Environmental Impact Assessment
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Lecture - 58
EIA Case Study – Mumbai Metro Line 3, Colaba - Bandra - SEEPZ

Welcome to the course Environmental Impact Assessment. And in today's session, we are going to look at the case study. In particular, we will look at a case study of Mumbai Metro line 3, which is proposed to run from Colaba Bandra to SEEPZ. When we do this case study will look at all the aspects that we have covered so far from the environmental concerns to legislation to different methods, public participation, and how we look at the alternatives and all that.

So, here you will see how whatever we have studied how that culminates into a case study. So, this is a very specific case study, but we will look at that and see how we are prepared and how does the case study looks like.

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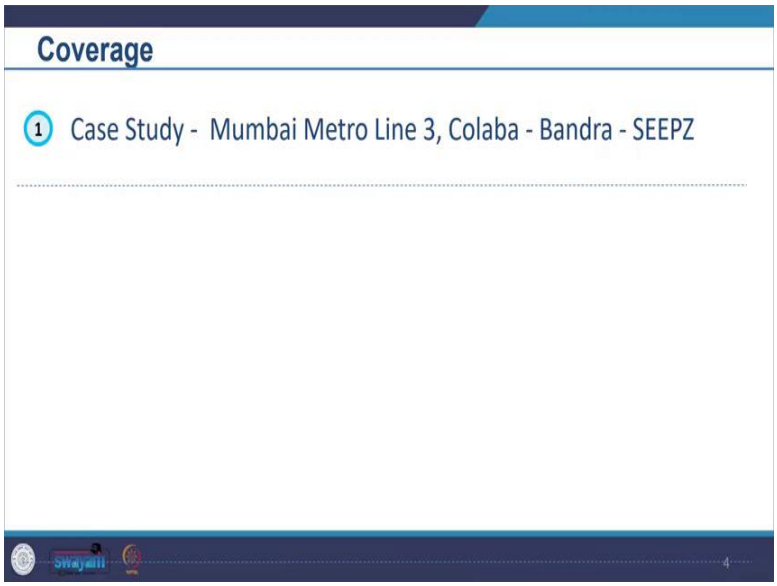

So, the coverage would include that will today in today's session, we will just look at the case study and the expected learning outcome is that you should be able to relate all the learnings from the environmental status to legislation, to different methods, to process, to public participation and alternatives. So, all the understanding you should be able to review from this particular case study.

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So looking at this case, which is proposing to have Mumbai Metro line 3, you can see in the diagram as well. So, it is proposed to run from Colaba Bandra to the SEEPZ area. If you remember, we had seen the social impact assessment for this particular report itself.

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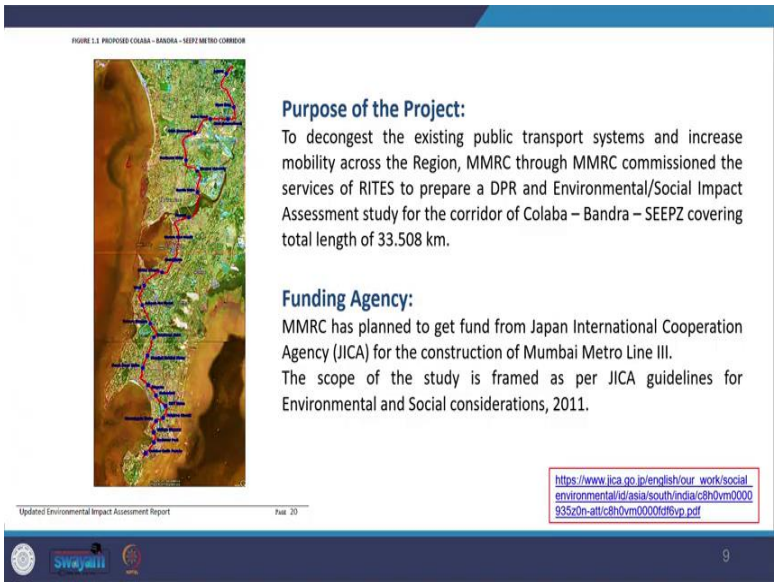

So, the looking at the purpose of this project, so, it is mainly for decongesting, the existing public transportation system and increasing the mobility across the region. So, through this project, they are trying to reduce the environmental impact which is happening. So, through this project, they are trying to do this. We see that it has been funded by JICA, which is the Japan International Corporation Agency. And they are funding it for the construction of Metro Line 3. And if you look at it, this particular document provides the environmental impact assessments.

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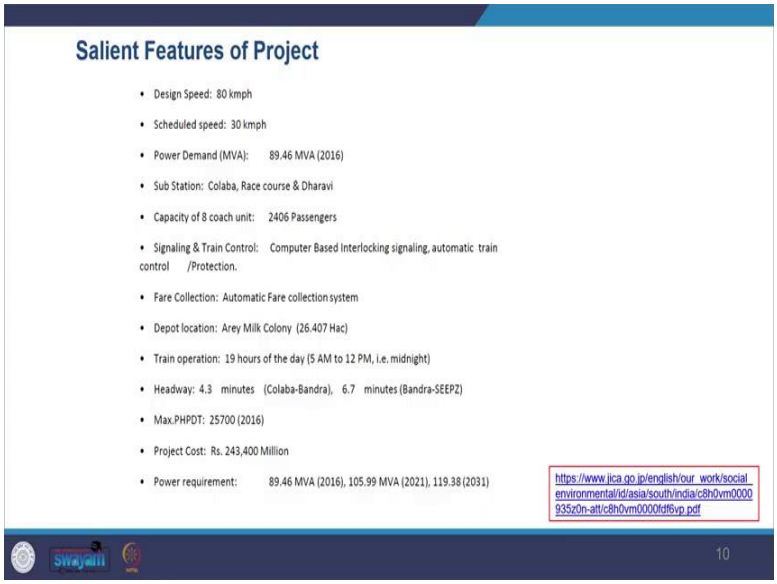

So, looking at the salient feature of the project, we see that it has a design speed of 80 kilometers per hour and, a scheduled speed of 30 kilometers per hour. And the range of power demand, the substations which will be there, the capacity of 8 coach units. So, that is going to take 2406 passengers and signaling and train control which will be their, fare collection, deport location, which is at Arey Milk colony, which you must have heard in the news as well.

And then also train operation, what will be the hours of operation and what is the headway. And then other details of the project costs, you can see, it is in the range of 243,400 million Indian currency, so you can see and what would be the power requirement. So, that is the scale of the project we are looking at.

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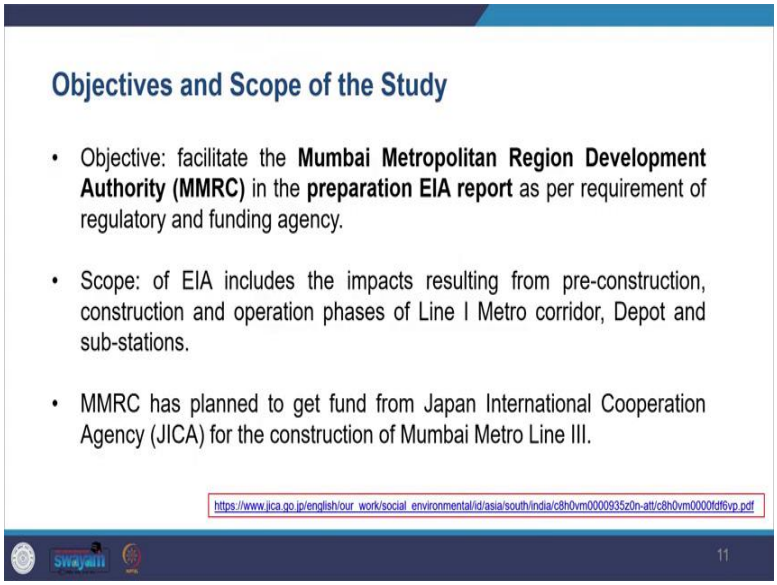

The objective of the study, if you will see these EIA documents is to facilitate MMRDA which MMRDA which is the Mumbai Metropolitan Regional Development Authority in preparation of the EIA report as per the requirement of regulatory and funding agency. So you see how every EIA is made within the regulatory or the

funding agencies' requirements. So we see the scope of this EIA, which includes the impact resulting from all the phases of construction pre-construction, construction operation phases of this Metro corridor, and whatever ancillary functions deport and substations which will come up.

And since MMRC, has planned to get funding from the Japan International Cooperation Agency for the construction of the Mumbai Metro line, you will see that usually, Moe FCC does not require their, as per the list which we have studied it does not fall under environmental clearance, but since it is required by the funding agency, the environmental impact assessment report was prepared for this.

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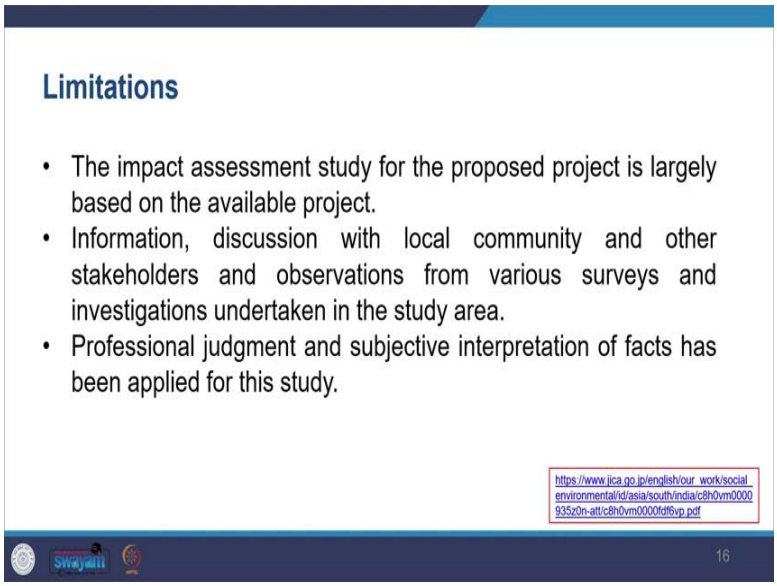

So, looking at this limitation of this particular EIA report, you will see that the impact assessment study for the project was prepared largely based on the available project information. So, information they had and also discussions with the local community and stakeholders, and observations from various studies and investigations they undertook. And a lot of professional judgment and subjective interpretation of facts have been applied to the study.

So, they are also giving their limitation and places and you will see that an impact assessment study has been undertaken for alignment that was approved. So, you see the design was already there by MMRCA, done in 2015. So, based on that, the impact assessment in been done. So, how clearly they are stating based on what has been done? And then you see that, since Japan International Cooperation Agency JICA, was involved, they required that the EIA has to be done as they are the lending agency here.

So, according to them, they required that there should be a transparent and accountable process, as well as the active participation of key stakeholders is required. So, we had discussed this, that even funding agencies have their requirements. So, according to that EIA was prepared for this and they aligned with the World Bank

operation policy 4.0, which also we have studied. So you see how each thing are aligning here and how that references have been made.

And even you will see that JICA recognizes certain principles, that one has to undertake, while they are dealing with projects relating to a wide range of environmental and social impact, which has to be addressed through the project, and then how different measurements of environmental and social considerations have to be taken at the early stage of the project and then how accountability and transparency have to be maintained.

And how stakeholders' opinions have to be incorporated what kind of disclosures have to be make made and then how one needs to look into the capacity of the organization and operations of the project and then also implementation of the projects while undertaking environmental and social considerations. So, how even the implementation have to be undertaken there?

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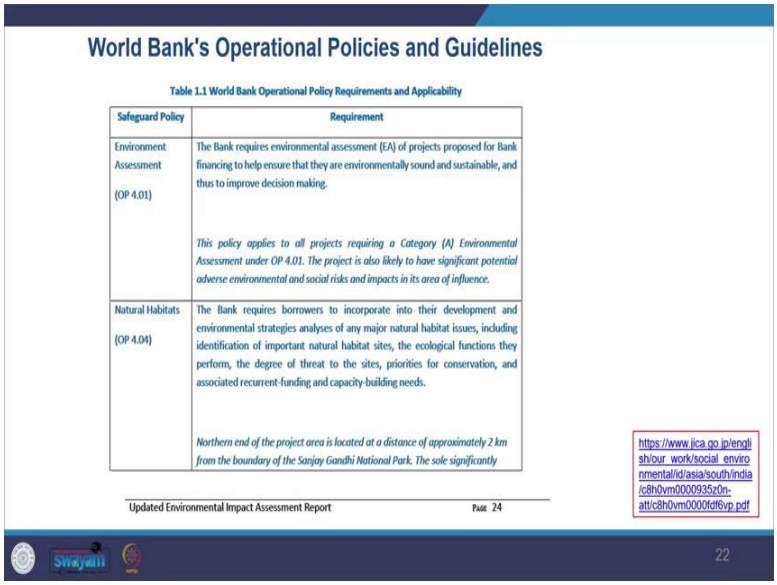

So, here you see the World Bank's operational policies and guidelines which are given in the EIA report itself. So which they have acknowledged and then they have identified what are the requirements. So, this also you have already seen, so, environmental assessment, operational policy 4.01 Environmental Assessment, then you see the natural habitats, how they have to be taken care of.

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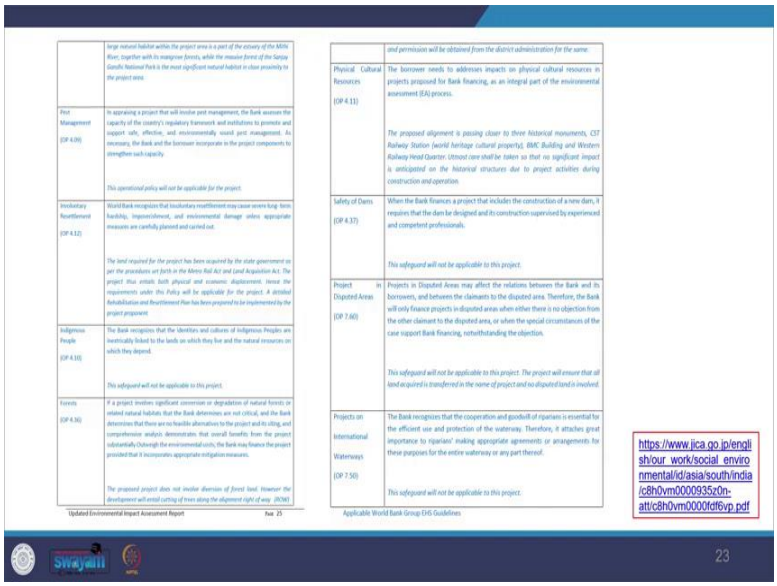

Then how even the pest management involuntary resettlement, which also we have seen. Indigenous people's consideration has to be undertaken even that has been addressed, how the forest, physical cultural resources, the safety of dams, projects, and disputed areas project on international waterways. So, all these have been acknowledged and referred to in the EIA document, As you see, they have also addressed the equator principle 3, also that reference has been made. So, you have also gone through that while we studied the subject.

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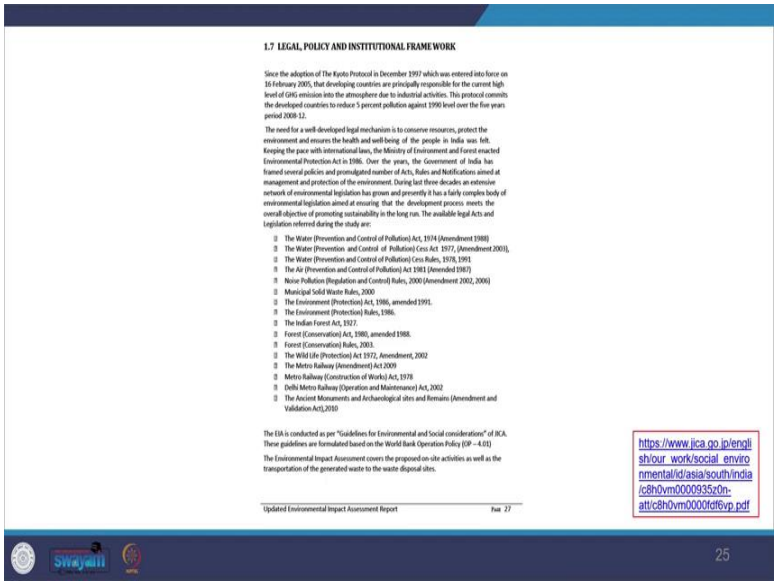

Thereafter, you see that they also address legal policy and institutional framework. So, within all the domains all the domain which you have studied, you can look at the list here, you can see the water-related domain, what kind of policies would be applicable, noise pollution related, what kind of laws will be applicable likewise municipal solid waste rules Environmental Protection Act, forest wildlife, Metro railway, Metro railway, Delhi

Metro railway and ancient monuments and archaeological sites and remain so, you see how legal policy and institutional framework has been addressed.

So, they have systematically they have looked at all the aspects, law, and regulation guidelines, and then what features they would adopt, will be applicable or not, and reasons for their applicability and whose responsibility will be, implementation responsible agencies, so, they have identified all the legal requirements here.

So, you have gone through all of these you can see all this air-related noise forest. So, we have done elaborate coverage of all the legislative parts. So, you see how that has to be addressed in an EIA report. So, you also see hazardous waste management, then motor vehicle development control regulation, then resettlement and rehabilitation. So, all these have been addressed here in the EIA report.

