

11. FINANCIAL ANALYSIS

11.1 FINANCIAL ANALYSIS

▪ INVESTMENT COST

The Financial Internal Rate of Return (FIRR) has been calculated with completion cost of Rs. 7178 Crore @ 5 % inflation. The cash flow of this investment is presented in **Table 11.1**.

The construction period is taken as 7 years starting from 2014-15 and System/ Corridor will be operational by 2021.

Table 11.1 Year Wise Investment Schedule

(Rs. in Crore)

Year	Construction cost	Land cost	Completion cost
2014-15	530	264	821
2015-16	530	264	849
2016-17	530		614
2017-18	795		967
2018-19	795		1015
2019-20	1060		1421
2020-21	1060		1492
Total	5302	528	7178

The land cost is divided into two initial years during which it is expected that the land acquisition work would be over and related payments would be released.

▪ REVENUES

Fare box revenue

It has been estimated that about 4.59 lakh passengers would use the Corridor in the year 2021, which would increase to about 17.76 lakh by 2041 and 26.29 lakh passengers by 2051.

Fare box revenue has been assessed on the basis of suburban fare structures – with fares assumed to increase by 10 % after every 5 years. As per the current observed suburban passenger trends in Mumbai, 80 % of the passengers are expected to travel by Second Class and 20 % by First Class. With the option of availability of season tickets, 75 % of the Second class and 98 % of the First class passengers are expected to travel by season tickets. As the Corridor would be developed as part of the suburban



system, the same fare structure and passenger distribution is taken for financial analysis.

Based on expected ridership and composition of second/ first class and single journey/ season ticket passengers, it has been estimated that fare box revenue in 2021-22 (first year of operation) for Corridor shall be Rs. 142 Crore.

Other sources of revenues

Other sources of revenues could be commercial development and advertisement at station buildings. The advertisement revenue has been estimated at 5% of the fare box revenues during operations. Also, it is possible to raise resources through leasing of parking rights at stations, advertisement on trains and tickets, advertisements within stations and parking lots, advertisements on viaducts, columns and other metro structures, co-branding rights to corporate, film shootings and special events on metro premises.

■ FINANCIAL INTERNAL RATE OF RETURN (FIRR)

The project is assumed to be funded entirely by the Indian Railways. The Financial Internal Rate of Return (FIRR) has been worked out upto the year 2051.

It is seen that the project has negative FIRR with even O&M expenses not being met by the revenue stream (**Table 11.2**). This can be made positive with non-fare box revenue being increased to about 155 % (presently taken as 5 %) of fare-box revenue each year.

Alternatively, if only O&M costs are considered (i.e. capital costs being considered as sunk money), the project can have breakeven with non-fare box revenue upwards of about 45 % of fare-box revenue.



Table 11.2 Financial Analysis of Project Based on Suburban Fare Structure

(Rs. in Crore)

Year	COST STREAM					REVENUE STREAM					Net Flow	Cash	
	Construction cost	Land cost	Completion cost	Replacement cost	O&M cost	TOTAL COST	Fare box Revenue @ fares as per Suburban Fare	Revenue from property deve & advt@5% of faire box rev	Total Revenue				
2014-15	530	264	821			821				0		-821	
2015-16	530	264	849			849				0		-849	
2016-17	530		614			614				0		-614	
2017-18	795		967			967				0		-967	
2018-19	795		1015			1015				0		-1015	
2019-20	1060		1421			1421				0		-1421	
2020-21	1060		1492			1492				0		-1492	
2021-22					394	394				142	7	150	-245
2022-23					410	410				169	8	178	-233
2023-24					431	431				183	9	192	-239
2024-25					449	449				197	10	207	-242
2025-26					471	471				213	11	224	-248
2026-27				190	525	715				230	12	242	-473
2027-28					551	551				273	14	287	-264
2028-29					573	573				295	15	310	-263
2029-30					601	601				319	16	335	-266
2030-31					625	625				344	17	362	-264
2031-32				1456	680	2135				372	19	391	-1744
2032-33					706	706				434	22	455	-251
2033-34					741	741				460	23	483	-259
2034-35					771	771				487	24	512	-259
2035-36					802	802				517	26	542	-259
2036-37					842	842				548	27	575	-267
2037-38					876	876				638	32	670	-205
2038-39					919	919				677	34	711	-209
2039-40					957	957				717	36	753	-204
2040-41					1005	1005				760	38	798	-206
2041-42				3267	1140	4408				806	40	846	-3561
2042-43				2068	1184	3252				922	46	988	-2284
2043-44					1243	1243				959	48	1007	-236
2044-45					1291	1291				997	50	1047	-243
2045-46					1355	1355				1037	52	1089	-266
2046-47					1408	1408				1079	54	1133	-275
2047-48					1478	1478				1234	62	1296	-183
2048-49					1536	1536				1283	64	1348	-189
2049-50					1597	1597				1335	67	1401	-196
2050-51					1677	1677				1388	69	1457	-220
2051-52				8422	1745	10166				1444	72	1516	-8651
										FIRR		-VE	



