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Economic Evaluation for Proposed Highway Railway Over Bridge –A Case Study of Naroda Rail Crossing

Ankit M Patel M.E. (Civil) Transportation Engineering, L.D. College of Engineering, Ahmedabad

ABSTRACT

Facility investment decisions represent major commitments of corporate resources and have serious consequences on the profitability and financial stability of a corporation. In the public sector, such decisions also affect the viability of facility investment programs and the credibility of the agency in charge of the programs. It is important to evaluate facilities rationally with regard to both the economic feasibility of individual projects and the relative net benefits of alternative and mutually exclusive projects.. In this paper a case study of Naroda Rail Crossing consider for determining the economic evaluation an objective to study the finding whether rail bridge is economic viable or not by different methods of economic evaluation.

KEYWORDS: Transport System, Economic Evaluation, Naroda Rail Crossing

1. INTRODUCTION

Transportation is a movement of men and goods is as old as civilization Roads or highways are one form of the means of transporting men and materials from one place to another. Transportation is the critical underpinning upon which the industrial and technological complex of the nation is based. Transportation is the life-line of any country. Because in all walks of life without transportation the progress or development of any country is impossible. Transportation plays a very important role in economical and social development of the country. Fixed facilities of the physical components of the system that is fixed in space and constitute the network of links (e.g., roadway segments, railway track, and pipes) and nodes (e.g., intersections, interchanges, transit terminals, harbors, and airport) of the transportation system.

2. STUDY AREA

Ahmedabad – Udaipur meter gauge rail line passes through the Northern Periphery of Ahmedabad. This railway line is of very great importance because it connects most of passenger and goods train of Rajasthan and Gujarat including all the major and minor historical and industrial places on the rail line

2.1 Indentifying the Study Problem

The Ahmedabad–Udaipur meter Gauge Line Passes through the Northern Periphery of Ahmedabad. This railway line is of very great importance because most of passenger and goods train traffic of Rajasthan and Gujarat including the entire major and minor and historical and industrial places moves on this line. And due to connection of main road to the Ahmedabad city traffic is also high on this crossing as shown in fig.1



Fig. 1: Traffic Problem at Naroda Crossing

3. DATA COLLECTION

It is necessary to collect relevant data for carrying out the study. The various traffic surveys conducted are

1. Traffic Classification and Volume
2. Pedestrians Volume
3. Frequency and duration of Gate closure of level crossing gate
4. Traffic delay Survey

Table 1: Volume Count Survey

Direction	Nana Chiloda to Naroda		Naroda to Nana Chiloda	
Vehicle Type	(In Vehicle)	(In PCU)	(In Vehicle)	(In PCU)
2-Wheelers	14383	7136	12067	6053
3-Wheelers	1489	1800	1687	2034
Car/ Jeep	1269	1269	1140	1140
Bus	168	504	165	495
Trucks	114	342	181	543
Tractors	57	228	72	288
Cycles	5440	2726	8196	4088
Others	247	1482	120	720
Total	23167	15487	23628	15361

From the table it can be observed that the at level crossing from Nana Chiloda to Naroda total of 23167 vehicle travels in the junction on the other hand some of 23628 vehicle travel in the level crossing. Which is the almost equal in both directions? From the table it can be also observed that movement of two wheelers is higher followed by three wheelers and four wheelers. But a significant noted that some of 13636 numbers of cycle traverse in both direction of junction.

3.1 Frequency and Duration of Gate Closure

From the study, there are total 16 numbers of trains passing through this line. With 14 numbers of passenger train and 2 numbers of Goods train passing through this level crossing. The gate closures per day were observed 2 hours and 01 minutes.. The gate closure detail is summarized below in Table.2.

Table 2: Gate Closure Details

Time		Total Minute	Type of Trains	No. of Trains
From	To			
7:40	7:50	0:10	Passenger Train	1
8:25	8:40	0:15	Passenger Train	1
8:40	8:50	0:10	Passenger Train	1
9:35	9:50	0:15	Passenger Train	1
11:58	12:20	0:22	Goods Train	2
12:30	12:50	0:20	Passenger Train	1
2:25	2:35	0:10	Passenger Train	1
4:20	4:30	0:10	Passenger Train	1
4:35	4:52	0:17	Passenger Train	1
6:10	6:15	0:05	Passenger Train	1
7:00	7:12	0:12	Passenger Train	1
7:50	8:03	0:13	Passenger Train	1
8:25	8:36	0:11	Passenger Train	1
10:00	10:15	0:15	Passenger Train	1
11:25	11:41	0:16	Passenger Train	1
Total (Hrs.)		2:01		16

3.2 Vehicle Affected By Gate Closure

From the study, it can be observed that total of 11819 vehicles affected in both the direction due to gate closure per day for the 2.01 hour around 25% of the total traffic volume.

Table 3: Vehicle Affected By Gate Closure

Direction	Nana Chiloda to Naroda (In Vehicle)	Naroda to Nana Chiloda (In Vehicle)	Total
Two Wheelers	4208	2590	6798
Three Wheelers	421	376	797
Car/Jeep	366	265	631
Bus	55	33	88
Trucks	27	31	58
Tractors	19	17	36
Cycles	1774	1637	3411
Total	6870	4949	11819

3.3 Delay Vehicle per Minute

From Fig: 2. we can say that For Two Wheelers, Three Wheelers, car/ Jeep, Bus, Trucks, Tractors, and Cycles the delay time are 8.84, 8.76, 8.6, 7.82, 8.31, 7.57, 8.7 minutes

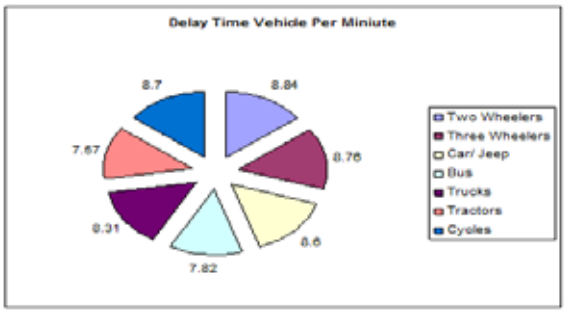


Fig. 2: Delay Time Vehicle per Minute

4. ECONOMIC ANALYSIS

The data collected through field surveys at identified crossing were computerized and analyzed primarily keeping in view the following:

- To assess the total average delay to traffic which is future used for compiling the idling fuel usage quantification?
- To assess the total traffic and vehicle composition during peak hours.