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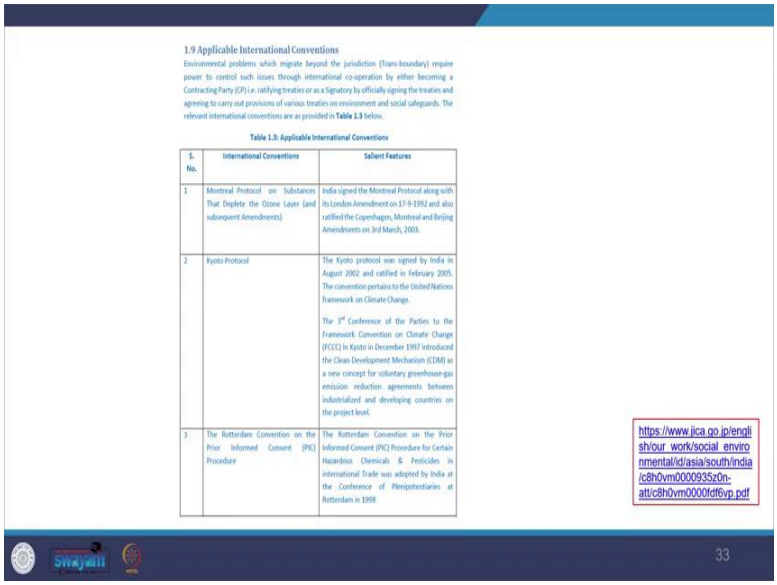

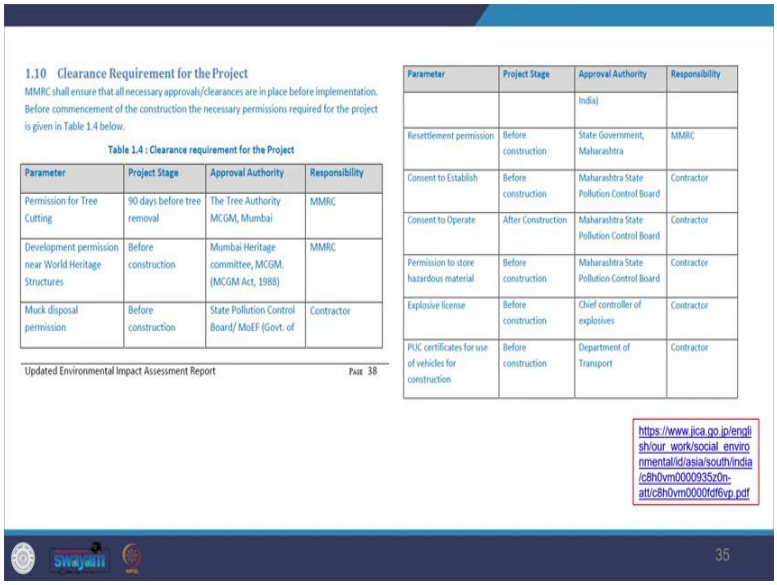

So, likewise, you also see applicable international conventions. So, we have also studied this. So, you see in the EIA report how they are also acknowledging international conventions. So, starting from the Montreal Protocol

to the Kyoto Protocol and all that has been listed here. Further, what kind of clearance requirements will be needed for the project has been also specified here in the table, you can see permission for the tree cutting, development permission near World Heritage structure, disposal permissions, resettlement permissions, consent to establish, consent to operate, permission to store hazardous material, explosive license and all certificates for use of vehicles for construction and so on. So, you see how all clearance requirements have been also notified here.

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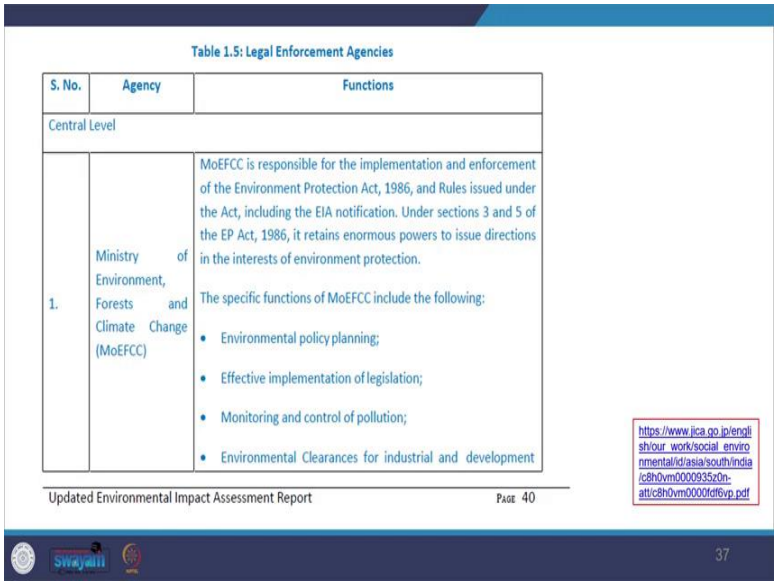

Table 1.5: Legal Enforcement Agencies

S. No.	Agency	Functions
Central Level		
1.	Ministry of Environment, Forests and Climate Change (MoEFCC)	MoEFCC is responsible for the implementation and enforcement of the Environment Protection Act, 1986, and Rules issued under the Act, including the EIA notification. Under sections 3 and 5 of the EP Act, 1986, it retains enormous powers to issue directions in the interests of environment protection. The specific functions of MoEFCC include the following: • Environmental policy planning; • Effective implementation of legislation; • Monitoring and control of pollution; • Environmental Clearances for industrial and development

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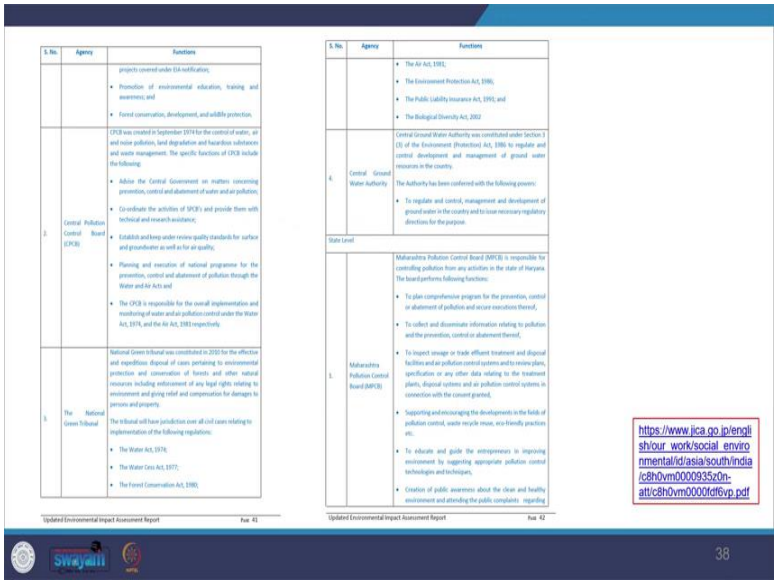

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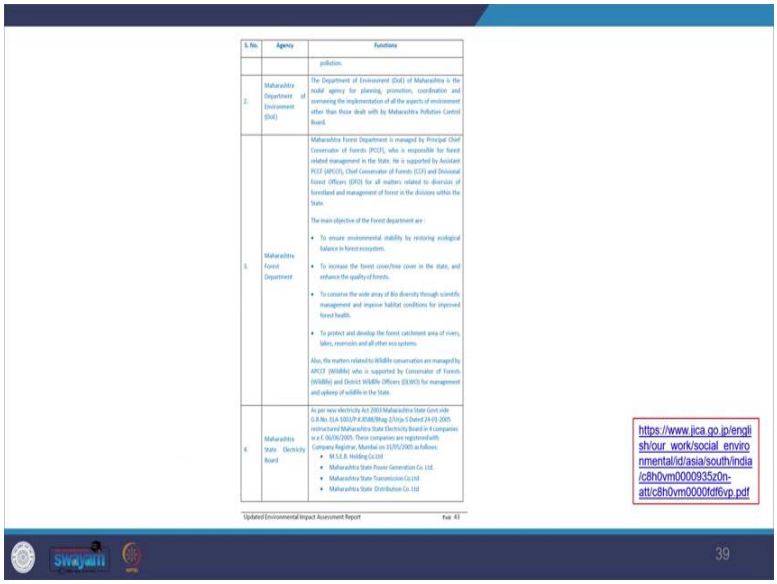

Then you see the institutional framework within which they are working. So, the key institution that is responsible is the Ministry of Environment and Forest, the nodal agency to which we have been referring all the time. So, you see, that is the key agency here, and the other agencies which you have also studied Central Pollution Control Board, as well as National Green Tribunal then you also have the central groundwater authority and then also the state-related Maharashtra Pollution Control Board and so on.

So, all that has been listed, you can have a look at this report. So, that was about the institutional framework. Now, moving ahead to approach and methodology, so, what approach did they adopt here, so, you see that as per the technical feasibility, the alignment was undertaken for the socio-economic acceptability and there were a lot of factors that guided how they would come up with the alignment for the metro rail.

So, based on the final alignment of the proposed alignment, then they worked out in different phases. So, impacts were assessed for various phases of the project cycle. So, we also try to see what project cycles are there. So, looking at the impact due to project location, impact due to project design, and impact due to product construction and project operation. So, based on that, they had done this plus, as we talked about like you also refer to a lot of other documents.

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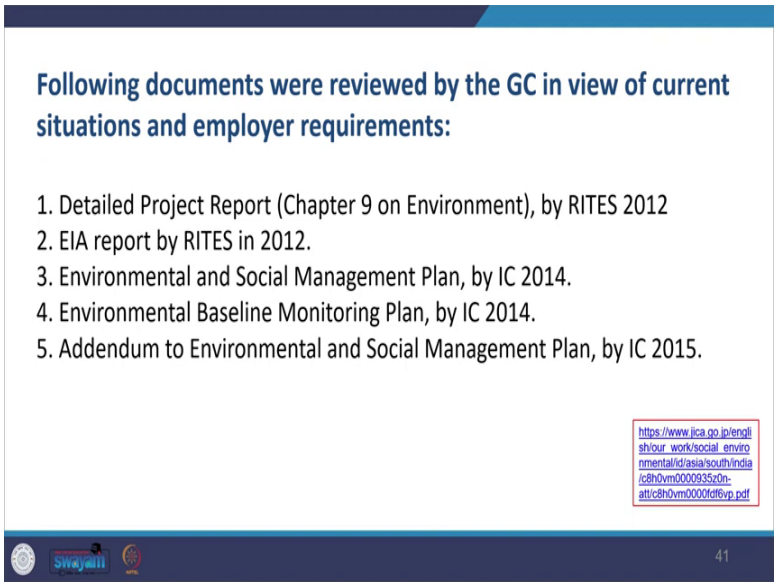

So, here they referred to the detailed project report DPR of the proposal. Plus EIA reports by rights and they also looked at the Environmental and Social Management Plan. And then they also looked at the Baseline Monitoring Plan and the Environment and Social Management Plan. So, all this was looked at.

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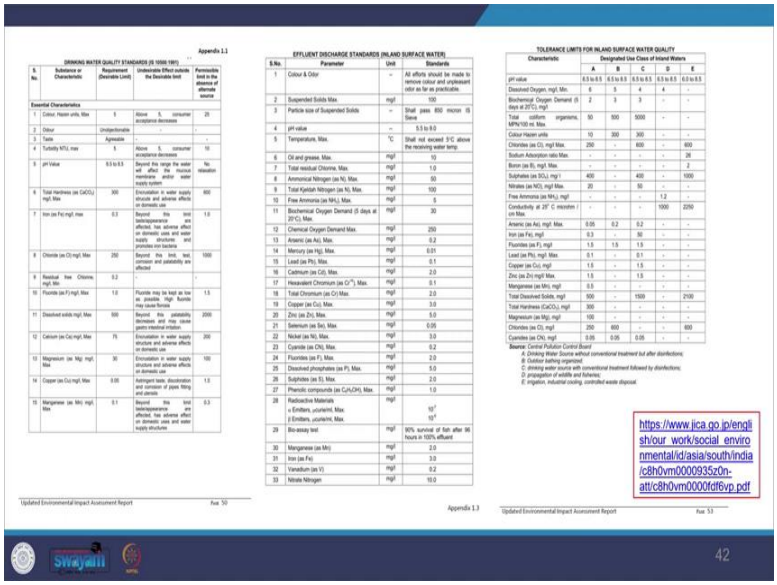

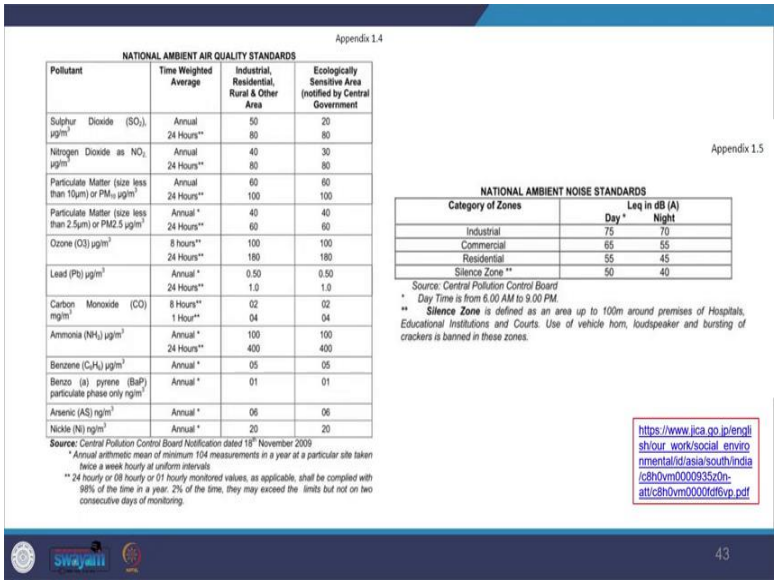

So, here you see how they aligned with refer to different standards. So, we have also seen different standards, you see that they have looked at the drinking water quality standards, effluent discharge standards, and then tolerance limits for inland surface water quality. So, all these sources have been identified for you in previous lectures. So, you also see national ambient air quality standards and national ambient noise standards.

So, all these are addressed in the report, you can have a look. So now, the next part is what we see in the EIA report, as we also learned about the structure of the EIA report. So, you see there is a project description. So, I am not going to get into the complete details of the project description, but I will just tell you the key elements, so, that we understand the associated impacts.

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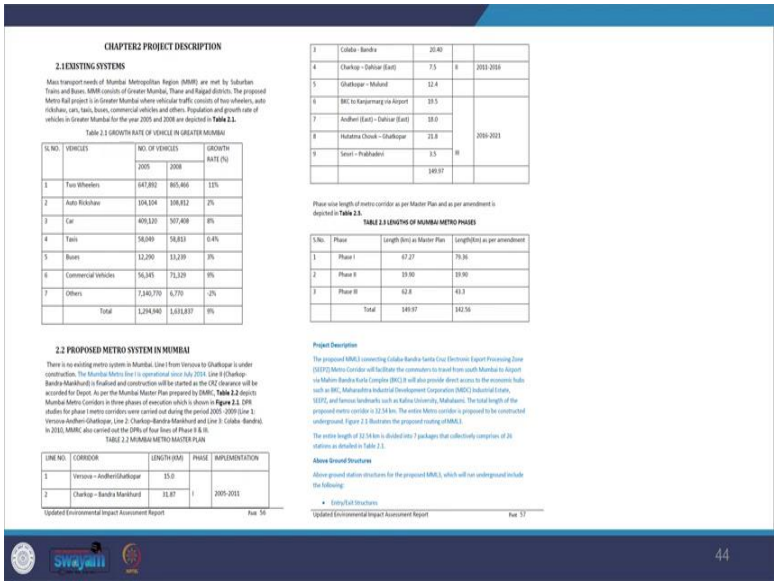

So, here project description gives, like, what is the existing transportation scenario and why this particular metro line has been proposed. So, if you remember the need of the project has to be emphasized. So, and then the details of the project have to be given. So, you see there that they have talked about the existing system and

then the proposed metro system in Mumbai and what all will happen within that, so, they are giving the project description here. So, we are in this just to understand the nature of the project.

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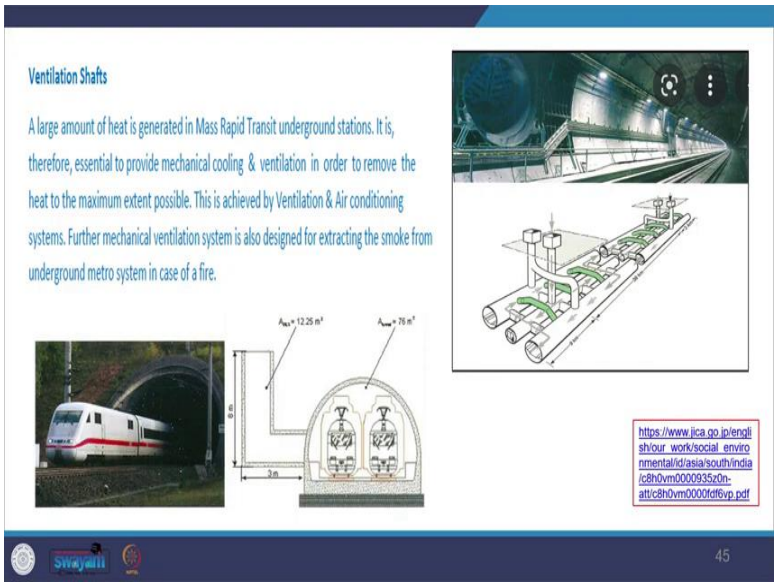

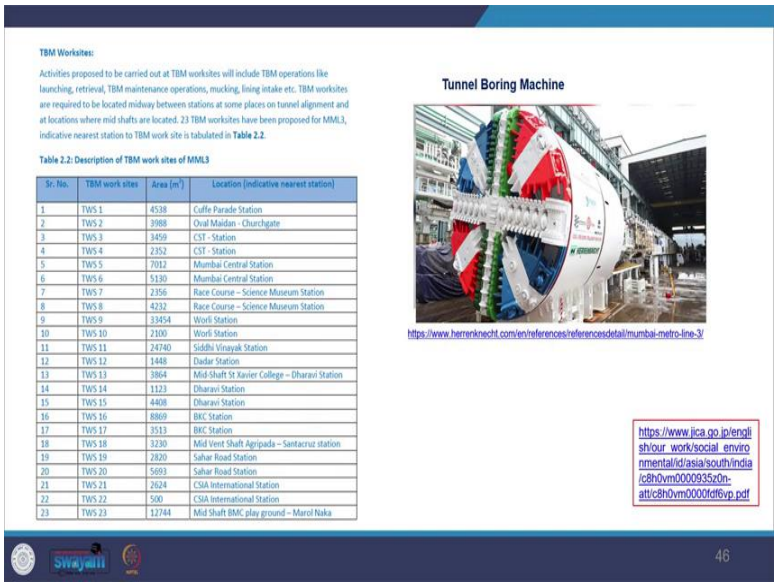

There might be ventilation shafts because there will be a lot of underground stations, that have a lot of ventilation requirements, and a lot of heat is generated in the process. So, those kinds of requirements would come, and then there would be tunnel boring machine work sites, so, which will create underground tunnels.

