International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET229319

Case Study of Traffic Forecasting of Nh-3 (New Nh 848) Section, Vadape to Thane

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Article Info
Volume 9, Issue 3

Page Number : 273-277

Publication Issue :
May-June-2022

Article History
Accepted : 15 May 2022
Published: 30 May 2022

ABSTRACT

On account of the recent thrust on developing and improving highways in order to boost national economy, the government of India recognizes that the expansion and development of efficient road network is one of the pre-requisites for country's economic development. The rate of traffic growth had always been a significant concern in the development of road infrastructures over the years, as it could either lead to premature failure of the pavement or could result in the wastage of valuable resources. The present study attempts on forecasting future traffic growth on Vadape-Thane section of NH-3 (New NH-848) from 539.200 to 563.00 km. In this research, traffic growth rate forecasting is done with the help of part registration of vehicle, economic growth of state and nation, socio-economic parameters, future economic growth, transport demand elasticity. The job of traffic forecasting becomes subjective and approximate with the hindrances of availability of proper data and fluctuation of economic parameters.
Keywords: Transport demand, Elasticity, Traffic growth rates, Regression analysis.

I. INTRODUCTION

The objective of this study is to estimate traffic growth using transport demand elasticity method. The investment priorities are governed by traffic demand, assessed benefits and cost of project. Demand plays the important role that governs which type of facility/ infrastructure to be created. This in terms determines likely benefits and cost to develop the same. The elasticity value for the future year is calculated based on growth trend of vehicle. The accurate estimation of traffic has direct bearing on design of the facility and the viability of project. Traffic forecasting is made by determining the past trend of traffic flow along the corridor and by use of economic models develops to co-relate past vehicle registration data, population growth and economic indicates such as Per Capital Income (PCI), Net State Domestic Product (NSDP) and Gross Domestic Product (GDP). By using the elasticity values obtained from the economic model and the likely rate of growth of indicators, the mode wise growth rate is arrived at. Applying the growth rates, future traffic volume is estimated.

In India, the recent environmental conditions have made the situation worse by implementing further restrictions on traffic growth and highway facility

development. IRC 108 (1996) lays down the guidelines for traffic prediction on rural highways as suggested by the Traffic Engineering Committee. IRC discusses models for traffic prediction based on past trends in traffic growth and uses economic indicator such as Gross Domestic Product (GDP) for the same.

II. PROBLEM STATEMENT

As per the DPR published by NHAI in August'2017 for Preparation of Feasibility-cum-Preliminary Design for 6/8 laning of Existing 4 lane NH-3 from Ch.539.500 (Vadape) to Ch.563.000 (Thane) NH-3, the observed average daily traffic was 92512 PCUs at existing toll plaza. But IRC has recommended tentatively, a daily capacity of 70,000 PCUs for four-lane divided carriageways located in plain terrain (In absence of sufficient information about the capacity of multi-lane roads under mixed traffic conditions). This shows that the present road is highly saturated in terms of Level of service. Also, the increased traffic volume due to commercial and industrial development in the form of warehouses, Logistic hubs, IT parks, has led to high degree of traffic congestion. This ultimately has led to associated problems like increases vehicle operating costs, accidents and increased travel time delay. This research work aims at estimating the future traffic growth and providing solutions for capacity augmentation.

III. Objectives

1. To analyze and understand capacity of existing road section.
2. To propose solutions for ease of traffic
3. To understand adverse effects of project development influence on existing corridor
4. To understand connectivity and traffic demand of future mega infrastructure projects along the corridor.

IV. Study Area Characteristics

National Highway–3 (NH-3), a busy corridor with exceptionally high traffic connects the Mumbai, Thane, Nashik, Dhule, Indore, Gwalior, Dholpur and Agra via Wadiware, Chandwad, Malegaon, Songir, Shirpur, Dharampuri, Dewas, Shajanpur, Sarangpur, Guna, Shivpuri. National Highways -211, 50, 6, 59A, 86, 12, 76, 25, 92, and 118 intersect NH 3 at different places. The project corridor Vadape-Thane Section of NH 3 starts from 539.500 km (Vadape) and ends at 563.000 km (Thane near Majiwada Junction). It is a well-designed four lane divided corridor carrying

heavy traffic. The total length of the stretch is 23.4 km. The project corridor traverses through plain terrain. There are 3 major junctions and 6 minor junctions along the project stretch, where traffic diversion is considerable. Number of Godowns and Warehouses are situated along the project corridor particularly in Bhiwandi area Corridor.

In the vicinity of Mumbai-Agra Road (NH-3) near Bhiwandi there are 4 more extremely busy National Highways, namely Mumbai-Ahmedabad (NH-8) and Mumbai-Pune- Bangalore (NH-4) Road, Eastern express highway along with proposed Samruddhi express highway ending close to Vadape and Virar-Alibag multi-modal corridor crossing NH-3 near Bhiwandi. These highways serve important ports of Mumbai and JNPT. Also, the proposed multimodal corridor from Virar to Alibag is crossing the NH-3 section road near Bhiwandi. Thus,There is and will be considerable amount of exchange of commercial traffic in between these 3 National Highways through connecting links joining them.

