger Reserve, once notified gets conferred protection on par with a Wildlife Sanctuary under section 38V (2). Further section 38W makes it mandatory to obtain approval of Standing Committee of NBWL for any activity including alteration of boundaries of Tiger Reserves. Therefore, any proposal involving any area under the notified Tiger Reserve will also be governed by the relevant provisions applicable to the Wildlife Sanctuaries and therefore, will be referred to the Standing Committee of NBWL for consideration.

### **3.4 Activities inside Conservation Reserves:**

The Ministry of Law and Justice has opined that activities to be taken up inside a Conservation Reserve can also be dealt with in the Standing Committee of NBWL. Therefore, the procedure indicated under para 4 below needs to be followed for planning and executing any activity inside Conservation Reserve also.

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### **3.5 Activities in areas other than Protected Areas:**

In addition to the notified protected areas as described above, the consideration of the Standing Committee of NBWL has been prescribed in certain circumstances, which are listed below:

#### **3.5.1 Activities within 10 Kms from boundaries of National Parks and Wildlife Sanctuaries:**

In pursuance to the order of Hon'ble Supreme Court dated 4<sup>th</sup> December 2006 in Writ Petition (Civil) No. 460/2004, in case any project requiring Environmental Clearance, is located within the eco-sensitive zone around a Wildlife Sanctuary or National Park or in absence of delineation of such a zone, within a distance of 10 kms from its boundaries, the User agency/Project Proponent is required to obtain recommendations of the Standing Committee of NBWL.

#### **3.5.2 Activities within areas connecting the Tiger Reserves, notified by NTCA for controlling the land use as per section 38 O (g):**

Section 38 O (g) of the Wild Life Protection Act, 1972 entrusts the responsibility to NTCA to ensure that areas connecting Tiger habitats are not diverted for ecologically unsustainable habitats except in public interest and with the approval of NBWL. Proposals for any activities in such areas duly notified by NTCA, and recommended by it in accordance with these provisions, to be covered under such regulation will be permitted only after seeking recommendations of the Standing Committee of NBWL. Violation of this provision is required to be dealt with by the NTCA.

### **4. PROCEDURE TO BE FOLLOWED FOR CONSIDERATION OF PROPOSALS BY THE STANDING COMMITTEE OF NATIONAL BOARD FOR WILDLIFE:**

4.1 The User Agency/Project Proponent is required to submit the proposal in the prescribed proforma that has been prescribed by the Ministry of Environment and Forests, and is available on the website of the Ministry (<http://moef.nic.in/modules/others> to be filled in) (**Annexure-1**).



4.2 The prescribed proforma has **five** parts and each part is required to be filled in by the User Agency; concerned Divisional Forest Officer/Park Manager; Concerned Chief Conservator of Forests; Concerned Chief Wildlife Warden and the Forest Secretary.

4.3 The proforma also seeks information in detail on the biodiversity of the area in question; maps of the area, other activities already in place; possible impacts of the proposal, etc.

4.4 The User agency is required to submit Part-I and Part-II of the proforma duly filled in to the concerned Forest Officer, who in turn, forwards the same to the Chief Wildlife Warden through the Chief Conservator of Forest.

4.5 The Chief Wildlife Warden, after giving his specific comments on the proposal, shall forward 15 copies of the same to the Government of India, through the Forest Secretary **after obtaining the recommendation of the State Board for Wildlife on the proposal.**

4.6 The proposal so received from the State Chief Wildlife Warden will be placed before the Standing Committee of NBWL, chaired by Minister of State (I/C) Environment and Forests. The meeting of the Standing Committee is convened once in 2-3 months.

4.7 In cases where the area proposed for diversion is large and/or the impact of the project on wildlife is considered to be serious, site inspections may be conducted by the members of the Committee or further studies/ surveys may be conducted by experts on the instructions of the Standing Committee of NBWL.

4.8 The site inspection reports are generally considered in the next meeting of the Standing Committee to enable the Committee to make its recommendation.

4.9 After the Standing Committee of NBWL recommends the proposal, the User Agency/State Government is required to approach Hon'ble Supreme Court for final clearance in view of the Court orders dated 13.11.2000 .

*[Note: Hon'ble Supreme Court vide their order dated 13.11.2000 had directed that there shall be no dereservation/ denotification of National Parks and Sanctuaries without approval of the Supreme Court. Therefore, to take up any such activity, a clearance from Hon'ble Court is mandatory.]*



4.10 In case of Border Roads, proposals of the Ministry of Defense, a simplified proforma for simultaneous clearance under the Forest (Conservation) Act, 1980 and wildlife clearance is being adopted under 'A Single Window System'.

#### **5. PROPOSALS FOR SURVEY WORK TO BE CARRIED OUT INSIDE NATIONAL PARKS AND WILDLIFE SANCTUARIES:**

In case any kind of survey work and/or Environment Impact Assessment (EIA) studies, that is a prelude to future diversion of land, are to be taken up in areas involving a wildlife habitat, then also the entire procedure, as prescribed in paragraph 4 above would need to be followed.

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**ANNEXURE-1**

**FORMS**

(All documents to be submitted in triplicate and signed in Blue ink)



**PART I**

**Proposal for Investigation and Survey in the National Park / Sanctuary  
(Details to be provided by the Applicant)**

1. Name of the Organization
2. Aims and Objectives of the Proposed Project
3. Location and Map (1:50,000 scale) of the area duly authenticated by the competent authority to be investigated/ surveyed
4. Whether investigation/survey requires clearing of vegetation
5. If yes, please specify the extent (in Ha.)
6. Opinion of the Officer In Charge of the NP/ WLS (Attach signed copy)
7. Opinion of the Chief Wildlife Warden (Attach signed copy). The following be included in the opinion:
  - i) Brief history of the protected area
  - ii) Current status of wildlife
  - iii) Current status of pressures on protected areas.
  - iv) Projected impacts of projects on wildlife, habitat management and access/ use of resource by various stakeholders.
  - v) Contiguous wildlife areas which would benefit wildlife if added to national park/sanctuary.
  - vi) Other areas in the State which have been recommended by State Government, Wildlife Institute of India, BNHS, SACON, IISC, IUCN or other expert body for inclusion in protected area network.

Signed

Signed

Signed

Project Head  
Name  
Organization

The Officer In Charge of the NP/ WLS  
Office Seal

The CWLW  
Office Seal



**PART II**

**(To be filled in by the Applicant)**

**1 Project details:**

- (i) Copy of the Investigation and Survey report.

(The report should include the dates of survey and the names of the investigators, surveyors and all officials of the concerned NP/ WLS who remained present during the period)

- (ii) Self contained and factual project report for which NP/WLS area is required

(Enclose copy of the Project Appraisal document)

- (iii) Map (duly authenticated by the Divisional / District Head of the Department dealing with Forests and Wildlife) on a scale of 1: 50,000 showing the boundaries of the NP/WLS, delineating the area in question in red color).

- (iv) Self contained and factual report of at least two alternatives considered by the project authorities along with technical and financial justification for opting national park/ sanctuary area.

- (v) Copy of the Bio diversity Impact Assessment report in case the proposal involves diversion of more than 50 ha. NP/WLS area.

**2 Location of the project/scheme**

- (i) State/Union Territory  
(ii) District  
(iii) Name of the National Park/ Sanctuary

**3 Details of the area required (in Hectares only)**



(Provide break up of the land use under the project, e.g., construction of dam, submergence, housing for staff, road etc)

4 Details of displacement of people, if any, due to the project

- (i) Total number of families involved in displacement
- (ii) Number of scheduled caste/Scheduled tribe families involved in displacement
- (iii) Detailed rehabilitation plan

5 Any other information relevant to the proposal but not covered in any of the columns above.

Signed by

Project Head

Name

Organization

Date of submission to the Head of the National Park / Sanctuary



**PART III**

(To be completed by the Officer –in- Charge of the National Park/  
Sanctuary completed and submitted to the Chief Wild Life Warden or  
officer authorized by him in this behalf within 30 days of the receipt of  
**PART - II**)

- 1 Date of receipt of the PART – II
- 2 Total Area (Ha.) of national park/sanctuary
- 3 Total area (Ha.) diverted from the NP/WLS so far for development purposes
- 4 List the past projects and the area (Ha.) diverted

Name of Project	Area Diverted	Year of Diversion
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- 5 Positive impact(s) due to the diversion of area for the projects referred  
to in column 4 above

Name of the Project(s)	Positive Impact	Scientific Basis of Assessment
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(Attach separate sheet, if required)

- 6 Negative impact/s due to the diversion of area for the projects referred  
to in column 4 above

Name of the Project(s)	Negative Impact	Scientific Basis of Assessment
------------------------	-----------------	--------------------------------

(Attach separate sheet, if required)

- 7 Management Plan Period

Attach copy of the Management Plan/Management Scheme/ Recommendation of  
Chief Wildlife Warden

- 8 List Management actions taken/ proposed to be taken in the whole Block/  
Zone in which the proposed area is located.

- 9 Type of forest in which the proposed area falls.

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- 10 Location of the proposed area w.r.t. the critical/intensive wildlife management areas/ wildlife habitats (attach Map to scale).
  - 11 List the likely POSITIVE AND NEGATIVE impact/s of the proposed project giving scientific and technical justification for each impact.
  - 12 Provide COMPREHENSIVE details of the impact of the proposal in terms of Sections 29 and/or section 35 (6) of the Wild Life (Protection) Act, 1972 as the case may be.
  - 13 Whether the project authorities have ever committed violation of the Wild Life (Protection) Act, 1972 or Forest Conservation Act, 1980. If yes, provide the EXHAUSTIVE details of the offence and the present status of the case.
- (Concealing or misrepresenting the facts will lead to rejection of the case in addition to any other penalty as prescribed under Law)
- 14 Have you examined the Project Appraisal document and the alternatives as provided in PART – II?
  - 15 Have you examined the Bio diversity Impact Assessment Report?
  - 16 If Yes, please give your comments on the recommendations given in the report?
  - 17 Dates and duration of your field visits to the proposed site.
  - 18 Do you agree that the present proposal of diversion of NP/WLS area is the best or the only option and is viable.
  - 19 Any other information that you would like to bring to the notice of the State Board for Wildlife, National Board for Wildlife or its Standing Committee that may be relevant and assist in decision making.
  - 20 Do you recommend the project.

*(Please provide full justification to support your recommendations)*

Signed by

The Officer In Charge of the NP/ WLS

Official Seal

Date of submission to the Chief Wild Life Warden or any other officer authorized by him in this regard

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**PART IV**

**(To be completed by the Chief Wildlife Warden within 15 days of the receipt of  
PART - II and Part- III)**

- 1 Date of RECEIPT of PART- II and Part- III by the Chief Wild Life Warden or the officer authorized by him in this regard
- 2 Do you agree with the information and recommendations provided by the Officer – in – Charge in PART – III?
- 3 If not, please provide the reasons
- 4 Have you visited the site yourself and held discussions with the applicant?
- 5(a) Do you agree that the present proposal for permitting use of NP/WLS area is the best option or the only option, and is viable?
- 5(b) Whether the proposal sub-judice? If yes, give details.
- 6 Please provide specific comments w.r.t. Section 29 of the Wild Life (Protection) Act, 1972
- 7 Any other information that you would like to bring to the notice of the State Board for Wildlife, National Board for Wildlife or its Standing Committee that may be relevant and assist in decision making
- 8 Do you recommend the project?  
*(Please provide full justification to support your recommendations)*
- 9 Conditions, if any, to be ensured in the interest of protection and conservation of wildlife for allowing use of the area?

Signed by  
The Chief Wildlife Warden  
Name  
State  
Official Seal  
Date of submission to the State Government



**PART V**

**( To be completed by the Department in Charge of Forestry and Wild Life in consultation with the State Board for Wild Life within 30 days of the receipt of PART – II, PART- III and PART- IV )**

- 1 Date of RECEIPT of PART- II, PART- III and PART - IV by the Department
- 2 Do you agree with the recommendation(s) of the Chief Wildlife Warden
- 3 If not, please provide the reasons.
- 4 Did you provide PART- II, PART- III and PART - IV to the members of the State Board for Wild Life?
- 5 Attach copy of the opinion of the State Board for Wild Life
- 6 Give details of the recommendations of the State Government

Signed by

The Principal Secretary

Name

State

Official Seal

Date of submission to the Central Government



### **A1-3 Detailed procedure for getting CRZ clearance**

Unlike the 1991 Notification which did not lay down the process for obtaining CRZ clearance, a specific procedure has been provided in the 2011 Notification for obtaining such clearance. This procedure is as follows:

- (i) The project authorities shall submit the proposal to the concerned State/UT CZMA along with the following documents/reports,-
  - Form-1 (Annexure-IV of the Notification);
  - Rapid Environment Impact Assessment (EIA) Report including marine and terrestrial EIA. Comprehensive EIA and cumulative studies for port and foreshore requiring projects as per guidelines issued by MoEFCC from time to time;
  - Disaster Management Report and Risk Management Report;
  - CRZ map indicating HTL and LTL demarcated by an authorized agency (1:4000 scale);
  - Project layout superimposed on the above mentioned map;
  - The CRZ map shall normally indicate a 7 km radius around the project site.
  - The CRZ map shall indicate the CRZ-I, II, III and IV areas;
  - No Objection Certificate from the concerned Pollution Control Boards or Committees for the projects which envisage discharge of effluents, solid wastes, sewage etc. (NOC from the Pollution Control Boards or Committees has been made mandatory in view to minimize pollution in the coastal waters).
- (ii) The concerned CZMA shall examine the above documents in accordance with the approved CZMP and CRZ Notification and make recommendations within a period of sixty days from date of receipt of above document to,-
  - SEAC or EAC in case of the project attracting EIA Notification, 2006;
  - MoEFCC or State Government for the project attracting CRZ Notification;
- (iii) MoEFCC or State Government shall consider such projects based on the recommendations of the concerned CZMA within a period of sixty days.

### **VALIDITY**

The clearance accorded to the projects under the 2011 Notification shall be valid for the period of five years from the date of issue of such clearance.



**Form-I for seeking clearance for project attracting CRZ notification**

Basic information:

Name of the Project:-

Location or site alternatives under consideration:-

Size of the project (in terms of total area) :-

CRZ classification of the area :-

Expected cost of the project:-

Contact Information:-

**(II) Activity**

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, and the like)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)		
1.2	Details of CRZ classification as per the approved Coastal Zone Management Plan?		
1.3	Whether located in CRZ-I area?		
1.4	The distance from the CRZ-I areas.		
1.5	Whether located within the hazard zone as mapped by Ministry of Environment and Forests/National Disaster Management Authority?		
1.6	Whether the area is prone to cyclone, tsunami, tidal surge, subduction, earthquake etc.?		
1.7	Whether the area is prone for saltwater ingress?		
1.8	Clearance of existing land, vegetation and buildings?		
1.9	Creation of new land uses?		
1.10	Pre-construction investigations e.g. bore hole, soil testing?		
1.11	Construction works?		



1.12	Demolition works?		
1.13	Temporary sites used for construction works or housing of construction workers?		
1.14	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations		
1.15	Underground works including mining or tunneling?		
1.16	Reclamation works?		
1.17	Dredging/reclamation/land filling/disposal of dredged material etc.?		
1.18	Offshore structures?		
1.19	Production and manufacturing processes?		
1.20	Facilities for storage of goods or materials?		
1.21	Facilities for treatment or disposal of solid waste or liquid effluents?		
1.22	Facilities for long term housing of operational workers?		
1.23	New road, rail or sea traffic during construction or operation?		
1.24	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?		
1.25	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?		
1.26	New or diverted transmission lines or pipelines?		
1.27	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?		
1.28	Stream and river crossings?		
1.29	Abstraction or transfers of water form ground or surface waters?		
1.30	Changes in water bodies or the land surface affecting drainage or run-off?		
1.31	Transport of personnel or materials for construction, operation or decommissioning?		
1.32	Long-term dismantling or decommissioning or restoration works?		
1.33	Ongoing activity during decommissioning which could have an impact on the environment?		
1.34	Influx of people to an area in either temporarily or permanently?		
1.35	Introduction of alien species?		
1.36	Loss of native species or genetic diversity?		
1.37	Any other actions?		