So, for that, you will see how much description of tunnel boring machine work sites would be the number of sites had been listed here in the report, and where it will be located during the construction of the project. So, all that has been identified, I have put the picture of just a tunnel boring machine so, that we understand what scale what kind of thing we are talking about.

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And then there might be, there will be also need for casting yards. So, all this will be pre-constructed and then would be taken to the construction site. So, you will see the details of tunnels and openings, station boxes, which would be there as the casting yards, and where all these from these casting yards would be and how much area they would take. So, I have put the picture also so, that we understand what the casting yard looks like.

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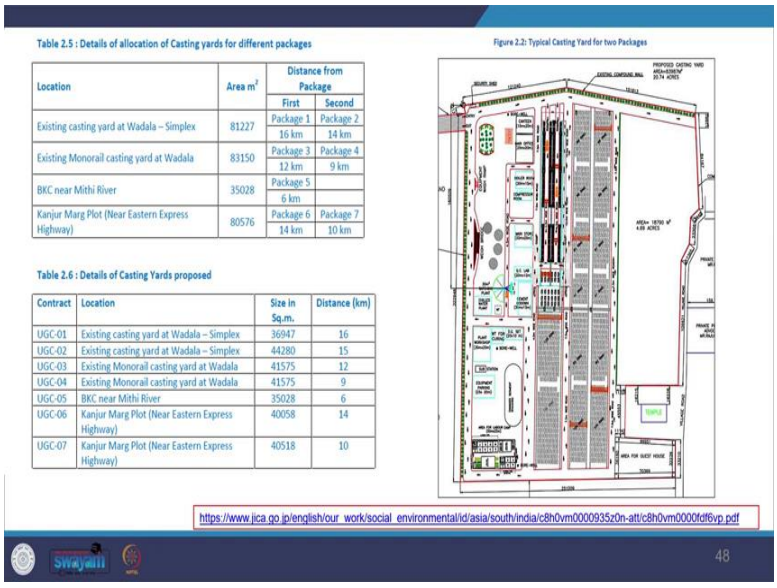

And then also various locations where these casting yards would come and then, what are the details of different casting yards proposed here, so, you see the range of places which are proposed, and then they have also provided the drawings of casting yards. As you can see here in the drawing, so, they have explained the complete project details in detail, we are skipping those details here. Further, they have analyzed the alternatives we discussed, like to ensure that what has been proposed is the best available alternatives or optimum alternatives that have to be established.

So, here they have analyzed the alternatives and alternatives have been analyzed on the way off as they have looked at the different alignments for planning this plus alignment has been taken with due consideration of catchment area, integration with the other mass transit corridor like how it connects with the other corridor transit systems then what is the feasibility of construction and the environment and social aspects. So, keeping that in point they have designed the alignment and alternatives have been considered.

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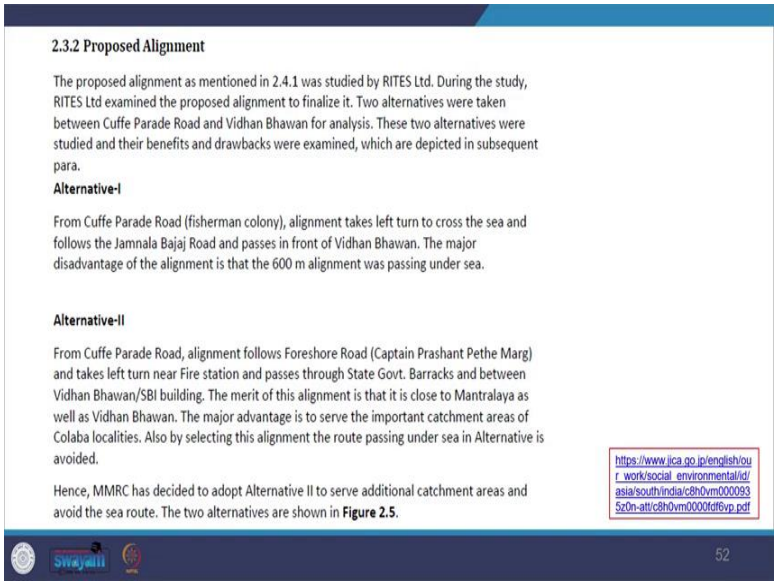

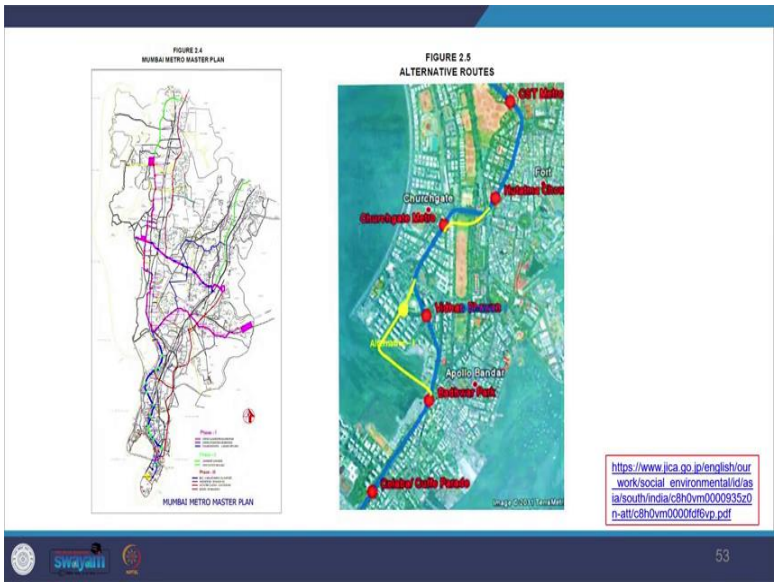

So, they have looked at certain alternatives. Alternative 1 deals with Cuffe Parade Road, which involves a fishermen's colony. Alternative 2 deals with the Cuffe Parade Road alignment follows the foreshore road. So, all these you can see in the map they have provided a map as well. So, that is the entire Mumbai master plan you can see, the Metro master plan and you can see in the red and yellow, the alternators which have been discussed here. So, yellow Alternative 1 and so on. So, what options do they have alternatives they are looking at.

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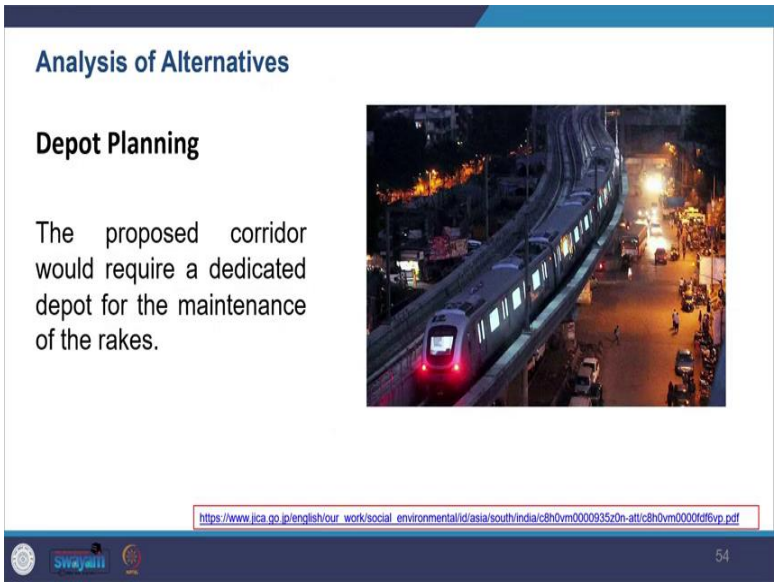

So, another Alternative they tried on Depot planning, like where all the depot would come from. The project needed a dedicated depot for the maintenance of the rakes. So, you can see the picture of what rakes are like and they would need a depot for that.

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So, you will see that they have proposed alternative sites for the depot, you can see on the map how they have these sites Mahalakshmi Race Course, then you can see in some central part, Kalina University land and then Aarey Milk Colony. So, finally, the project description tells that they are going to build it at the Aarey Milk colony.

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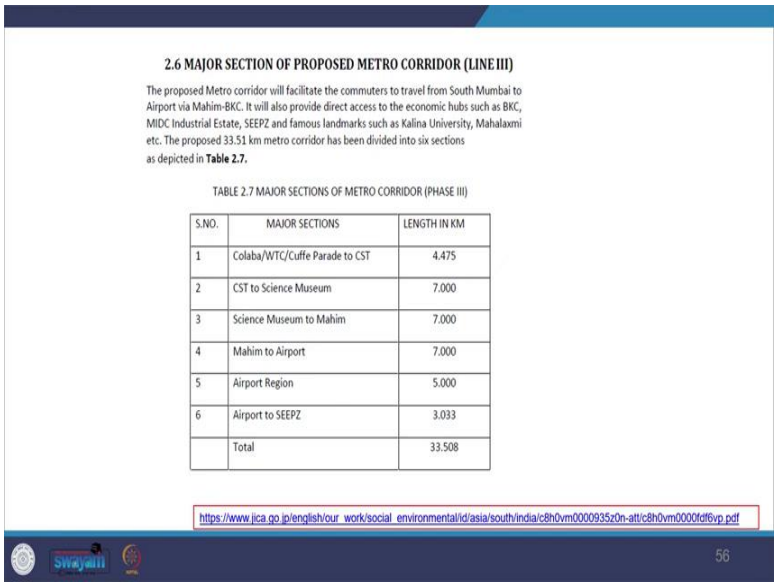

So, a major section of the proposed Metro corridor is also provided like at phase 3, where they will do it, then ridership on the proposed Metro corridor. So, that study is also undertaken, then, you also see, they have provided construction methodology. So, that is also with extensive detail has been provided. So, I am not getting into the details.

So, what kind of construction strategy they have adopted here has been well explained. So, as we had discussed before even the designs can change, even the layouts can change, and there can be many alternatives. So, now with the construction methodology, they are handling the environmental part.

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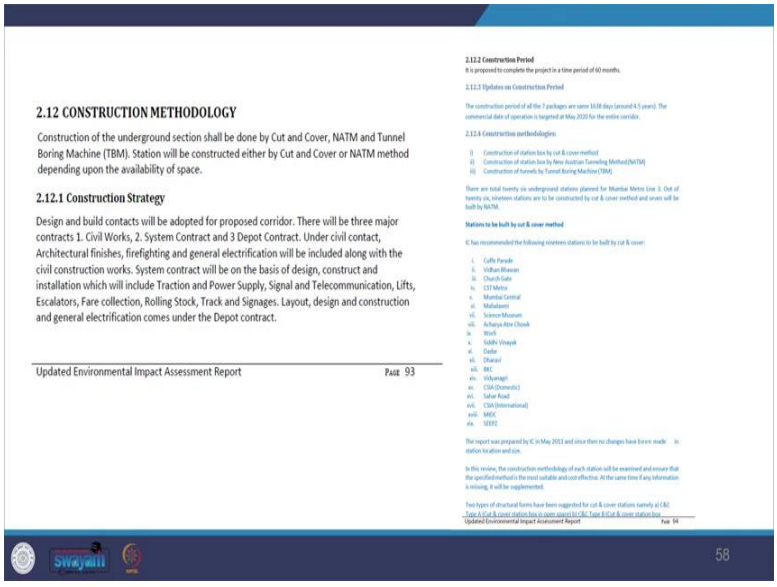

So, you can see the construction, they have also mentioned the construction period, the construction methodology, which they have used, and then all the details of different locations where they will undertake that. So, that was about the construction methodology.

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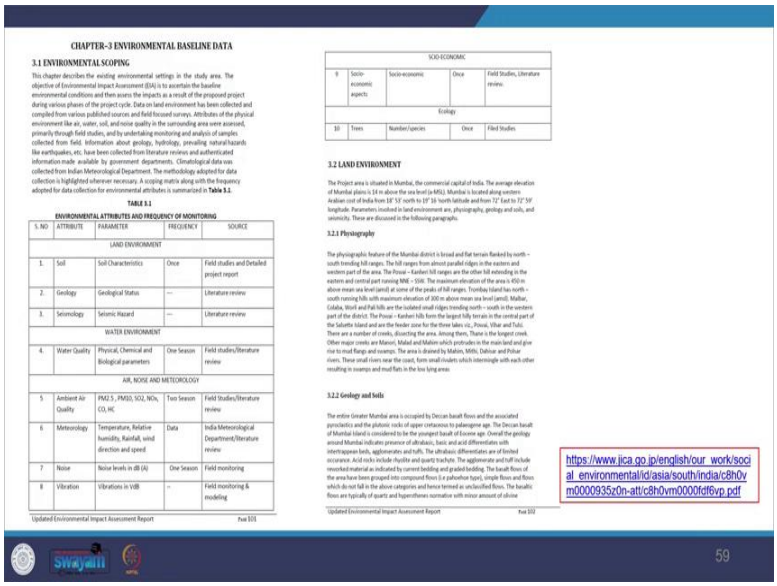

CHAPTER-3 ENVIRONMENTAL BASELINE DATA

3.1 ENVIRONMENTAL SCOPING

This chapter describes the existing environmental settings in the study area. The objective of Environmental Impact Assessment (EIA) is to ascertain the baseline environmental conditions and then assess the impacts as a result of the proposed project during various phases of the project cycle. Data on land environment has been collected and compiled from various published sources and field focused surveys. Attributes of the physical environment like air, water, soil, and noise quality in the surrounding area were assessed, primarily through field studies, and by undertaking monitoring and analysis of samples collected from field. Information about geology, hydrology, prevailing natural hazards like earthquakes, etc. have been collected from literature reviews and authenticated information made available by government departments. Climatological data was collected from Indian Meteorological Department. The methodology adopted for data collection is highlighted wherever necessary. A scoping matrix along with the frequency adopted for data collection for environmental attributes is summarized in Table 3.1.

TABLE 3.1

ENVIRONMENTAL ATTRIBUTES AND FREQUENCY OF MONITORING

S. NO	ATTRIBUTE	PARAMETER	FREQUENCY	SOURCE
LAND ENVIRONMENT				
1.	Soil	Soil Characteristics	Once	Field studies and Detailed project report
2.	Geology	Geological Status	--	Literature review
3.	Seismology	Seismic Hazard	--	Literature review
WATER ENVIRONMENT				
4.	Water Quality	Physical, Chemical and Biological parameters	One Season	Field studies/literature review
AIR, NOISE AND METEOROLOGY				
5	Ambient Air Quality	PM2.5 , PM10, SO2, NOx, CO, HC	Two Season	Field Studies/literature review
6	Meteorology	Temperature, Relative humidity, Rainfall, wind direction and speed	Data	India Meteorological Department/literature review
7	Noise	Noise levels in dB (A)	One Season	Field monitoring
8	Vibration	Vibrations in VdB	--	Field monitoring & modeling

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SOCIO-ECONOMIC				
9	Socio-economic aspects	Socio-economic	Once	Field Studies, Literature review.
Ecology				
10	Trees	Number/species	Once	Filed Studies

3.2 LAND ENVIRONMENT

The Project area is situated in Mumbai, the commercial capital of India. The average elevation of Mumbai plains is 14 m above the sea level (+MSL). Mumbai is located along western Arabian cost of India from 18° 53' north to 19° 16' north latitude and from 72° East to 73° 59' longitude. Parameters involved in land environment are, physiography, geology and soils, and seismicity. These are discussed in the following paragraphs.

3.2.1 Physiography

The physiographic feature of the Mumbai district is broad and flat terrain flanked by north – south trending hill ranges. The hill ranges from almost parallel ridges in the eastern and western part of the area. The Powai – Kanheri hill ranges are the other hill extending in the eastern and central part running NNE – SSW. The maximum elevation of the area is 450 m above mean sea level (amsl) at some of the peaks of hill ranges. Trombay Island has north – south running hills with maximum elevation of 300 m above mean sea level (amsl). Malbar, Colaba, Worli and Pali hills are the isolated small ridges trending north – south in the western part of the district. The Powai – Kanheri hills form the largest hilly terrain in the central part of the Salsette Island and are the feeder zone for the three lakes viz., Powai, Vihar and Tulsi. There are a number of creeks, dissecting the area. Among them, Thane is the longest creek. Other major creeks are Manori, Malad and Mahim which protrudes in the main land and give rise to mud flangs and swamps. The area is drained by Mahim, Mithi, Dahisar and Poisar rivers. These small rivers near the coast, form small rivulets which intermingle with each other resulting in swamps and mud flats in the low lying areas

3.2.2 Geology and Soils

The entire Greater Mumbai area is occupied by Deccan basalt flows and the associated pyroclastics and the plutonic rocks of upper cretaceous to palaeogene age. The Deccan basalt of Mumbai Island is considered to be the youngest basalt of Eocene age. Overall the geology around Mumbai indicates presence of ultrabasic, basic and acid differentiates with intertrappean beds, agglomerates and tuffs. The ultrabasic differentiates are of limited occurance. Acid rocks include rhyolite and quartz trachyte. The agglomerate and tuff include reworked material as indicated by current bedding and graded bedding. The basalt flows of the area have been grouped into compound flows (i.e paleohen type), simple flows and flows which do not fall in the above categories and hence termed as unclassified flows. The basaltic flows are typically of quartz and hypersthenes normative with minor amount of olivine

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Now, coming on to the baseline data. So, that is the key part of the environmental impact assessment. So, where they are establishing baseline data. So, here you see that they use mostly secondary data as well as references from the other studies and they have also conducted studies. So, just to look at we have already covered baseline data, and how to undertake it domain-wise in detail, so, we are just going to skim through and then see how how it comes in the report.

