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Feasibility Study of Linking Himmatnagar to Mehsana by Railway Track

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Abstract- The proposed study is aimed to determine the feasibility of connecting Himmatnagar to Mehsana by railway link. In this study, railway link (i) Himmatnagar to Vijapur - a new broad gauge railway track construction of 25km and (ii) From Vijapur to Ambaliyasan - conversion of metre gauge to broad gauge of 41km are proposed. At present passengers from Sabarkantha and Aravalli district are going in Kachchh region by GSRTC and Luxury buses in large number from Himmatnagar. There is acute need of connecting Himmatnagar to Bhuj by short length railway track. This study may be helpful to take decision for the construction of proposed railway line. In this regard technical as well as economical feasibility of the proposed railway track will be carried out.

Index Terms- Feasibility, Railway, Travel Time Saving Cost, Fuel Consumption Cost, NPV Method, B/C Method

1. INTRODUCTION

Railways are ideally suited for long distance travel and movement of bulk commodities. Regarded better than road transport in terms of energy efficiency, land use, environment impact and safety it is always in forefront during national emergency **(1).**

Indian Railways, in 1851 when the first train ran in the country for hauling construction material in Roorkee and by 16th April 1853 the first passenger train service became operational running between Bori Bunder, Bombay and Thane **(1).**

Indian Railways (IR) is a one of the largest transportation and logistics networks of the world which runs 19,000 trains. It runs 12,000 trains to carry over 23 million passengers per day connecting about 8,000 stations spread across the sub-continent. It is equivalent to moving the entire population of Australia **(1).**

It runs more than 7,000 freight trains per day carrying about 3 million tonnes of freight every day. Its network of 65,000 route kilometres is more than one and half times the circumference of the earth. It has joined the select club of countries comprising Chinese, Russian and United States Railways with an originating freight loading of 1008.09 million tonnes (i.e. one billion plus) in 2012-13 **(1).**

During 2013-14, Indian Railways carried 1.05 billion tonnes of revenue earning freight traffic and is expected to carry 1.1 billion tonnes in 2014-15 **(1)**.

2. LITERATURE REVIEW

Ivona et al. (2015) have concluded that the railway is ecologically the most efficient traffic system that enables quick transport of goods and passengers. Railways in different countries achieved a high degree of unification the regulations, on standardization of the underlying assets and mutual coordination of the work. Railway vehicles could transfer from one country to another, if they meet the established technical requirements. Thus facilitates the transport of goods and passengers, transiting through one or more countries. Having into consideration the general trends in the world and development of urban civil engineering can be expected further improvement of railways as a world traffic system. The role of rail traffic in contemporary terms is reduced, but is very important because the problems with the price and the reserves of oil are imposing on Global level, as well as the increased sensitivity of citizens in developed countries to the disruption of the environment. Therefore it is important to find more modern vehicles and less expensive way of constructing and exploitating this type of traffic **(2).**

Jomy Jose (2014) has concluded that Railway is considered as the most secure manifestation of transport. The possibilities of mishaps and breakdown of tracks are low as contrasted with different modes of transportation. The convey limit of the routes is to a great degree huge. Additionally, its ability is versatile which can without much of a stretch be expanded by including more wagons. Their charges are based on charge what the movement can endure standards which helps poor people. At present, we have an extraordinary window of chance, which must be promoted with a feeling of desperation to convert routes to convey auspicious profits to the individuals and the country. Actually, it is a national need to develop a rail line between Kottayam and Maduari through Idukki District **(3).**

3. METHODOLOGY

Methodology has been adopted to collect legacy data like simple map and satellite map of the Himmatnagar region and other intermediate region for estimation of other existing railway lines connecting to Bhuj. The data is to be collected CVC, O-D survey and IPT survey and from other secondary data like train and bus schedules, population data and railway construction data should be collected as a secondary source to examine feasibility.