2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

S. No.	Information/checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)		
2.2	Water (expected source & competing users) unit: KLD		
2.3	Minerals (MT)		
2.4	Construction material – stone, aggregates, sand/soil (expected source – MT)		
2.5	Forests and timber (source – MT)		
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)		
2.7	Any other natural resources (use appropriate standard units)		

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)		
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)		
3.3	Affect the welfare of people e.g. by changing living conditions?		
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,		
3.5	Any other causes, that would affect local communities, fisherfolk, their livelihood, dwelling units of traditional local communities etc		

4. Production of solid wastes during construction or operation or decommissioning (MT/month)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data



4.1	Spoil, overburden or mine wastes		
4.2	Municipal waste (domestic and or commercial wastes)		
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)		
4.4	Other industrial process wastes		
4.5	Surplus product		
4.6	Sewage sludge or other sludge from effluent treatment		
4.7	Construction or demolition wastes		
4.8	Redundant machinery or equipment		
4.9	Contaminated soils or other materials		
4.10	Agricultural wastes		
4.11	Other solid wastes		

**5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)**

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources		
5.2	Emissions from production processes		
5.3	Emissions from materials handling including storage or transport		
5.4	Emissions from construction activities including plant and equipment		
5.5	Dust or odours from handling of materials including construction materials, sewage and waste		
5.6	Emissions from incineration of waste		
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)		
5.8	Emissions from any other sources		

**6. Generation of Noise and Vibration, and Emissions of Light and Heat:**

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers		
6.2	From industrial or similar processes		
6.3	From construction or demolition		
6.4	From blasting or piling		
6.5	From construction or operational traffic		
6.6	From lighting or cooling systems		



6.7	From any other sources		
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7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials		
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)		
7.3	By deposition of pollutants emitted to air into the land or into water		
7.4	From any other sources		
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?		

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances		
8.2	From any other causes		
8.3	Could the project be affected by natural disasters causing environmental damage (e.g., floods, earthquakes, landslides, cloudburst etc)?		

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.:  Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)		



	housing development extractive industries supply industries other		
9.2	Lead to after-use of the site, which could have an impact on the environment		
9.3	Set a precedent for later developments		
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects		

### III. Environmental Sensitivity

S. No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value		
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests		
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration		
4	Inland, coastal, marine or underground waters		
5	State, National boundaries		
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas		
7	Defence installations		
8	Densely populated or built-up area		
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)		
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)		
11	Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)		
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)		

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**CRZ Notification 2011**

(To be published in the Gazette of India, Extraordinary, Part-II, Section 3, Sub-section (ii) of dated the 6th January, 2011)

COASTAL REGULATION ZONE NOTIFICATION MINISTRY OF ENVIRONMENT AND FORESTS (Department of Environment, Forests and Wildlife)

S.O.19 (E).- WHEREAS a draft notification under sub-section (1) of section and clause (V) of sub- section (2) of section 3 of the Environment (Protection) Act, 1986 was issued inviting objections and suggestions for the declaration of coastal stretches as Coastal Regulation Zone and imposing restrictions on industries, operations and processes in the CRZ was published vide S.O.No.2291 (E), dated 15th September, 2010.; AND WHEREAS, copies of the said Gazette were made available to the public on 15th September, 2010. AND WHEREAS, the suggestions and objections received from the public have been considered by the Central Government. Now, therefore, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government, with a view to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas, to conserve and protect coastal stretches, its unique environment and its marine area and to promote development through sustainable manner based on scientific principles taking into account the dangers of natural hazards in the coastal areas, sea level rise due to global warming, does hereby, declare the coastal stretches of the country and the water area upto its territorial water limit, excluding the islands of Andaman and Nicobar and Lakshadweep and the marine areas surrounding these islands upto its territorial limit, as Coastal Regulation Zone (hereinafter referred to as the CRZ) and restricts the setting up and expansion of any industry, operations or processes and manufacture or handling or storage or disposal of hazardous substances as specified in the Hazardous Substances (Handling, Management and Transboundary Movement) Rules, 2009 in the aforesaid CRZ.; and in exercise of powers also conferred by clause (d) and sub rule (3) of rule 5 of Environment (Protection) Act, 1986 and in supersession of the notification of the Government of India in the Ministry of Environment and Forests, number S.O.114(E), dated the 19th February, 1991 except as respects things done or omitted to be done before such supercession, the Central Government hereby declares the following areas as CRZ and imposes with effect from the date of the notification the following restrictions on the setting up and expansion of industries, operations or processes and the like in the CRZ,-

- (i) the land area from High Tide Line (hereinafter referred to as the HTL) to 500mts on the landward side along the sea front.
- (ii) CRZ shall apply to the land area between HTL to 100 mts or width of the creek whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of 5 parts per thousand (ppt) measured during the driest period of the year and distance upto which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plans (hereinafter



referred to as the CZMPs). Explanation.- For the purposes of this sub-paragraph the expression tidal influenced water bodies means the water bodies influenced by tidal effects from sea, in the bays, estuaries, rivers, creeks, backwaters, lagoons, ponds connected to the sea or creeks and the like.

- (iii) the land area falling between the hazard line and 500mts from HTL on the landward side, in case of seafront and between the hazard line and 100mts line in case of tidal influenced water body the word ‘hazard line’ denotes the line demarcated by Ministry of Environment and Forests (hereinafter referred to as the MoEF) through the Survey of India (hereinafter referred to as the SoI) taking into account tides, waves, sea level rise and shoreline changes.
  - (iv) land area between HTL and Low Tide Line (hereinafter referred to as the LTL) which will be termed as the intertidal zone.
  - (v) the water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies.
2. For the purposes of this notification, the HTL means the line on the land upto which the highest water line reaches during the spring tide and shall be demarcated uniformly in all parts of the country by the demarcating authority(s) so authorized by the MoEF in accordance with the general guidelines issued at Annexure-I. HTL shall be demarcated within one year from the date of issue of this notification.
3. Prohibited activities within CRZ,- The following are declared as prohibited activities within the CRZ,-
- (i) Setting up of new industries and expansion of existing industries except,-
    - (a) those directly related to waterfront or directly needing foreshore facilities;  
*Explanation:* The expression “foreshore facilities” means those activities permissible under this notification and they require waterfront for their operations such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations and the like.;
    - (b) projects of Department of Atomic Energy;
    - (c) facilities for generating power by non-conventional energy sources and setting up of desalination plants in the areas not classified as CRZ-I(i) based on an impact assessment study including social impacts.;
    - (d) development of green field Airport already permitted only at Navi Mumbai;
    - (e) Reconstruction, repair works of dwelling units of local communities including fishers in accordance with local town and country planning regulations.
  - (ii) Manufacture or handling oil storage or disposal of hazardous substance as specified in the notification of Ministry of Environment and Forests, No. S.O.594 (E), dated the 28th July 1989, S.O.No.966(E), dated the 27th November, 1989 and GSR 1037 (E), dated the 5<sup>th</sup> December ,1989 except,-
    - (a) transfer of hazardous substances from ships to ports, terminals and refineries and vice versa;



- (b) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II appended to this notification and facilities for regasification of Liquefied Natural Gas (hereinafter referred to as the LNG) in the areas not classified as CRZ- I(i) subject to implementation of safety regulations including guidelines issued by the Oil Industry Safety Directorate in the Ministry of Petroleum and Natural Gas and guidelines issued by MoEF and subject to further terms and conditions for implementation of ameliorative and restorative measures in relation to environment as may be stipulated by in MoEF. Provided that facilities for receipt and storage of fertilizers and raw materials required for manufacture of fertilizers like ammonia, phosphoric acid, sulphur, sulphuric acid, nitric acid and the like, shall be permitted within the said zone in the areas not classified as CRZ-I(i).
- (iii) Setting up and expansion of fish processing units including warehousing except hatchery and natural fish drying in permitted areas:
- (iv) Land reclamation, bunding or disturbing the natural course of seawater except those,-
  - (a) required for setting up, construction or modernisation or expansion of foreshore facilities like ports, harbours, jetties, wharves, quays, slipways, bridges, sealink, road on stilts, and such as meant for defence and security purpose and for other facilities that are essential for activities permissible under the notification;
  - (b) measures for control of erosion, based on scientific including Environmental Impact Assessment (hereinafter referred to as the EIA) studies
  - (c) maintenance or clearing of waterways, channels and ports, based on EIA studies;
  - (d) Measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structures for prevention of salinity ingress and freshwater recharge based on carried out by any agency to be specified by MoEF.
- (v) Setting up and expansion of units or mechanism for disposal of wastes and effluents except facilities required for,-
  - (a) discharging treated effluents into the water course with approval under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);
  - (b) storm water drains and ancillary structures for pumping;
  - (c) treatment of waste and effluents arising from hotels, beach resorts and human settlements located in CRZ areas other than CRZ-I and disposal of treated wastes and effluents;
- (vi) Discharge of untreated waste and effluents from industries, cities or towns and other human settlements. The concerned authorities shall implement schemes for phasing out existing discharge of this nature, if any, within a time period not exceeding two years from the date of issue of this notification.
- (vii) Dumping of city or town wastes including construction debris, industrial solid wastes, fly ash for the purpose of land filling and the like and the concerned authority shall implement schemes for phasing out any existing practice, if any, shall be phased out within a period of one year from date of commencement of this notification.



Note:-The MoEF will issue a separate instruction to the State Governments and Union territory Administration in respect of preparation of Action Plans and their implementation as also monitoring including the time schedule thereof, in respect of paras (v), (vi) and (vii).

- (viii) Port and harbour projects in high eroding stretches of the coast, except those projects classified as strategic and defence related in terms of EIA notification, 2006 identified by MoEF based on scientific studies and in consultation with the State Government or the Union territory Administration.
  - (ix) Reclamation for commercial purposes such as shopping and housing complexes, hotels and entertainment activities.
  - (x) Mining of sand, rocks and other sub-strata materials except,- (a) those rare minerals not available outside the CRZ area,
    - (a) Exploration and exploitation of Oil and Natural Gas.
  - (xi) Drawl of groundwater and construction related thereto, within 200mts of HTL; except the following:-
    - (a) In the areas which are inhabited by the local communities and only for their use.
    - (b) In the area between 200mts-500mts zone the drawl of groundwater shall be permitted only when done manually through ordinary wells for drinking, horticulture, agriculture and fisheries and where no other source of water is available.

Note:-Restrictions for such drawl may be imposed by the Authority designated by the State Government and Union territory Administration in the areas affected by sea water intrusion.
  - (xii) Construction activities in CRZ-I except those specified in para 8 of this notification.
  - (xiii) Dressing or altering the sand dunes, hills, natural features including landscape changes for beautification, recreation and other such purpose.
  - (xiv) Facilities required for patrolling and vigilance activities of marine/coastal police stations.
4. Regulation of permissible activities in CRZ area.- The following activities shall be regulated except those prohibited in para 3 above,-
- (i)(a) clearance shall be given for any activity within the CRZ only if it requires waterfront and foreshore facilities;
  - (b) for those projects which are listed under this notification and also attract EIA notification, 2006 (S.O.1533 (E), dated the 14th September, 2006), for such projects clearance under EIA notification only shall be required subject to being recommended by the concerned State or Union territory Coastal Zone Management Authority (hereinafter referred to as the CZMA).



- (c) Housing schemes in CRZ as specified in paragraph 8 of this notification;
  - (d) Construction involving more than 20,000sq mts built-up area in CRZ-II shall be considered in accordance with EIA notification, 2006 and in case of projects less than 20,000sq mts built-up area shall be approved by the concerned State or Union territory Planning authorities in accordance with this notification after obtaining recommendations from the concerned CZMA and prior recommendations of the concern CZMA shall be essential for considering the grant of environmental clearance under EIA notification, 2006 or grant of approval by the relevant planning authority.
  - (e) MoEF may under a specific or general order specify projects which require prior public hearing of project affected people.
  - (f) construction and operation for ports and harbours, jetties, wharves, quays, slipways, ship construction yards, breakwaters, groynes, erosion control measures;
- (ii) the following activities shall require clearance from MoEF, namely:-
- (a) those activities not listed in the EIA notification, 2006.
  - (b) construction activities relating to projects of Department of Atomic Energy or Defence requirements for which foreshore facilities are essential such as, slipways, jetties, wharves, quays; except for classified operational component of defence projects. Residential buildings, office buildings, hospital complexes, workshops of strategic and defence projects in terms of EIA notification, 2006.
  - (c) construction, operation of lighthouses;
  - (d) laying of pipelines, conveying systems, transmission line;
  - (e) exploration and extraction of oil and natural gas and all associated activities and facilities thereto;
  - (f) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal power plants. MoEF may specify for category of projects such as at (f), (g) and (h) of para 4;
  - (g) Mining of rare minerals as listed by the Department of Atomic Energy;
  - (h) Facilities for generating power by non-conventional energy resources, desalination plants and weather radars;
  - (i) Demolition and reconstruction of (a) buildings of archaeological and historical importance, (ii) heritage buildings; and buildings under public use which means buildings such as for the purposes of worship, education, medical care and cultural activities; Procedure for clearance of permissible activities.- All projects attracting this notification shall be considered for CRZ clearance as per the following procedure, namely:-
- (i) The project proponents shall apply with the following documents seeking prior clearance under CRZ notification to the concerned State or the Union territory Coastal Zone Management Authority,-
- (a) Form-1 (Annexure-IV of the notification);
  - (b) Rapid EIA Report including marine and terrestrial component except for construction projects listed under 4(c) and (d)
  - (c) Comprehensive EIA with cumulative studies for projects in the stretches classified as low and medium eroding by MoEF based on scientific studies and



- in consultation with the State Governments and Union territory Administration;
- (d) Disaster Management Report, Risk Assessment Report and Management Plan;
  - (e) CRZ map indicating HTL and LTL demarcated by one of the authorized agency (as indicated in para 2) in 1:4000 scale;
  - (f) Project layout superimposed on the above map indicated at (e) above;
  - (g) The CRZ map normally covering 7km radius around the project site.
  - (h) The CRZ map indicating the CRZ-I, II, III and IV areas including other notified ecologically sensitive areas;
  - (i) No Objection Certificate from the concerned State Pollution Control Boards or Union territory Pollution Control Committees for the projects involving discharge of effluents, solid wastes, sewage and the like.;
- (ii) The concerned CZMA shall examine the above documents in accordance with the approved CZMP and in compliance with CRZ notification and make recommendations within a period of sixty days from date of receipt of complete application,-
- (a) MoEF or State Environmental Impact Assessment Authority (hereinafter referred to as the SEIAA) as the case may be for the project attracting EIA notification, 2006;
  - (b) MoEF for the projects not covered in the EIA notification, 2006 but attracting para 4(ii) of the CRZ notification;
- (iii) MoEF or SEIAA shall consider such projects for clearance based on the recommendations of the concerned CZMA within a period of sixty days. The clearance accorded to the projects under the CRZ notification shall be valid for the period of five years from the date of issue of the clearance for commencement of construction and operation.
- (iv) For Post clearance monitoring – (a) it shall be mandatory for the project proponent to submit half-yearly compliance reports in respect of the stipulated terms and conditions of the environmental clearance in hard and soft copies to the regulatory authority(s) concerned, on 1st June and 31st December of each calendar year and all such compliance reports submitted by the project proponent shall be published in public domain and its copies shall be given to any person on application to the concerned CZMA. (b) the compliance report shall also be displayed on the website of the concerned regulatory authority.
- (v) To maintain transparency in the working of the CZMAs it shall be the responsibility of the CZMA to create a dedicated website and post the agenda, minutes, decisions taken, clearance letters, violations, action taken on the violations and court matters including the Orders of the Hon'ble Court as also the approved CZMPs of the respective State Government or Union territory.
5. Preparation of Coastal Zone Management Plans.
- (i) The MoEF may obtain the CZMPs prepared through the respective State Government or Union territory;



- (ii) The CZMPs may be prepared by the coastal State Government or Union territory by engaging reputed and experienced scientific institution(s) or the agencies including the National Centre for Sustainable Coastal Management (hereinafter referred to as the NCSCM) of MoEF and in consultation with the concerned stakeholders;
- (iii) The hazard line shall be mapped by MoEF through SoI all along the coastline of the country and the hazard line shall be demarcated taking into account, tide, waves, sea level rise and shoreline changes;
- (iv) the purpose of depicting the flooding due to tides, waves and sea level rise in the next fifty and hundred years, the contour mapping of the coastline shall be carried out at 0.5m interval normally upto 7km from HTL on the landward side, and the shoreline changes shall be demarcated based on historical data by comparing the previous satellite imageries with the recent satellite imageries;
- (v) Mapping of the hazard line shall be carried out in 1:25,000 scale for macro level planning and 1:10,000 scale or cadastral scale for micro level mapping and the hazard line shall be taken into consideration while preparing the land use plan of the coastal areas;
- (vi) The coastal States and Union Territory will prepare within a period of twenty four months from the date of issue this notification, draft CZMPs in 1:25,000 scale map identifying and classifying the CRZ areas within the respective territories in accordance with the guidelines given in Annexure-I of the notification, which involve public consultation;
- (vii) The draft CZMPs shall be submitted by the State Government or Union territory to the concerned CZMA for appraisal, including appropriate consultations, and recommendations in accordance with the procedure(s) laid down in the Environment (Protection) Act, 1986;
- (viii) The Government or Union territory CZMA shall submit the draft CZMPs to MoEF alongwith its recommendations on the CZMP within a period of six months after incorporating the suggestions and objections received from the stakeholders;
- (ix) MoEF shall thereafter consider and approve the CZMPs within a period of four months from the date of receipt of the CZMPs complete in all respects;
- (x) All developmental activities listed in this notification shall be regulated by the State Government, Union Territory Administration, the local authority or the concerned CZMA within the framework of such approved CZMPs as the case may be in accordance with provisions of this notification;
- (xi) The CZMPs shall not normally be revised before a period of five years after which, the concerned State Government or the Union territory may consider undertaking revision of the maps following the above procedures;
- (xii) The CZMPs already approved under CRZ notification, 1991 shall be valid for a period of twenty four months unless the aforesaid period is extended by MoEF by a specific notification subject to such terms and conditions as may be specified therein.