So, you will see here that they have provided environmental attributes and frequency of monitoring, and then they have identified how it is impacting the land environment.

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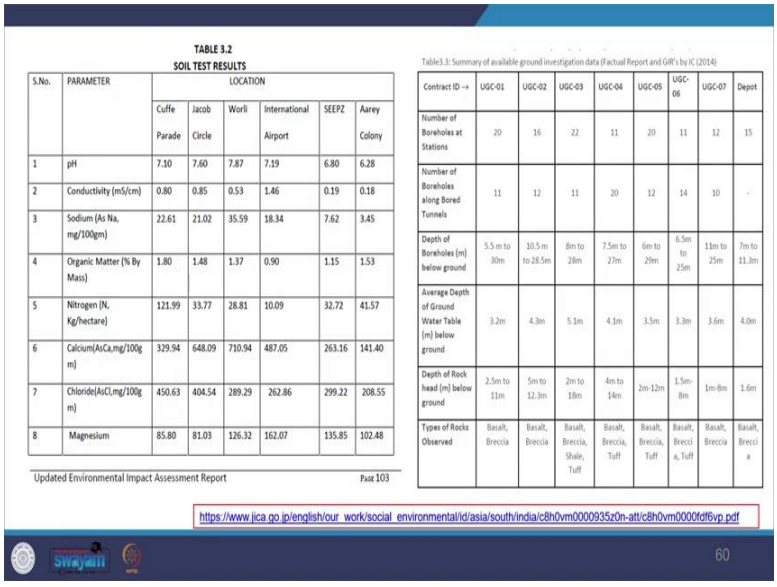

TABLE 3.2

SOIL TEST RESULTS

S.No.	PARAMETER	LOCATION					
		Cuffe Parade	Jacob Circle	Worli	International Airport	SEEPZ	Aarey Colony
1	pH	7.10	7.60	7.87	7.19	6.80	6.28
2	Conductivity (mS/cm)	0.80	0.85	0.53	1.46	0.19	0.18
3	Sodium (As Na, mg/100gm)	22.61	21.02	35.59	18.34	7.62	3.45
4	Organic Matter (% By Mass)	1.80	1.48	1.37	0.90	1.15	1.53
5	Nitrogen (N, Kg/hectare)	121.99	33.77	28.81	10.09	32.72	41.57
6	Calcium(AsCa,mg/100gm)	329.94	648.09	710.94	487.05	263.16	141.40
7	Chloride(AsCl,mg/100gm)	450.63	404.54	289.29	262.86	299.22	208.55
8	Magnesium	85.80	81.03	126.32	162.07	135.85	102.48

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Table3.3: Summary of available ground investigation data (Factual Report and GIR's by IC (2014)

Contract ID →	UGC-01	UGC-02	UGC-03	UGC-04	UGC-05	UGC-06	UGC-07	Depot
Number of Boreholes at Stations	20	16	22	11	20	11	12	15
Number of Boreholes along Bored Tunnels	11	12	11	20	12	14	10	-
Depth of Boreholes (m) below ground	5.5 m to 30m	10.5 m to 28.5m	8m to 28m	7.5m to 27m	6m to 29m	6.5m to 25m	11m to 25m	7m to 11.3m
Average Depth of Ground Water Table (m) below ground	3.2m	4.3m	5.1m	4.1m	3.5m	3.3m	3.6m	4.0m
Depth of Rock head (m) below ground	2.5m to 11m	5m to 12.3m	2m to 18m	4m to 14m	2m-12m	1.5m-8m	1m-8m	1.6m
Types of Rocks Observed	Basalt, Breccia	Basalt, Breccia	Basalt, Breccia, Shale, Tuff	Basalt, Breccia, Tuff	Basalt, Breccia, Tuff	Basalt, Breccia, Tuff	Basalt, Breccia	Basalt, Breccia

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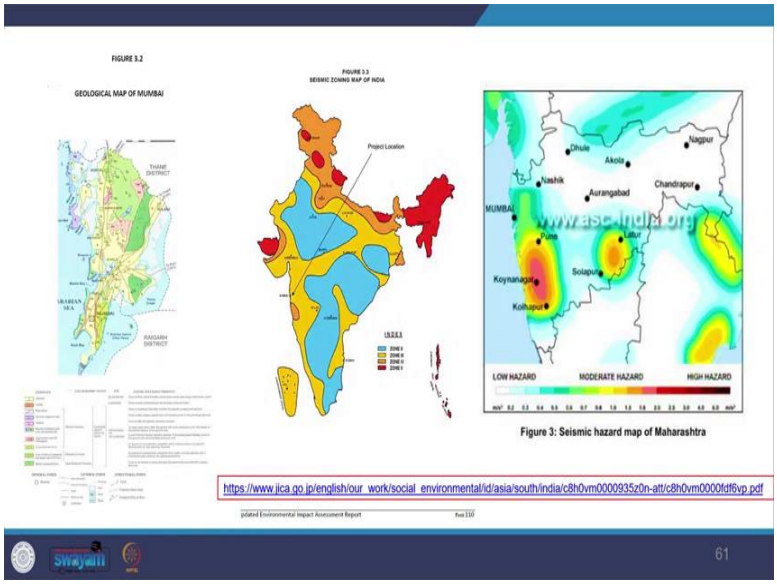

Then you can see how they have presented all the tables related to soil test results, then you can see all the data which was available with the ground investigation data which was already there, and you can see a geological map of Mumbai, then you can see the Seismic zone map and then Seismic hazard map of Maharashtra.

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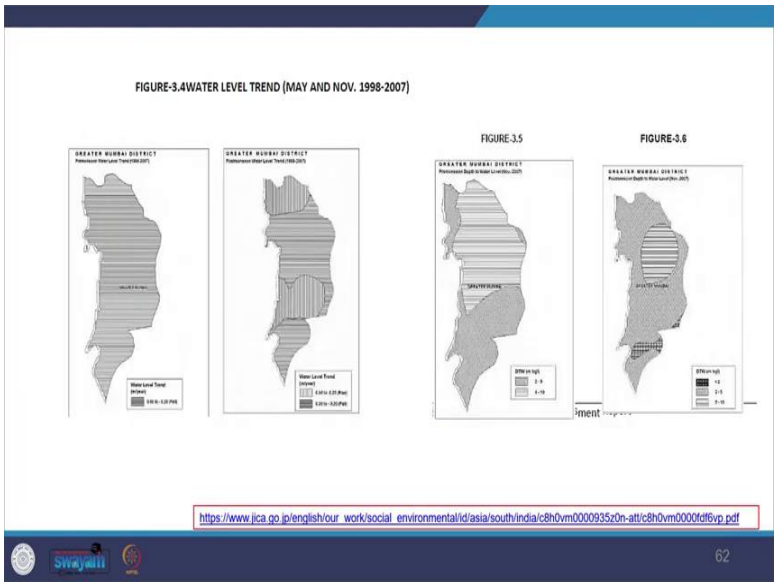

TABLE 3.5
WATER QUALITY AT PROJECT SITE

PARAMETER	LOCATION							
	1	2	3	4	5	6	7	8
pH	7.20	7.21	6.89	7.10	7.02	6.98	7.41	7.72
Total Hardness as CaCo3(mg/l)	48.0	6031.07 .00	3500	140.00	44.00	444.72	126.48	379.44
Calcium (As Ca, mg/l)	8.02	11.22	480.96	38.48	9.62	107.93	107.93	55.60
Alkalinity (As CaCO3, mg/l)	51.08	52.39	2060.19	143.91	80.15	466.44	102.29	249.2
Chloride (As Cl, mg/l)	13.80	9.86	5518.86	25.62	11.83	181.99	58.71	68.49
Magnesium (As Mg, mg/l)	6.80	7.78	558.90	10.69	4.86	42.63	11.90	58.49

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Figure 3.7: Hydrogeology of Mumbai

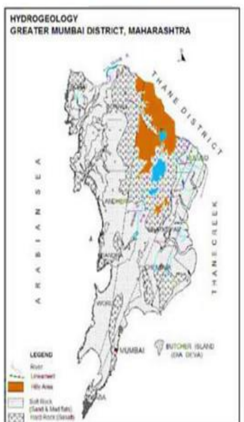

Figure 2: Hydrogeology of Mumbai

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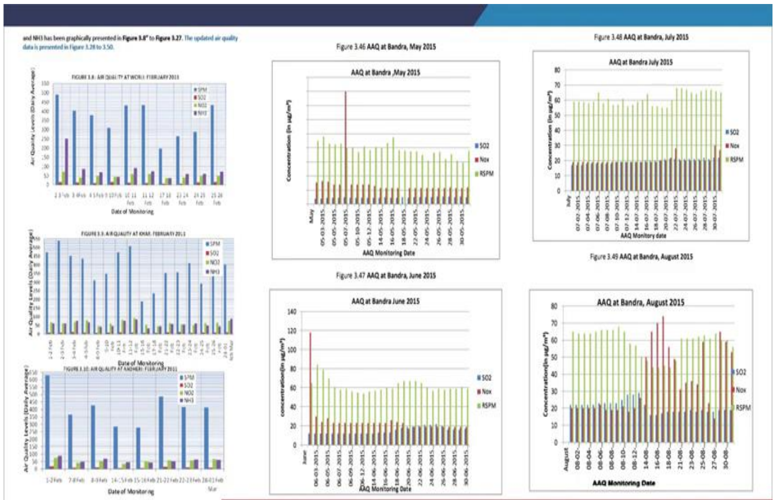

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So, they have studied all that, water level trend they have studied in this place, water quality at the project site, the hydrology of Mumbai they have studied and the metrology data they have gathered here, and then a very

intensive study of air quality data and for different, different you can see for different months they have collected the data here. So, I have just snipped some of this elaborate data there.

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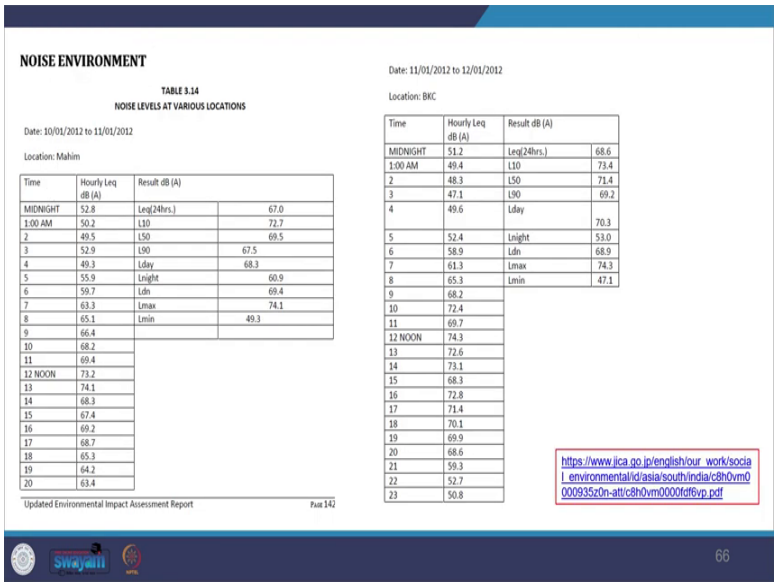

NOISE ENVIRONMENT

TABLE 3.14
NOISE LEVELS AT VARIOUS LOCATIONS

Date: 10/01/2012 to 11/01/2012

Location: Mahim

Time	Hourly Leq dB (A)	Result dB (A)	
MIDNIGHT	52.8	Leq(24hrs.)	67.0
1:00 AM	50.2	L10	72.7
2	49.5	L50	69.5
3	52.9	L90	67.5
4	49.3	Lday	68.3
5	55.9	Lnight	60.9
6	59.7	Ldn	69.4
7	63.3	Lmax	74.1
8	65.1	Lmin	49.3
9	66.4		
10	68.2		
11	69.4		
12 NOON	73.2		
13	74.1		
14	68.3		
15	67.4		
16	69.2		
17	68.7		
18	65.3		
19	64.2		
20	63.4		

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Date: 11/01/2012 to 12/01/2012

Location: BKC

Time	Hourly Leq dB (A)	Result dB (A)	
MIDNIGHT	51.2	Leq(24hrs.)	68.6
1:00 AM	49.4	L10	73.4
2	48.3	L50	71.4
3	47.1	L90	69.2
4	49.6	Lday	70.3
5	52.4	Lnight	53.0
6	58.9	Ldn	68.9
7	61.3	Lmax	74.3
8	65.3	Lmin	47.1
9	68.2		
10	72.4		
11	69.7		
12 NOON	74.3		
13	72.6		
14	73.1		
15	68.3		
16	72.8		
17	71.4		
18	70.1		
19	69.9		
20	68.6		
21	59.3		
22	52.7		
23	50.8		

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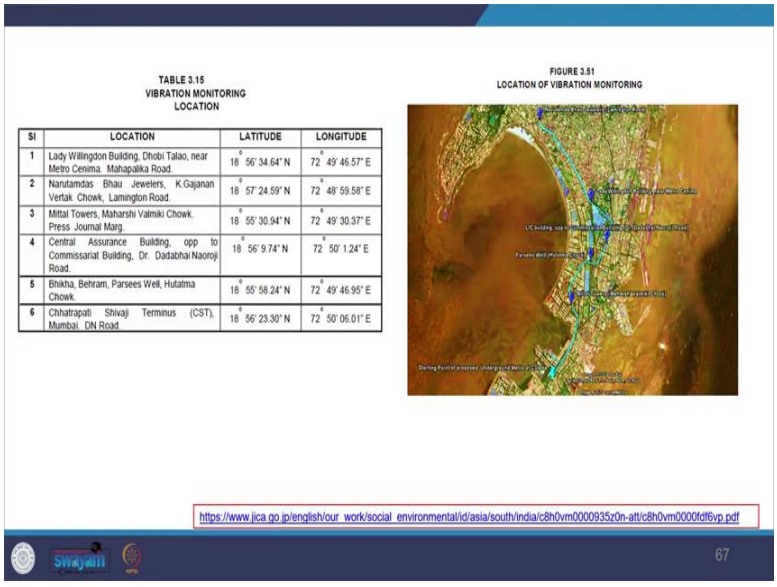

TABLE 3.15
VIBRATION MONITORING
LOCATION

Sl	LOCATION	LATITUDE	LONGITUDE
1	Lady Willingdon Building, Dhobi Talao, near Metro Cenima. Mahapalika Road.	18° 56' 34.64" N	72° 49' 46.57" E
2	Narutamdas Bhau Jewelers, K.Gajanan Vertak Chowk, Lamington Road.	18° 57' 24.59" N	72° 48' 59.58" E
3	Mittal Towers, Maharshi Valmiki Chowk. Press Journal Marg.	18° 55' 30.94" N	72° 49' 30.37" E
4	Central Assurance Building, opp to Commissariat Building, Dr. Dadabhai Naoroji Road.	18° 56' 9.74" N	72° 50' 1.24" E
5	Bhikha, Behram, Parsees Well, Hutatma Chowk.	18° 55' 58.24" N	72° 49' 46.95" E
6	Chhatrapati Shivaji Terminus (CST), Mumbai. DN Road.	18° 56' 23.30" N	72° 50' 06.01" E

FIGURE 3.51
LOCATION OF VIBRATION MONITORING

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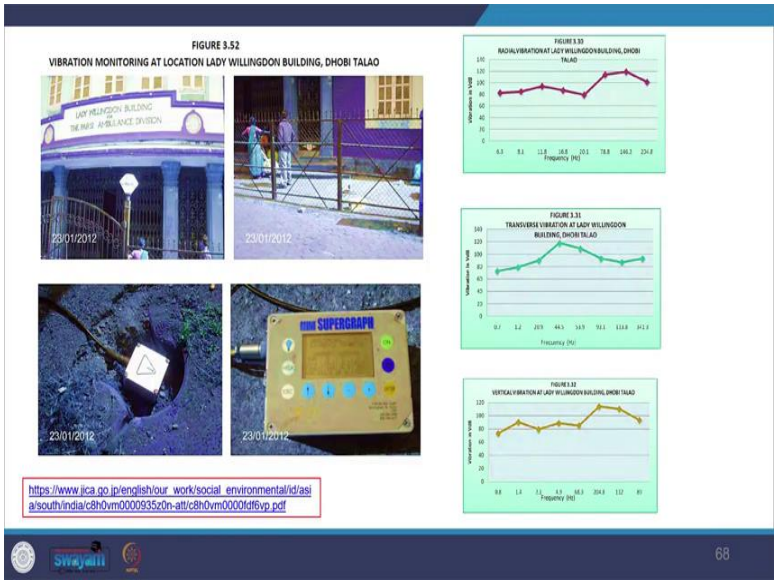

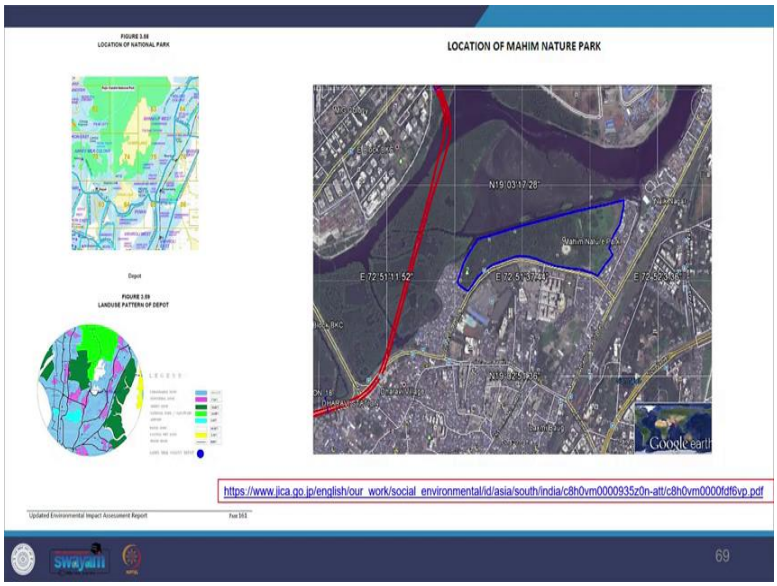

And they have also connected collected data on the noise environment. Also, vibration data has been collected on the map they have also shown from where all which places they have collected this data. So, you can see how they have put the pictures and also evidence of how and when they are collecting that data.