V. Project Influence area

Analysis of movement pattern for passenger vehicles shows that all the traffic is originating and destining in the Maharashtra state only whereas goods vehicles traffic originating and destining in Maharashtra state

accounts to 94% and in Gujarat and Rajasthan state accounts to 6%. Hence, for further evaluation of traffic growth rates, Socio-economic parametric data and vehicular registration data of Maharashtra state is only used.

VI. Methodology

IRC-108 "Guidelines for traffic prediction on rural highways" has described the procedure for estimating traffic growth rates by transport demand elasticity method. Vehicle registration data of the project influence area has been considered in determining the traffic growth rates. The primary data is taken as traffic volume count data obtained from classified volume survey and the secondary data is taken as vehicle registration data of Maharashtra state and economic parameters like NSDP, population, Per capita income, Agricultural growth etc. sourced from Government websites. This data will be used to perform regression analysis as dependent and independent variables for computing elasticity values.

VII. Transport demand elasticity

The elasticity values are obtained by fitting log-log regression between the registered vehicle types and NSDP, Population and Per-capita income. The regression analysis was carried out using various combinations of economic indicators and population with registered vehicles and the elasticity values resulted from the best fit equations were used estimating the growth rates. R Square is another measure of the explanatory power of the model. In theory, R square compares the amount of the error explained by the model as compared to the amount of error explained by averages. The higher the R-Square the better it is. The equation for regression analysis is as follows-

$$y = \beta 0 + \beta 1\, x$$

y= Dependent Variables (Passenger and goods Traffic)
x= Independent Variables (NSDP/NDDP, PCI & Population)
β1= Elasticity Value

VIII. Vehicle registration data

Vehicle registration data for past 10 years of Maharashtra state

Year (as on 31st March)	Vehicle Registration Data				
	Two Wheelers	Car/ Jeep/ Taxi	Auto	Bus	Goods Vehicle
2011-2012	13921763	2936521	640040	89540	1811940
2012-2013	15457173	3261217	655299	98429	1980400
2013-2014	16910395	3527302	658977	108214	2147193
2014-2015	18603835	3836508	695619	107012	2304663
2015-2016	20355825	4194840	703030	116704	2445060
2016-2017	22102376	4583542	753373	120332	2597672
2017-2018	24108572	4957244	849890	136328	2739263
2018-2019	27085948	5516366	1028863	151867	3054674
2019-2020	27711430	5624580	1052230	157420	3130150
2020-2021	28340410	5779070	1060620	158420	3208570
CAGR	8.22%	7.81%	5.77%	6.54%	6.56%

Sources: Motor Transport Statistics of Maharashtra from Year 2011-2019, Transport Statistic India-2014-MoRTH

IX. Economic growth parameters of the state

Gross Domestic Product (GDP) and State Domestic Product (NSDP) popularly known as Country/state income and related aggregates are of very much use to meet the requirements of planning and policy making purposes. Two different bases are there for the calculation of these indices, based on constant price

and current prices. The constant price indices are considered for all practical purposes. The base considered is 2011 – 12 prices.

Year (as on 31st March)	Economic Parameters (Rs Million at Constant Price 2011-2012)			Population (in Million)
	NSDP (in Million)	Mnfctr + Agrcltr (in Million)	PCI (Rs.)	
2011-2012	11265950	3501360	99597	113.12
2012-2013	11897100	3643490	104008	114.39
2013-2014	12675520	4107150	109597	115.66
2014-2015	13453410	4055620	115058	116.93
2015-2016	14525160	4324750	122889	118.20
2016-2017	15961210	4880140	133686	119.39
2017-2018	16869770	5137750	139958	120.53
2018-2019	17898390	5314550	147097	121.68
2019-2020	18738020	5373020	152566	122.82
2020-2021	19618707	5625552	159737	122.82
CAGR	6.36%	5.41%	5.39%	0.92%

Sources: Economic Survey of Maharashtra (2011-2019), Directorate of Economics & Statistics, Maharashtra, Reports (2011-2019), Central Statistics Office (MOSPI), Govt. of India, Population Census, GoI, 2011 & 2001.

X. Regression results

Vehicle Type	Independent Variable	Combined with Weighted Average	
		Elasticity	R^2
Motor Cycles	PCI	1.43	0.99
	NSDP	1.25	0.99
	POPULATION	8.35	0.997
Cars	PCI	1.39	0.99
	NSDP	1.21	0.99
	POPULATION	8.10	1.00
Auto	PCI	1.11	0.91
	NSDP	0.97	0.91
	POPULATION	6.41	0.90
Buses	PCI	1.11	0.96
	NSDP	0.97	0.96
	POPULATION	6.45	0.97
Trucks/ M. Axles	NSDP	0.97	0.99
	Mnfctr + Agri.	1.08	0.97