6. Enforcement of the CRZ, notification, 2011-
  - (a) For the purpose of implementation and enforcement of the provisions this notification and compliance with conditions stipulated thereunder, the powers either original or delegated are available under Environment (Protection) Act, 1986 with the MoEF, State Government or the Union territory Administration NCZMA and SCZMAs;
  - (b) The composition, tenure and mandate of NCZMA and State Government or the Union territory CZMAs have already been notified by MoEF in terms of Orders of Hon'ble Supreme Court in Writ Petition 664 of 1993;
  - (c) the State Government or the Union territory CZMAs shall primarily be responsible for enforcing and monitoring of this notification and to assist in this task, the State Government and the Union territory shall constitute district level Committees under the Chairmanship of the District Magistrate concerned containing atleast three representatives of local traditional coastal communities including from fisherfolk;
  - (d) The dwelling units of the traditional coastal communities including fisherfolk, tribals as were permissible under the provisions of the CRZ notification, 1991, but which have not obtained formal approval from concerned authorities under the aforesaid notification shall be considered by the respective Union territory CZMAs and the dwelling units shall be regularized subject to the following condition, namely-
    - (i) these are not used for any commercial activity
    - (ii) these are not sold or transferred to non-traditional coastal community.
7. Classification of the CRZ – For the purpose of conserving and protecting the coastal areas and marine waters, the CRZ area shall be classified as follows, namely:-
  - (i) CRZ-I,-
    - A. The areas that are ecologically sensitive and the geomorphological features which play a role in the maintaining the integrity of the coast,-
      - (a) Mangroves, in case mangrove area is more than 1000 sq mts, a buffer of 50meters along the mangroves shall be provided;
      - (b) Corals and coral reefs and associated biodiversity;
      - (c) Sand Dunes;
      - (d) Mudflats which are biologically active;
      - (e) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the Forest (Conservation) Act, 1980 (69 of 1980) or Environment (Protection) Act, 1986 (29 of 1986); including Biosphere Reserves;
      - (f) Salt Marshes;
      - (g) Turtle nesting grounds;
      - (h) Horse shoe crabs habitats;
      - (i) Sea grass beds;
      - (j) Nesting grounds of birds;



- (k) Areas or structures of archaeological importance and heritage sites.
- B. The area between Low Tide Line and High Tide Line;
- (ii) CRZ-II,-

The areas that have been developed upto or close to the shoreline.  
*Explanation.-* For the purposes of the expression “developed area” is referred to as that area within the existing municipal limits or in other existing legally designated urban areas which are substantially built-up and has been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains;
- (iii) CRZ-III,

Areas that are relatively undisturbed and those do not belong to either CRZ-I or II which include coastal zone in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas, which are not substantially built up.
- (iv) CRZ-IV,
  - A. the water area from the Low Tide Line to twelve nautical miles on the seaward side;
  - B. shall include the water area of the tidal influenced water body from the mouth of the water body at the sea upto the influence of tide which is measured as five parts per thousand during the driest season of the year.
- (v) Areas requiring special consideration for the purpose of protecting the critical coastal environment and difficulties faced by local communities,-
  - A.
    - (i) CRZ area falling within municipal limits of Greater Mumbai;
    - (ii) the CRZ areas of Kerala including the backwaters and backwater islands;
    - (iii) CRZ areas of Goa.
  - B. Critically Vulnerable Coastal Areas (CVCA) such as Sunderbans region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 and managed with the involvement of coastal communities including fisherfolk.
- 8. Norms for regulation of activities permissible under this notification,-
  - (i) The development or construction activities in different categories of CRZ shall be regulated by the concerned CZMA in accordance with the following norms, namely:-

Note: - The word existing use hereinafter in relation to existence of various features or existence of regularisation or norms shall mean existence of these features or regularisation or norms as on 19.2.1991 wherein CRZ notification, was notified.
- I. CRZ-I,-



- (i) no new construction shall be permitted in CRZ-I except,-
  - (a) projects relating to Department of Atomic Energy;
  - (b) pipelines, conveying systems including transmission lines;
  - (c) facilities that are essential for activities permissible under CRZ-I;
  - (d) installation of weather radar for monitoring of cyclones movement and prediction by Indian Meteorological Department;
  - (e) construction of trans harbour sea link and without affecting the tidal flow of water, between LTL and HTL.
  - (f) development of green field airport already approved at only Navi Mumbai;
- (ii) Areas between LTL and HTL which are not ecologically sensitive, necessary safety measures will be incorporated while permitting the following, namely:-
  - (a) exploration and extraction of natural gas;
  - (b) construction of dispensaries, schools, public rainshelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants living within the biosphere reserves after obtaining approval from concerned CZMA.
  - (c) necessary safety measure shall be incorporated while permitting such developmental activities in the area falling in the hazard zone;
  - (d) salt harvesting by solar evaporation of seawater;
  - (e) desalination plants;
  - (f) storage of non-hazardous cargo such as edible oil, fertilizers and food grain within notified ports;
  - (g) construction of trans harbour sea links, roads on stilts or pillars without affecting the tidal flow of water.

**II. CRZ-II,-**

- (i) buildings shall be permitted only on the landward side of the existing road, or on the landward side of existing authorized structures;
- (ii) buildings permitted on the landward side of the existing and proposed roads or existing authorized structures shall be subject to the existing local town and country planning regulations including the 'existing' norms of Floor Space Index or Floor Area Ratio: Provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road;
- (iii) reconstruction of authorized building to be permitted subject with the existing Floor Space Index or Floor Area Ratio Norms and without change in present use;
- (iv) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II appended to this notification and facilities for regasification of Liquefied Natural Gas subject to the conditions as mentioned in sub-paragraph (ii) of paragraph 3;
- (v) desalination plants and associated facilities;



- (vi) storage of non-hazardous cargo, such as edible oil, fertilizers and food grain in notified ports;
  - (vii) facilities for generating power by non-conventional power sources and associated facilities;
- III. CRZ-III,-
- A. Area upto 200mts from HTL on the landward side in case of seafront and 100mts along tidal influenced water bodies or width of the creek whichever is less is to be earmarked as “No Development Zone (NDZ)”,-
- (i) the NDZ shall not be applicable in such area falling within any notified port limits;
  - (ii) No construction shall be permitted within NDZ except for repairs or reconstruction of existing authorized structure not exceeding existing Floor Space Index, existing plinth area and existing density and for permissible activities under the notification including facilities essential for activities; Construction/reconstruction of dwelling units of traditional coastal communities including fisherfolk may be permitted between 100 and 200 metres from the HTL along the seafront in accordance with a comprehensive plan prepared by the State Government or the Union territory in consultation with the traditional coastal communities including fisherfolk and incorporating the necessary disaster management provision, sanitation and recommended by the concerned State or the Union territory CZMA to NCZMA for approval by MoEF;
  - (iii) however, the following activities may be permitted in NDZ –
    - (a) agriculture, horticulture, gardens, pasture, parks, play field, and forestry;
    - (b) projects relating to Department of Atomic Energy;
    - (c) mining of rare minerals;
    - (d) salt manufacture from seawater;
    - (e) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II;
    - (f) facilities for regasification of liquefied natural gas subject to conditions as mentioned in subparagraph (ii) of paragraph 3;
    - (g) facilities for generating power by non conventional energy sources;
    - (h) Foreshore facilities for desalination plants and associated facilities;
    - (i) weather radars;
    - (j) construction of dispensaries, schools, public rain shelter, community toilets, bridges, roads, provision of facilities for water supply, drainage, sewerage, crematoria, cemeteries and electric sub-station which are required for the local inhabitants may be permitted on a case to case basis by CZMA;
    - (k) construction of units or auxiliary thereto for domestic sewage, treatment and disposal with the prior approval of the concerned Pollution Control Board or Committee;
    - (l) facilities required for local fishing communities such as fish drying yards, auction halls, net mending yards, traditional boat building yards, ice plant, ice crushing units, fish curing facilities and the like;
    - (m) development of green field airport already permitted only at Navi Mumbai.



**B. Area between 200mts to 500mts,-**

The following activities shall be permissible in the above areas;

- (i) development of vacant plot in designated areas for construction of hotels or beach resorts for tourists or visitors subject to the conditions as specified in the guidelines at Annexure-III ;
- (ii) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II;
- (iii) facilities for regasification of liquefied natural gas subject to conditions as mentioned in sub-paragraph (ii) of paragraph 3;
- (iv) storage of non-hazardous cargo such as, edible oil, fertilizers, food grain in notified ports;
- (v) foreshore facilities for desalination plants and associated facilities;
- (vi) facilities for generating power by non-conventional energy sources;
- (vii) construction or reconstruction of dwelling units so long it is within the ambit of traditional rights and customary uses such as existing fishing villages and goathans. Building permission for such construction or reconstruction will be subject to local town and country planning rules with overall height of construction not exceeding 9mts with two floors (ground + one floor);
- (viii) Construction of public rain shelters, community toilets, water supply drainage, sewerage, roads and bridges by CZMA who may also permit construction of schools and dispensaries for local inhabitants of the area for those panchayats, the major part of which falls within CRZ if no other area is available for construction of such facilities;
- (ix) reconstruction or alteration of existing authorised building subject to sub-paragraph (vii), (viii);
- (x) development of green field airport already permitted only at Navi Mumbai.

**(IV) In CRZ-IV areas,-**

The activities impugning on the sea and tidal influenced water bodies will be regulated except for traditional fishing and related activities undertaken by local communities as follows:-

- (a) No untreated sewage, effluents, ballast water, ship washes, fly ash or solid waste from all activities including from aquaculture operations shall be let off or dumped. A comprehensive plan for treatment of sewage generating from the coastal towns and cities shall be formulated within a period of one year in consultation with stakeholders including traditional coastal communities, traditional fisherfolk and implemented;



- (b) Pollution from oil and gas exploration and drilling, mining, boat house and shipping;
  - (c) There shall be no restriction on the traditional fishing and allied activities undertaken by local communities.
- V. Areas requiring special consideration,-
1. CRZ areas falling within municipal limits of the Greater Mumbai.
- (i) Developmental activities in the CRZ area of the Greater Mumbai because of the environmental issues, relating to degradation of mangroves, pollution of creeks and coastal waters, due to discharge of untreated effluents and disposal of solid waste, the need to provide decent housing to the poor section of society and lack of suitable alternatives in the inter connected islands of Greater Mumbai shall be regulated as follows, namely:-
- A. Construction of roads - In CRZ-I areas indicated at sub-paragraph (i) of paragraph 7 of the notification the following activities only can be taken up:-
- (a) Construction of roads, approach roads and missing link roads approved in the Developmental Plan of Greater Mumbai on stilts ensuring that the free flow of tidal water is not affected, without any benefit of CRZ-II accruing on the landward side of such constructed roads or approach roads subject to the following conditions:- ( i ) All mangrove areas shall be mapped and notified as protected forest and necessary protection and conservation measures for the identified mangrove areas shall be initiated.
- (ii) Five times the number of mangroves destroyed/cut during the construction process shall be replanted.
- B. Solid waste disposal sites shall be identified outside the CRZ area and thereafter within two years the existing conventional solid waste sites shall be relocated outside the CRZ area.
- (iii) In CRZ-II areas-
- (a) The development or redevelopment shall continue to be undertaken in accordance with the norms laid down in the Town and Country Planning Regulations as they existed on the date of issue of the notification dated the 19th February, 1991, unless specified otherwise in this notification.
- (b) SLUM REHABILITATION SCHEMES,-
1. In the Greater Mumbai area there are large slum clusters with lakhs of families residing therein and the living conditions in these slums are deplorable and the civic agencies are not able to provide basic infrastructure such as drinking water, electricity, roads, drainage and the like because the slums come up in an unplanned and congested manner and the slums in the coastal area are at great risk in the event of cyclones, storm surges or tsunamis, in view of the difficulties in providing rescue, relief and evacuation.



2. To provide a safe and decent dwelling to the slum dwellers, the State Government may implement slum redevelopment schemes as identified as on the date of issue of this notification directly or through its parastatal agencies like Maharashtra Housing and Area Development Authority (MHADA), Shivshahi Punarvasan Prkalp Limited (SPPL), Mumbai Metropolitan Region Development Authority (MMRDA) and the like.:

Provided that,-

- (i) such redevelopment schemes shall be undertaken directly or through joint ventures or through public private partnerships or other similar models ensuring that the stake of the State Government or its parastatal entities shall be not less than 51%;
  - (ii) the Floor Space Index or Floor Area Ratio for such redevelopment schemes shall be in accordance with the Town and Country Planning Regulations prevailing as on the date on which the project is granted approval by the competent authority;
  - (iii) it shall be the duty of the project proponent undertaking the redevelopment through conditions (i) (2) above along with the State Government to ensure that all legally regularized tenants are provided houses in situ or as per norms laid down by the State Government in this regard.
- (c) REDEVELOPMENT OF DILAPIDATED, CESSSED AND UNSAFE BUILDINGS:
1. In the Greater Mumbai, there are, also a large number of old and dilapidated, cessed and unsafe buildings in the CRZ areas and due to their age these structures are extremely vulnerable and disaster prone and therefore there is an urgent need for the redevelopment or reconstruction of these identified buildings.
  2. These projects shall be taken up subject to the following conditions and safeguards:
- (i) such redevelopment or reconstruction projects as identified on the date of issue of this notification shall be allowed to be taken up involving the owners of these buildings either above or with private developers in accordance with the prevailing Regulation, directly or through joint ventures or through other similar models.
  - (ii) the Floor Space Index or Floor Area Ratio for such redevelopment schemes shall be in accordance with the Town and Country Planning Regulations prevailing as on the date on which the project is granted approval by the competent authority
  - (iii) suitable accommodation to the original tenants of the specified buildings shall be ensured during the course of redevelopment or reconstruction of the buildings by the project proponents, undertaking the redevelopment through condition 2(i) above.
- (d) Notwithstanding anything contained in this notification, the developmental activities for slums and for dilapidated, cessed and unsafe buildings as specified at paras (b) and (c) above shall be carried out in an accountable and



transparent manner by the project proponents mentioned therein which shall include the following pre-condition measures, wherever applicable;-

1. (i) applicability of the Right to Information Act, 2005 to all redevelopment or reconstruction projects granted clearance by the Competent Authorities;
- (ii) MoEF shall issue an order constituting the CPIO and the first Appellate Authority of appropriate ranks in consultation with Government of Maharashtra;
- (iii) details of the Slum Rehabilitation Scheme, including the complete proposal and the names of the eligible slum dwellers will be declared suo-moto as a requirement of Section 4 of compliance of the Right to Information Act, 2005 by the appropriate authority in the Government of Maharashtra in one month before approving it;
- (iv) the implementing or executing agency at the State Government with regard to projects indicated at sub-item (b) and (c) of item (iii) of sub-paragraph V shall display on a large notice boards at the site and at the office of the implementing or executing agency the names of the eligible builders, total number of tenements being made, names of eligible slum dwellers who are to be provided the dwelling units and the extra area available for free sale.
- (v) Projects being developed under sub-items (b) and (c) of item (iii) of sub-paragraph V shall be given permission only if the project proponent agree to be covered under the Right to Information Act, 2005.
2. MoEF may appoint statutory auditors, who are empanelled by the Comptroller and auditor General (hereinafter referred to as the C&AG) to undertake performance and fiscal audit in respect of the projects relating to redevelopment of dilapidated, cessed and unsafe buildings and the projects relating to Slum Rehabilitation Scheme shall be audited by C&AG.
3. A High Level Oversight Committee may be set up by the Government of Maharashtra for periodic review of implementation of V(iii)(b) and (c) which shall include eminent representatives of various Stakeholders, like Architects, Urban Planner, Engineers, and Civil Society, besides the local urban bodies, the State Government and the Central Government.
4. The individual projects under V(iii)(b) and (c) shall be undertaken only after public consultation in which views of only the legally entitled slum dweller or the legally entitled tenant of the dilapidated or cessed buildings shall be obtained in accordance with the procedures laid down in EIA notification, 2006.
  - (e) In order to protect and preserve the ‘green lung’ of the Greater Mumbai area, all open spaces, parks, gardens, playgrounds indicated in development plans within CRZ-II shall be categorized as CRZ-III, that is, ‘no development zone’.
  - (f) the Floor Space Index upto 15% shall be allowed only for construction of civic amenities, stadium and gymnasium meant for recreational or sports related activities and the residential or commercial use of such open spaces shall not be permissible.



