Economic Analysis of NH-48 (Four Lanning of Hassan to Maranahally Section of NH-75) in the State of Karnataka on EPC Mode

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Abstract - *The economic analysis involves comparison of project costs and benefits under the "with" and "without" project conditions and determining the Economic Internal Rate of Return (EIRR) of the project using discounted cash flow technique. HDM-IV developed by the World Bank, has been used for over two decades to combine technical and economic appraisals of road projects, to prepare road investment programs and to analyze road network strategies.*

Key Words: *EIRR, VOC, IRR, Analysis, Forecast*

1. INTRODUCTION

The Project stretch starts at Km 189.700 (Hassan) and terminates at Km 237.000 (Maranahally). The Project Road mainly passes through Hassan, Alur, Balupet, Sakleshpur and ending at Maranahally.

1.1 Economic Analysis

The Construction of roads brings about a variety of benefits that are enjoyed practically by all sectors of the economy. Scarcity of resources and competing demands from various sectors are the important features of a developing economy. It therefore becomes extremely necessary to allocate the scarce resources in the most beneficial manner. In view of the above, it is necessary to ensure that the projects selected for investment are thoroughly evaluated to determine the economic and social benefits offered by the project and the ease with which the project can be implemented. Highway economic analysis is a technique wherein the cost and benefits of a scheme are quantified over a selected time horizon and evaluated by a common yardstick.

1.2 Model Used

The economic analysis involves comparison of project costs and benefits under the "with" and "without" project conditions and determining the Economic Internal Rate of Return (EIRR) of the project using discounted cash flow technique. This shows the returns, which the society could expect from the proposed investment during the project life, i.e. analysis period.

2. LITERATURE REVIEW

David Ashley et.al (1998) carried out a research to know the viability of privatized transportation project and developed a Project Scoring Table(PST). A principal way by which the PST can help define public-private partnerships is by distinguishing those decisions in which the interests of the owner and the developer are the same, and when they are different.

Ross B. Corotis (2007) carried out a study for highway user travel time evaluation. This study has investigated an alternative approach to the very important valuation of user time, which serves both as a benefit measure for new projects and a cost item during construction and maintenance.

Sanjeev Aggarwal et al. have tried to develop a pavement management strategy for selected National Highway network in India. The total network considered for this study was 310Km, which was divided into 22 homogenous sections. The data required for development of Pavement Management system was collected from primary and secondary sources. HDM 4 computer program was consider for carrying out the pavement management strategies .The data collected was used to prepare the vehicle fleet database, Maintenance and Rehabilitation work Database, Cost Data and Road Network Data. Finally the maintenance and rehabilitation strategy for the road network was prepared at both project level as well as at network level. Finally budget optimization was carried out to get the final Maintenance and Rehabilitation strategy under the constraint.

3. PROBLEM STATEMENT

3.1 Objectives:

Collection of an exact figure of traffic data currently utilising the study stretch

Traffic forecast or the traffic projection of the study stretch which is under up gradation

Feasibility Analysis of Traffic and Engineering Investigation data acquired for the study stretch and to carry out the improvement proposals

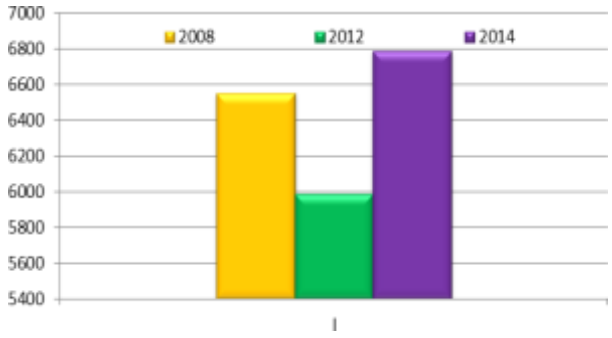
Conduction of economic analysis for the study stretch using the calibrated HDM-IV

4. TRAFFIC SURVEYS AND ANALYSIS

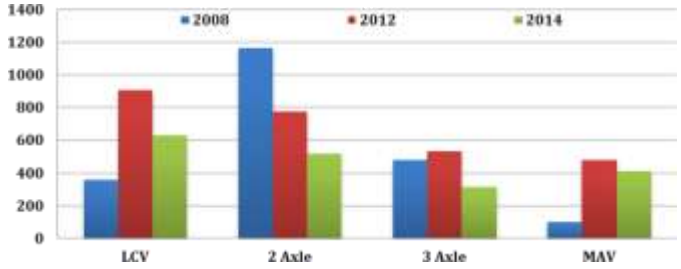
4.1 Primary Surveys - Schedules: Classified Traffic Volume Count (CTVC) Origin – Destination Survey (OD)