11.2 ECONOMIC ANALYSIS

▪ ECONOMIC ANALYSIS APPROACH

The economic appraisal has been carried out within the broad framework of Social Cost – Benefit Analysis Technique. It is based on the incremental costs and benefits and involves comparison of project costs and benefits in economic terms under the “with” and “without” project scenario. In the analysis, the cost and benefit streams arising under the above project scenarios have been estimated in terms of market prices and economic values have been computed by converting the former using appropriate shadow prices. This has been done to iron out distortions due to externalities and anomalies arising in real world pricing systems. The annual streams of project costs and benefit have been compared upto the year 2051 to estimate the net cost/ benefit and to calculate the economic viability of the project in terms of EIRR.

The Economic Internal Rate of Return (EIRR) for the project has then been arrived using Discounted Cash Flow technique to the net benefit stream at economic prices.

▪ ESTIMATION OF BENEFITS

The Virar-Panvel Suburban Corridor will yield tangible and non-tangible savings due to equivalent reduction in road traffic and certain socio-economic benefits. The Introduction of fast track rail corridor will result in reduction in number of buses, usage of private vehicles, air pollution and increase the speed of road-based vehicles. This, in turn, will result in significant social benefits due to reduction in fuel consumption, vehicle operating cost and travel time of passengers. Reduction in accidents, pollution and road maintenance costs are the other benefits to the society in general.

The benefit stream that has been quantified includes:

- Capital and operating cost (on present congestion norms) of carrying the total volume of passenger traffic by existing bus system and private vehicles in case fast track rail corridor is not taken up.
- Savings in operating costs of all buses and other vehicles due to de-congestion including those that would continue to use the existing transport network even after the fast track rail corridor is introduced.
- Savings in time of commuters using the new fast track rail corridor over the existing transport modes because of faster speed.
- Savings in time of those passengers continuing on existing modes, because of reduced congestion on roads.
- Savings on account of prevention of accidents and pollution with introduction of fast track rail corridor.
- Savings in road infrastructure and development costs that would be required to cater to increase in traffic, in case fast track rail corridor is not introduced.
- Savings in fuel consumption on account of less number of vehicles on road and decongestion effect with introduction of fast track rail corridor are included in those of vehicle operating cost.
- The quantification of benefits in monetary terms in coming paragraphs has been done at 2013 prices.



▪ TRANSPORT DEMAND ON VIRAR - PANVEL SUBURBAN CORRIDOR

At present the corridor is served by rail, bus system and IPT modes in addition to private vehicles. The total transport demand and demand estimated on this Suburban corridor for various years is given in **Table 11.5**.

Table 11.3 Transport Demand Forecast on Virar-Panvel Suburban Corridor

ITEM	2021	2031	2041	2051
Daily Trips on (Virar-Panvel Corridor (Lakh)	4.6	9.9	17.8	26.3

The traffic on suburban corridor will come due to shifting of traffic from buses, IPT and private modes and also from train, once a more efficient system is available. From road, the shifting of traffic would be from both buses and private vehicles. It has been estimated that 516 buses will decrease with the introduction of this corridor. This will save Rs. 218 Cr in the year 2021 towards capital and operating cost of bus system. The saving in respect of private vehicles will be approx. Rs. 929 Cr.