- (g) Koliwada namely, fishing settlement areas as identified in the Development Plan of 1981 or relevant records of the Government of Maharashtra, shall be mapped and declared as CRZ-III so that any development, including construction and reconstruction of dwelling units within these settlements shall be undertaken in accordance with applicable as per local Town and Country Planning Regulations.
- (h) Reconstruction and repair works of the dwelling units, belonging to fisher communities and other local communities identified by the State Government, shall be considered and granted permission by the Competent Authorities on a priority basis, in accordance with the applicable Town and Country Planning Regulations.

## 2. CRZ for Kerala

In view of the unique coastal systems of backwater and backwater islands alongwith space limitation present in the coastal stretches of the State of Kerala, the following activities in CRZ shall be regulated as follows, namely:-

- (i) all the islands in the backwaters of Kerala shall be covered under the CRZ notification;
- (ii) the islands within the backwaters shall have 50mts width from the High Tide Line on the landward side as the CRZ area;
- (iii) within 50mts from the HTL of these backwater islands existing dwelling units of local communities may be repaired or reconstructed however no new construction shall be permitted;
- (iv) beyond 50mts from the HTL on the landward side of backwater islands, dwelling units of local communities may be constructed with the prior permission of the Gram panchayat;
- (v) foreshore facilities such as fishing jetty, fish drying yards, net mending yard, fishing processing by traditional methods, boat building yards, ice plant, boat repairs and the like, may be taken up within 50mts width from HTL of these backwater islands.

## 3. CRZ of Goa.-

In view of the peculiar circumstances of the State Goa including past history and other developments, the specific activities shall be regulated and various measures shall be undertaken as follows:-

- (i) the Government of Goa shall notify the fishing villages wherein all foreshore facilities required for fishing and fishery allied activities such as traditional fish processing yards, boat building or repair yards, net mending yards, ice plants, ice storage, auction hall, jetties may be permitted by Grama Panchayat in the CRZ area;
- (ii) reconstruction, repair works of the structures of local communities including fishermen community shall be permissible in CRZ;



- (iii) purely temporary and seasonal structures customarily put up between the months of September to May;
  - (iv) the eco sensitive low lying areas which are influenced by tidal action known as khazan lands shall be mapped;
  - (v) the mangroves along such as khazan land shall be protected and a management plan for the khazan land prepared and no developmental activities shall be permitted in the khazan land;
  - (vi) sand dunes, beach stretches along the bays and creeks shall be surveyed and mapped. No activity shall be permitted on such sand dune areas;
  - (vii) the beaches such as Mandrem, Morjim, Galgiba and Agonda has been designated as turtle nesting sites and protected under the Wildlife Protection Act, 1972 and these areas shall be surveyed and management plan prepared for protection of these turtle nesting sites;
  - (viii) no developmental activities shall be permitted in the turtle breeding areas referred to in sub-paragraph (vii).
4. (a) Critical Vulnerable Coastal Areas (CVCA) which includes Sunderbans and other identified ecological sensitive areas which shall be managed with the involvement of the local coastal communities including the fisher folk;-
- (b) the entire Sunderbans mangrove area and other identified ecologically important areas such as Gulf of Khambat and Gulf of Kutch in Gujarat, Malvan, Achra-Ratnagiri in Maharashtra, Karwar and Coondapur in Karnataka, Vembanad in Kerala, Gulf of Mannar in Tamil Nadu, Bhaitarkanika in Orissa, Coringa, East Godavari and Krishna in Andhra Pradesh shall be declared as Critical Vulnerable Coastal Areas (CVCA) through a process of consultation with local fisher and other communities inhabiting the area and depend on its resources for their livelihood with the objective of promoting conservation and sustainable use of coastal resources and habitats;
  - (c) the process of identifying planning, notifying and implementing CVCA shall be detailed in the guideline which will be developed and notified by MoEF in consultations with the stakeholders like the State Government, local coastal communities and fisherfolk and the like inhabiting the area;
  - (d) the Integrated Management Plans (IMPs) prepared for such CVCA shall inter alia keep in view the conservation and management of mangroves, needs of local communities such as, dispensaries, schools, public rain shelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage and the impact of sea level rise and other natural disasters and the IMPs will be prepared in line with the para 5 above for preparation of Coastal Zone Management Plans;
  - (e) till such time the IMPs are approved and notified, construction of dispensaries, schools, public rain shelters, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants shall be permitted on a case to case basis, by the CZMA with due regards to the views of coastal communities including fisherfolk.





[F.No.11-83/2005-IA-III]

**J. M. MAUSKAR, Addl. Secy.**



## **A1-4 Revenue and Forest Department**

भाग चार-ब] महाराष्ट्र शासन राजपत्र, असा., डिसेंबर २०, २००५/अग्रहायण २९, शके १९२७ १९७५

**REVENUE AND FORESTS DEPARTMENT**  
Mantralaya, Mumbai 400 032, dated the 19th December 2005

### **NOTIFICATION**

MAHARASHTRA FELLING OF TREES (REGULATION) ACT, 1964.

No. TRS. 1094/C.R. 177/F-6.—In exercise of the powers conferred by sub-section (1) of section 15 of the Maharashtra Felling of Trees (Regulation) Act, 1964 (Mah. XXXIV of 1965), and of all other powers enabling it in this behalf, the Government of Maharashtra hereby makes the following rules further to amend the Maharashtra Felling of Trees (Regulation) Rules, 1967, the same having been previously published as required by sub-section (1) of the said section 15, as follows :—

1. These rules may be called the Maharashtra Felling of Trees (Regulation) (Amendment) Rules, 2005.

2. Throughout the Maharashtra Felling of Trees (Regulation) Rules, 1967 (hereinafter referred to as “the principal rules”), including the Forms appended thereto, for the words “Revenue Officer” the words “Tree Officer” shall be substituted.

3. In rule 3 of the principal rules, after sub-rule (2), the following sub-rules shall be added, namely :—

“(3) If any person, institute or company wishes to do silvicultural operations like thinning or felling of trees scientifically for optimum growth of an artificial plantation, as provided in sub-section (1Ba) of section 3, he shall apply, in writing, in Form III, prescribed for obtaining the permission in that behalf.

(4) On receipt of an application under sub-rule (3), if the applicant fulfills the conditions mentioned in sub-rule (2) of rule 5, the Tree Officer shall acknowledge the receipt of application. An incomplete application shall be returned immediately to the applicant with the reasons recorded therein by the Tree Officer. The applicant may apply again after fulfilling the conditions as required in the prescribed Form III.”.

4. The existing rule 5 of the principal rules shall be renumbered as sub-rule (1) thereof, and after sub-rule (1) as so renumbered, the following sub-rules shall be added, namely :—

“(2) If any person, institute or company who has artificially planted scheduled tree species on the privately owned lands and wishes to do



११७६ महाराष्ट्र शासन राजपत्र, असा., डिसेंबर २०, २००५/अग्रहायण २९, शके १९२७ [भाग चार-ब

thinning or felling of a tree or trees, he shall strictly fulfill the following conditions prior to applying for permission in that behalf:—

(a) An entry of the artificially planted scheduled trees shall be taken by the Talathi in the 7/12 extracts of land record of the concerned land similar to the entry of other agricultural crops.

(b) The entry of the existing artificial plantation in the 7/12 extracts shall be made within 3 months from the date of commencement of the Maharashtra Felling of Trees (Regulation) (Amendment) Rules, 2005, and it shall be the duty of the grower to make an application in this behalf.

(c) A copy of the 7/12 extracts showing the above entries shall be submitted to the Tree Officer.

(d) Minimum 50 trees per hectare shall be left unfelled in the artificial plantation, and the owner shall give an undertaking in this behalf.

(e) After undertaking the plantation of the scheduled tree species, an entry of the subsequent planting, thinning, felling and the existing balance of trees shall be got entered into the concerned 7/12 extracts of land, by the growers and the Talathi.

(f) A note book called 'Plantation Book' containing information about the artificial plantation, the area, the species and the number of seedlings planted shall be given to the owners of the plantation by the Tree Officer. The Tree Officer shall record the survival percentage of the plantation in the Plantation Book from the fourth year of the plantation undertaken and shall also record any thinning done in the plantation, from time to time.

(g) No tree within 30 meters of the extremes of the bank of any water course, spring or a tank shall be felled, except with the previous permission of the Collector.

(h) If the artificial plantation, where thinning or felling of trees is to be done, is having boundary adjacent to the Government forests (reserved/protected/ "E" class jungle or otherwise), the owner of the plantation shall submit the certificate which contains the boundaries and map of the said plantation demarcated by the District Inspector of Land Record.



भाग चार-ब] महाराष्ट्र शासन राजपत्र, असा., डिसेंबर २०, २००५/अग्रहायण २९, राके १९२७ ११७७

(i) If the plantation area is recorded as "Forests", the permission for thinning or felling shall be given only after the preparation of the working plan (*Karya Yojana*) and after the prior approval of the said working plan by the Government of India. The owner of such plantation shall not take any action before obtaining such prior approval."

5. After Form II appended to the principal rules, the following, Form shall be added, namely :—

" FORM III

An application for obtaining permission for thinning/felling of scheduled trees as per the rule 3(3) of the Maharashtra Felling of Trees (Regulation) Rules, 1967.

To,

Name of the applicant : .....

Occupation : .....

Residence/Contact Address .....

I hereby request you to grant me the permission for thinning/felling of trees specified in the column No. (3) of the following proforma, which are grown in the artificial plantations specified in columns No. (1) and (2), for the reasons given below.

The documents of the concerned land received from the Revenue Department are enclosed herewith.

On the trees grown in the artificial plantations mentioned in the column No. (3) of the proforma, the silvicultural operations like thinning/felling of trees scientifically for optimum growth of artificial plantations, as provided in sub-section (1Ba) of section 3 of the Maharashtra Felling of Trees (Regulation) Act, 1964 (Mah. XXXV of 1964), are proposed.

I hereby declare that I shall fulfill the conditions laid down, and made binding on me, under the Maharashtra Felling of Trees (Regulation) Rules, 1967, for such thinning/felling of trees grown in the artificial plantations.



महाराष्ट्र शासन राजपत्र, असा., डिसेंबर २०, २००५/अग्रहायण २९, शके १९२८ [भाग चार-व]

**PROFORMA**

(1)	Particulars of land (2)	Particulars of the trees (scheduled trees) (3)		
		Species (A)	No. of trees existing on the land. (B)	No. of trees to be thinned/ felled. (C)
(A) District				
(B) Taluka				
(C) Village				
(D) Survey No.				
(E) Part/Sub Part No.				
(F) Total area of the land.				

Date :

Place :

Signature  
(Name of applicant/s)."

By order and in the name of the Governor of Maharashtra,

**A. V. ASHTEKAR,**  
Joint Secretary to Government.

शासकीय मध्यवर्ती मुद्रणालय, मुंबई



### Table A1-1 Standard of the noise each countries

No	Country	Title	Space of assessment	Time	Index	Noise level limits	Notes
1	Austria	Railway Noise Immission Ordinance 1993	Free field	Day-night	$L_{Aeq,T}$	65 dB (06-22), 55 dB (22-06)	Limits for the level of railway noise are adjusted by - 5dB to allow for lower perceived annoyance from trains at the same average sound level as other sources.
2	Belgium	Environmental convention concerning noise and vibration from railways (2001)	Outdoor	Daytime and nighttime	$L_{Aeq,sp,rail-ways}$	70 dB (07-22), 65 dB (22-07)	$L_{Aeq,sp,rail-ways}$ : time averaged, A-weighted sound level calculated for a specified location for the sound from all railway operations within a specified period.  1) Limits for new railway infrastructures or for expanded operations on existing infrastructures  65 dB (07-22), 60 dB (22-07) <sup>1)</sup>



							provide goals for limits lower than the specified limits. The Guidelines also describe situations where urgent intervention may be needed to reduce the existing time-averaged sound level so as to not exceed the limits.
3	Denmark	Guidelines from the Environmental Protection Agency, 1/1997 and Annex to Guideline 1/1997: Noise and vibrations from railways (2007 July)	Free field	Day-evening-night	$L_{den}$	59 dB  64 dB  69 dB	- Summer Residential, Camping  - Hospital, School, Residential  - Hotel, Office



4	France	Basic law about the fight against noise n°92-1444 (31/12/92) Decree n°95 22(9/01/95) about land-transport noise limits /Order of 8/11/99 concerning railway noise	Outdoor 2 m in front of windows	Day-night	$L_{Aeq,T}$				New or modified land uses: - Residential areas, and schools  - Hospitals  - Other areas
5	Germany	Traffic Noise Ordinance, 1990 June 12	Outdoor, 1 m from façade	Day-night	$L_{Aeq,T}$				Limits for new & significantly modified roads*)  - Hospitals and schools  - Residential areas







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6	Germany	Remedial Program for existing federal roads (since 1978) and railways (since 1999)	Outdoor, Free field	Day-night	$L_{Aeq,T}$	70 dB (06-22) , 60 dB (22-06)  72 dB (06-22) , 62 dB (22-06)  75 dB (06-22) , 65 dB (22-06)	<ul style="list-style-type: none"> <li>- Hospitals, schools, &amp; residential areas</li> <li>- Mixed business &amp; residential areas</li> <li>- Areas with light industry (with 5 dB adjustment for the sound of railway operations, see above)</li> </ul>
7	Germany	Annex 1 to DIN 18005 Noise Protection in Urban Planning (1987)	Outdoor, Free field	Day-night	$L_{Aeq,T}$	50 dB (06-22) , 40 dB (22-06)  55 dB (06-22) , 45 dB (22-06)  55 dB (06-22) , 45 dB (22-06)  60 dB (06-22) , 45 dB (22-06)	Noise level limits apply for planning of new residential and other areas  - Purely residential areas, spa areas, vacation areas  - Mainly residential areas, campgrounds  - Cemeteries, parks  - Special residential areas









9	Japan	Environmental Quality Standards for Noise of Shinkansen Trains (1975)	Outdoor: free field	Any time (06-24)	$L_{A_{Smax}}^{1)}$	70 dB  75 dB	<p>- Area I (mainly for residential use)</p> <p>- Area II (where normal living conditions should be preserved, including commercial and industrial areas)</p> <p><sup>1)</sup>The maximum S-time-weighted and A-frequencyweighted sound level is measured at a prescribed position during the passage of 20 consecutive trains. For assessing compliance with the noise-level limits, the level of the average of the squared sound pressure signals is calculated from the ten highest of the 20 measured maximum sound levels.</p>
10	Korea	Environmental Quality Standards (1991, revised 2000)	Outdoors (affected areas)	Day-night	$L_{Aeq,24h}$	63 dB	<p>Existing train lines</p> <p>- Area I: Areas for mainly residential use.</p>



