



ASSESSMENT OF NATIONAL HIGHWAYS AUTHORITY OF INDIA [NHAI] PROJECTS BASED ON SELECTED FINANCIAL PARAMETERS

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Abstract: Overall, the objective of the dissertation was to conduct financial assessment of the sample of 61 national highway project based on the project characteristics. The regression analysis result suggests that capital expenditure and tollable length of the highway project significantly influenced the toll rates. Further, for each sample project, the project internal rate of return, payback period and discounted payback period was estimated based on project specific information available. Further, the sensitivity of these financial parameters with change in key project variables (i.e. toll rates and traffic intensity) was also investigated.

Index Terms - Payback period, Capital, traffic density, Toll rates, Design Capacity, Toll Plazas

I. INTRODUCTION

1.1 Toll Collection System

India has the second largest road network in the world and more than 90% of total passengers in India prefer roads for travelling. Roads are one of the important parameters, when it comes to measuring the economic growth of a country. It not only connects two different cities/states but also it is a crucial part of supply chain and logistics. Building world class roads for uninterrupted ride requires a lot of investment, which is a challenge for government. To overcome this, roads in India are built in public private partnership, as they are usually termed as, Build Operate Transfer (BOT) projects. Where private companies build roads, operates the road via collecting toll tax from public in return of using that road, and after recovery of the capital invested; it transfers it to the government. This process is called "TOLL COLLECTION SYSTEM".

National Highways Authority of India (NHAI) is a government agency founded in 1988 by an act of parliament, and since then is working as an autonomous body that functions independently. It is a part of Ministry of Road Transport & Highways; and is responsible for the development, maintenance and management of over 50,000 km of national highways out of 1,15,000 km in India.



1.2 Toll Collection Methods in India

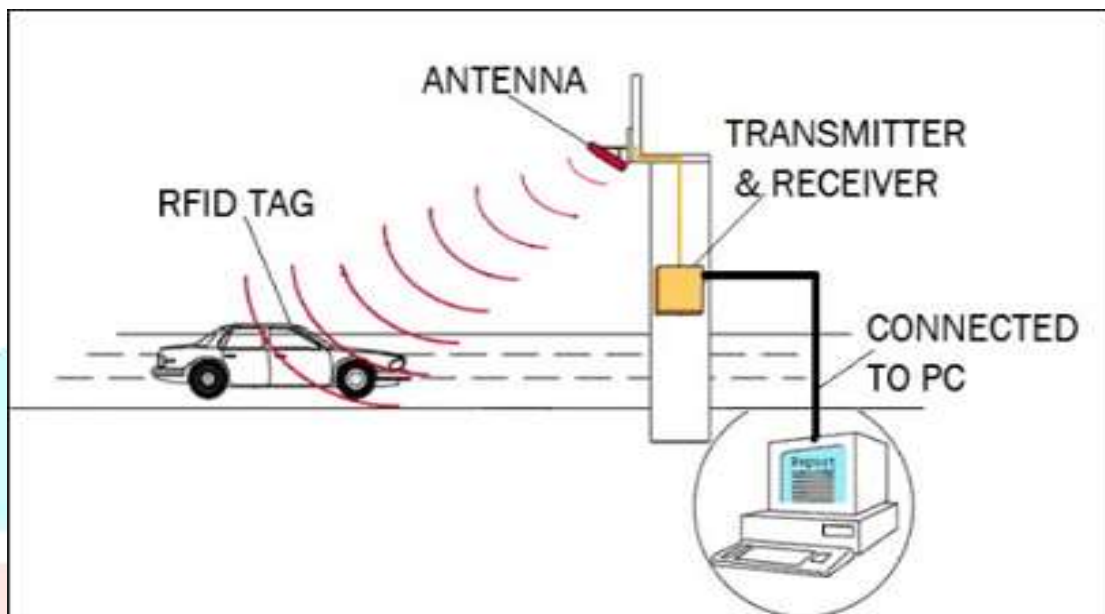
1.2.1 Conventional Toll Collection System

In conventional method, toll collection is done manually, where vehicles are stopped at toll booths to pay toll charges collected by an attendant and only after the payment the gateway is opened. There is a major disadvantage of this method, it is very time consuming and results in heavy traffic jams and wastage of fuel. Managing so much cash and giving change in return is also a challenge. The ticket given at toll is for single journey or two-way (single and return).

1.2.2 Automatic Electronic Toll Collection System

It is an automatic and convenient way, in which there is no need to stop the car for collecting toll charges. There is a radio frequency transponder device (bar code label) attached on the vehicle. When a vehicle passes, toll reader device sends radio signals, matches and transmits back and debits from the accounts of registered car owners. Electronic method is better than manual as there are no delays, traffic jams and saves driving time.

Radio Frequency Identification (RFID) system has two parts tag and reader. Tag has a specific sequence, to decode this information two-way interrogator (transmitter-receiver) emits signal. The tag reacts with the data composed in its memory bank. The interrogator will then transmit it to a computer.