So, you can also see the dates, the equipment's coming, and the location coming in the picture. And then how they are preparing the drafts related to that. So, other you see here they are also talking about the National Park, then also land use pattern from where the depot is coming, and then what all area Mahim nature park which is coming here.

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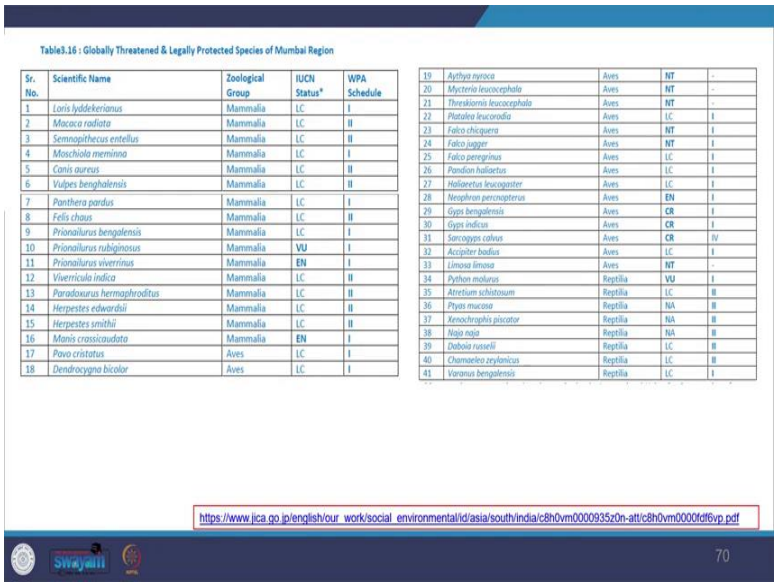

Sr. No.	Scientific Name	Zoological Group	IUCN Status*	WPA Schedule
1	*Loris lyddekerianus*	Mammalia	LC	I
2	*Macaca radiata*	Mammalia	LC	II
3	*Semnopithecus entellus*	Mammalia	LC	II
4	*Moschiola meminna*	Mammalia	LC	I
5	*Canis aureus*	Mammalia	LC	II
6	*Vulpes benghalensis*	Mammalia	LC	II
7	*Panthera pardus*	Mammalia	LC	I
8	*Felis chaus*	Mammalia	LC	II
9	*Prionailurus bengalensis*	Mammalia	LC	I
10	*Prionailurus rubiginosus*	Mammalia	VU	I
11	*Prionailurus viverrinus*	Mammalia	EN	I
12	*Viverricula indica*	Mammalia	LC	II
13	*Paradoxurus hermaphroditus*	Mammalia	LC	II
14	*Herpestes edwardsii*	Mammalia	LC	II
15	*Herpestes smithii*	Mammalia	LC	II
16	*Manis crassicaudata*	Mammalia	EN	I
17	*Pavo cristatus*	Aves	LC	I
18	*Dendrocygna bicolor*	Aves	LC	I
19	*Aythya nyroca*	Aves	NT	-
20	*Mycteria leucocephala*	Aves	NT	-
21	*Threskiornis leucocephala*	Aves	NT	-
22	*Platalea leucorodia*	Aves	LC	I
23	*Falco chicquera*	Aves	NT	I
24	*Falco jugger*	Aves	NT	I
25	*Falco peregrinus*	Aves	LC	I
26	*Pandion haliaetus*	Aves	LC	I
27	*Haliaeetus leucogaster*	Aves	LC	I
28	*Neophron percnopterus*	Aves	EN	I
29	*Gyps bengalensis*	Aves	CR	I
30	*Gyps indicus*	Aves	CR	I
31	*Sarcogyps calvus*	Aves	CR	IV
32	*Accipiter badius*	Aves	LC	I
33	*Limosa limosa*	Aves	NT	-
34	*Python molurus*	Reptilia	VU	I
35	*Atretium schistosum*	Reptilia	LC	II
36	*Ptyas mucosa*	Reptilia	NA	II
37	*Xenochrophis piscator*	Reptilia	NA	II
38	*Naja naja*	Reptilia	NA	II
39	*Daboia russelii*	Reptilia	LC	II
40	*Chamaeleo zeylanicus*	Reptilia	LC	II
41	*Varanus bengalensis*	Reptilia	LC	I

So, they have identified all the legally protected species. So, we have studied how we need to identify that is the basics that you identify in every context in every country, what is the protected list, so they have taken it as for the Mumbai region, so you can see an elaborate list coming here. Even this list goes very long; I have just taken one snap.

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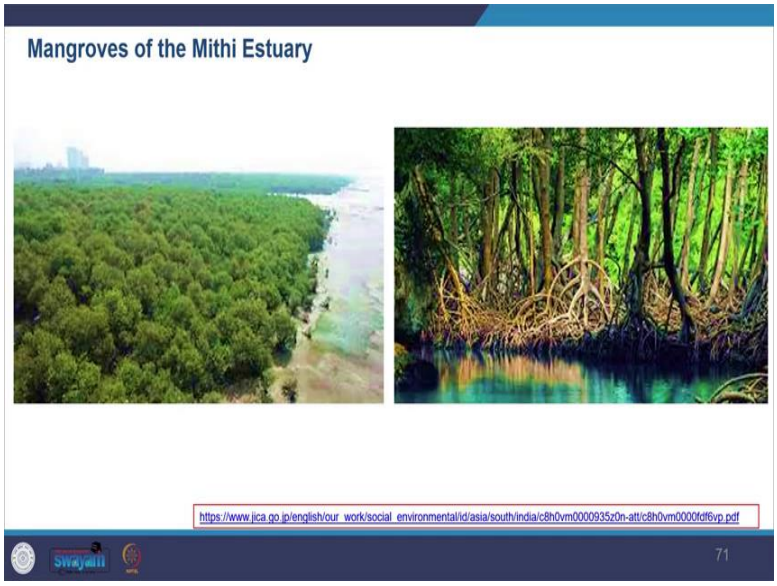

Sanjay Gandhi National Park

Table 3.17 : Common Plant Species of Sanjay Gandhi National Park

Sr. No.	Species	Habit	Family
1	*Alangium salvifolium*	Tree	Alangiaceae
2	*Ampelocissus latifolia*	Climber	Vitaceae
3	*Anogeissus latifolia*	Tree	Combretaceae
4	*Apluda mutica*	Grass	Poaceae
5	*Argyreia nervosa*	Climber	Convolvulaceae
6	*Argyreia sericea*	Climber	Convolvulaceae
7	*Arundinella pumila*	Grass	Poaceae
8	*Baliospermum montanus*	Forb	Euphorbiaceae
9	*Bauhinia foveolata*	Tree	Caesalpiniaceae
10	*Bauhinia racemosa*	Tree	Caesalpiniaceae
11	*Blumea sp.*	Forb	Asteraceae
12	*Bombax ceiba*	Tree	Bombacaceae
13	*Borassus flabellifer*	Tree	Arecaceae
14	*Bridelia retusa*	Tree	Euphorbiaceae
15	*Butea monosperma*	Tree	Fabaceae

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Modified Habitats

3.7.3.4 Mahim Nature Park, Dharavi

The Maharashtra Nature Park (MNP), popularly known as Mahim Nature Park (approximate location: 19° 03' 09" N, 72° 51' 42" E), situated on the southern bank of the Mithi River in the Dharavi area, is a planted woodland covering approximately 35 acres of land and serving as one of the larger green spaces of Mumbai city.

The proposed underground alignment of the MML3 between the Dharavi and BKC stations, spanning a length of approximately 1 km, passes within a distance of 0.5 km to the west and northwest of the MNP. The proposed Dharavi station box is located at a distance of less than 1 km to the west of the MNP, while the proposed BKC station box is located less than 1 km to the northwest of the MNP.

BPT Garden, Colaba

Sagar Upavan, also known as BPT Garden or Mumbai Port Trust Garden (approximate location: 18° 54' 37" N, 72° 49' 25" E), situated in the Sassoon Docks area of Colaba, is a botanical garden covering approximately 50,000 square metres and serving as one of the green spaces of the area. The proposed Cuffe Parade station of MML3 is situated less than 350 metres to the west of the garden.

3.7.3.5 Colaba Woods Garden, Colaba

Colaba Woods, (approximate location: 18° 54' 45" N, 72° 49' 08" E), situated in the Cuffe Parade area of Colaba, is a garden covering approximately 30,000 square metres and serving as one of the green spaces of the area. Some of the accessory areas associated with the garden, comprising mainly a tennis court, a basket-ball court, a children's playground, a plant- nursery and public walkways, fall within the proposed project-area of the Cuffe Parade station of MML3, while the main garden area is situated within 50 metres of it.

There are few more gardens which are within 500 m of the proposed alignment. The names of these gardens are as given below in Table 3.18 :-

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So, here you can see the also mangroves of the Mithi estuary. So, which is identified as a sensitive area. Then you can see Sanjay Gandhi National Park also which falls within the zone and then common plant species of the

Sanjay Gandhi National Park has been identified. An elaborate list has been created. Then we also learned about modified habitat. So, there is also a modified habitat in this area which is Mahim Nature Park, Dharavi, then you also see Colaba Woods garden here.

So, you can see in the picture these areas. So, you see that the identified potential ecological impact of the project, so, it would lead to the removal of trees it would lead to loss and degradation of biodiversity and it would lead to loss and degradation of soil. So, that was identified in the project, then further they looked into socio-economic conditions.

So, for this, they prepared a separate report Social Impact Assessment for the Mumbai Metro corridor. So, we have already seen that briefly when we were covering socio-economic impact assessment. However, I have given the link again if you wish to see the report again from this perspective, so, you can see it.

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So, we see here that overall project impact, how much land would be acquired, how much impact it would have on the structure, how many project-affected people would be there, and total project-affected people and surveys people and so on all those details have been given.

(Refer Slide Time: 24:20)

HISTORICAL MONUMENTS WITHIN VICINITY OF MML3 ALIGNMENT

Sr. No.	HISTORICAL MONUMENTS	DISTANCE FROM CENTRE OF METRO ALIGNMENT
1	CST Railway Station	40 metre
2	BMC Building	22 metre
3	Western Railway Head Quarter	45 metre

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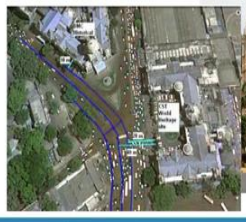
CST Railway Station &
BMC Building at DN Road



Western Railway Head Quarter
on Jamshedji Tata Road

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And then other how it is going to influence all the historical sites. So, that is also given here. So, you see that they have identified CST railway station which is like of distance from the center of the Metro alignment, it is just 40 meters away, then you can see the BMC building which is 22 meters away, and Western Railway headquarters, which is 45 meters away. So, you can see all these CST, BMC, and Western Railway headquarters, and how they look like just so, that you can visualize them. And then also relate to the alignment. So, you can see in the map also, how it is.

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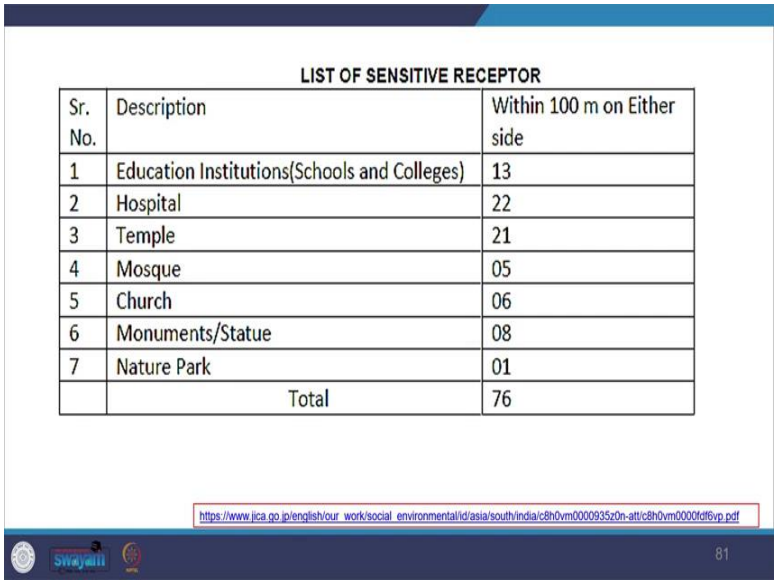

Then, they have also identified the sensitive receptors. So, we have understood the concept of sensitive receptors. So, they have identified, so, you can see the educational institutions hospitals temples, mosques, and so on. They have identified how far it is. And then you can also see a tree inventory which they have done for each station along the Mumbai Metro line 3. So, the list almost goes 200 pages and we are talking about 500 Plus pages page of the EIA report.

So, the list of documentation goes on nearly 200 pages. So, you can see in which zone it is coming and how they have grouped it and which station it is, trees to be retained and trees to be removed all those numbers have been quite quantified here and trees to be planted. So, that is how they have undertaken intensive documentation they have undertaken. So, now looking at the negative environmental impact.

So, the negative environmental impact is like you have, they have identified as likely on the land Environment, Water, Air, Noise, biological environment, and socio-economic environments. So, they have identified all that and there are impacts due to the project locations, and then they are like you have project-affected people who will be dis effected economically or physically.

Then there will be also a change of land use then there will be also loss of trees and forests. Then also there will be a problem with utility drainage problems, and then there will be problems with the historical and cultural monuments and there has been an anticipated impact on the local transport facilities. So, you have already seen how one undertakes all these things. So, these are all covered in this particular report.

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LAND REQUIREMENT (Ha)

S.NO	PARTICULARS	PERMANENT LAND REQUIREMENT		TEMPORARY LAND REQUIREMENT	
		GOVERNMENT	PRIVATE	GOVERNMENT	PRIVATE
1	Depot	26.407	--	-	-
2	Stations	1.49	3.23	-	-
3	TSS	0.4	0.2	-	-
4	Cut & Cover Station	-	-	1.84	0.067
5	Construction Depot	-	-	10.95	1.23
Total		**28.297**	**3.43**	**12.79**	**1.29**

Source: DPR

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4.2.3 Loss of Trees/Forests

The proposed alignment of metro rail is in urban/ city area and not passing through any forest. Hence no loss of forest is anticipated. The trees are getting affected only at stations and at depot location since proposed alignment is underground. There are 589 trees observed along the alignment at station locations and 1652 trees are at depot (Refer Section 3.7.1). Hence the total number of trees observed on project site area is 2241. It is observed from the tree survey (Updated table given in Chapter 3) that, out of total 70% (i.e 1568) of the tree has girth below 1 metre which will be transplanted and remaining 30% (i.e 673) of the trees needs to be cut. With removal of these trees the process of CO2 absorption and O2 production will get affected and the losses are reported in TABLE 4.2. The loss of tree will have short term Heat-Island Phenomenon and would be mitigated after construction due to afforestation. The loss of tree will have short term heat-island phenomenon and would be mitigated after construction due to afforestation.

TABLE 4.2
OXYGEN DEFICIT DUE TO TREE LOSS

SI	DESCRIPTION	QUANTITY
1.	Total no. of Trees to be cut	673
2.	Increase in CO_2 @ 21.8 Kg/year/ tree	14672 kg
3.	Decrease in Oxygen production @ 49 Kg/year/ tree	32977 kg

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Here you can quickly see how they have identified the land requirement for this particular project for all the components of the project. So, also the loss of trees and forests. So, the total number of trees to be cut is 673. What kind of increase will be there in carbon dioxide and what is the formula they have used for calculation and then decrease in oxygen production? So, that kind of calculation they have made.

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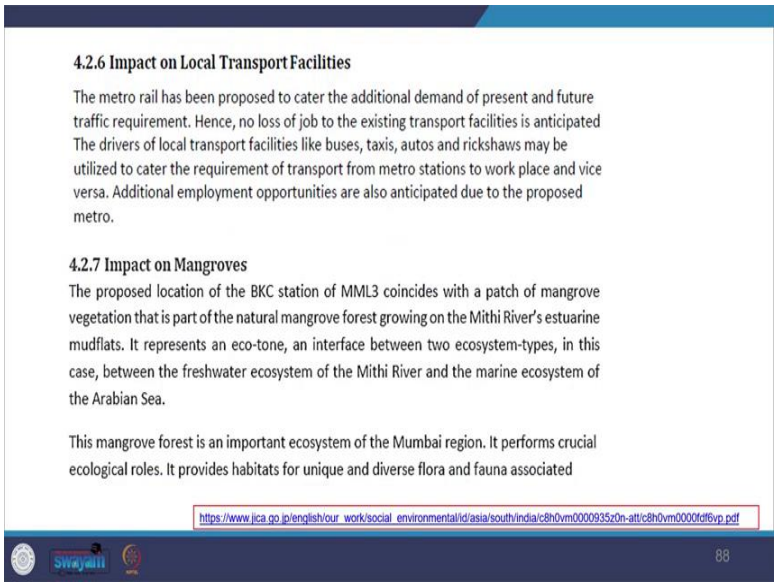

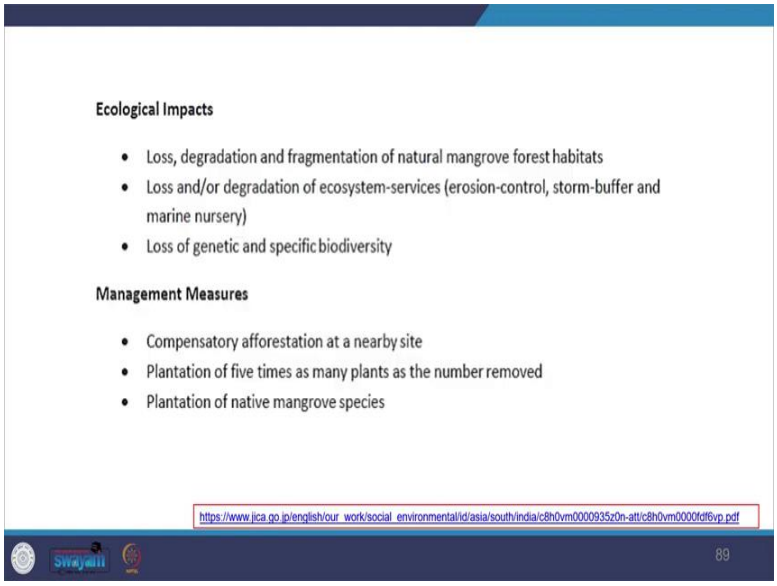

All these are related to drainage and also historical and cultural monuments and the impact on local transportation facilities on mangroves and then they have identified the ecological impact so, which is like loss, degradation, and fragmentation of natural mangrove forest habitat.