4. STUDY AREA

Himmatnagar is a district head quarter of Sabarkantha district. Prantij and Talod are the major industrial locations in Sabarkantha for Industry Sectors like Agriculture, ceramics, chemicals and milk processing and it also has nearer Tourist Destinations – Idar, Polo Forests, Vijaynagar. Location of Himmatnagar is 23.6036° N, 72.9639° E at an average elevation 127 meters **(4)**. Total population of Himmatnagar is 81137 with Males constitute 52% of the population and females 48% as per Gujarat census 2011 **(5)**. Location of Mehsana is 23.5880° N, 72.3693° E at an average elevation 83 meters **(6)**. Total population of Mehsana is 1.84 lakhs with Males constitute 52% of the population and females 48% as per Gujarat census 2011 **(7).** Location of main intermediate stand Vijapur is 23.5609° N, 72.7511° E at an average elevation 116 meters **(8).** Total population of Vijapur is 25558 with Males constitute 52% of the population and females 48% as per Gujarat census 2011 **(9)**. For the Industrial and Agricultural purpose people are moving daily on the intermediate station Vijapur for mainly agricultural purpose and Mehsana for commercial, agricultural, industrial as well as multiple uses.

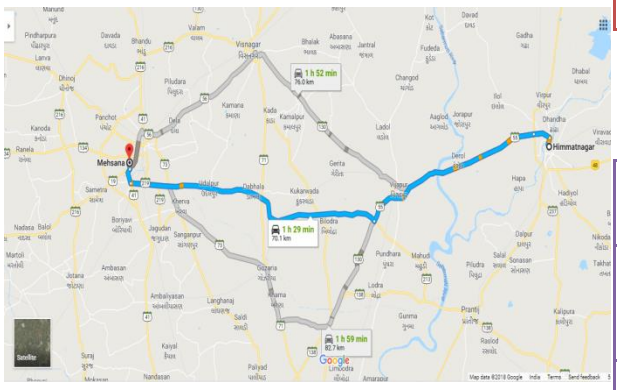

Figure 1: Study area map from Himmatnagar to Mehsana **(10)**

5. DATA COLLECTION AND ANALYSIS

5.1 Classified volume count

Classified volume count of conducted of 6 hours on peak hours for the study for below four type of category.

Table 1: Total no of Vehicle Passing During Survey

Vehicle type	*Himmatnagar approach*	*Mehsana approach*
2 W	1820	1704
Car	1308	1241
4 W (Public)	332	286
Bus	18	17

5.2 Origin and destination survey (11)

Table 2: Contribution of Trips in Percentage

Zone No	Origin in %	Destination in %	Overall contribution %
HIMMATNAGAR	12.46	11.04	23.50
NAVALPUR	3.71	4.9	8.61
VIJAPUR	31.23	30.7	61.93
VIHAR	6.82	10.08	16.90
VASAI	10.40	12.24	22.64
MEHSANA	35.38	31.05	66.43

5.3 Intermediate public transport Survey

Table 3: Contribution of Trips in Percentage

Zone No	Origin in %	Destination in %	Overall contribution %
HIMMATNAGAR	9.00	13.35	**22.35**
NAVALPUR	3.72	3.41	**7.13**
VIJAPUR	34.64	28.18	**62.82**
VIHAR	14.03	10.61	**24.64**
VASAI	12.73	11.98	**24.71**
MEHSANA	25.88	32.46	**58.34**

5.4. Travel Time Saving Calculation

Table 4: Average Journey Time

Average journey time (Min/veh)				
No.	**Direction**	**Morning**	**Afternoon**	**Evening**
1	**HMT to MSN**	109.28	109.08	112.87
2	**MSN to HMT**	111.45	113.58	113.65
Total		220.74	222.66	226.58
Average		110.37	111.33	113.29
Average delay Per Vehicle		**111.65**		

Total 5: No. of Vehicle Use the Route				
No of vehicle get benefitted by Railway				
No.	**Vehicle type**	**HMT**	**MSN**	**Total**
1	2 W	1093	1167	2260
2	4 W (Private)	717	756	1473
3	4 W (Public)	212	246	458
4	Bus	9	10	19