SOURCE: <https://images.app.goo.gl/nyZygYCKCq42ZZgA7>

1.3. Background of Study:

Globally, in the year 2018, India was ranked 44 in logistic performance index (LPI) by the world bank which includes the parameters covering customs, infrastructure, international shipment, logistic competence, tracking and tracing and timeliness (source: World Bank). To improve the competitiveness of logistic sector in India. In India, Government of India has been introducing various reforms. To improve the efficiency in the collection and management of toll, the government has introduced RFID based toll collection system, which will replace the existing predominantly cash based toll collection system. The new system has been introduced with effect from October 2019. This is likely to bring efficiency in the collection and management of tolls in India.

The existing system of determining the toll rates are inadequate and lack transparency from the perspective of the commuters. In public-private partnership (PPP model), the contract between government agencies (NHAI) and private company may take various forms, Build-Own-Transfer (BOT) has been dominant in construction of NHAI projects. This type of contract allows the private construction company (private party) to recover a prespecified rate of return (IRR) through collection of toll for a specified period after the construction of highway/commercial operation (a proportion of revenue is shared with NHAI i.e. revenue sharing model) and before the transfer of assets to the Government. Hence, various factors are considered to determine the toll rate. Among those factors are the projected cost of the project (capital expenditure), historical evidence with similar projects, project characteristics, expected traffic intensity, toll collectable length and the expected tenure/rights for toll collection are significant factors.

This study mainly focuses on assessment of toll rates across the country and what are the deciding factors to fix toll prices for a given toll plaza. Specifically, the study investigates the following research questions. First, is there any relationship or dependability of toll rates with the capital invested to build that toll? Second, what is the role of project specific parameters like traffic intensity, tollable length and design capacity of a toll plaza on fixation of toll rates. Third, how variability in specific project parameters influence the financial feasibility of the project measured in terms of payback period and discounted payback period.

II. LITERATURE REVIEW

Various studies in past have been undertaken on "Toll Road System in India". Most of these studies focus on different types of toll collecting methods, and their comparative analysis in order to find out which is the most feasible option out of all the options available. One such paper was published by **Bharvi Joshi and her team in 2017**. This paper focuses on comparison between conventional toll

collection method and some automatic toll collection methods such as RFID, Fastag and Book my toll [Mobile Application to pay toll], where automatic methods like Fastag comes out to be better than the conventional ways. As these are less time consuming, reduces fuel wastage, no traffic jams and less processing time during payment.

Nagarjuna Pilaka (2018) assessed the performance of toll road system based on the sample of Pune region of India. The region comprised of major toll roads in and around Pune region. The toll plazas are set up by the private players for collecting toll from the vehicles passing through the road as portion of the contract agreement made with the Government. Most of the users felt that roads within the study region were not upto the required operational measures and the contractors never followed stipulated norms, as laid down within the roadway Operation & Maintenance contract. The citizens were unwilling to pay the toll expenses for the roads whereas the administrators increased the cost and were not taking any steps to decrease travel time. This Study was utilized for gathering the information on user satisfaction parameters because it may be a way of evaluating the system performances in terms of user benefit quality; and bringing transparency in the system. Primary data was collected through questionnaire survey, based on the sample data of 336 passengers across all six roads, covering various types of vehicles. The study utilized analysis of variance method (ANOVA), hypothesis testing and factor analysis to assess and validate this perception that the road users of this region has low level of satisfaction. The findings suggested that Pune-Ahmedabad road was found to be more efficient performance wise based on selected parameters, whereas Pune-Satara road was the worst performing among all six roads.

So, most of the studies in past have primarily focused on performance assessment of toll roads and to find better toll collection system in India, to reduce traffic jams and waiting time. But in this study we will talk about the escalation and increment in toll rates by the Government is justified or not, factors affecting toll rates and how much time does it take to recover back the money that is been invested in the project.

III. OBJECTIVES OF THE STUDY

The overall objective of the dissertation is to analyze the various aspects of NHAI projects based on the sample of selected NHAI projects. Further the study also explores the predictors of toll charges based on the sample data. The specific research objectives of the study are as follows:

- I. To investigate the association of toll rates with capital investment, traffic (PCU/Day), tollable length and design capacity, based on the sample of NHAI projects.
- II. To find out payback period (recovery time) in which the capital invested to build toll plazas is recovered.
The sub-objectives were:
 - (a) To investigate the internal rate of return (IRR) from the project based on the assumptions taken with respect to project.
 - (b) To investigate the payback period for the project based on the assumptions taken with respect to project.
 - (c) To investigate the discounted payback period based on the assumptions taken with respect to project.
 - (d) To investigate the sensitivity of the project payback period with changes in the toll rates.
 - (e) To investigate the sensitivity of the project payback period with changes in traffic intensity.

IV. RESEARCH METHODOLOGY

4.1 Research objective:

- i) To investigate the association of toll rates with capital investment, traffic (PCU/Day), tollable length and design capacity, based on the sample of NHAI projects.