Axle Load Survey (AL)

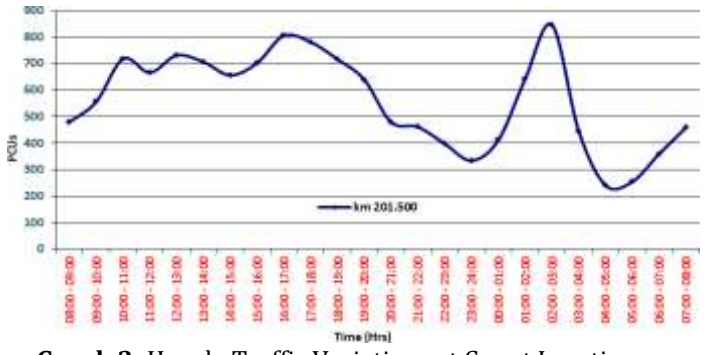
4.2 Data Analysis:



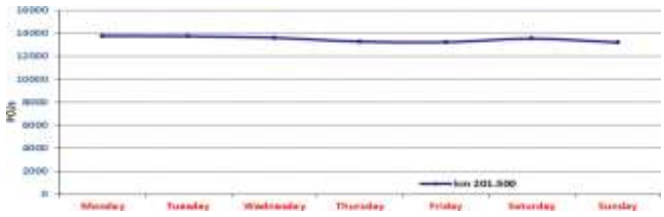
Graph 1: Variation of Numbers in Tollable Traffic



Graph 2: Variation of Numbers in Commercial Vehicles



Graph 3: Hourly Traffic Variations at Count Locations



Graph 4: Daily Variation of Traffic Volumes

Table 1: Traffic Composition

Mode of Vehicle	km 201.500	
	Nos.	%
Car / Jeep / Van	3816	42.77
Mini Bus	227	2.54
Std Bus	871	9.76
LCV	629	7.05
2 Axle	519	5.82
3 Axle	315	3.53
MAV (4 - 6 Axles)	412	4.62
MAV (7++ Axles)	0	0.00

Tollable vehicles	**6789**	**76.08**
3 Wheeler	271	3.04
2 Wheeler	1801	20.18
Agri. Tractor	14	0.16
Tractor with Trailer	35	0.39
Cycle	13	0.15
Cycle Rickshaw	0	0.00
Animal Drawn	0	0.00
Non-Tollable Vehicles	**2134**	**23.92**

4.3 Traffic Forecast:

The investment priorities are governed by the traffic demand, assessed benefits and cost of the project. Demand plays the important role, which governs which type of facility / infrastructure to be created. This in turn determines likely benefits and costs to develop the same. A highway project of this nature calls for significant investment. Prediction of traffic demand becomes an important task and has to be carried out near accurately. The accurate estimation of traffic has direct bearing on design of the facility and the viability of project. Recognising this, efforts are made to carefully assess all the parameters that help in predicting the traffic demand in future.

For the design of pavement, to plan for the future maintenance programme and for economic evaluation, it is necessary to have realistic estimate of the size of traffic in the design period of 20 years, say, from year 2011 to year 2031. Traffic forecasting is made by determining the past trend of traffic flow along the corridor and by use of economic models developed to co-relate past vehicle registration data and economic indicators such as per capita income (PCI), gross state domestic product (GSDP) and gross domestic product (GDP). By using the elasticity values obtained from the econometric models and the likely rate of growth of indicators, the mode wise growth rates are obtained. Applying this growth rates, future traffic volume is estimated.

4.4 Traffic Forecasting Methodology

Appreciating the functional characteristics of existing NH 48 to act as a major freight corridor after upgrading this link between Mangalore and Bangalore, the transport demand elasticity method was decided to be adopted for traffic forecast. The details of these are given in ensuing sections.

The growth of vehicles hold good relationship with GSDP and PCI of Karnataka. The roots for this decision are in observed traffic desire, which is largely hypothesized to be driven by state income as well as nation's income. Past GSDP, PCI and GDP were collected for constant prices for 1999 –

00. Future values were derived relating past NSDP with GDP. This implicitly means that national growth accelerates growth of states and vice-versa.

In this endeavour, trip ends of traffic generation are considered to minimize the gap and appropriately predict the traffic levels. In this context, it is important to appreciate and incorporate the spatial traffic generation characteristics in traffic forecasting. The spatial characteristics can be apprehended by analysing the intercepted traffic on corridor in terms of its trip production zones. Different components of traffic are likely to exhibit different growth potentials depending on what zone they will be originating from and/or destined to.

The past vehicle registration data for Karnataka has been collected.