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						68 dB	- Area II: Areas for commercial and industrial use with no significant residential use.
							For new train lines after 2015
						60 dB	- Area I
						65 dB	- Area II
11	Norway	Guideline on noise in planning (T-1442, 2012)	Outdoor, most exposed facade, free field, relevant height for dwelling	Day-evening-night	$L_{den}$ $L_{5,AF}$	58 dB 75 dB	Red zone, nearest the noise source, enter an area that is not suited to noise-sensitive uses and the establishment of new buildings with noise sensitive uses should be avoided
					$L_{den}$ $L_{5,AF}$	68 dB 90 dB	Yellow zone is an assessment zone where buildings with noise sensitive uses can be listed if mitigation measures provide a satisfactory noise



12	Slovenia	Decree relating to assessment and management of environmental noise (O. J. RS, 121/2004)	Outdoor per ISO 1996-2	Day-evening-night  Day: 06-18 Evening: 18-22 Night: 22-24  &00-06	$L_n$ $L_{den}$	<table><thead><tr><th>Area</th><th><math>L_n</math></th><th><math>L_{den}</math></th></tr></thead><tbody><tr><td>A</td><td>65 dB</td><td>75 dB</td></tr><tr><td>B</td><td>50 dB</td><td>60 dB</td></tr><tr><td>C</td><td>45 dB</td><td>55 dB</td></tr><tr><td>D</td><td>40 dB</td><td>50 dB</td></tr></tbody></table>	Area	$L_n$	$L_{den}$	A	65 dB	75 dB	B	50 dB	60 dB	C	45 dB	55 dB	D	40 dB	50 dB	Noise level limits applicable to individual areas depend on the corresponding land use and the applicable time-average sound level. Four types of areas are specified as follows:  - A: Areas where high sound levels are permitted, for example, non-residential areas used for industry and manufacturing  - B: Areas where lower levels of intruding noise are permitted, for example, residential areas with some retail and light-manufacturing businesses  - C: Areas where disturbing sounds are not permitted, for example, primarily residential areas  - D: Areas that require the lowest level of prevailing sound, for example, quiet
Area	$L_n$	$L_{den}$																				
A	65 dB	75 dB																				
B	50 dB	60 dB																				
C	45 dB	55 dB																				
D	40 dB	50 dB																				



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									regions in open country
13	Slovenia	Decree relating to limits on time average sound level indicators of environmental noise (O. J. RS, 105/2005)	Outdoor per ISO 1996-3	Day-evening-night  Day: 06-18 Evening: 18-22 Night: 22-24 & 00-06	$L_d$ $L_e$ $L_n$ $L_{den}$	Area A B C D	$L_d$ 70 dB $L_e$ 65 dB $L_n$ 60 dB $L_{den}$ 70 dB 65 dB 60 dB 55 dB	These noise level limits apply to individual areas as described above and for the sound from road traffic, railways, and operations of civil aircraft from major airports	
14	Spain	Royal legislative decree 1302/1986	Outdoor	All day or day-night	$L_{Aeq,T}$	$L_{Aeq,24h}$ : 65 dB or $L_{Aeq,d}$ : 65 dB and $L_{Aeq,n}$ : 55 dB	For residential areas and areas where wildlife are to be protected		
15	Sweden	Guidelines adopted by Parliament and implemented by government authorities	Free field	All day	$L_{Aeq,24h}$  $L_{AFmax}$	55 dB outdoors 30 dB indoors 70 dB outdoors 45 dB indoors			



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16	Switzerland	Noise Abatement Ordinance, issued 1986 (latest rev: 2006 September)	Middle of open window	Day: 06-22 Night: 22-06	$L_{Aeq,T}^{(1)}$	same noise-level limits as for road-traffic noise	<sup>1)</sup> Rating level $L_r$ $= 10 \lg (10^{0.1 \cdot L_{r1}} + 10^{0.1 \cdot L_{r2}})$ with $L_{r1} = L_{Aeq,T} + K1$ for regular train traffic $L_{r2} = L_{Aeq,T} + K2$ for train-shunting noise Adjustment K1 for regular train traffic: $K1 = -5 \text{ dB for } N > 79$ $K1 = 10 \lg(N/250) \text{ dB for } 7.9 < N < 79$ $K1 = -15 \text{ dB for } N < 7.9$ (N = trains/day or night) Adjustment K2 for shunting noise: 0 to +8 dB
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<sup>1)</sup> A: Noise not a factor



		Country Planning Acts, (1990):  a) Planning Policy Guidance Note 24 (PPG24) (PAN 56, Scotland)  b) Planning Directive 85/337 (Environmental Impact assessments)		Night: 00-06		<div> <div>A</div> <div>B</div> <div>C</div> <div>D<sup>1)</sup></div> </div> <div> D: &lt;55 66 N: &lt;45 45- 59 59- 66 66 </div>	<p>B and C: Noise mitigation measures need to be included in the planning proposal before permission to build is granted.</p> <p>D: Planning permission should normally be refused, because of noise.</p> <p>PPG24 applies to situations where residential development is planned close to an existing noise source.</p> <p>D = daytime N = nighttime</p> <p>Where a new noise source is planned close to existing residential development a noise impact assessment is required.</p>	
20	USA	High-Speed Ground Transportation Noise and Vibration Impact	Outdoor, free field	Day-night	$L_{dn}$	65 dB	<p>A day-night averaged sound level of 65 dB is considered “severe impact”.</p>	



# *EIA Study for Mumbai-Ahmedabad High Speed Railway Corridor*



		Assessment [Federal Railway Administration (FRA), 1998]				50 dB to 55 dB	A day-night averaged sound level between 50 dB and 55 dB is considered to be an “impact”. The “impact” boundary varies with the type of the land use and with the existing level of ambient sound.
21	USA	Surface Transportation Board (STB, 1998)	Outdoor, free field	Day-night	$L_{dn}$	65 dB  50 dB to 55 dB	A day-night averaged sound level of 65 dB is considered “severe impact”.  A day-night averaged sound level between 50 dB and 55 dB is considered to be an “impact”. The “impact” boundary varies with the type of the land use and with the existing level of ambient sound.





## **A1-6 Detail of felling of trees**

### **Permission for felling of trees**

On the basis of baseline study and impacts, issues like tree cutting & Transplantation, needs necessary approvals/clearance. The necessary permission required for the cutting & Transplantation is show in Table A1-2.

**Table A1-2:  
Necessary approvals/clearnces requiremnet**

State	Provision of Laws & Regulations	Due Date	Approval Authority
Maharashtra	Maharashtra felling of Trees (Regulation Act, 1964) Amended in 2006.	Before Construction	The Tree Authority Municipal Corporation of Greater Mumbai (MCGM).
Gujarat	Saurashtra Felling of Trees (Infliction of Punishment) Act, 1951. Rules framed under the Act in 1961.	Before Construction	The Park and Garden Department of Ahmedabad Municipal Corporation (AMC)/Western Railway

The objective of the afforestation programme should be to develop natural areas in which ecological functions could be maintained on a sustainable basis. The detail of tree likely to be removed or transplanted is given in the Table A1-3

**Table A1-3:  
Necessary place of trees cutting and transportation**

No	Particulars
1	Along Alignment
2	Around the station planned construction site
3	Depot

## **Compensatory Afforestation**

### **A) Afforestation**

The number of trees to be transplanted depends on the site condition and root condition & health of tree. More stress should have been given for transplantation of the tree rather than removal.

The Details of afforestation each States are show in Table ○○.



**Table A1-4: Details of trees cut and plantation**

State	Number of afforestation	Land for plantation
Maharashtra	The trees which are cut will be compensated by planting two times* the number of trees.	Land for plantation of trees will be identified by the project proponent in consultation with Forest Department of State Government.
Gujarat	The trees which are cut will be compensated by planting ten times* the number of trees.	Land for plantation of trees will be identified by the project proponent in consultation with AMC/Forest Department of State Government.

Note: \* For the detail of number of planting trees, will decide with related organizations consultation.

### **B) Transplantation**

The management plans for transplantation of trees are summarized below:

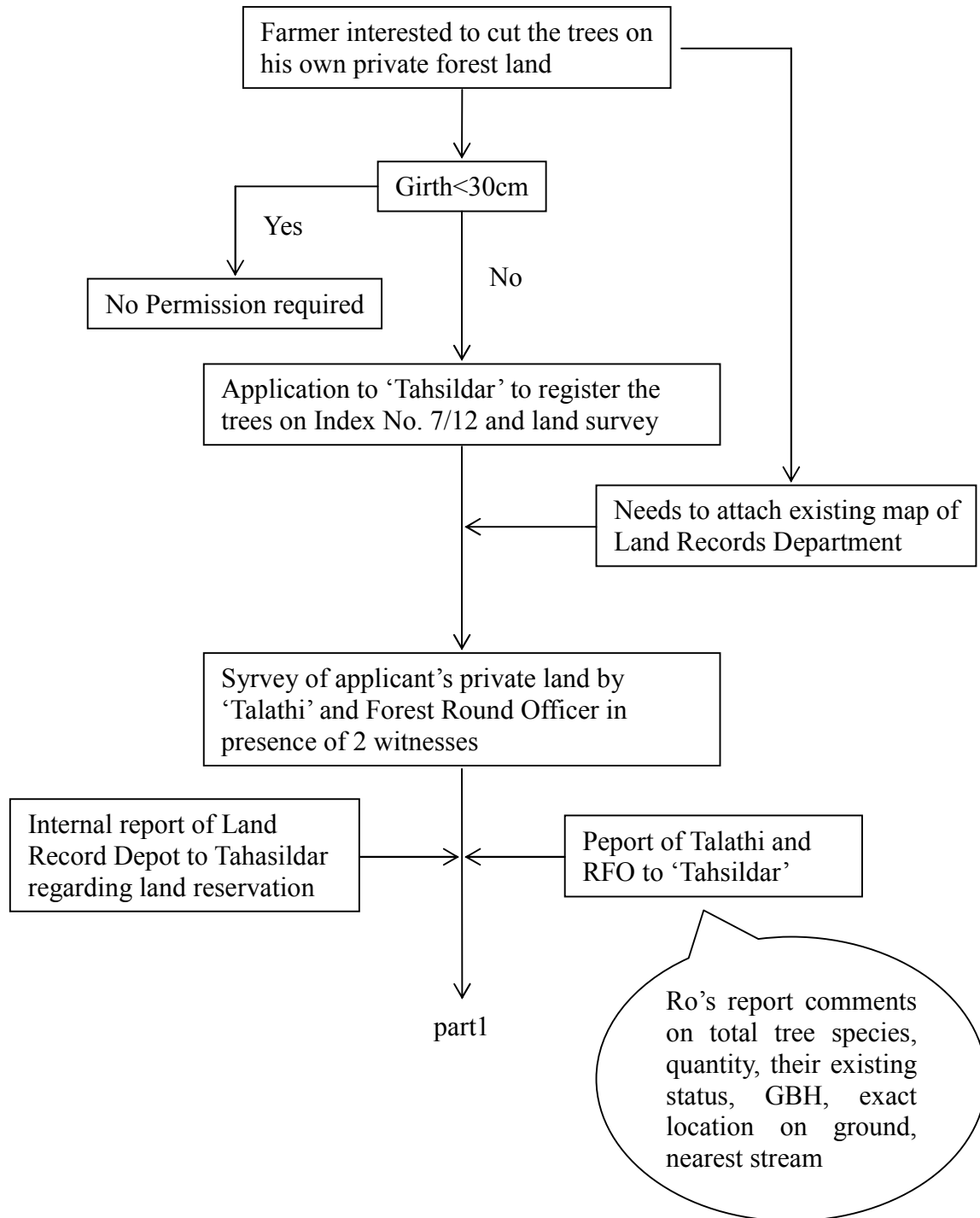
- Preliminary root investigation should be carried out,
- Health diagnosis of the tree should be carried out for treating infected trees,
- Soil condition where the tree has to be transplanted is thoroughly checked & necessary treatments are applied to the soil after digging a pit,
- The pit size has to be kept in accordance with the root ball of the tree,
- Packing material should be strong enough to hold the soil around the root zone,
- Crane should be used to lift the packed tree and a trolley or truck should be used to transport the tree,
- Timely feeding of the plant should be done with soluble fertilizers and watering,
- JCB should be used for digging pits,
- There should be regular monitoring for fertilizer schedules and the chemicals like insecticides and pesticides.
- Scaffolding should be used wherever required to support the trees,
- Any broken stems during transplantation should be removed cautiously.

After transplantation, there are chances of external infections to the tree which needs maintenance for at least 2-3 months. The cost towards transplantation of trees varies with its girth.

### **C) Procerure of felling of trees**

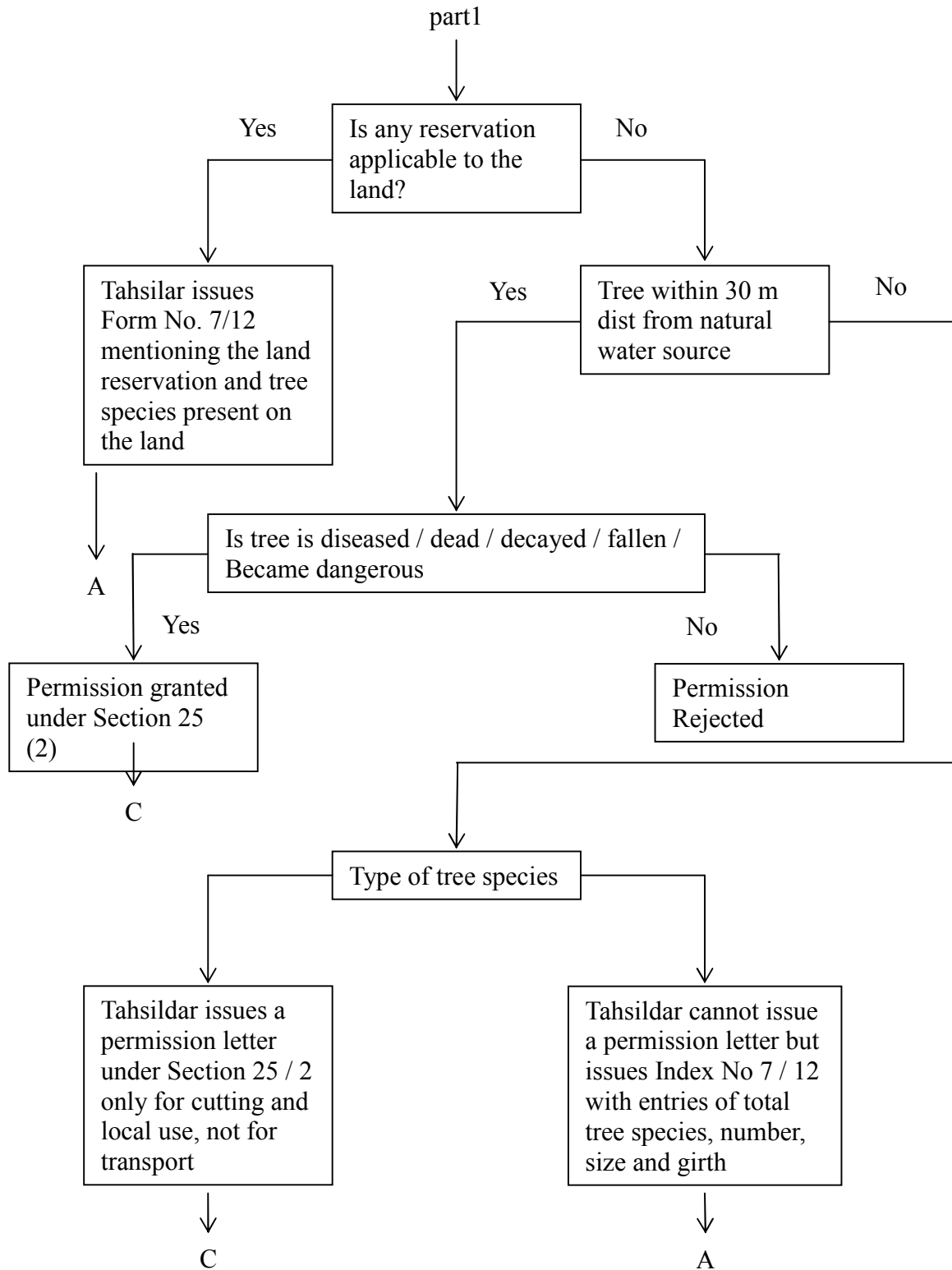
The Procedure of felling of trees each state is shown in below figure:





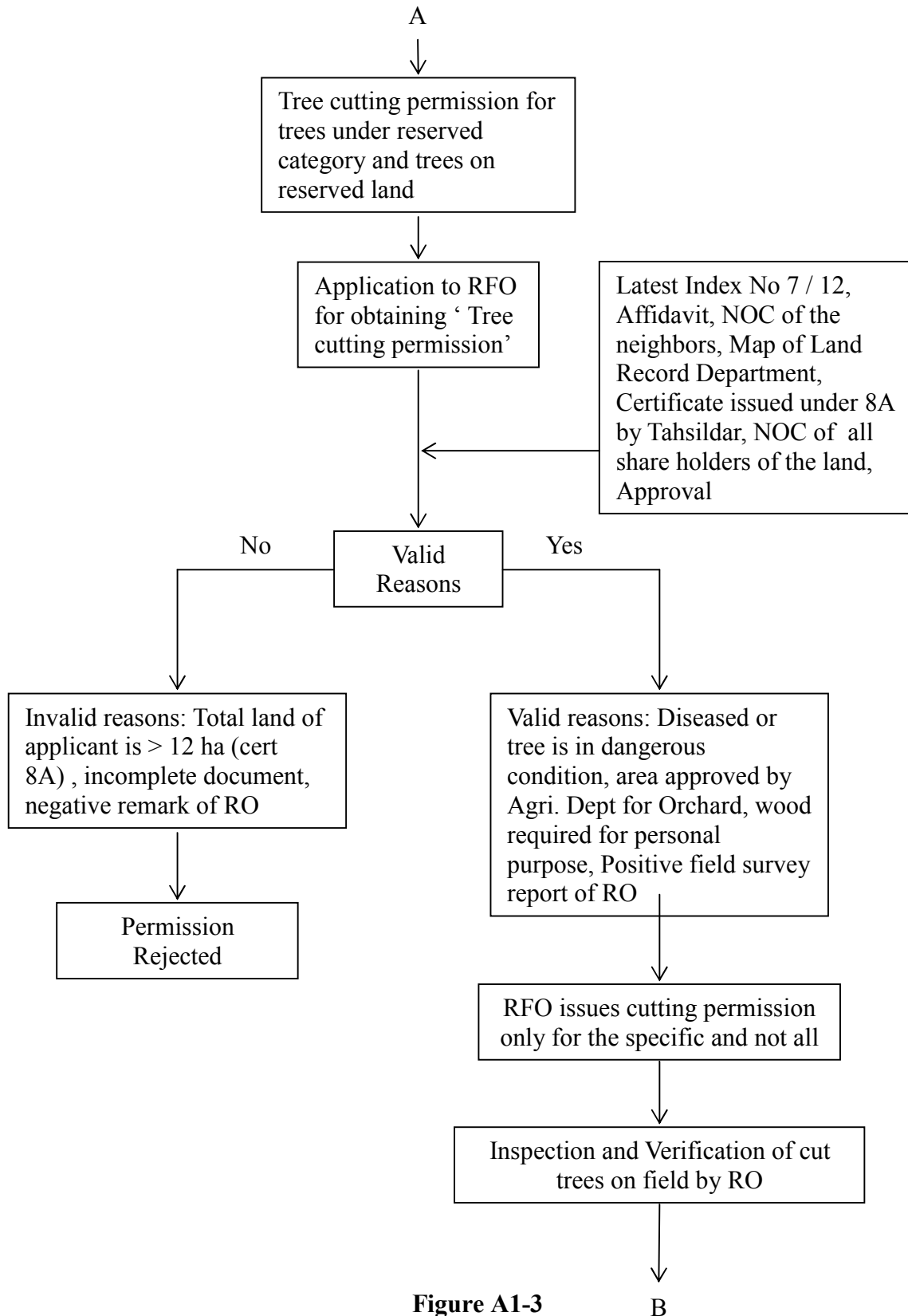
**Figure A1-1  
Procedure for felling of trees at Maharashtra (1)**





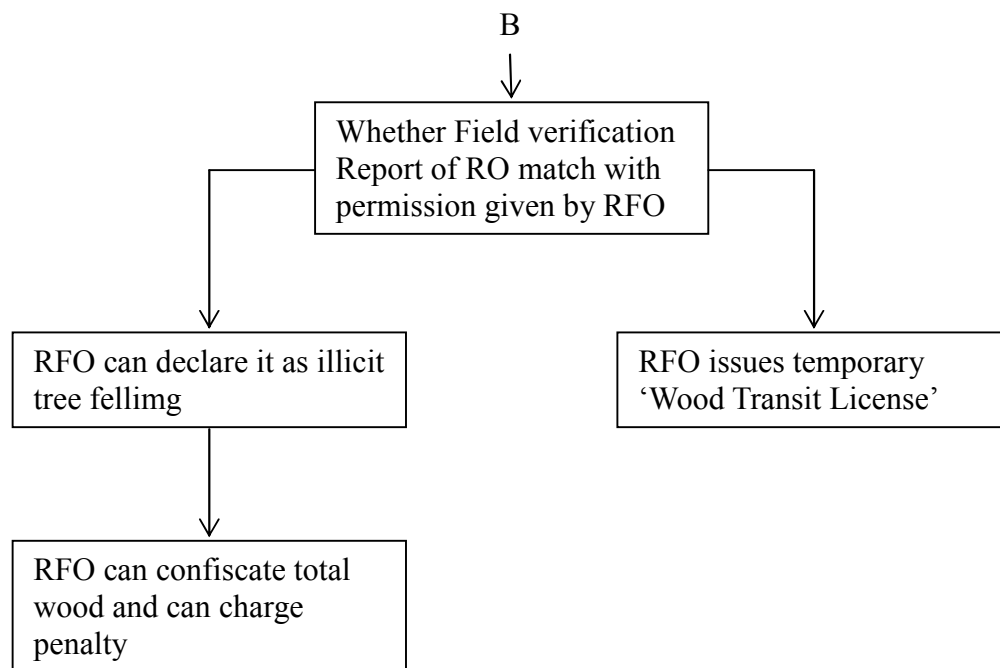
**Figure A1-2  
Procedure for felling of trees at Maharashtra (2)**





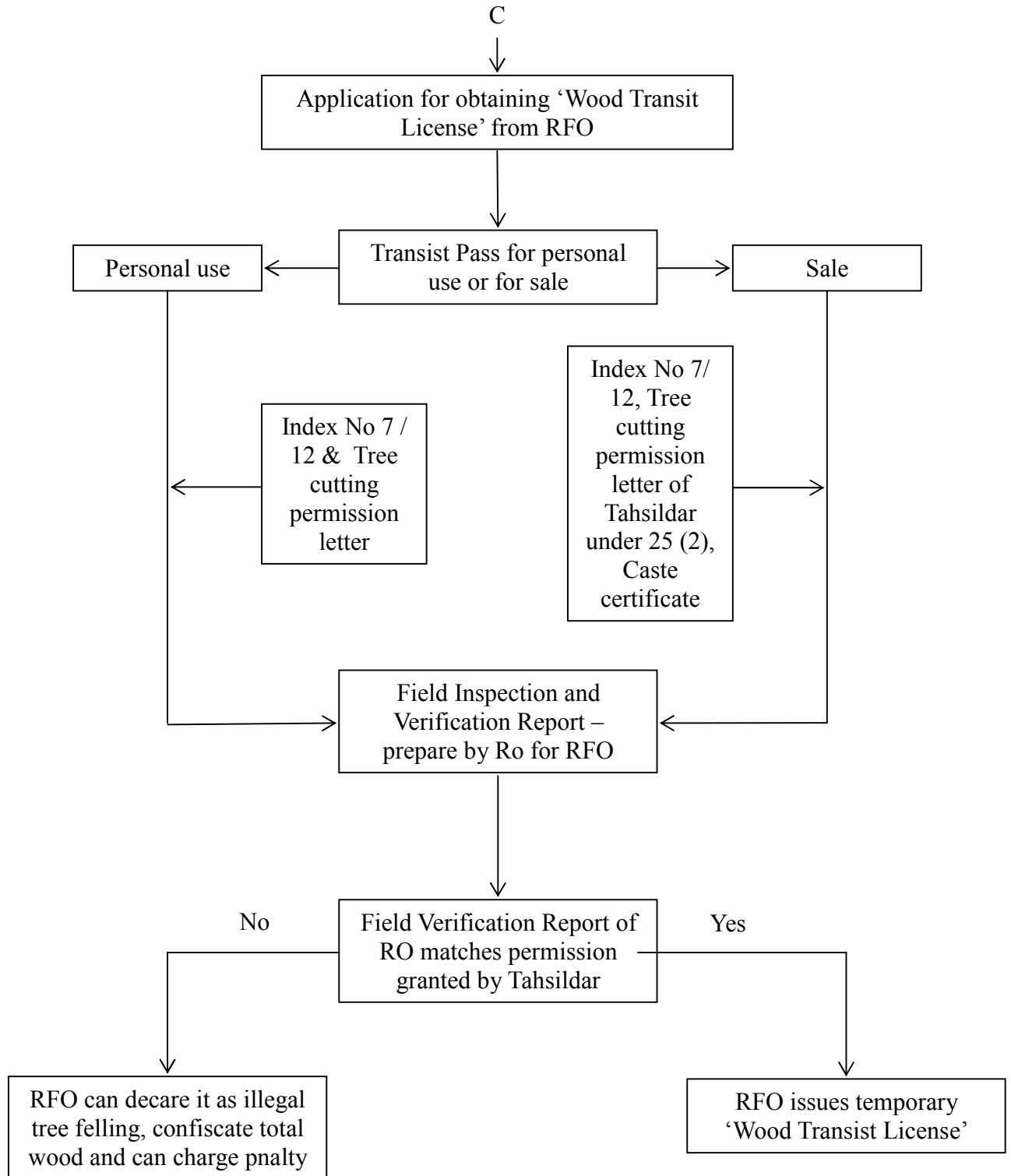
**Figure A1-3  
Procedure for felling of trees at Maharashtra (3)**





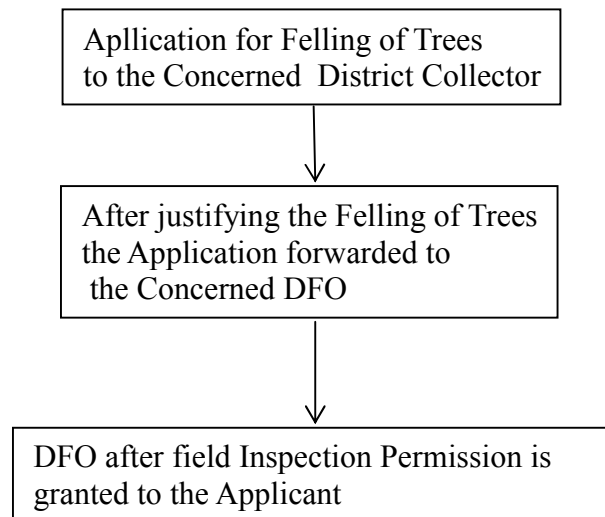
**Figure A1-4  
Procedure for felling of trees at Maharashtra (4)**





**Figure A1-5  
Procedure for felling of trees at Maharashtra (5)**





**Figure A1-6  
Procedure for felling of trees at Gujarat**



## **Appendix -II**



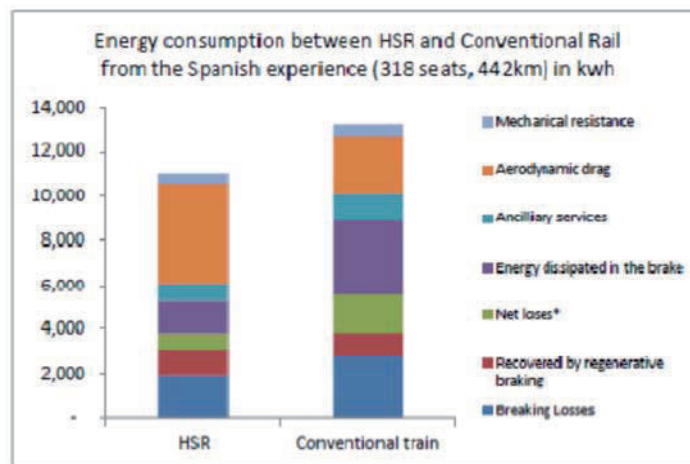
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## **A2-1 Impacts of CO<sub>2</sub> (Green House Gas) Emission**

This section focuses on evaluating the potential impacts of high speed train operations between Ahmedabad and Mumbai on energy consumption and CO<sub>2</sub> emission. This is based on the study carried out by the The Energy and Research Institute (TERI) titled “Estimating the impacts on energy consumption and emissions due to High Speed Rail operations along the Ahmedabad-Mumbai corridor”. High speed trains, operating at about 300-350 km/hour are expected to offer benefits in terms of reduced travel time, comfortable journey experience and a complete redesign of the urban mobility. Over and above, the introduction of high speed rail would also result in a lot of travel demand shifting from modes such as automobiles, airlines, buses and conventional trains to high speed trains. This would result in completely changing the energy demand for transport along this study corridor. From petroleum based fuels used in air and road modes, a significant share of the mobility is expected to electricity based traction on high speeds. This study examines the impacts on the energy use and consequent carbon emission resulting from this change in the mode shift in traffic.



Source: (UIC, 2010)

\*net losses are energy losses net of energy recovered from regeneration braking

**Figure A2-1:**

**Comparison of energy consumption between HSR and conventional rail from the Spanish experience for a distance of 442km and same seat capacity of 318 seats (in kwh)**

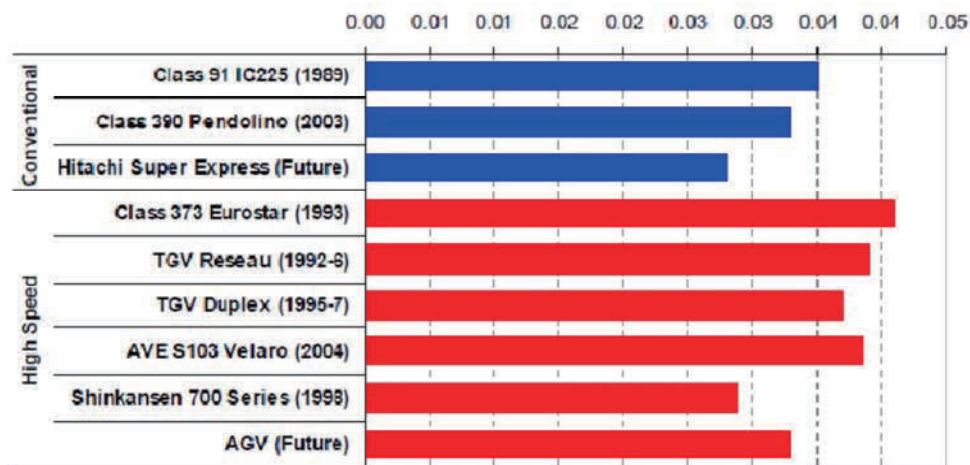
Common perception is that an increase in travel speeds would relate to square times increase in energy consumption. But a survey of the literature does not show this to be necessarily true. Energy consumption by a vehicle is not only a function of its acceleration and speeds but a combination of a multitude of factors such as mechanical resistance, air intake resistance, aerodynamic drag, breaking resistance, auxiliary services, etc. While some of these factors that determine energy use are directly proportional to speeds, some such as auxiliary services and breaking resistance are not related to speed but are major energy consumers. As a result, increased speeds would not necessarily mean an increase in energy consumption or increased emissions from energy consumption. Another common perception is that High Speed Rail is much more energy intensive in its operations as compared to other transport modes. This too is not necessarily true. Calculations reveal that HSR is less energy intensive per passenger kilometer as compared to either personalized



modes such as cars or faster modes such as airlines. Not only are they more energy intensive, but both these modes also rely on petroleum based fuels which heavily increase India's energy import dependence. When compared to modes such as conventional rail or buses however, HSR has higher energy intensity per passenger kilometer. Therefore the impact on energy and emissions as a result of the introduction of HSR along a particular corridor would depend largely on the composition of this mode shift from various modes to HSR. While a shift from the more energy and emissions intensive modes such as cars and airlines to HSR would lead to a reduction in the energy demand along a particular corridor, a shift of traffic from conventional railways or buses to HSR could adversely affect the energy and emission of a corridor. The impacts would therefore keep varying from corridor to corridor depending on the mode share and shift rates from various modes to HSR.