Data Source Sample Size and Methods:

The data related to key variables were collected from the official website of NHAI (<http://tis.nhai.gov.in/tollplazasataglance>) and other publicly available source. Out of data of 500 tolls available, a sample data of 61 toll projects were taken for which the variables specific data were available. The key variables included in the study are as follows:-

Table 1: Description of variables

Variable	Description
Toll rate (V1)	Toll rate charged for PCU and single journey in ₹)
Capital Expenditure (V2)	The total capital expenditure incurred in the construction of the span of highway (as per the project term) (in ₹)

Tollable length (V3)	in Kilo Meter
Design Capacity (PCU) (V4)	Maximum number of passenger car unit accommodated in per unit time
Traffic (PCU/day) (V5)	Measured in terms of passenger car unit per day

Hypothesized Model:

$$\text{Toll rate (V1)} = f(\text{V2, V3, V4, V5}) \text{ ----- (1)}$$

Statistical Method applied: Multiple regression analysis was used using IBM SPSS 20.0

ii) To find out payback period (recovery time) in which the capital invested to build toll plazas is recovered.

The sub-objectives were:

- (f) To investigate the internal rate of return (IRR) from the project based on the assumptions taken with respect to project.
- (g) To investigate the payback period for the project based on the assumptions taken with respect to project.
- (h) To investigate the discounted payback period based on the assumptions taken with respect to project.
- (i) To investigate the sensitivity of the project payback period with changes in the toll rates.
- (j) To investigate the sensitivity of the project payback period with changes in traffic intensity.

Key assumptions:

- (i) Risk free rate of interest was assumed to be annual rate of interest on fixed deposit with 10-year maturity (State Bank of India) = 3.70 %
- (ii) Risk Premium (Market Rate of Return minus Risk Free Rate of Return) = 5%
- (iii) Each of the project were assumed to have similar risk characteristics and hence having similar hurdle rate of return for each project (i.e. risk-free rate + risk premium = 8.7%)
- (iv) Number of working days were assumed to be 365 days.
- (v) The proportion of revenue sharing with NHAI was assumed to be 5 % (based on the evidence from the annual report of sample construction companies)
- (vi) Operating and maintenance expense was assumed to be 10 % of the proportion of revenue (without adjustment for depreciation).
- (vii) Expected life of each project was assumed to be 50 years.
- (viii) Corporate tax rate was assumed to be 25 %.

Steps involved:

- (i) The annual income arising out of toll collection was estimated as given below:
Annual income arising out of toll collection = Expected traffic per day X number of days X toll charge per vehicle (in ₹ per PCU per journey)
- (ii) Next, annual income was adjusted for the share of revenue with NHAI.
Net income arising out of toll collection = Annual income arising out of toll collection minus revenue share with NHAI (based on revenue sharing agreement)
- (iii) Estimation of Earning Before Interest and Tax (EBIT)
EBIT = Net Income arising out of toll collection – (operating and maintenance expenses + depreciation)
- (iv) Estimation of annual cash inflow from the project
Annual cash inflow from the project = EBIT (1 - Tax rate) + Depreciation
- (v) Estimation of project Internal Rate of Return (Project IRR is the discount rate at which the present value (PV) of cash outflow (i.e. project capital investment) will become equal to present value of cash inflow as shown in equation 2
Project Capital Investment = $\sum_{i=1}^{i=50} CF_i / (1 + k)^i$ -----(2)
Where k = Internal rate of return (IRR)
- (vi) Estimation of project payback period
Project payback period is the period (in years) in which the project will be able to recover its investments (i.e. project capital investment)
- (vii) Estimation of project discounted payback period
Project discounted payback discounts the future cash flow at the hurdle rate/ required IRR to estimate the period in which the project will be able to recover its investments (i.e. project capital investment).
- (viii) Sensitivity analysis was conducted to assess the sensitivity of payback period and discounted payback period with
 - (i) changes/increase in the annual toll rate under various scenarios and
 - (ii) changes in traffic density under various scenarios.

V. DATA INTERPRETATION AND ANALYSIS

Results of Regression Analysis**REGRESSION OUTPUT:****Descriptive Statistics**

	Mean	Std. Deviation	N
Toll_Rate	72.1639	31.12190	61
Project Capital Investment	607.3462	564.36250	61
Tollable_Length	50.3803	23.98627	61
Design_Capacity	47783.0164	36892.52674	61
Traffic	126332.4918	317524.99932	61

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.659 ^a	.434	.394	24.22830	.434	10.750	4	56	.000

a. Predictors: (Constant), Traffic, Design_Capacity, Tollable_Length, Capital

- From the output table we can see the summary of regression model. Values of R^2 is .434 with adjusted $R^2 = .394$, meaning linear regression explains 39.4% of the variance in the data.
- R-Square: This shows the amount of variance of the dependent variable (which is toll rate) explained by the independent variable (here, capital, tollable length, traffic, design capacity). In this research, the model explains 39.4% of the variance in sales.