▪ SAVINGS IN TRAFFIC CONGESTION

New Corridor will contribute towards reducing the congestion and journey time on roads because of diversion of some traffic to this corridor. Reduction in traffic congestion will save the necessary capital investment and vehicle operating cost as well as increase in time saved per vehicle. With the implementation of this corridor, the savings from operating costs due to decongestion effect has been estimated to be Rs 36 Cr in the year 2021.

▪ PASSENGER TIME SAVING

With the introduction of Virar-Panvel Suburban Corridor, there will be reduction in traffic congestion on the roads and correspondingly, there will be saving in time of commuters travelling by various modes of road transport. With the improved technology, the new system is expected to be faster than the existing suburban system and there will be saving in passenger time shifting o the new rail system. With the implementation of the project, the passenger time savings are estimated at Rs. 146 Cr for the year 2021.

▪ SAFETY

The reduction in traffic volumes on roads brought about by modal transfer to Virar-Panvel Suburban Corridor is expected to reduce number of accidents. Any reduction in number of accidents will involve savings from damage to vehicles and savings towards medical and insurance expenses to persons involved in accidents. The benefits because of accidents prevented with the introduction of this MRTS corridor works out to Rs.6.6 Cr in the year 2021.

▪ REDUCED AIR POLLUTION

The benefits because of saving in cost of prevention of vehicular pollution, with the implementation of Virar-Panvel Suburban Corridor in Mumbai in the year 2021 are expected to be Rs 70 Cr.

▪ SHADOW PRICING

The value of Project cost and benefits have been expressed in terms of market prices. These prices, however, do not reflect the real resource cost and value of benefits derived from the project to the economy. The market prices are distorted due to variety of factors. These factors could be controlled/administered prices of inputs, monopolistic market of inputs, tax



structure, etc. The factors used for converting project inputs and output to economic costs are given in **Table 11.4**.

Table 11.4 Factors used for Converting Project Inputs and Output to Economic Costs

S.No	Item	Factor
1	Capital Cost	0.85
2	Operations & Maintenance Cost	0.80
3	Savings In Capital & Operating Cost Of Buses	0.89
4	Savings In Capital & Operating Cost Of Private Vehicles	0.8
5	Savings In Passenger Time	1.0
6	Savings In VOC	1.1
7	Savings In Accident Costs	1.0
8	Savings In Pollution Costs	1.0

▪ RESULT OF ECONOMIC ANALYSIS

The cost and benefit streams upto 2051 in the economic prices have been worked out and presented in **Tables 11.5**. The residual value of facilities (e.g. Rail corridors, equipment for power supply and tele-communication, rolling stock, etc.) in last year has not been taken into account as benefit in these tables. The total cost worked out on the above basis is then subtracted from the total benefits to estimate the net benefit of the project. This flow is then subjected to the process of discounting to work out the internal rate of return on the project, to examine the viability of the Project in Economic terms. Thereafter, the Project EIRR in economic terms has been arrived by using shadow prices.

The EIRR in economic terms works out to **25.73 %**.



Table 11.5 Cost and Benefit Stream for Virar Panvel Suburban Corridor in Mumbai: Economic Prices