### **HSR Efficiency**

Various studies have been undertaken to estimate the efficiencies of the different kinds of HSR operating across the world. A comparative set of figures for different HSR across the world is shown in Figure A2-2. The Shinkansen 700 series come out as one of the most energy efficient HSR train-sets in the world. While the efficiency range of HSR train-sets seem to be in the range of 0.029kwh/seat-km to 0.041 kwh/seat-km, the energy efficiencies seem to vary across different HSR lines based on a host of different parameters, such as route distances, number of stops, train-set seat capacities, high-speeds, etc.

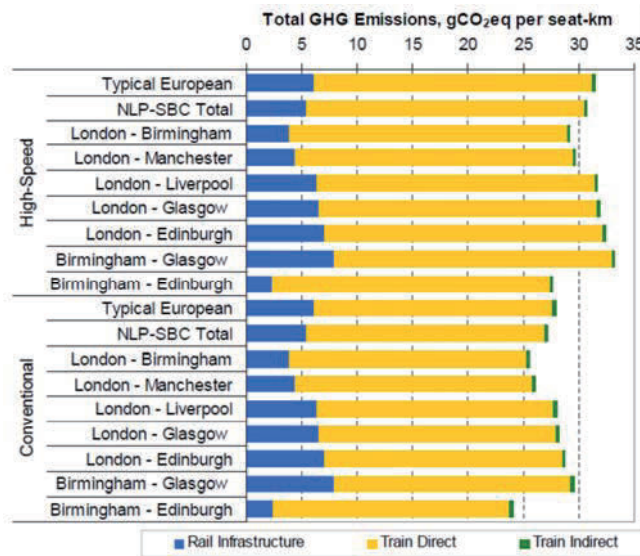


Source: (Network Rail)

**Figure A2-2:  
Relative energy efficiencies of different kinds of HSR across the world  
(kwh/seat-km)**

One of the most important parameters for these energy efficiency estimates however seem to be the distance of travel. With increasing distances, while the traction needs increase marginally, there is a proportional increase in the auxiliary power requirements for passenger comfort needs such as cooling and lighting and technical purposes such as compressors, motor ventilators, etc. (UIC, 2010). This is apparent in the Figure A2-3 below, where there is variation in the emissions (and the energy consumption) per seat-km even on the same High Speed system such as that in the United Kingdom. It is therefore important to compare energy efficiencies of HSR's along similar route lengths to make comparable estimates.





Source: (Network Rail)

**Figure A2-3:  
Estimates of GHG emissions per seat-km in UK**

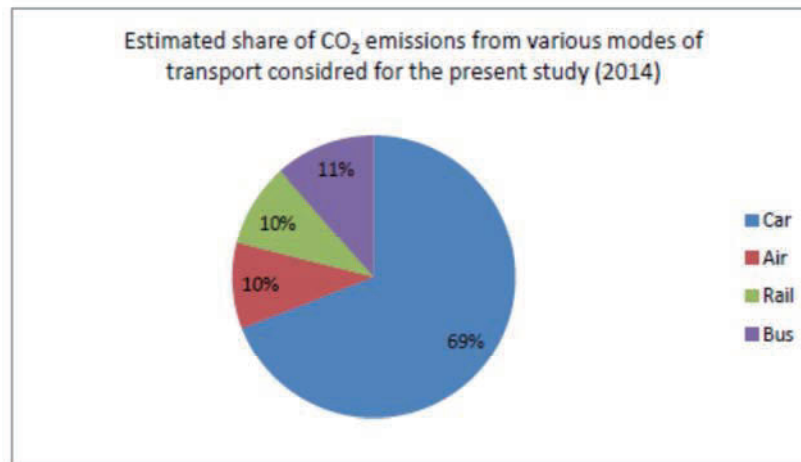
For the present study, the train characterization of the Shinkansen 700 series train has been used as per the following calculations:

Train	Shinkansen 700 Series (1998)
Speed (km/h)	300
Seating capacity	1323
Length (m)	400
Vehicles per unit	16
Tare mass (tonnes)	634
Mass per train metre(tonnes)	1.59
Mass per seat(tonnes)	0.48
Energy consumption (kWh/seat km)	0.029
Total distance*	534
Total energy consumption	20,488
Occupancy (%)*	70%
Energy consumption (kWh/100seatkm) @70% occup.*	<b>4.14</b>

#### **Current Levels of CO<sub>2</sub> Emissions from Traffic considered for the Study**

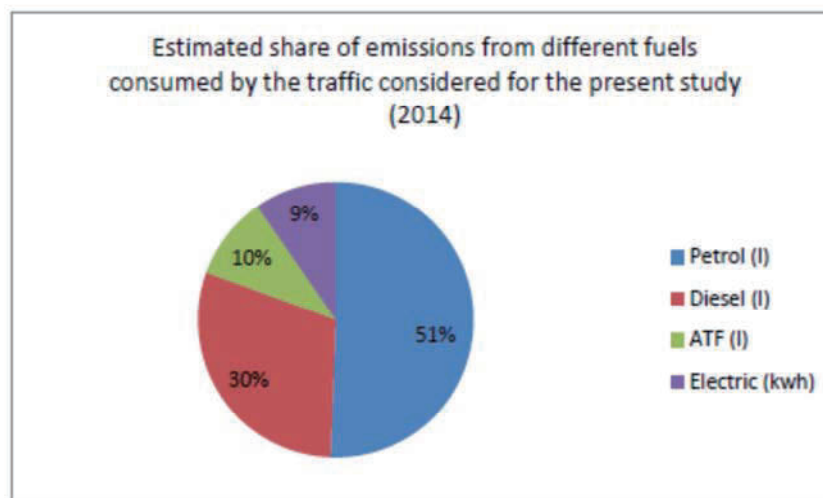
As seen in the case of the relative CO<sub>2</sub> emissions intensities and the energy intensities of each of the modes considered for the study, there is variation between in the emissions profile of the traffic from the energy profile as described in the previous section. As of 2014, cars are estimated to be generating the largest volumes of CO<sub>2</sub> emissions (69%) followed by buses (11% share) and aviation and railways both with 10% of the shares.





**Figure A2-4:**  
**Estimated share of emissions from various modes of transport considered for the present study**

What is interesting to note is that in 2014, railways, with about 13% of the share in traffic and consuming only 3% of the energy, is estimated to be generating about 10% of the total CO<sub>2</sub> emissions. This is largely because of the fact that the electricity used by railways is generated from emissions intensive thermal coal which has high emissions content. Buses, which are the least emissions intensive, have only 3% of the CO<sub>2</sub> emissions shares.



**Figure A2-5:**  
**Estimated share of emissions from different fuels consumed by the traffic considered for the present study**

Petrol has the largest share of emissions (51%) followed by diesel (30%) and ATF (10%). The share of emissions generated from electricity forms only 9% (only emissions from railways) of the total emissions generated by the traffic considered for the study.

## **A2-2 Impacts on fuel and energy consumption with the introduction of HSR**



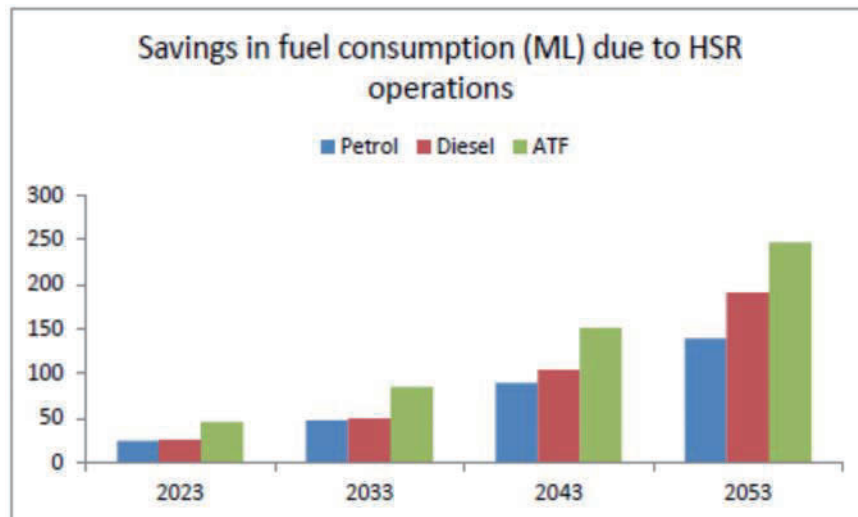
### **Growth Rates in Fuel Consumption**

In the scenario without HSR, the demand for petroleum products used for driving mobility is estimated to keep growing continuously at about 7 per cent annually (CAGR) between 2014 and 2053. Of all the fuels, growth in diesel consumption is estimated to be fastest at about 8% CAGR between 2014 and 2053, followed by ATF at 7% and petrol at 6% in the same period of time. Electricity consumption is expected to increase only by about 3% in the scenario without HSR. In the scenario with the introduction of HSR, there is a marginal decline in the growth rates of petroleum products, which are expectedly substituted by electricity consumption by HSR. The growth rate of petrol and diesel goes down to 5.5% and 7.5% respectively followed by ATF the growth rate of which falls to 4.7% (CAGR between 2014 and 2053). There is substantial substitution of petroleum products with electricity due to the introduction of HSR. The rate of electricity consumption increases to almost 8% between 2014 and 2053 in the scenario with HSR, as compared to 3% in the scenario without HSR.

### **Fuel Savings**

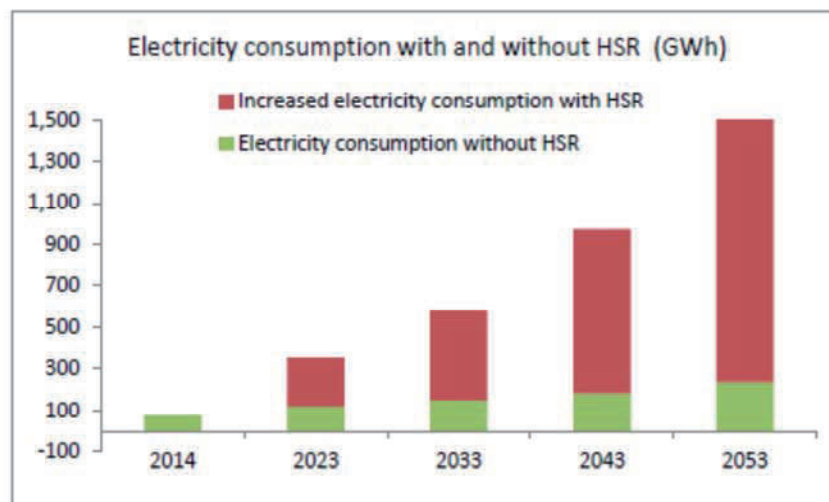
The introduction of HSR has a large number of impacts on the fuel and energy consumption for the traffic considered for this study. The largest impact in terms of the petroleum fuel reduction due to the introduction of HSR is expected to be for ATF. The ATF consumption levels of 2053 are estimated to be reduced by 246 ML in the scenario with HSR as compared to the scenario without HSR. This is a result of the large migration of traffic from air to HSR. In absolute terms, over the total estimation horizon period 2023 to 2053, about 3,959 ML of ATF is estimated to be saved due to HSR operations. In monetary terms this amounts to an estimated savings of Rs. 218 billion from just ATF savings between 2023 and 2053 at 2012-13 prices of the fuel.





**Figure A2-6:**  
**Savings in petroleum fuels due to operations of HSR along the Ahmedabad-Mumbai corridor**

HSR operations would also result in reduced consumption of petrol and diesel. A total of about 4,983 ML of petrol and diesel is also estimated to be saved through the horizon period 2023 to 2053 due to the operations of HSR along the corridor. The reduction in petroleum products would however be substituted by increased consumption of electricity. From just 79 GWh in 2014, the electricity consumption goes up to 238 GWh in the scenario without HSR and to 1,545 GWh in the scenario with HSR by 2053.



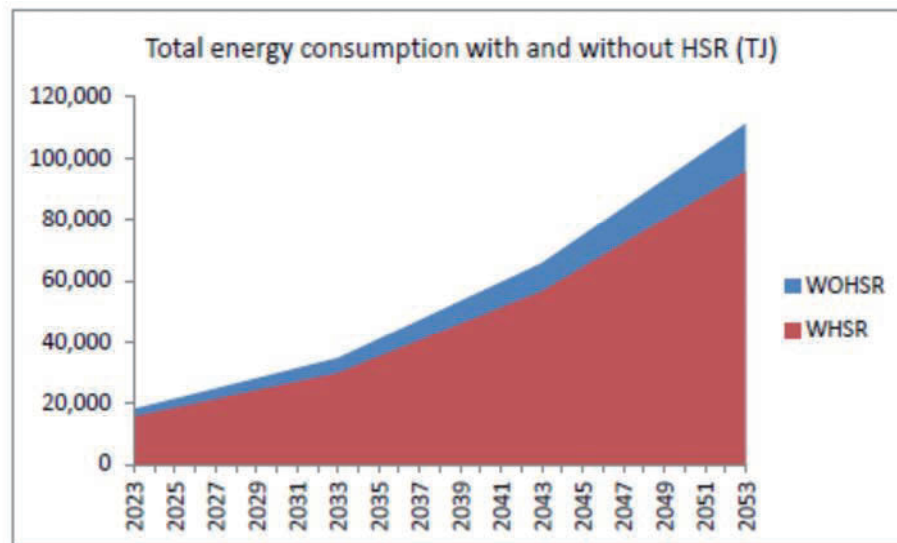
**Figure A2-7:**  
**Electricity Consumption with and without HSR (GWh)**

### **Resulting energy savings**

There is a net savings in energy seen due to the introduction of HSR along the corridor. A total cumulative savings of 317,608 TJ is estimated between 2023, the start year of HSR operations, and 2053, the end horizon of the analysis due to the reduction in the consumption of petroleum fuels. Of this, the largest energy reduction is from air (45%) followed by cars (43%) and then buses (10%). The reduction of energy consumption due to reduced conventional rail travel is estimated



to be only 1%.



**Figure A2-8:  
Estimated total Energy Consumption with and without HSR**

In monetary terms the savings in petroleum consumption results in estimated cumulative savings of about Rs. 450 billion in the 30 year study period at 2012-13 prices of fuel. Of this, 49% of the monetary savings is estimated to be from the reduction in ATF consumption, 28% is due to the reduction in diesel consumption and 23% is due to the reduction in petrol consumption. When these energy reductions are looked at from the point of view of the different modes consuming energy, the cumulative energy consumption by cars between 2023 and 2053 is estimated to be reduced by 10%, air by 61%, rail by 21% and buses by 31% due to the start of HSR operations.

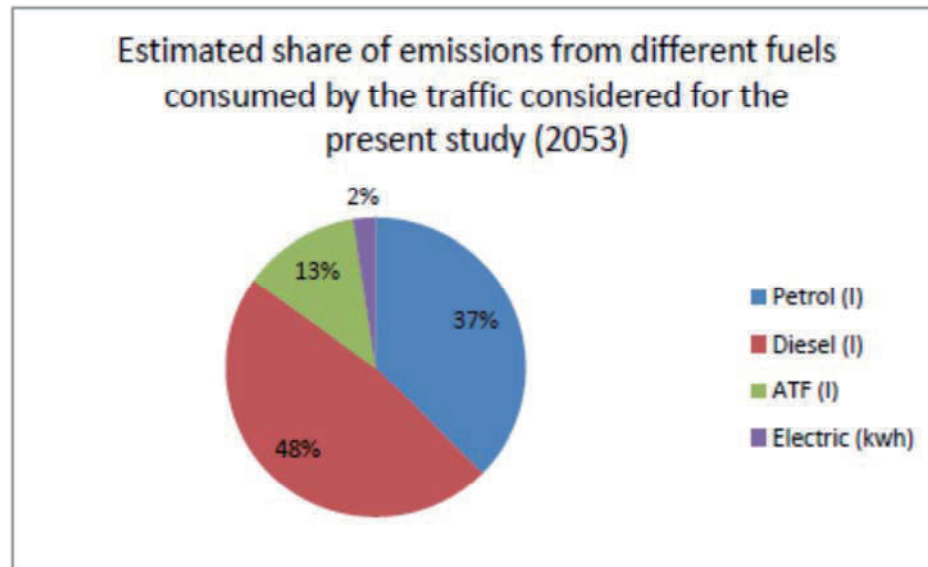
### **Impacts on CO<sub>2</sub> Emissions with the introduction of HSR**

The CO<sub>2</sub> emission in the scenario with and without HSR operations for the traffic under study is a function of the volumes of fuels used and their types along with their CO<sub>2</sub> emissions intensities.