Table 6 : Savings in Vehicle Time in Hours/ day				
No	**Vehicle type**	**No. of vehicle**	**Saving in vehicle time in min.**	**Saving in vehicle time in hr./day**
1	2w	2260	252344.44	4205.74
2	4 W (Private)	1473	164470.52	2741.18
3	4 W (Public)	458	51138.83	852.31
4	bus	19	2121.48	35.36

Table 7: Average Occupancy of Vehicles		
No.	**Type of vehicle**	**Occupancy**
1	2w	1.5
2	4 W (Private)	1.9
3	4 W (Public)	9.2
4	bus	49

Table 8 : Saving in Vehicle Time in Passenger hours/day				
No	**Vehicle Type**	**Saving in vehicle time in hr./day**	**Vehicle Occupancy**	**saving in vehicle time in passenger hour/day**
1	2w	4205.74	1.5	6308.61
2	4 W (Private)	2741.18	1.9	5208.23
3	4 W (Public)	852.31	9.2	7841.29
4	Bus	35.36	49	1732.54

Table 9 : Travel Time Saving in Rs. /year					
No	**Type of Vehicle**	**Savings in vehicle time in Passenger-hours /day**	**Travel Time Saving in Rs./ Passenger-hour**	**Travel Time Saving in Rs. / day**	**Travel Time Saving in Rs. / year**
1	2w	6308.61	67.48	425705.08	155382352.70
2	4 W (Private)	5208.23	34.81	181298.59	66173985.50
3	4 W (Public)	7841.29	34.81	272955.21	99628650.91
4	bus	1732.54	10.23	17723.90	6469224.69
Total travel time saving Cost					**327654213.81**
In Cr.					32.77

5.5. Fuel Consumption Cost

Table 10: Total Fuel Consumption Cost during Year

No.	Vehicle Type	No. of Vehicles benefitted by construction of Railway in 1 day	Money saving in Rs. in 1 year
1	TW	2260	328098.48
2	4 W Private	1473	304673.91
3	4 W Public	458	94732.28
4	Bus	19	19709352.68
			20436857.34

5.6 Fuel Emission Cost

Table 11: Yearly Pollution (g/l)

Type	Total from 2W, Car, 4W (Public) Bus, LCV & Truck	Equivalent (Euro/kg)	Damage Cost per year (Rs.)
SOx	**77793344.2**	**6.3**	**38330570**
NOx	**53920459.3**	**9.9**	**41749479.4**
CO2	**1849104769**	**0.0034**	**4917028.4**
CO	**303896359**		
PM	**9695628.2**	**8.9**	**6748826.24**
TOTAL		**91745904**	
			9.1745904

As per the SP030 we can say that in the peak hours the traffic growth will be 8% of the total traffic. Rate of interest is taken 10% for this method to find out total benefit for railway **(12).**

Table 11:Economic Evaluation

Discount rate 10 %			
NO.	**Cost**	**Benefits**	**output**
2030			
NPV	682.73	633.92	**-49.48**
B/C			**0.92**
2035			
NPV	682.73	744.86	**62.19**
B/C			**1.09**
2040			
NPV	682.73	846.7	**163.96**
B/C			**1.24**
2045			
NPV	682.73	939.57	**256.88**
B/C			**1.39**

6. Conclusion and Future scope

Followings are the conclusion made from the study.

1. This study is useful to fulfill or provide new public transportation with respect to work.
2. From Origin –Destination survey determine the incoming and outgoing passenger data from the various station for passenger demand satisfaction.
3. From the calculation of travel time saving, fuel consumption cost and fuel emission cost are used to determine benefit or cost for the proposed railway link.
4. Before 2030 the value of NPV and B/C is negative and below 1 respectively so the project is not feasible up till 2030.
5. After 2030 the project seems to become feasible according to result obtain.
6. Selection of Feasible alignment design work should be done in future.
7. Routing and scheduling of train should be done for betterment of public in future.

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