XI. Projected traffic growth rates

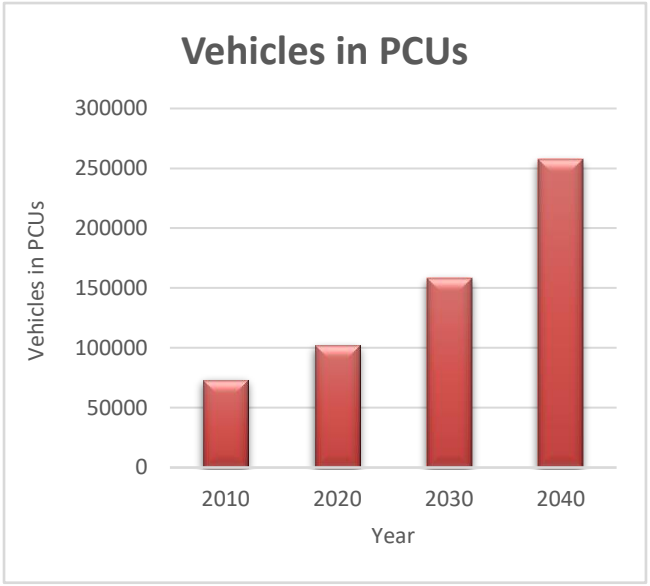
Out of the three scenarios i.e normal growth, pessimistic and optimistic growth, growth rates for only normal growth scenario have been calculated. The growth of passenger and goods traffic and vehicle population are based on the respective elasticities and the perspective growth of the Maharashtra state. Prediction of the future growth accurately is difficult because of the various parameters affecting growth.

Period	T/W	Auto	Car	Bus	LCV	2AT	3AT	MAV
Normal Growth Scenario								
2020-2025	7.10	5.75	7.56	5.50	5.25	4.88	4.88	3.53
2025-2030	7.26	5.85	7.73	5.59	5.34	4.76	5.08	3.54
2030-2035	6.40	5.10	6.83	4.86	4.63	4.10	4.39	2.97
2035-2040	5.84	4.60	6.26	4.37	4.15	3.64	3.92	2.56
Beyond 2040	5.56	4.31	5.98	4.09	3.87	3.36	3.64	2.28

XII. Analysis and Results

The Traffic projections were carried out for study period of 30 horizon years by applying the estimated vehicle traffic growth rates to the base year (2019) traffic. As per IRC, a minimum of 5% growth rate has been considered.

Projected traffic along NH-3 section from Thane to Vadape



XIII. Conclusion

The growth rate obtained from transport demand elasticity method is being widely used in India. The growth rates by vehicles type are worked out based on the future GDP, NSDP, Population and PCI growth rates and future elasticity values. New technology car, LGV and MAV are expected to grow fast and old technology car and 2 axle trucks with reduced growth rate in the future. The production and sale of commercial vehicles were analyzed. Transport demand elasticity are adopted to predict future traffic growth to obtain information for traffic volume and laning requirement. The estimated growth rate factors for normal growth scenario are considered for projecting traffic demand of NH-3 (New NH 848) SECTION FROM Vadape to Thane. The resulting projected traffic shows that the existing lane configuration is highly incapable of catering the future traffic demand and hence needs to be augmented as per IRC provisions.

XIV. REFERENCES

[1]. Jahar R. Sarkar and Dr. Bhargab Maitra "Critical consideration of Travel Demand Forecasting on National Highways: A Case Study". IRC: Volume 62 No.3 2001

[2]. Pravin Tapashetti and Prof. Naresh Patil "Study of Traffic volume and Traffic forecasting on State Highway-41" International Research Journal of Engineering and Technology, Vol. 5 Issue 10

[3]. L.R. Kadiyali & T.V. Shashikala, "Road Transport Demand Forecast for 2000 AD Revisited and Demand Forecast for 2021" Journal of the IRC October – December 2009 Paper No. 557

[4]. Avadhesh Pandey and Dr. Arun Kumar Mishra, "Case study of Traffic Forecasting of NH-7, Lalganj to Hanumanha" Journal of Information and Computational Science Volume 13-Issue 6-2020.

[5]. Ramjit Nandakumar and Mithun Mohan "Analysis of Traffic growth on a rural highway: A case study from India" European Transport \ Trasporti Europei (2019) Issue 74, Paper n° 5, ISSN 1825-3997

[6]. Vijay Kumar, "Traffic Characteristics and Demand Along North and South Corridors- A Case Study", M.E. Thesis, Bangalore University, Bangalore March 2001.

[7]. IRC: 102-1988, "Traffic Studies for Planning Bypass around towns"

[8]. IRC:108-1996, "Guidelines for Traffic Predictions on Rural Highways"

[9]. MORT&H, Road Transport Year Book 2004-2007, 2007-2009, 2009-2011

[10]. Reserve Bank of India Annual report.

Cite this article as :

Sumit G Malusare, Dr. P. L. Naktode, "Case Study of Traffic Forecasting of Nh-3 (New Nh 848) Section, Vadape to Thane", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 3, pp. 273-277, May-June 2022. Available at doi : https://doi.org/10.32628/IJSRSET229319

Journal URL : https://ijsrset.com/IJSRSET229319