ANOVA:

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	25241.774	4	6310.443	10.750	.000 ^b
	Residual	32872.587	56	587.010		
	Total	58114.361	60			

a. Dependent Variable: Toll_Rate

b. Predictors: (Constant), Traffic, Design_Capacity, Tollable_Length, Capital

COEFFICIENTS:

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	28.036	9.048		3.099	.003
	Project Capital Investment	.020	.006	.363	3.183	.002
	Tollable_Length	.705	.136	.543	5.183	.000
	Design_Capacity	-3.547E-5	.000	-.042	-.388	.699
	Traffic	-1.452E-5	.000	-.148	-1.363	.178

a. Dependent Variable: Toll Rate

The findings of regression analysis suggest that (i) overall model was significant ($F=10.750, p<.05$), (ii) project capital investment ($\beta = 0.543, p<.05$) and tollable length ($\beta = 0.363, p<.05$) significantly positively influenced the toll rate. Further, design capacity and traffic intensity did not significantly influence the toll rate for the sample company.

Overall, the regression model was

Toll rate = $28.036 + (.020) \text{ Project Capital Investment} + (.705) \text{ Tollable_Length} - (3.547 \times 10^{-5}) \text{ Design Capacity} - (1.45 \times 10^{-5}) \text{ Traffic Intensity}$.

For estimation of payback period and discounted payback period for the sample projects:

Table 3: Snapshot of Project NH-16 financial performance analysis

Sensitivity Analysis with Changes in Key Variables					Sensitivity Analysis with Changes in Key Variables				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2	Payback Period (in years)	2	2	2	2
Discounted payback Period (in years)	2	2	2	2	Discounted payback Period (in years)	2	2	2	2
Internal Rate of Return (in %)	96%	98%	101%	106%	Internal Rate of Return (in %)	96%	98%	101%	106%

Table 4: Snapshot of Project NH-16 financial performance analysis

Sensitivity Analysis with Changes in Key Variables					Sensitivity Analysis with Changes in Key Variables				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
Project Name: NH-5 (Bellupada)	Project Capital Investment (in ₹ crores): 183.46	Tollable Length (in KM): 57.454	Expected Traffic per Day (in PCU/Day): 22649	Toll charges per vehicle (in ₹/ PCU per Journey): 90	Design Capacity (in PCU): 40000				

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	4	4	4	4	Payback Period (in years)	4	4	4	4
Discounted payback Period (in years)	5	5	5	5	Discounted payback Period (in years)	5	5	5	5
Internal Rate of Return (in %)	27%	29%	32%	37%	Internal Rate of Return (in %)	27%	28%	31%	36%

Table 5: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-16 (Chilakapalem)

Project Capital Investment (in ₹ crores): 171.25

Tollable Length (in KM): 48

Expected Traffic per Day (in PCU/Day): 40928

Toll charges per vehicle (in ₹/ PCU per Journey): 45

Design Capacity (in PCU): 40000

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	4	4	4	4

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	4	4	4	4

Discounted payback Period (in years)	5	5	5	5	Discounted payback Period (in years)	5	5	5	5
Internal Rate of Return (in %)	26%	28%	31%	36%	Internal Rate of Return (in %)	26%	28%	31%	36%

Table 6: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-16 (Eethakota)

Project Capital Investment (in ₹ crores): 716.71

Tollable Length (in KM): 48.53

Expected Traffic per Day (in PCU/Day): 25601

Toll charges per vehicle (in ₹/ PCU per Journey): 95

Design Capacity (in PCU):19877

Sensitivity Analysis with Changes in Key Variables

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate

Sensitivity of the project with annual increase in traffic

	Base toll rate (in ₹ per vehicle)	annual increase			Expected Traffic per Day (in PCU/Da y)	annual increase			
		(2 %)	(5 %)	(10 %)		(2 %)	(5 %)	(10 %)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	12	11	10	9	Payback Period (in years)	12	11	10	9
Discount ed payback Period (in years)	NA	25	17	13	Discount ed payback Period (in years)	NA	26	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 7: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-16 (Kaza)

Project Capital Investment (in ₹ crores): 675

Tollable Length (in KM): 82.5

Expected Traffic per Day (in PCU/Day): 64209

Toll charges per vehicle (in ₹/ PCU per Journey): 90

Design Capacity (in PCU):90000

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	6	5
Discounted payback Period (in years)	7	7	5	6
Internal Rate of Return (in %)	21%	23%	26%	31%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	5	5
Discounted payback Period (in years)	7	7	6	6
Internal Rate of Return (in %)	21%	22%	25%	30%

Table 8: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-16 (Krishnavaram)

Project Capital Investment (in ₹ crores):431

Tollable Length (in KM): 71.27

Expected Traffic per Day (in PCU/Day): 39167

Toll charges per vehicle (in ₹/ PCU per Journey): 85

Design Capacity (in PCU):10763

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50

Payback Period (in years)	6	6	5	5	Payback Period (in years)	6	6	5	5
Discounted payback Period (in years)	8	8	7	6	Discounted payback Period (in years)	8	8	7	6
Internal Rate of Return (in %)	19%	21%	24%	29%	Internal Rate of Return (in %)	19%	21%	23%	28%

Table 9: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-16 (Laxmipuram)