The vehicles hours computed is converted into passenger- hours based on vehicles occupancy. The following average occupancy values are adopted for different mode keeping in view the type land use in the study is.

Table 4: Vehicle Occupancy Table

Type of Vehicle	Occupancy
Two Wheelers	1.8
Three Wheelers	2.4
Car	1.4
Bus	64.0

Table 5: Total Passengers Hours at Naroda

Type of Vehicle	No. of Vehicles Delayed	Delay in Vehicle Hours	Delay in Passenger HRS. Per day	Delay in Passenger hours Per Year
2- Wh.	6797	1002	1804	658460
3- Wh.	798	117	281	102565
Cart	632	91	128	46720
Bus	87	12	768	280320
Trucks	59	9	9	3285
Tractors	35	5	5	1825
Cycles	3407	494	494	180310
Total				1273485

Idling fuel consumption of the delayed vehicles is analyzed by taking the total delay in vehicle hours of each vehicle group multiplied by corresponding PCRA Idling fuel consumption coefficients. Idling fuel consumption coefficients of vehicles are as follows.

Table 6: Idle Fuel Consumption

Type of Vehicle	Idle fuel consumption
2- Wheelers	0.34
3- Wheelers	0.42
Cars	0.54
Buses	0.86
LCV	0.69

(Source: PCRA study 1996)

Based on traffic analysis and delay characteristics at the selected crossing, it has been workout that on an average daily 108054.6 liters of petrol and 16074.6 liters of diesel is estimated to be wasted due to idling of vehicles. (Source: PCRA study 1996). The tables depict the Average Fuel Loss per day on each category of the traffic intersection

Table 7: Total Fuel Consumption, Cost and Emission of Delayed Vehicles at Study Area

Fuel	(Liters/Year)	Rs./Liter	Amount in Rupees
Petrol	108054.6	70	7563822
Diesel	546536.4	46	739432
Total			8303254

The vehicle-hour computed is converted into passenger-hour based on vehicle occupancy. The following average occupancy value is adopted for different modes keeping in view the type of land use in the study area.

Table 8: Travel Time Saving In Rupees

Type of Vehicle	Travel time saving in Rupees/passenger-hour
Two Wheelers	RS. 67.48
Three Wheelers	RS. 34.81
Car	RS. 10.23
Bus	RS. 10.23

(Source: DMRC study)

4.1 Evaluation of Travel Time Saving

These values are used for evaluating the travel time saving for vehicle at this Nana Chiloda Crossing.

Table 9: Travel Time Saving In Rs.

Type of Vehicle	Delay in Passenger-hour per year	Travel time savings for passenger – hour in Rs.	Travel time savings Rs. Per year
Two Wheelers	658460	67.48	44432880.8
Three Wheelers	102566	10.23	1049239.95
Car	46720	34.81	1626323.2
Bus	280320	10.23	2867673.6
Trucks	3285	-	
Tractors	1825	-	
Cycle	180310	-	
Total	1273485		49976117.6

From table.9.and 10 we can conclude that with the construction of Rail over Bridge we can achieve following benefits in terms of Rupees.

Table 10: Benefit after Construction of Rob

Sr. NO	Savings	Amount in Rs.
1	Travel Time Savings	49976117.6
2	Fuel Time Savings	8303253.6
Total		58279371.2

4.2 Construction Cost of Rob

Table 11: Total Construction Cost of R.O.B.

Sr No.	Type of Work	Cost (In RS.)
1	Cost of R.O.B. Approach & Railway Portion	14,71,77,000
2	Additional 3% Consultancy fees	44,15,310
3	Additional 10.30% Service Tax On Consultancy fees	4,54,776.93
Total Cost Of Railway over Bridge =		Rs.15,20,47,086.93

As from the result of table.11. The total cost for a construction of R.O.B. is Rs.15, 20, 47,086.93. It is appropriate to assume a construction period of 2 years. The equal distribution of fund is assumed during the construction period.
Year 1, 50% of initial capital cost
Year, 50% of initial capital cost
Maintenance cost of R.O.B. is 30, 40,941.73 (2% of cost of bridge) per year.

4.2.1 Calculation for Various Method of Economic Evaluation

With help of above data economic evaluation of rail over bridge at selected study area can be done by various method of it and get a results of different method as per below table.

Table 12: Results of Economic Evaluations by different methods

Rate of Return	NPV Value	B/C Ratio	IRR Value
36.31%	27.46 Crores	2.8	42%

5 CONCLUSIONS

- NPV values is 27.46 crore, which is positive. Hence, project is justified
- B/C ratio is 2.80 which is greater than one. Hence, project is justified
- IRR is 42% which is more than 15%. Hence, project is justified
- Rate of return is 36.31% which is more than prevailing market rate. Hence, project is justified.
- Saving in travel time cost is Rs. 4, 99, 76,117.6per year.
- Saving in fuel saving is Rs. 83, 03,253.6 per year.
- Increase in the speed of the various vehicles.

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