Regression analysis has been carried out using vehicle registration data and economic indicators. The elasticity values obtained for passenger and goods vehicles. Generally, it is considered as better practice to prepare a forecast based on growth trends of annual population, per capita income, agricultural and industrial growth estimated for the area of influence, and thereby relating it with the elasticity of traffic in relation to these economic features. The forecasting method followed is in tune with this concept and is related to the area's specific economic activity, apart from incorporating the overall impact of economic development on traffic zones beyond the influence area.

Normally, the growth potential of passenger traffic in a zone depends on its population and economic growth rates. Therefore, both these parameters have been incorporated in forecasting of passenger traffic. Further, taking into account the fact that different modes of passenger traffic grow at different rate, elasticity (as discussed earlier) with respect to population and income growth rates is graded differently by different modes.

Growth potential of goods traffic is different from passenger traffic. This is more directly related to zone's economic activity and production levels than its population and income growth, although the latter may strongly correlate with the former, especially the income growth.

The influence factor for each mode of vehicle is calculated from O – D data.

4.5 Projected Traffic:

Table 2: Projected Traffic

Year	km 201.500	
	Nos	PCUs
2014-15	8923	13426
2015-16	9368	14093
2016-17	9835	14793
2017-18	10325	15528
2018-19	10838	16296
2019-20	11378	17105
2020-21	11946	17956
2021-22	12541	18847
2022-23	13166	19782
2023-24	13821	20762
2024-25	14511	21794
2025-26	15235	22878
2026-27	15995	24016
2027-28	16792	25209
2028-29	17631	26465
2029-30	18509	27778
2030-31	19432	29162
2031-32	20403	30614
2032-33	21420	32138
2033-34	22490	33741

Year	km 201.500	
	Nos	PCUs
2034-35	23612	35420
2035-36	24790	37184
2036-37	26026	39032
2037-38	27325	40976
2038-39	28688	43015
2039-40	30121	45160
2040-41	31624	47408
2041-42	33202	49769
2042-43	34859	52250
2043-44	36599	54855
2044-45	38425	57586
2045-46	40343	60455
2046-47	42357	63467

5. RESULTS

Fig -1: Process Economic Analysis

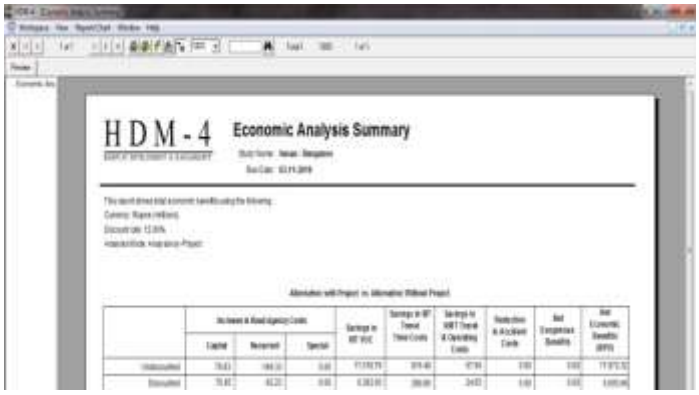


Fig -2: Results of Economic Analysis

6. CONCLUSION

- Economic analysis results concluded that the road is economically viable for the proposed improvement as the EIRRs for the project road packages were more than 12% (assumed rate of interest)
- Economic analysis justifies that the project investment with more risk absorption capacity. However, the sensitivity is unlikely to happen (a) as the traffic is expected to grow to accompany to current economic growth, (b) there is little uncertainty on the cost of the works and © VOCs are unlikely to be reduced in view of the past trends for the price of the inputs such as fuel, lubricants, tires and salaries
- Traffic studies and analysis can conclude that the proposed improvement to the existing section of the study stretch and upgrading the existing to 4 lane with paved shoulders configuration to improve the road geometrics and meet the project objectives is required
- Identification of the possible improvements in the existing alignment and bypassing congested locations with alternatives are evaluated and compared based on techno-economics and other considerations and recommendations, most appropriate alternative is selected

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[6] Patel and Hajiani (2015) carried out economic analysis for the Transportation project. In this research they have adopted analysis using HDM-4 model. The authors evaluated the impact on traffic and checked economical viability of the project. The results indicated that there was great saving towards Vehicle Operating Cost and Travel Time Cost after analyzing with HDM-4 software. They also concluded that flexible pavement is economically viable with the economic internal rate of return of 27.3%.

[7] Aggarwal et al. (2004) developed a Pavement Management System (PMS) for the identified NH network to assist Highway Engineers. They have calibrated the pavement deterioration models which were incorporated in HDM-4 for the adaptability to the local conditions. With the help of 'Project Analysis', the Authors demonstrated the various aspects of project level PMS through 4 different case studies.