### **CO<sub>2</sub> Emissions without HSR**

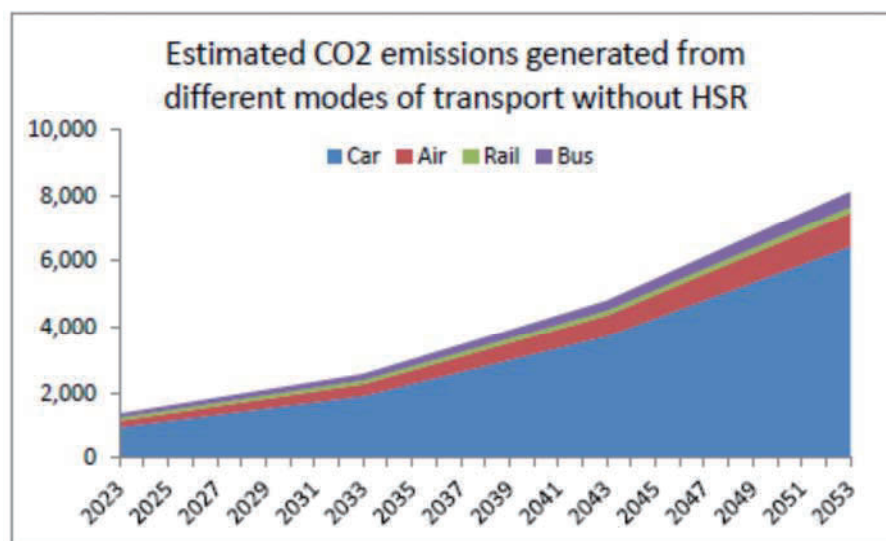
As explained in the previous section, as of 2014, petrol is estimated to be the single largest source of energy to drive the traffic considered for the present study. It is also responsible for the largest volumes of emissions generated for driving this traffic with 51% (341 thousand tonnes of CO<sub>2</sub>) of the emissions share, followed by diesel (202 thousand tonnes of CO<sub>2</sub>) and ATF (66 thousand tonnes of CO<sub>2</sub>) and electricity (65 thousand tonnes of CO<sub>2</sub>, i.e. 9%). In the future scenario without HSR, this situation continues to get further skewed, with increasing shares of emissions being generated due to the continued use of petroleum fuels. In the scenario without HSR, the share of emissions from the use of electricity goes down to 2% of the total emissions from transport.





**Figure A2-9:**  
**Estimated share of CO<sub>2</sub> Emissions from different fuels consumed by traffic in the Scenario without HSR in 2053**

In terms of modes of transport the share of emissions from aviation and cars continue to keep growing, while the shares of emissions by railways and buses decline. This is shown in the figure below.



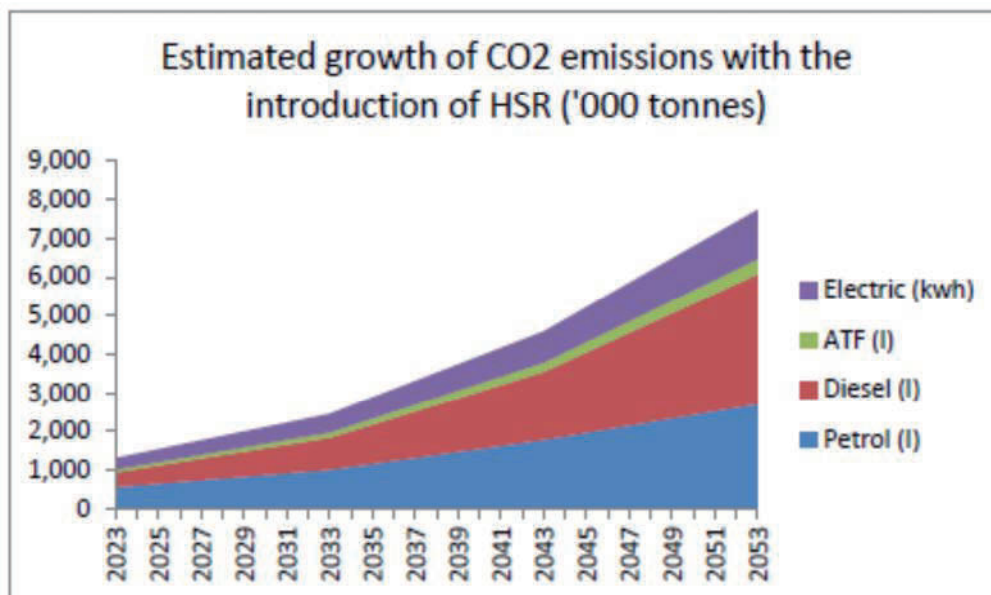
**Figure A2-10:**  
**Estimated CO<sub>2</sub> Emissions generated from different modes of transport in the Scenario without HSR in 2053**

The CO<sub>2</sub> emissions from cars are estimated to dominate by 2053, with over 79% of the share of total emissions from the traffic under consideration. This is followed by CO<sub>2</sub> emissions generated by airlines (13%), bus (6%) and rail (2%) shares in 2053. The CO<sub>2</sub> emission for the total traffic under study is estimated to increase by over 12 times between 2014 and 2053. In terms of absolute volumes, it increases from 673 thousand tonnes of CO<sub>2</sub> in 2014 to 8,120 thousand tonnes of CO<sub>2</sub> in 2053 in the scenario without HSR.



### **CO<sub>2</sub> Emissions with HSR**

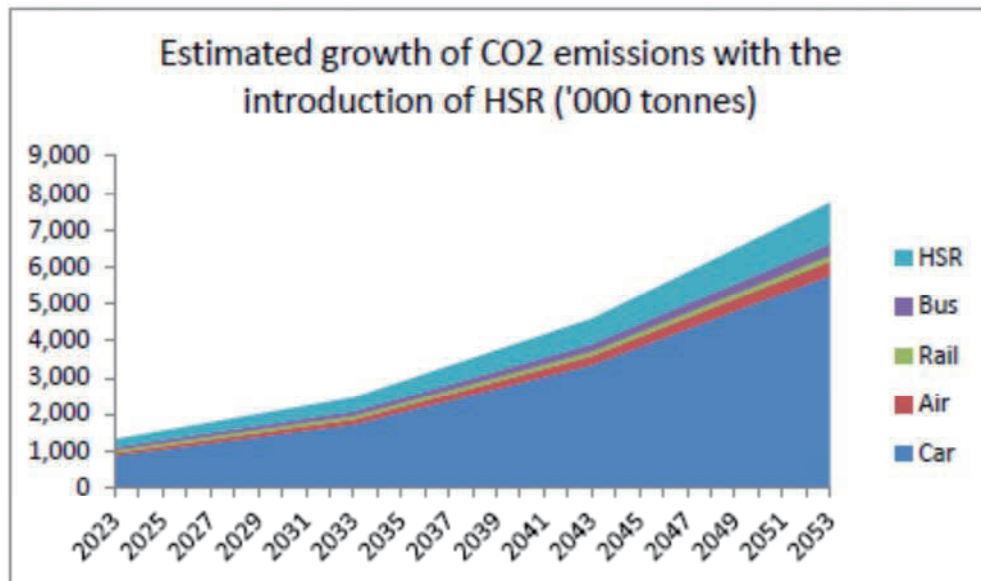
The future outlook for CO<sub>2</sub> emissions for the traffic under consideration changes with the introduction of HSR. While on one hand the reduction in the total volumes of energy consumption due to the introduction of HSR is expected to reduce the emissions volumes, the mode shift from the relatively less CO<sub>2</sub> emissions intensive buses and conventional railways to HSR increase emissions. In terms of fuels used the share of CO<sub>2</sub> emissions generated by petroleum products declines with the introduction of HSR. Between 2014 and 2053, it is estimated that there will be a decline in the share of CO<sub>2</sub> emissions from ATF (from 10% in 2014 to 5% in 2053) and petrol consumption (51% in 2014 and 35% in 2053). These declining shares CO<sub>2</sub> emissions is compensated by increasing shares of CO<sub>2</sub> emissions due to diesel consumption from 30 to 44% in the same period of time. Increased electricity consumption due to HSR operations lead to increase in the shares of CO<sub>2</sub> emissions from electricity between 2014 and 2053. In terms of volumes, the total CO<sub>2</sub> emissions generated due to the consumption of electricity increases from 65 thousand tonnes of CO<sub>2</sub> in 2014 to 1,267 thousand tonnes of CO<sub>2</sub> emissions by 2053 due to use by conventional railways and HSR.



**Figure A2-11:**  
**Estimated growth of CO<sub>2</sub> Emissions with the introduction of HSR**

In terms of the modes of transport, the share of emissions generated by cars is estimated to increase from 69% of the total CO<sub>2</sub> emissions in 2014 to 75% by 2053. The share of CO<sub>2</sub> emissions by conventional railways and buses are estimated to reduce from 10 to 2% and 11 to 4% respectively. CO<sub>2</sub> emissions generated due to the operations of HSR is estimated to become 14% of the total emissions (1,112 thousand tonnes of CO<sub>2</sub>) by 2053. This is about three seven the emissions from electricity consumption by conventional railways in the same year.



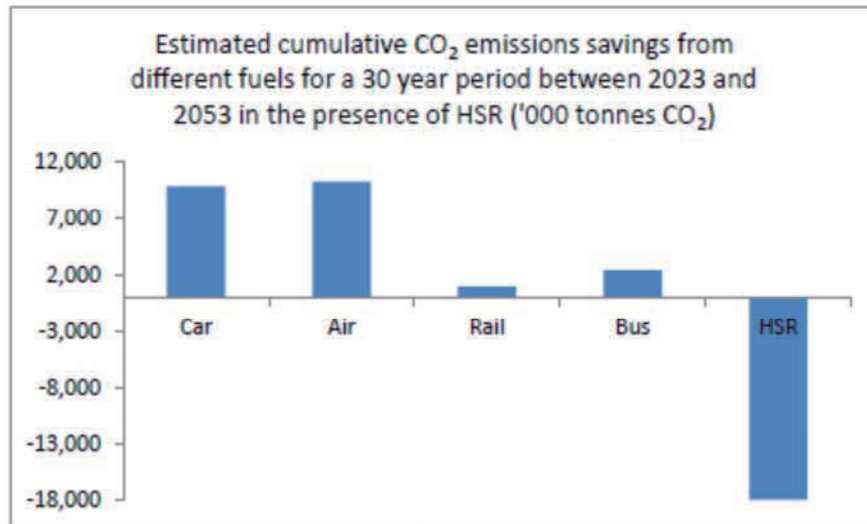


**Figure A2-12:  
Estimated CO2 Emissions in the Scenario with HSR**

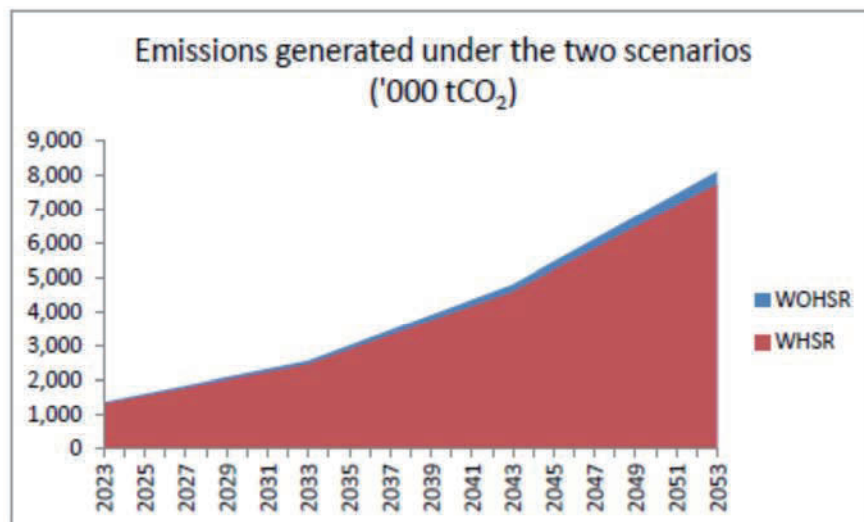
#### **Impact of emissions with HSR**

The relative impact on the CO<sub>2</sub> emissions generated due to the operations of HSR is marginal compared to the benefit due to energy savings. While there is a reduction in the total energy consumed by the traffic considered for transport along this corridor, there is little impact on the CO<sub>2</sub> consumptions. In 2023, the start year of HSR, the total emissions due to the traffic considered for this study under the scenario with HSR is estimated to be 1,315 thousand tonnes of CO<sub>2</sub>. This is marginally lower than the emissions generated in the scenario without HSR in the same year (1,363 thousand tonnes of CO<sub>2</sub>). As a result there is a slight decline in the overall CO<sub>2</sub> emissions from the traffic even in the starting year of HSR operations (reduction of 48 thousand tonnes of CO<sub>2</sub>). This trend is estimated to continue in the future, with improvements in the total CO<sub>2</sub> emissions under the scenario with HSR. By 2053, the end period of the study the difference between the CO<sub>2</sub> emissions under the scenario without HSR and with HSR reduces keeps increasing, indicating increasing reductions of CO<sub>2</sub>. From 8,120 thousand tonnes of CO<sub>2</sub> emissions in 2053 in the scenario without HSR, the CO<sub>2</sub> emissions is estimated to reduce to 7,740 thousand tonnes of CO<sub>2</sub> with the introduction of HSR.





**Figure A2-13:**  
**Estimated cumulative CO<sub>2</sub> Emissions savings from different fuels for 30 years period between 2023 and 2053 in the presence of HSR (000 tonnes CO<sub>2</sub>)**



**Figure A2-14:**  
**Savings in CO<sub>2</sub> Emissions due to the introduction of HSR**

When these additional CO<sub>2</sub> units are translated in to monetary terms at 2013-14 global prices of CO<sub>2</sub>, it leads to year on year savings due to the presence of HSR. In the 30 year time period between the start year of operations in 2023, and the end of the study horizon period of 2053, the annual average savings that would be incurred in lieu of CO<sub>2</sub> emissions savings would be about Rs. 93 million per year. In cumulative terms this would amount to a savings of Rs. 2.8 billion over the 30 year study horizon period. This impact on CO<sub>2</sub> emissions due to HSR operations given the estimated volumes of traffic can be attributed largely to the fact that the CO<sub>2</sub> emissions factors for an energy unit of electricity generated from the NEWNE grid in India is almost three times those that of equivalent petroleum fuels. This is because most of the electricity in India comes from thermal coal, which has very high CO<sub>2</sub> emissions factors. Over the 30 year horizon period of the study between 2023 and 2053, there is a net savings of 239,139 TJ of energy due to the operations of HSR along this corridor. This amounts to a 14% reduction in the overall



cumulative energy consumption for all the modes of transport along this corridor of study. In the scenario with HSR, the cumulative energy consumptions over the 30 year study period reduce by the by cars, air, rail and bus reduce by 10%, 61%, 21% and 31% respectively. There is a reduction in energy consumption of petroleum products by 313,475 TJ during the study period and a net increase in electricity consumption by 74,336 TJ due to the operations of HSR. This translates into a net savings in energy expenditure by Rs. 357,521 million (at 2012-13 prices) over the 30 year study horizon period due to the operations of HSR. There is also some CO<sub>2</sub> emissions savings as a result of the operations of HSR along this study corridor. Starting from 48 thousand tons of CO<sub>2</sub> savings in the starting year of its operations in 2023, the annual savings increase to 380 thousand tons of CO<sub>2</sub> by 2053, the end of the study horizon period. In cumulative terms, this amounts to a savings of 5,565 thousand tons of CO<sub>2</sub> over the same period of time. Like in the case of energy savings, the largest CO<sub>2</sub> emissions savings are expected to be from airlines followed by cars and buses. Assuming the prevailing prices of carbon in the global market to remain constant during the entire horizon of the study (2023-2053), this would amount in a potential cumulative savings of Rs. 2,782 million. As mentioned in the previous section, the savings from emissions reductions could be increased further if the source of electricity generation is changed from coal based thermal generation to more cleaner sources of energy. It is therefore evident from this study that there are both energy and CO<sub>2</sub> emissions savings potentials from the operations of HSR along the proposed Ahmedabad-Mumbai corridor.