Project Capital Investment (in ₹ crores):229.39

Tollable Length (in KM): 66.15

Expected Traffic per Day (in PCU/Day): 18413

Toll charges per vehicle (in ₹/ PCU per Journey): 115

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
	Hurdle Rate	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	5	4
Discounted payback Period (in years)	6	6	6	5
Internal Rate of Return (in %)	22%	24%	27%	32%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
	Hurdle Rate	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	5	4
Discounted payback Period (in years)	6	6	6	5
Internal Rate of Return (in %)	22%	24%	27%	32%

Table 10: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-16 (Madapam)

Project Capital Investment (in ₹ crores):248.18

Tollable Length (in KM): 63

Expected Traffic per Day (in PCU/Day): 32648

Toll charges per vehicle (in ₹/ PCU per Journey): 30

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	27	19	14	11
Internal Rate of Return (in %)	10%	12%	15%	20%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	27	19	15	11
Internal Rate of Return (in %)	10%	12%	14%	19%

Table 11: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-5, Main Toll (Panchvati)

Project Capital Investment (in ₹ crores):181.91

Tollable Length (in KM):10.336

Expected Traffic per Day (in PCU/Day): 34442

Toll charges per vehicle (in ₹/ PCU per Journey): 37

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	6	6	6	5	Payback Period (in years)	6	6	6	5
Discounted payback Period (in years)	9	8	8	7	Discounted payback Period (in years)	9	8	8	7
Internal Rate of Return (in %)	17%	19%	22%	27%	Internal Rate of Return (in %)	17%	19%	22%	27%

Table 12: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-16 (Nathavalasa/ Vizianagaram)

Project Capital Investment (in ₹ crores):181.36

Tollable Length (in KM):46.34

Expected Traffic per Day (in PCU/Day): 30896

Toll charges per vehicle (in ₹/ PCU per Journey): 50

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50

Payback Period (in years)	5	5	5	5	Payback Period (in years)	5	5	5	5
Discounted payback Period (in years)	7	7	6	6	Discounted payback Period (in years)	7	7	6	6
Internal Rate of Return (in %)	20%	22%	25%	30%	Internal Rate of Return (in %)	20%	22%	25%	30%

Table 13: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-5 (Secondary Toll (Gosthani Gate /Sheela Nagar))

Project Capital Investment (in ₹ crores):181.91

Tollable Length (in KM):10.336

Expected Traffic per Day (in PCU/Day): 34442

Toll charges per vehicle (in ₹/ PCU per Journey): 37

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate****Sensitivity of the project with annual increase in traffic**

	Base toll rate (in ₹ per vehicle)	annual increase			Expected Traffic per Day (in PCU/Day)	annual increase			
		(2 %)	(5 %)	(10 %)		(2 %)	(5 %)	(10 %)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	6	6	6	5	Payback Period (in years)	6	6	6	5
Discounted payback Period (in years)	9	8	8	7	Discounted payback Period (in years)	9	8	8	7
Internal Rate of Return (in %)	17%	19%	22%	27%	Internal Rate of Return (in %)	17%	19%	22%	27%

Table 14: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-16 [Vempadu]

Project Capital Investment (in ₹ crores):234

Tollable Length (in KM):89.27

Expected Traffic per Day (in PCU/Day): 43363

Toll charges per vehicle (in ₹/ PCU per Journey): 110

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	3	3	3	2
Discounted payback Period (in years)	3	3	3	3
Internal Rate of Return (in %)	48%	50%	53%	58%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	3	3	3	2
Discounted payback Period (in years)	3	3	3	3
Internal Rate of Return (in %)	48%	50%	53%	58%

Table 15: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-31 [Barsoni]

Project Capital Investment (in ₹ crores):384.36

Tollable Length (in KM):48.045

Expected Traffic per Day (in PCU/Day): 24970

Toll charges per vehicle (in ₹/ PCU per Journey): 55

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables					Sensitivity of the project with annual increase in traffic				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	12	11	10	8	Payback Period (in years)	12	11	10	9
Discounted payback Period (in years)	48	23	16	12	Discounted payback Period (in years)	48	23	16	12
Internal Rate of Return (in %)	9%	11%	14%	19%	Internal Rate of Return (in %)	9%	11%	14%	18%

Table 16: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-19 [Saukala]

Project Capital Investment (in ₹ crores):431.74

Tollable Length (in KM):60

Expected Traffic per Day (in PCU/Day): 36368

Toll charges per vehicle (in ₹/ PCU per Journey): 85

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables					Sensitivity of the project with annual increase in traffic				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50

Payback Period (in years)	6	6	6	5	Payback Period (in years)	6	6	6	5
Discounted payback Period (in years)	9	8	7	7	Discounted payback Period (in years)	9	8	7	7
Internal Rate of Return (in %)	17%	19%	22%	27%	Internal Rate of Return (in %)	17%	19%	22%	27%

Table 17: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-6 (Durg Bypass)

Project Capital Investment (in ₹ crores):123

Tollable Length (in KM):18

Expected Traffic per Day (in PCU/Day): 20742

Toll charges per vehicle (in ₹/ PCU per Journey): 60

Design Capacity (in PCU):15000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	4	4
Discounted payback Period (in years)	6	6	5	5
Internal Rate of Return (in %)	24%	26%	29%	34%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	4	4
Discounted payback Period (in years)	6	6	5	5
Internal Rate of Return (in %)	24%	26%	29%	34%