So, we have studied what fragmentation means, what degradation and loss mean, and then the loss and degradation of ecosystem services we have already studied the loss of genetic and specific biodiversity, and we are familiar with that. Then, they took management measures like compensatory afforestation at the nearby site, the plantation of 5 times as many plants as the number removed, and the plantation of native mangrove species. So, that is what management measures they are going to adopt.

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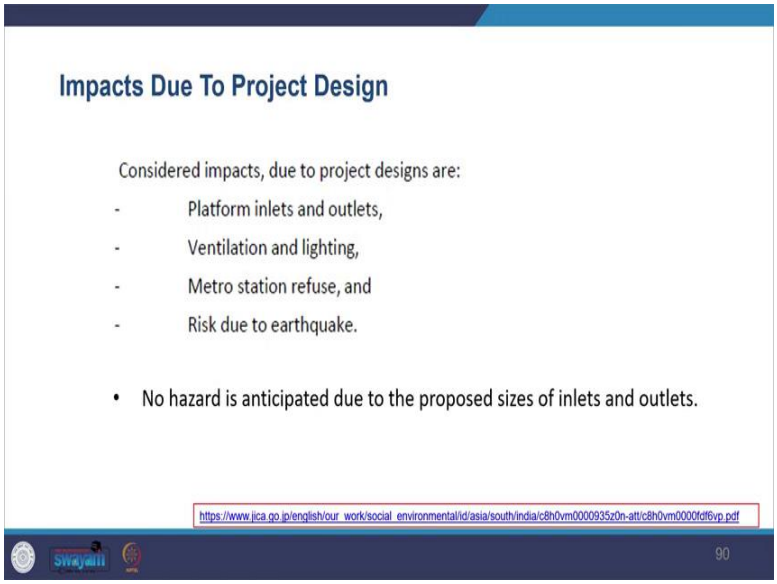

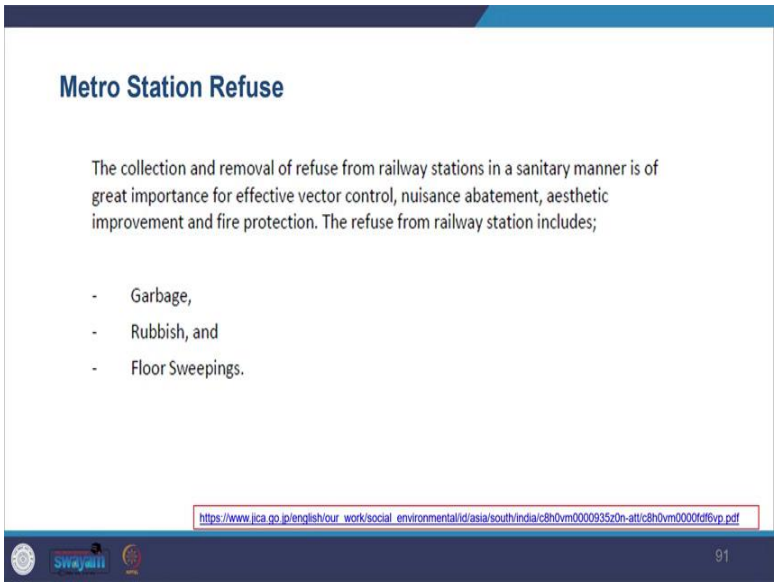

And then now, we see impacts due to project design. So, project design part they have platform inlet and outlet ventilation and lighting, Metro Station refuse, and risks due to earthquakes. So, most of it by the design, no hazard was anticipated to the proposed sizes of the inlet and outlet. And then they also studied how they are going to manage the garbage, rubbish, and floor-sweeping. So, that would be taken care of, and the risk due to the earthquake has been already taken care of within the design elements of the project.

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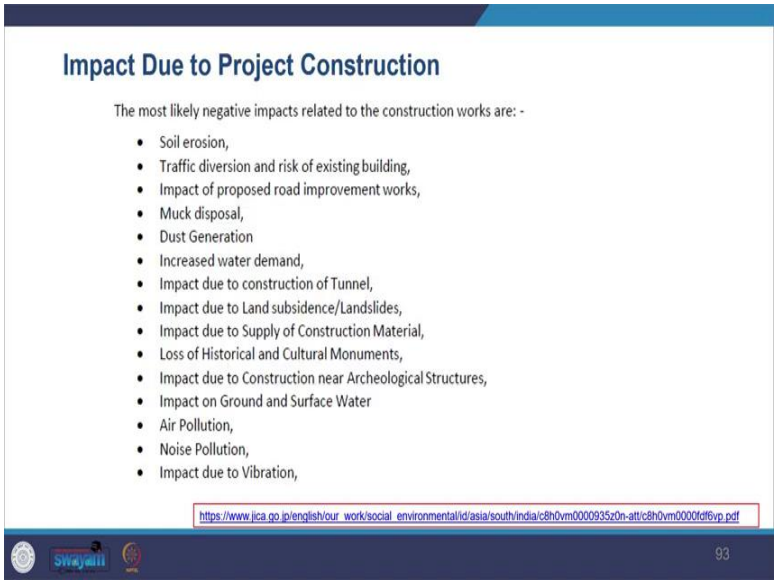

Now looking at the impact due to the project construction. So, they have identified environmental hazards that will occur due to the construction work related to the soil they would be as soil erosion, traffic diversion, the impact of the proposed road improvement work, Muck disposal, dust generation, increased water demand impact due to the construction of the tunnel, impact due to land subsidence, landslides, supply of construction material, and then what kind of loss will happen to historic and cultural monuments and so on.

So, all that has been identified is what will happen during the construction of the project. So, you see how massive the project is. So, it will have an impact on several aspects just during its construction phase. Further, they have also looked into the health risks at the construction sites, we have also studied how to undertake health risks and we see the impact on sensitive receptors has been also studied here.

And then what kind of impact it will have due to the labor camp. So, they are going to have a labor camp with all the people working so, what kind of possibilities are there concerning health? So, there are construction workers are more prone to infectious diseases like HIV, AIDS, and so on. So, how those things will be taken care of, and then also impact due to blasting, and then also the ground vibration those calculations have been made.

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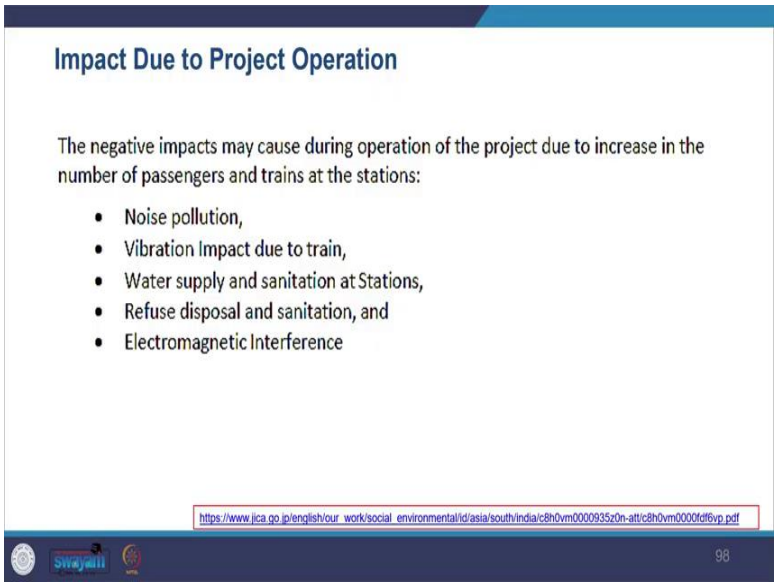

Now, so, that is about the construction phase. Now, we will look at the impact due to project operations. So, how they have looked into it, they have identified that there will be the impact on noise, and vibration impact due to trains, there would be the impact on water supply and sanitation at stations and refuse disposal and sanitation and Electromagnetic interference which can happen.

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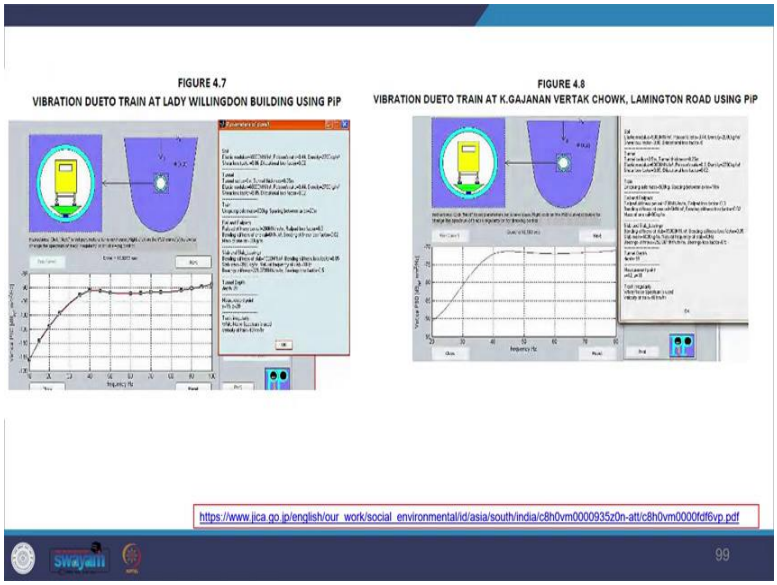

OVERALL RESULT OF VIBRATION IMPACT

Sl	Location	Field Measured vertical vibration (VdB)	Vibration due to TBM Operation(VdB)	Vibration due to Metro Train Operation (VdB)	Standards of Vibration in (VdB)
1	Lady Willingdon Building.	113.9	144	85 to 90	65- 83
2	Narutamdas Bhau Jewelers, Lamington Road.	123.5	147.8	70 to 75	65- 83
3	Mittal Towers, Maharshi Valmiki Chowk	126	143	65 to 70	65- 83
4	Central Assurance Building, Dr. Dadabhai Naoroji Road.	124	147.8	65 to 70	65- 83
5	Bhikha, Behram, Parsees Well, Hutatma Chowk	113.9	143	68 to 70	65- 83
6	Chhatrapati Shivaji Terminus	110-126	147.3	90-95	65- 83

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Water Supply and Sanitation

Public Health facilities such as water supply and sanitation are very much needed at the stations. The water demands will be for drinking, toilet, cleaning and also for other purpose like AC, chiller etc. The demand is presented in Table **4.9**. It is assumed that there would be similar water requirements in Mumbai Metro corridors also. The Water Demand of existing Delhi Metro is corridors considered for requirement of Mumbai metro. Water should be treated before use upto WHO drinking water standards. Municipal supply/Ground water shall be used for this purpose.

S.No.	Particular	Water Demand at Each Station (KLD)	Total Water Demand (KLD)
1	At Stations for Drinking Purpose	6	162
2	For AC, cleaning, chiller and other purposes	240-250	6750
		Total	**6912**

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Impacts Due to Depot

The depot at Araey colony is planned for metro corridor Line III. The area of depot is about 26.407 hectares. The area at depot is vegetated with no habitation. The depot will have following facilities:

- Washing Lines,
- Operation and Maintenance Lines,
- Workshop, and
- Offices.

These facilities could generate water and noise issues. The area will be levelled through cut and fill method within the depot and additional earth will be taken from tunnelling to raise the ground level. Problems anticipated at depot sites are:

- Water supply,
- Effluent Treatment,
- Oil Pollution
- Noise Pollution,
- Surface drainage,
- Solid Waste,
- Cutting of trees.

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So, you see all that has been calculated here. You can see where all the locations they have been documenting and water supply and sanitation, how they have been recording the requirements. And then they also looked at the impact due to the depot. So, not just the real track, but also because of the operation of the depot.

So, where the cleaning would take place, so, washing lines operations, and maintenance workshop in an office, will have an impact on water supply, effluent treatment, oil pollution, noise surface drainage, solid waste, and cutting of trees would happen there. So, that was about the impact. Now looking at the positive environmental impacts, they looked at the negative looking at the positive environmental impact.

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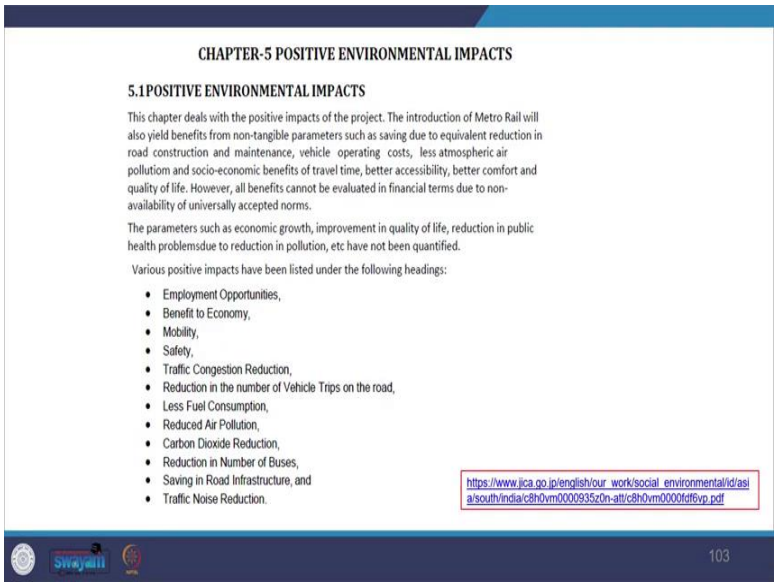

So, positive environmental impact was identified as employment, benefits to the economy, mobility, safety, traffic congestion reduction, reduction in the number of vehicle trips, less fuel consumption, reduced air pollution, carbon dioxide reduction in number of buses, saving and road infrastructure, traffic noise reduction. So, you see the initial argument, what we have been talking about environmental status, and then how we are looking at the sustainable way of approaching it.

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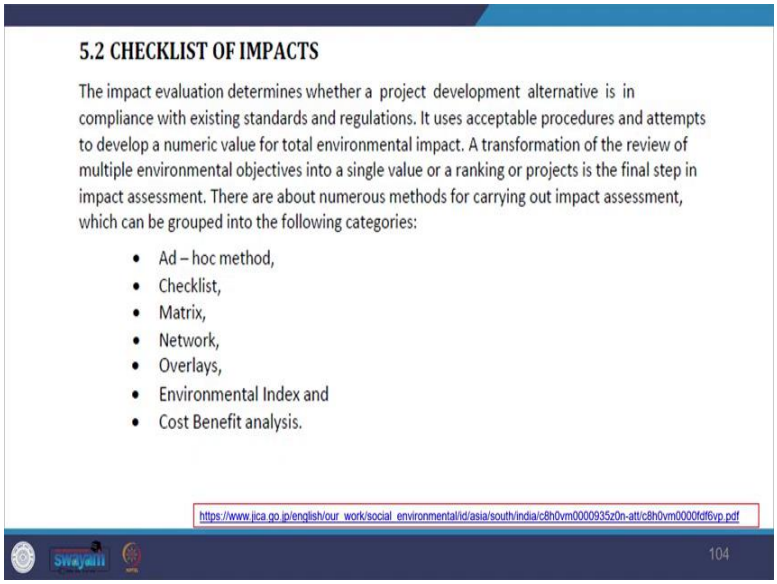

So, they have in the end also used the checklist of impact. So, how they are summarizing it, how they are looking at it. So, you look there are various methods of carrying out impact assessments. So, you see the Ad-hoc method, checklist method, Matrix, network, Overlays, Environmental Index, and Cost-benefit analysis.

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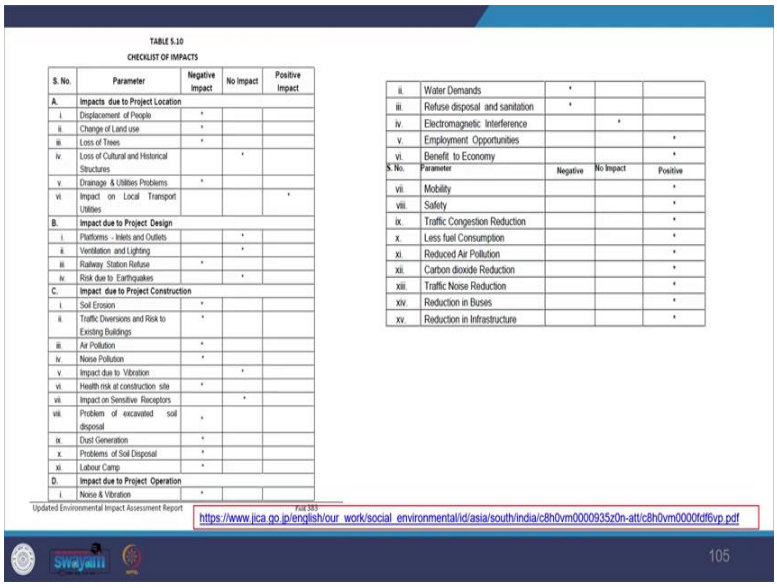

So, here you see they have adopted the checklist of impact and all these impacts have been identified where it is a negative impact, no impact, and positive impact. So, you can look at this checklist of impacts. So, impact due to project location. So, here they are summarizing everything. Impact due to project location, you can see the impact due to project design, project construction project operation, and all the parameters that they have looked into.