YEAR	CAPITAL	RUNNING EXPENSE OF MRTS	TOTAL COSTS	SAVINGS BUSES	FROM OTHERS VEHICLES	TIME	SAVINGS FROM		Units: Rs in Crores	
							VOC	ACC/POL	TOTAL SAVINGS	NET CASH FLOW
										Rs. IN Cr.
2014-15	698	0	698	0	0	0	0	0	0	-698
2015-16	721	0	721	0	0	0	0	0	0	-721
2016-17	522	0	522	0	0	0	0	0	0	-522
2017-18	822	0	822	0	0	0	0	0	0	-822
2018-19	863	0	863	0	0	0	0	0	0	-863
2019-20	1208	0	1208	0	0	0	0	0	0	-1208
2020-21	1268	0	1268	0	0	0	0	0	0	-1268
2021-22	0	315	315	301	1153	175	62	118	1809	1494
2022-23	0	328	328	341	1308	198	70	134	2052	1723
2023-24	0	345	345	387	1483	225	79	152	2326	1982
2024-25	0	359	359	439	1682	255	90	172	2638	2279
2025-26	0	377	377	498	1907	289	102	195	2992	2615
2026-27	162	420	581	565	2163	328	116	222	3392	2811
2027-28	0	441	441	640	2452	372	131	251	3847	3406
2028-29	0	458	458	726	2781	422	149	285	4362	3904
2029-30	0	481	481	823	3153	478	169	323	4947	4466
2030-31	0	500	500	934	3576	542	192	366	5610	5109
2031-32	1237	544	1781	1216	4258	646	229	436	6784	5003
2032-33	0	565	565	1353	4739	719	254	485	7550	6985
2033-34	0	593	593	1506	5275	800	283	540	8403	7810
2034-35	0	617	617	1676	5871	890	315	601	9353	8736
2035-36	0	641	641	1866	6534	991	351	669	10410	9769
2036-37	0	673	673	2076	7272	1103	390	744	11586	10913
2037-38	0	701	701	2311	8094	1227	434	828	12895	12195
2038-39	0	736	736	2572	9009	1366	484	922	14352	13617
2039-40	0	766	766	2863	10027	1520	538	1026	15974	15209
2040-41	0	804	804	3186	11160	1692	599	1142	17779	16975
2041-42	2777	912	3689	3940	12514	1883	1136	1318	20791	17102
2042-43	1758	947	2705	4303	13665	2057	1240	1439	22704	19999
2043-44	0	994	994	4699	14922	2246	1354	1572	24793	23799
2044-45	0	1033	1033	5131	16295	2453	1479	1717	27074	26042
2045-46	0	1084	1084	5603	17794	2678	1615	1874	29565	28481
2046-47	0	1126	1126	6119	19431	2925	1764	2047	32285	31158
2047-48	0	1183	1183	6681	21219	3194	1926	2235	35255	34072
2048-49	0	1229	1229	7296	23171	3488	2103	2441	38498	37269
2049-50	0	1278	1278	7967	25303	3808	2296	2665	42040	40762
2050-51	0	1342	1342	8700	27630	4159	2508	2911	45908	44566
2051-52	7158	1396	8554	9501	30172	4541	2738	3178	50132	41577
IRR										25.73%

▪ SENSITIVITY ANALYSIS

A sensitivity analysis of the EIRR with 10% cost overrun and 10% reduction in traffic materialization (separately) has been carried out. The EIRRs under these scenarios are given in **Table 11.6**.

Table 11.6 EIRR - Sensitivity Analysis

Sensitivity Parameter	EIRR (%)
Basic EIRR	25.73
With increase in cost by 10%	24.81
With decrease in traffic by 10%	25.61
With increase in cost by 10% & decline in traffic by 10%	24.70

It can be seen from the above table that 10% increase in cost affects economic viability more than 10% decline in traffic. Accordingly, it is recommended that controls should be exercised to keep the cost of construction under check.

11.3 IMPLEMENTATION STRATEGY

The proposed Panvel – Virar Corridor is an augmentation of the suburban railway network, which will have the same fare levels and acceptability as the Mumbai suburban System.

The Project has negative FIRR, but a good economic rate of return. Considering the social and developmental benefits that the Project may provide, IR may decide to implement the Project through Government financing.

To implement the Project in a short period, it is necessary that actions on all major activities are taken in parallel. The major activities involved in the implementation of the project are:

- Approval of the Feasibility Report by IR
- Approvals from other agencies viz MMRDA, CIDCO, NMMC, VVMC, etc.
- Arrangement of Finances
- Preliminary activities
 - Land Acquisition (Temporary and Permanent)
 - Utility Diversions
 - Traffic Diversion arrangements
- Fund allocation and Organization for Implementation