Table 18: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-6, old 53(Kharun, MoRTH)

Project Capital Investment (in ₹ crores):123

Tollable Length (in KM):82

Expected Traffic per Day (in PCU/Day): 10251

Toll charges per vehicle (in ₹/ PCU per Journey): 24

Design Capacity (in

PCU):22103

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	14	12	11	9
Discounted payback Period (in years)	NA	35	20	14
Internal Rate of Return (in %)	7%	9%	12%	17%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	14	12	11	10
Discounted payback Period (in years)	NA	37	21	14
Internal Rate of Return (in %)	7%	9%	12%	17%

Table 19: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-48

Project Capital Investment (in ₹ crores):555

Tollable Length (in KM):27.7

Expected Traffic per Day (in PCU/Day): 94559

Toll charges per vehicle (in ₹/ PCU per Journey): 65

Design Capacity (in PCU):180000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	14	12	11	9
Discounted payback Period (in years)	NA	35	20	14
Internal Rate of Return (in %)	7%	9%	12%	17%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	14	12	11	10
Discounted payback Period (in years)	NA	37	21	14
Internal Rate of Return (in %)	7%	9%	12%	17%

Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	4	4	4	4	Payback Period (in years)	4	4	4	4
Discounted payback Period (in years)	5	5	5	5	Discounted payback Period (in years)	5	5	5	5
Internal Rate of Return (in %)	26%	28%	31%	36%	Internal Rate of Return (in %)	26%	28%	31%	36%

Table 20: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-59 (bhatwada)

Project Capital Investment (in ₹ crores):750

Tollable Length (in KM):87.102

Expected Traffic per Day (in PCU/Day): 17736

Toll charges per vehicle (in ₹/ PCU per Journey): 140

Design Capacity (in PCU):60000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	11	10	9
Discounted payback Period (in years)	NA	27	18	13

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	10	9
Discounted payback Period (in years)	NA	27	18	13

Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%	18%
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Table 21: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-8 (boriach)

Project Capital Investment (in ₹ crores):2528.57

Tollable Length (in KM):55.2

Expected Traffic per Day (in PCU/Day): 268219

Toll charges per vehicle (in ₹/ PCU per Journey): 60

Design Capacity (in PCU):90000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	7	7	6	6
Discounted payback Period (in years)	10	9	8	7
Internal Rate of Return (in %)	15%	17%	20%	25%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	7	7	6	6
Discounted payback Period (in years)	10	10	8	7
Internal Rate of Return (in %)	15%	17%	20%	25%

Table 22: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-8 (choryasi)

Project Capital Investment (in ₹ crores):1405.49

Tollable Length (in KM):65

Expected Traffic per Day (in PCU/Day): 119377

Toll charges per vehicle (in ₹/ PCU per Journey): 75

Design Capacity (in PCU):70000

Sensitivity Analysis with Changes in Key Variables					Sensitivity of the project with annual increase in traffic				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	7	7	6	6	Payback Period (in years)	7	7	6	6
Discounted payback Period (in years)	10	9	8	7	Discounted payback Period (in years)	10	9	8	7
Internal Rate of Return (in %)	15%	17%	20%	25%	Internal Rate of Return (in %)	15%	17%	20%	25%

Table 23: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-27 (Old 8B)

Project Capital Investment (in ₹ crores):421.01

Tollable Length (in KM):65.1

Expected Traffic per Day (in PCU/Day): 107964

Toll charges per vehicle (in ₹/ PCU per Journey): 95

Design Capacity (in PCU):4

Sensitivity Analysis with Changes in Key Variables					Sensitivity of the project with annual increase in traffic				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2	Payback Period (in years)	2	2	2	2

Discounted payback Period (in years)	2	2	2	2	Discounted payback Period (in years)	2	2	2	2
Internal Rate of Return (in %)	58%	60%	63%	68%	Internal Rate of Return (in %)	58%	60%	62%	67%

Table 24: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-8A in Gujarat

Project Capital Investment (in ₹ crores):435.81

Tollable Length (in KM):71.253

Expected Traffic per Day (in PCU/Day): 137990

Toll charges per vehicle (in ₹/ PCU per Journey): 90

Design Capacity (in PCU):4

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicl e)	annual increase		
		(2 %)	(5 %)	(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2
Discount ed payback Period (in years)	2	2	2	2

Sensitivity of the project with annual increase in traffic

	Expecte d Traffic per Day (in PCU/Da y)	annual increase		
		(2 %)	(5 %)	(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2
Discount ed payback Period (in years)	2	2	2	2

Internal Rate of Return (in %)	67%	69%	72%	77%	Internal Rate of Return (in %)	67%	69%	72%	77%
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Table 25: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-8B [Vanana]