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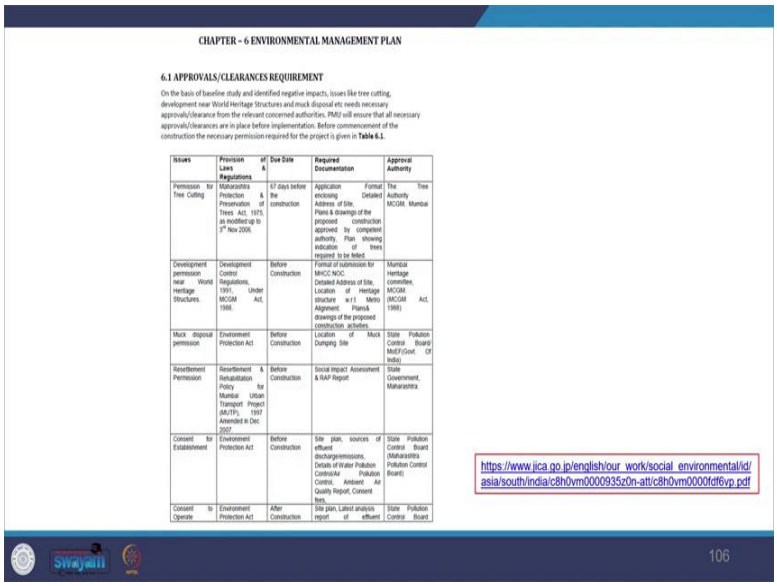

Further, they have prepared an environmental management plan. So, how they are looking at it and then they have prepared a Tabular form, all these issues which they have to take care of, which laws and regulations they would adhere to, by when they have to do it, what kind of documentation would be required and which will be the authority with which they will be dealing with.

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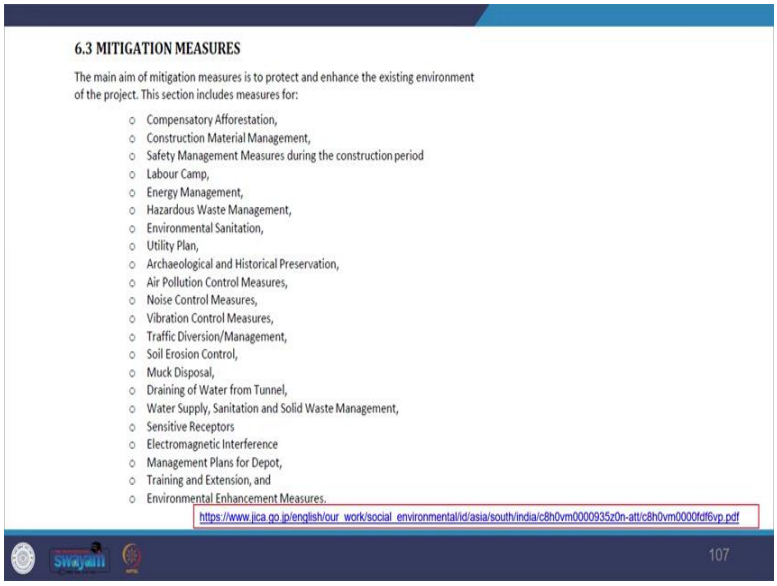

And then the range of mitigation measures, you can see a range of mitigation measures here, compensatory Afforestation, construction material Management, Safety management, labor camp, energy management, and hazardous waste management. So, all these range of mitigation measures will be taken.

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DETAILS OF TREES CUT AND TRANSPLANTATION

Sr. No	Particulars	Number of Trees observed	Number of trees to be cut	Number of trees to be Transplanted	Remarks
1	Along Alignment	589	177 (30%)	412 (70%)	(Stations, Entry & Exit)
2	Depot	1652	496 (30%)	660 (40%)	30% (i.e 496) trees in depot area will remain as where it is.
	Total	2241	673	1072	

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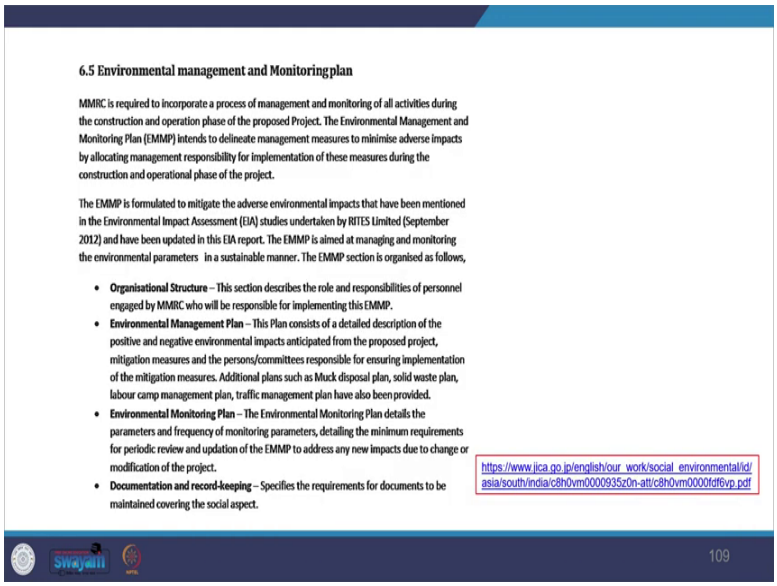

6.5 Environmental management and Monitoring plan

MMRC is required to incorporate a process of management and monitoring of all activities during the construction and operation phase of the proposed Project. The Environmental Management and Monitoring Plan (EMMP) intends to delineate management measures to minimise adverse impacts by allocating management responsibility for implementation of these measures during the construction and operational phase of the project.

The EMMP is formulated to mitigate the adverse environmental impacts that have been mentioned in the Environmental Impact Assessment (EIA) studies undertaken by RITES Limited (September 2012) and have been updated in this EIA report. The EMMP is aimed at managing and monitoring the environmental parameters in a sustainable manner. The EMMP section is organised as follows,

- **Organisational Structure** – This section describes the role and responsibilities of personnel engaged by MMRC who will be responsible for implementing this EMMP.
- **Environmental Management Plan** – This Plan consists of a detailed description of the positive and negative environmental impacts anticipated from the proposed project, mitigation measures and the persons/committees responsible for ensuring implementation of the mitigation measures. Additional plans such as Muck disposal plan, solid waste plan, labour camp management plan, traffic management plan have also been provided.
- **Environmental Monitoring Plan** – The Environmental Monitoring Plan details the parameters and frequency of monitoring parameters, detailing the minimum requirements for periodic review and updation of the EMMP to address any new impacts due to change or modification of the project.
- **Documentation and record-keeping** – Specifies the requirements for documents to be maintained covering the social aspect.

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And what kind of plantations they are going to do here and then also environmental management and monitoring plan. So, what kind of organizational structure would be there, what is the environmental management plan, how are they going to monitor the plan, and then how they are going to maintain the documentation and record-keeping so that all has been discussed here?

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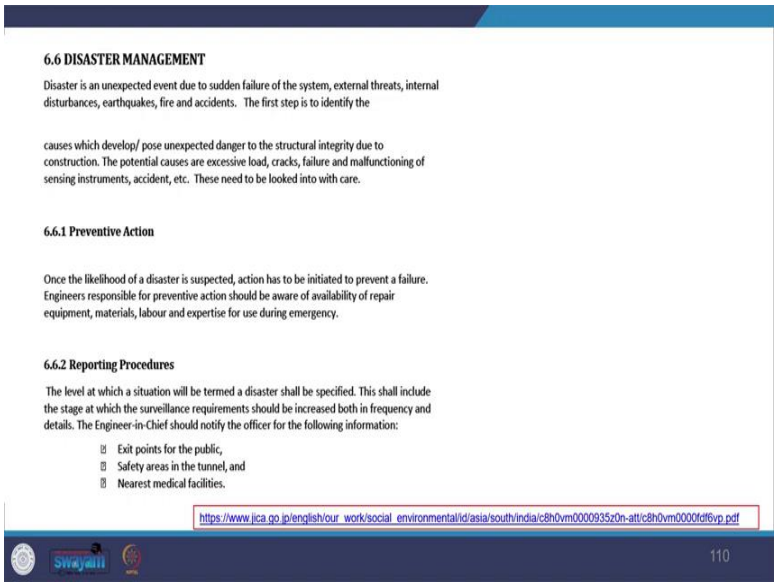

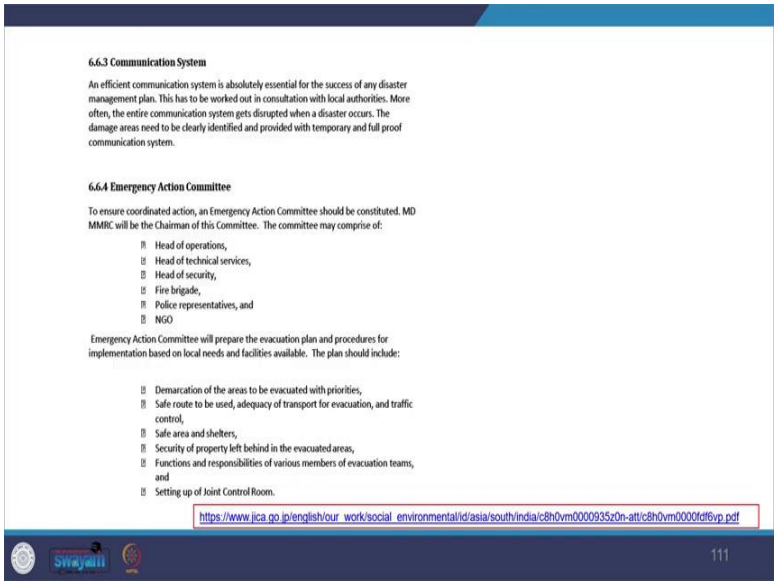

And then also the disaster management, how what kind of prevention actions they would take, what kind of reporting procedure would be followed, and what kind of communication system would be there Emergency Action Committee, which will be there.

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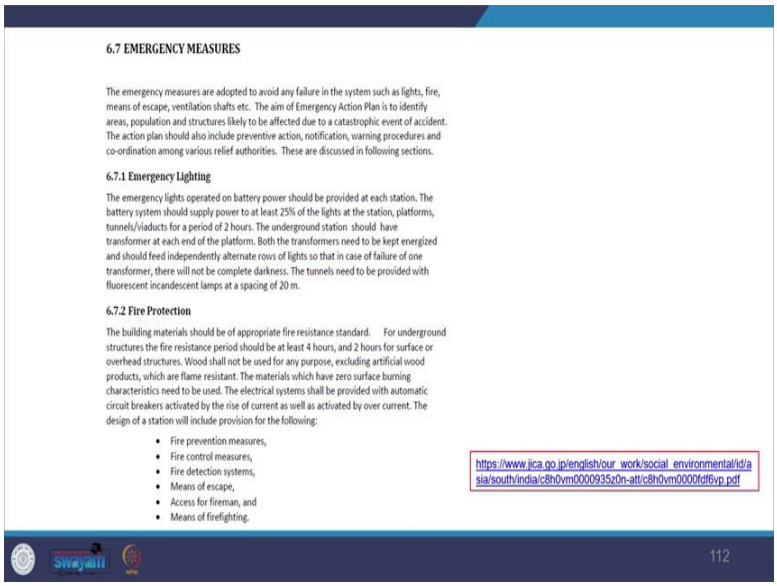

6.7 EMERGENCY MEASURES

The emergency measures are adopted to avoid any failure in the system such as lights, fire, means of escape, ventilation shafts etc. The aim of Emergency Action Plan is to identify areas, population and structures likely to be affected due to a catastrophic event of accident. The action plan should also include preventive action, notification, warning procedures and co-ordination among various relief authorities. These are discussed in following sections.

6.7.1 Emergency Lighting

The emergency lights operated on battery power should be provided at each station. The battery system should supply power to at least 25% of the lights at the station, platforms, tunnels/viaducts for a period of 2 hours. The underground station should have transformer at each end of the platform. Both the transformers need to be kept energized and should feed independently alternate rows of lights so that in case of failure of one transformer, there will not be complete darkness. The tunnels need to be provided with fluorescent incandescent lamps at a spacing of 20 m.

6.7.2 Fire Protection

The building materials should be of appropriate fire resistance standard. For underground structures the fire resistance period should be at least 4 hours, and 2 hours for surface or overhead structures. Wood shall not be used for any purpose, excluding artificial wood products, which are flame resistant. The materials which have zero surface burning characteristics need to be used. The electrical systems shall be provided with automatic circuit breakers activated by the rise of current as well as activated by over current. The design of a station will include provision for the following:

- Fire prevention measures,
- Fire control measures,
- Fire detection systems,
- Means of escape,
- Access for fireman, and
- Means of firefighting.

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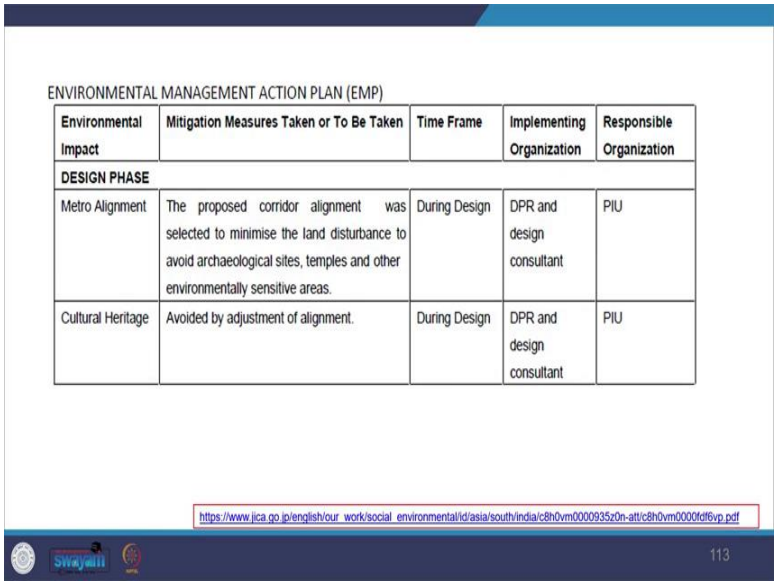

ENVIRONMENTAL MANAGEMENT ACTION PLAN (EMP)

Environmental Impact	Mitigation Measures Taken or To Be Taken	Time Frame	Implementing Organization	Responsible Organization
DESIGN PHASE				
Metro Alignment	The proposed corridor alignment was selected to minimise the land disturbance to avoid archaeological sites, temples and other environmentally sensitive areas.	During Design	DPR and design consultant	PIU
Cultural Heritage	Avoided by adjustment of alignment.	During Design	DPR and design consultant	PIU

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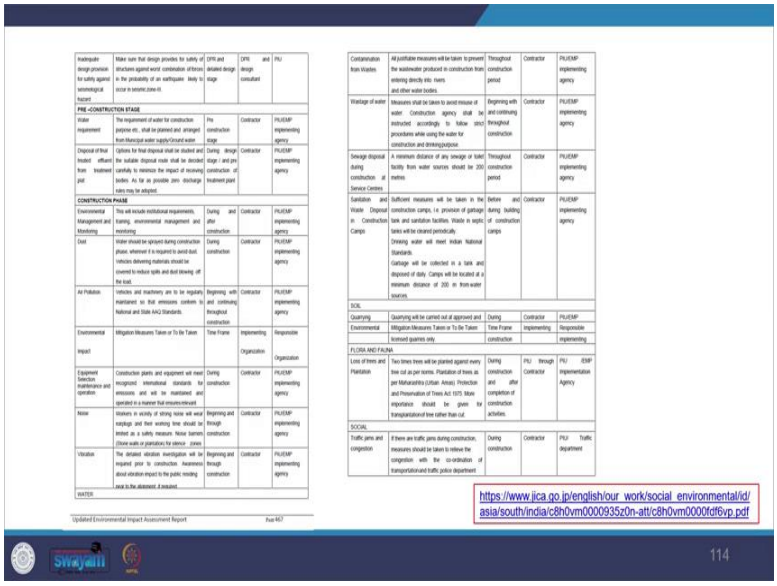

Inadequate design provision for safety against seismological hazard	Make sure that design provides for safety of structures against worst combination of forces in the probability of an earthquake likely to occur in seismic zone-III	DPR and detailed design stage	DPR and design consultant	PIU
PRE-CONSTRUCTION STAGE				
Water requirement	The requirement of water for construction purpose etc., shall be planned and arranged from Municipal water supply/Ground water	Pre construction stage	Contractor	PIU/EMP implementing agency
Disposal of final treated effluent from treatment plat	Options for final disposal shall be studied and the suitable disposal route shall be decided carefully to minimize the impact of receiving bodies. As far as possible zero discharge rules may be adopted.	During design stage / and pre construction of treatment plant	Contractor	PIU/EMP implementing agency
CONSTRUCTION PHASE				
Environmental Management and Monitoring	This will include institutional requirements, training, environmental management and monitoring	During and after construction	Contractor	PIU/EMP implementing agency
Dust	Water should be sprayed during construction phase, wherever it is required to avoid dust. Vehicles delivering materials should be covered to reduce spills and dust blowing off the load.	During construction	Contractor	PIU/EMP implementing agency
Air Pollution	Vehicles and machinery are to be regularly maintained so that emissions conform to National and State AAQ Standards.	Beginning with and continuing throughout construction	Contractor	PIU/EMP implementing agency
Environmental Impact	Mitigation Measures Taken or To Be Taken	Time Frame	Implementing Organization	Responsible Organization
Equipment Selection maintenance and operation	Construction plants and equipment will meet recognized international standards for emissions and will be maintained and operated in a manner that ensures minimum	During construction	Contractor	PIU/EMP implementing agency
Noise	Workers in vicinity of strong noise will wear earplugs and their working time should be limited as a safety measure. Noise barriers (Stone walls or plantation) for silence zones	Beginning and through construction	Contractor	PIU/EMP implementing agency
Vibration	The detailed vibration investigation will be required prior to construction. Awareness about vibration impact to the public residing near to the alignment, if required	Beginning and through construction	Contractor	PIU/EMP implementing agency
WATER				

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Contamination from Wastes	All justifiable measures will be taken to prevent the wastewater produced in construction from entering directly into rivers and other water bodies.	Throughout construction period	Contractor	PIU/EMP implementing agency
Wastage of water	Measures shall be taken to avoid misuse of water. Construction agency shall be instructed accordingly to follow strict procedures while using the water for construction and drinking purpose.	Beginning with and continuing throughout construction	Contractor	PIU/EMP implementing agency
Sewage disposal during construction at Service Centres	A minimum distance of any sewage or toilet facility from water sources should be 200 metres	Throughout construction period	Contractor	PIU/EMP implementing agency
Sanitation and Waste Disposal in Construction Camps	Sufficient measures will be taken in the construction camps, i.e. provision of garbage tank and sanitation facilities. Waste in septic tanks will be cleared periodically. Drinking water will meet Indian National Standards. Garbage will be collected in a tank and disposed of daily. Camps will be located at a minimum distance of 200 m from water sources.	Before and during building of construction camps	Contractor	PIU/EMP implementing agency
SOIL				
Quarrying	Quarrying will be carried out at approved and licensed quarries only	During construction	Contractor implementing	PIU/EMP Responsible implementing
Environmental Impact	Mitigation Measures Taken or To Be Taken	Time Frame		
FLORA AND FAUNA				
Loss of trees and Plantation	Two times trees will be planted against every tree cut as per norms. Plantation of trees as per Maharashtra (Urban Areas) Protection and Preservation of Trees Act 1975. Move importance should be given for transplantation of tree rather than cut.	During construction and after completion of construction activities	PIU through Contractor	PIU EMP Implementation Agency
SOCIAL				
Traffic jams and congestion	If there are traffic jams during construction, measures should be taken to relieve the congestion with the co-ordination of transportation and traffic police department	During construction	Contractor	PIU Traffic department

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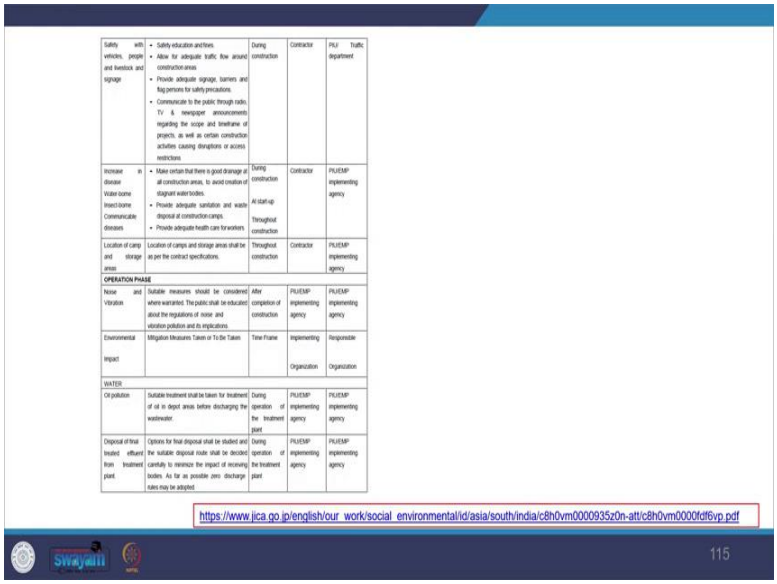

Further, you also look at the emergency measures. So, what kind of emergency measures are provided in the project, emergency lighting, fire protection, and then they have developed in Environmental Management Action Plan EMP. So, you can see at various at the design phase, how they are doing it pre-construction stage, how they are undertaking it.

And then for all the aspects domain, which we have discussed, you can see here, then you can see the construction phase as well. And then you see at the operation phase as well how they are going to take it.

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CHAPTER-7 PUBLIC CONSULTATION

7.3 CONSULTATION AT PROJECT LEVEL

The consultations were conducted during the reconnaissance/ field visit during second and third week of January 2012 and based on informal unstructured interviews and focus group discussion. The objective of the consultation was to disseminate the project information and ascertain stakeholder's views on probable environmental and social impacts that may arise due to the implementation of the proposed project. Public were intimated about the consultation venue, date and time. The venues, date and time of the public consultations are presented in **Table 7.1**. RITES experts with MMRC officials explained about need of the project describing social and environmental issues like land acquisition, anticipated positive & negative impacts and use of techniques during construction and time frame of construction period during public consultation. About 93 people from different community participated for public consultation at project level. Of the total participants, 5 persons at Girgaon, 9 at Dharavi and 12 persons at Santacruz had raised the questions related to environmental issues.

The following issues were discussed during the consultations.

- Overall need of the project;
- Project location;
- Environmental concerns; and
- Social concerns

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TABLE 7.1
PROJECT LEVEL PUBLIC CONSULTATION VENUE

S.No.	Venue of the Public Consultation	No. Of Participant	Time and Venue
1	Girgaon	14	14.30 PM, 13th Jan 2012
2	Dharavi	34	13.30 PM, 16th Jan 2012
3	Dori Nagar, Santacruze	45	14.00 PM, 17th Jan 2012
4	Dori Nagar, Santacruze		16.00 PM, 17th Jan 2012

The photographs showing stakeholders participation at public consultation held at various places are shown in **Figure 7.1**.

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ISSUES RAISED	SUGGESTIONS OF STAKEHOLDERS	MITIGATION MEASURES
Muck Transportation	Compact engineering solution through traffic management, monitoring of air, noise and vibration and safety precautions.	Traffic regulatory measures would be developed during construction. Contractor in consultation with local government will prepare traffic management plan for the construction period. Water, air, noise monitoring will be conducted as per schedule. Vibration Monitoring during construction & Operation.
Air & Noise pollution	Pollution due to air and noise during the construction and insisted for regular air monitoring.	Latest technology will be adopted to minimize pollution during construction. Air & noise monitoring will be conducted regularly as per schedule.
Tree removal	Transplantation and some new trees should be afforested.	Cutting of trees will be minimized wherever possible. Compensatory afforestation will be done by transplanting & planting trees.
Work Schedule	Work should be carried out in systematic manner and working hours should be up to 6 pm.	Work will be carried out in systematic manner and the working hours would be up to 6 pm.
Employment	Job preference should be given to the local people.	As per policy contractors will give preference to affected PAFs.
Muck Disposal	Muck should be disposed at safer site.	Muck will be disposed at identified site & systematic manner. It will be reclaimed immediately after the project completion.
Construction Depot	It should be kept away from the habitation zone.	Depot has been planned at Aarey Milk colony area which is well away from the habitation. All necessary pollution measures will be adopted at depot.
Labour Camp	Provide adequate sanitation facilities and safe drinking water at labour camps.	Adequate sanitation facilities and safe drinking water will be provided at labour camps.

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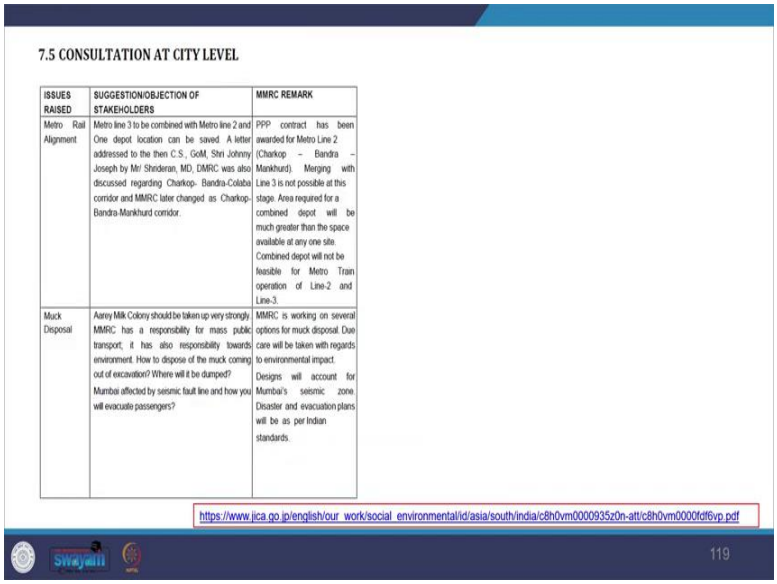

7.5 CONSULTATION AT CITY LEVEL

ISSUES RAISED	SUGGESTION/OBJECTION OF STAKEHOLDERS	MMRC REMARK
Metro Rail Alignment	Metro line 3 to be combined with Metro line 2 and One depot location can be saved. A letter addressed to the then C.S., GoM, Shri Johnny Joseph by Mr/ Shrideran, MD, DMRC was also discussed regarding Charkop- Bandra-Colaba corridor and MMRC later changed as Charkop-Bandra-Mankhurd corridor.	PPP contract has been awarded for Metro Line 2 (Charkop – Bandra – Mankhurd). Merging with Line 3 is not possible at this stage. Area required for a combined depot will be much greater than the space available at any one site. Combined depot will not be feasible for Metro Train operation of Line-2 and Line-3.
Muck Disposal	Aarey Milk Colony should be taken up very strongly MMRC has a responsibility for mass public transport; it has also responsibility towards environment. How to dispose of the muck coming out of excavation? Where will it be dumped? Mumbai affected by seismic fault line and how you will evacuate passengers?	MMRC is working on several options for muck disposal. Due care will be taken with regards to environmental impact. Designs will account for Mumbai's seismic zone. Disaster and evacuation plans will be as per Indian standards.

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FIGURE 7.2
PHOTOGRAPHS OF STAKEHOLDERS' CONSULTATION AT CITY LEVEL

DETAILS OF PUBLIC CONSULTATION HELD WITH PROJECT AFFECTED PEOPLE & VARIOUS OTHER ORGANISATIONS / INSTITUTIONS HELD AFTER 2012.

Sr.No.	Division	Date	Place
1	Gyaneshwar Nagar-BKC	28-11-2014	Nanstwo G- Block Bandra Kurla Complex, Bandra (East).
2	Agripada (Santacruz) & Dharavi	02-12-2014	Nanstwo G- Block Bandra Kurla Complex, Bandra (East).
3	Saripat Nagar (Aarey Colony)	11-12-2014	Community Hall Durga Nagar Rehabilitation Colony Jogeshwari-Vikhroli Link Road.
4	M.I.D.C	26-12-2014	Labour/Worker Welfare Centre Andheri – (East).
5	Maheshwari Nagar Police (Tent) Colony - Discussion Session	13-02-2015	Police Colony Maheshwari Nagar Rd.No.16, M.I.D.C. Andheri (East).
6	Kalbadevi & Girgaon	02-03-2015 To 04-03-2015	CR-2 Building, 1st Floor Nariman Point, Mumbai.
7	Cuff Parade & Churchgate Local Residents Association - Discussion Session	05-03-2015	CR-2 Building, 1st Floor Nariman Point, Mumbai.
8	Sahar (Shanti Nagar)	12-03-2015	Nanstwo G - Block Bandra Kurla Complex, Bandra (East).
9	Kalbadevi & Girgaon Action Committee	16-03-2015	CR-2 Building, 1st Floor Nariman Point, Mumbai.
10	Indian Merchant Chambers - Discussion Session With Them & Presentation	26-03-2015	CR-2 Building, 1st Floor Nariman Point Mumbai
11	Mumbai 1st Pwes Club. - Discussion Session With Them & Presentation	27-03-2015	CR-2 Building, 1st Floor Nariman Point Mumbai
12	M.I.D.C. Officers & M.I.D.C. Plot Owners	08-06-2015	Territorial / Regional office M.I.D.C., Thane Div. Office Complex Bldg. 1st Floor, Thane
13	M.I.D.C. Officers & M.I.D.C Plot Owners	22-06-2015	Association Office Pl., No. 15, Street No.14, M.I.D.C Marol, Andheri - East. Mumbai.
14	Cricket Club Of India - Discussion Session With Them & Presentation	24-07-2015	CR-2 Building, Floor Nariman Point Mumbai.
15	Janata/Naya Nagar Mahim	29-07-2015	Nanstwo G- Block Bandra Kurla Complex, Bandra (East).
16	Oval Ground Association. Mumbai Discussion Session With Them.	24-08-2015	CR-2 Building, Floor Nariman Point Mumbai.
17	Girgaon Kalbadevi Residents Association - Discussion Session With Them.	28-08-2015	CR-2 Building, Floor Nariman Point Mumbai.

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So, you see that they have also like it was the requirement of JICA, that they have to have a thorough public consultation. You have learned about the public consultation concept here. So, they have done consultation at the project level. Plus, you can see the picture here where all they did at the project level, and then they identified all the issues that were raised, and what kind of suggestions were made by the stakeholders.

And what kind of mitigation measures have been taken? So, all that has been documented. Then you also see the consultation at the city level. So, when did they conduct that has been documented what kind of issues were raised, what kind of suggestions were made, and what kind of actions have been taken to that?

So, you see that they have documented it, concerning photographs when and where they were conducted it and all that you can see the table where it was done, the date it was done place it was done, and what kind of inputs came and what kind of actions were taken. So, all that has been documented, you can see the minutes of the meetings also documented here. So, that is what we saw in the case study.

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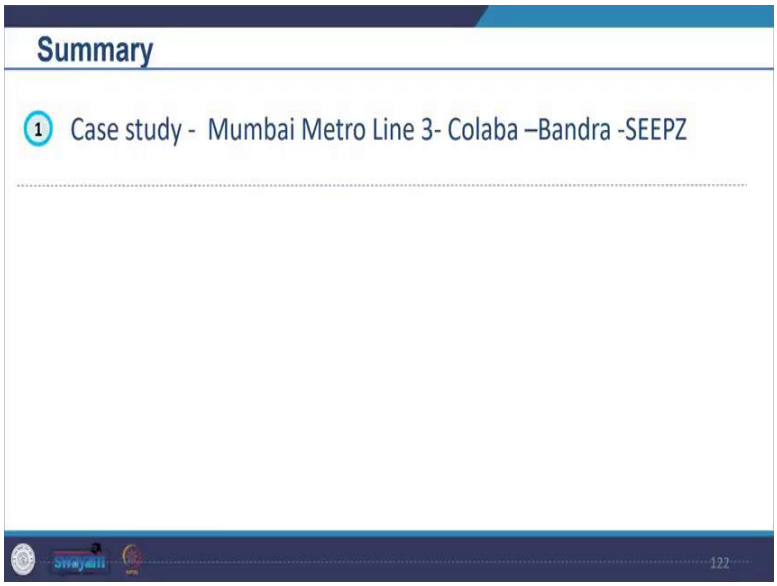

So, summarizing today, especially, while looking at this case study, we reflected upon all the learnings we have seen from, what kind of environmental context environmental pressure we are dealing with and what kind, how in practice, we handle all these aspects. So, by looking at Mumbai, metro line 3, Colaba, and Bandra SEEPZ, project we try to understand all those aspects.

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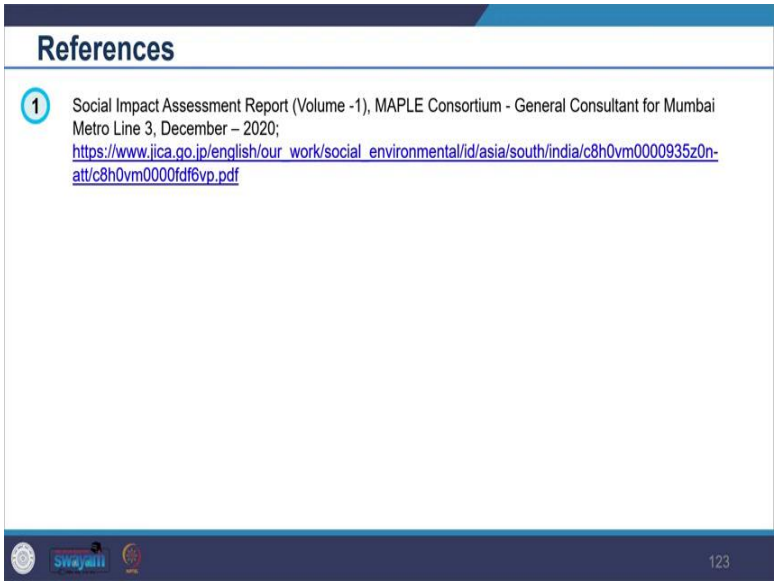

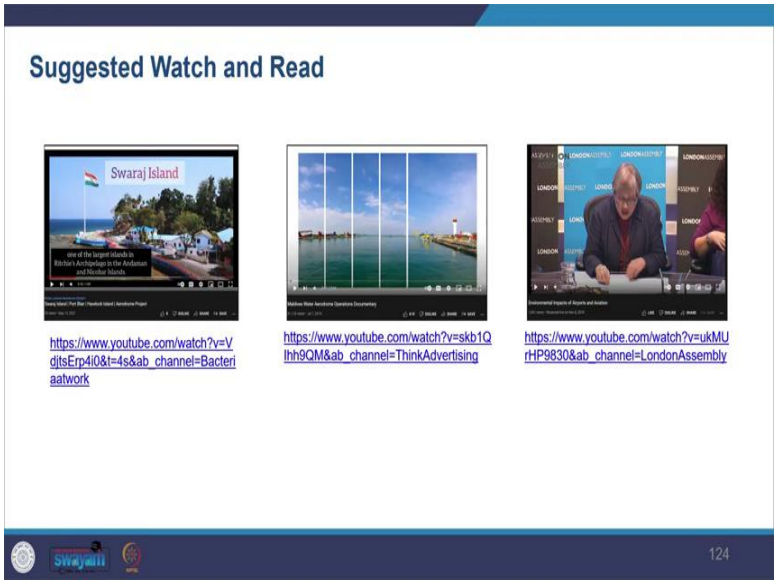

So, these were our key references for this. So, we looked at this case report, and I have given you the link for that. Our references were also to the other part of what course book which we have been using, and these are the suggested watch and read, winding up. Please feel free to ask questions. Let us know about any concerns you have, and do share your opinions, experiences, and suggestions. Looking forward to interacting and CO learning with you while exploring EIA.

Thank you.