Project Capital Investment (in ₹ crores):272.44

Tollable Length (in KM):51.46

Expected Traffic per Day (in PCU/Day): 91820

Toll charges per vehicle (in ₹/ PCU per Journey): 65

Design Capacity (in PCU):4

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate

Sensitivity of the project with annual increase in traffic

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2	Payback Period (in years)	2	2	2	2
Discounted payback Period (in years)	3	2	3	3	Discounted payback Period (in years)	3	2	3	3
Internal Rate of Return (in %)	52%	54%	57%	62%	Internal Rate of Return (in %)	52%	54%	57%	62%

Table 26: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-71

Project Capital Investment (in ₹ crores):650

Tollable Length (in KM):44.875

Expected Traffic per Day (in PCU/Day): 28119

Toll charges per vehicle (in ₹/ PCU per Journey): 75

Design Capacity (in PCU):30000

Sensitivity Analysis with Changes in Key Variables					Sensitivity of the project with annual increase in traffic				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	14	12	11	9	Payback Period (in years)	13	12	10	9
Discounted payback Period (in years)	NA	35	20	13	Discounted payback Period (in years)	NA	29	19	13
Internal Rate of Return (in %)	7%	9%	12	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 27: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-44(Old NH 01)

Project Capital Investment (in ₹ crores):2747.5

Tollable Length (in KM):110.00

Expected Traffic per Day (in PCU/Day): 71779

Toll charges per vehicle (in ₹/ PCU per Journey): 125

Design Capacity (in PCU):30000

Sensitivity Analysis with Changes in Key Variables					Sensitivity of the project with annual increase in traffic				
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50

Payback Period (in years)	13	12	10	9	Payback Period (in years)	13	12	10	9
Discounted payback Period (in years)	NA	28	18	13	Discounted payback Period (in years)	NA	28	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 28: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-71A

Project Capital Investment (in ₹ crores):807

Tollable Length (in KM):41.53

Expected Traffic per Day (in PCU/Day): 24071

Toll charges per vehicle (in ₹/ PCU per Journey): 130

Design Capacity (in PCU):60000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	14	12	11	8
Discounted payback Period (in years)	NA	35	20	11
Internal Rate of Return (in %)	7%	9%	12	19%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	29	20	15	11
Internal Rate of Return (in %)	9%	11%	14%	19%

Table 29: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-44(Old NH 01)								
Project Capital Investment (in ₹ crores):2747.5								
Tollable Length (in KM):110.00								
Expected Traffic per Day (in PCU/Day): 71779								
Toll charges per vehicle (in ₹/ PCU per Journey): 125								
Design Capacity (in PCU):90000								
Sensitivity Analysis with Changes in Key Variables								
Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic			
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50
Payback Period (in years)	13	12	10	9	Payback Period (in years)	13	12	10
Discounted payback Period (in years)	NA	28	18	13	Discounted payback Period (in years)	NA	28	18
Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%

Table 30: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-10 [Rohad]								
Project Capital Investment (in ₹ crores):486								
Tollable Length (in KM):55.722								
Expected Traffic per Day (in PCU/Day): 30902								
Toll charges per vehicle (in ₹/ PCU per Journey): 60								

Design Capacity (in PCU): 84000

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8	Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	31	20	15	11	Discounted payback Period (in years)	31	20	15	12
Internal Rate of Return (in %)	9%	11%	14%	19%	Internal Rate of Return (in %)	9%	11%	14%	19%

Table 31: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-33 [Pundag]

Project Capital Investment (in ₹ crores):625.07

Tollable Length (in KM):58.067

Expected Traffic per Day (in PCU/Day): 26974

Toll charges per vehicle (in ₹/ PCU per Journey): 100

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate					Sensitivity of the project with annual increase in traffic				
	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)		Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50

Payback Period (in years)	10	9	8	7	Payback Period (in years)	10	9	8	8
Discounted payback Period (in years)	21	16	13	10	Discounted payback Period (in years)	21	16	13	10
Internal Rate of Return (in %)	11%	13%	16%	20%	Internal Rate of Return (in %)	11%	12%	15%	20%

Table 32: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-19 [Rasoiya Dhamna]

Project Capital Investment (in ₹ crores):601.67

Tollable Length (in KM):80

Expected Traffic per Day (in PCU/Day): 31579

Toll charges per vehicle (in ₹/ PCU per Journey): 100

Design Capacity (in PCU):40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase		
		(2 %)	(5 %)	(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	8	8	7	7
Discounted payback Period (in years)	14	12	10	9
Internal Rate of Return (in %)	13%	15%	18%	23%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase		
		(2 %)	(5 %)	(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	8	8	7	7
Discounted payback Period (in years)	14	12	10	9
Internal Rate of Return (in %)	13%	15%	18%	23%

Table 33: Snapshot of Project NH-16 financial performance analysis

Project Name:NH-7 [Bagepalli]

Project Capital Investment (in ₹ crores):402.87

Tollable Length (in KM):71.450

Expected Traffic per Day (in PCU/Day): 18502

Toll charges per vehicle (in ₹/ PCU per Journey): 90

Design Capacity (in PCU):50000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	10	10	9	8
Discounted payback Period (in years)	24	17	14	11
Internal Rate of Return (in %)	10%	12%	15%	20%

Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	10	10	9	8
Discounted payback Period (in years)	24	18	14	11
Internal Rate of Return (in %)	10%	12%	15%	20%

Table 34: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-73 [Brahamarakotlu]

Project Capital Investment (in ₹ crores): 181.5

Tollable Length (in KM): 18.137

Expected Traffic per Day (in PCU/Day): 33886

Toll charges per vehicle (in ₹/ PCU per Journey): 25

Design Capacity (in PCU): 40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2 %)	annual increase(5 %)	annual increase(10 %)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50

Payback Period (in years)	9	9	8	7	Payback Period (in years)	9	9	8	7
Discounted payback Period (in years)	18	14	12	10	Discounted payback Period (in years)	18	14	12	10
Internal Rate of Return (in %)	11%	13%	16%	21%	Internal Rate of Return (in %)	11%	13%	16%	21%

Table 35: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-4 [Chalageri]

Project Capital Investment (in ₹ crores): 484.08

Tollable Length (in KM): 60.98

Expected Traffic per Day (in PCU/Day): 25023

Toll charges per vehicle (in ₹/ PCU per Journey): 75

Design Capacity (in PCU): 40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate	annual increase(annual increase(annual increase(
	(in ₹ per vehicle)	2%)	5%)	10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	29	19	15	11
Internal Rate of Return (in %)	9%	11%	14%	19%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(annual increase(annual increase(
		2%)	5%)	10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	29	20	15	11
Internal Rate of Return (in %)	9%	11%	14%	19%

Table 36: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-75 [Gaddurur]

Project Capital Investment (in ₹ crores): 141.11

Tollable Length (in KM): 17.588

Expected Traffic per Day (in PCU/Day): 18105

Toll charges per vehicle (in ₹/ PCU per Journey): 25

Design Capacity (in PCU): 50000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	10	9
Discounted payback Period (in years)	NA	29	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	11	9
Discounted payback Period (in years)	NA	30	19	13
Internal Rate of Return (in %)	8%	10%	13%	17%

Table 37: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-48 [Karjeevanhalli]

Project Capital Investment (in ₹ crores): 1142

Tollable Length (in KM): 57

Expected Traffic per Day (in PCU/Day): 46600

Toll charges per vehicle (in ₹/ PCU per Journey): 80

Design Capacity (in PCU): 120000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	10	9

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	10	9

Discounted payback Period (in years)	NA	28	18	13	Discounted payback Period (in years)	NA	28	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 38: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-48 [Hebbalu]

Project Capital Investment (in ₹ crores): 420.62

Tollable Length (in KM): 71

Expected Traffic per Day (in PCU/Day): 24552

Toll charges per vehicle (in ₹/ PCU per Journey): 60

Design Capacity (in PCU): 40000

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in toll rate

Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	12	11	10	9
Discounted payback Period (in years)	NA	24	17	12
Internal Rate of Return (in %)	9%	11%	14%	18%

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in traffic

Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	12	11	10	9
Discounted payback Period (in years)	NA	24	17	12
Internal Rate of Return (in %)	9%	10%	13%	18%

Table 39: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-92 [Baretha (MoRTH)]

Project Capital Investment (in ₹ crores): 314.53

Tollable Length (in KM): 50

Expected Traffic per Day (in PCU/Day): 15128

Toll charges per vehicle (in ₹/ PCU per Journey): 70

Design Capacity (in PCU): 25000

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in toll rateSensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in traffic

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)		Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	14	12	11	9	Payback Period (in years)	12	11	10	9
Discounted payback Period (in years)	NA	35	20	13	Discounted payback Period (in years)	NA	26	18	13
Internal Rate of Return (in %)	7%	9%	12	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 40: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-66 [Surathkal]

Project Capital Investment (in ₹ crores): 181.5

Tollable Length (in KM): 17.362

Expected Traffic per Day (in PCU/Day): 35080

Toll charges per vehicle (in ₹/ PCU per Journey): 50

Design Capacity (in PCU): 40000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	5	4
Discounted payback Period (in years)	6	6	6	5
Internal Rate of Return (in %)	23%	25%	28%	33%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	5	4
Discounted payback Period (in years)	6	6	6	5
Internal Rate of Return (in %)	23%	25%	28%	33%

Table 41: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-66 [Talapady]

Project Capital Investment (in ₹ crores): 1050.1

Tollable Length (in KM): 13.2

Expected Traffic per Day (in PCU/Day): 423892

Toll charges per vehicle (in ₹/ PCU per Journey): 40

Design Capacity (in PCU): 29702

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	3	3	3	3
Discounted payback Period (in years)	4	4	3	3
Internal Rate of Return (in %)	38%	40%	43%	48%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	3	3	3	3
Discounted payback Period (in years)	4	4	3	3
Internal Rate of Return (in %)	38%	40%	43%	48%

Table 42: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-3(old) NH52(New) [Chhapra]

Project Capital Investment (in ₹ crores): 1897.4

Tollable Length (in KM): 58.05

Expected Traffic per Day (in PCU/Day): 830120

Toll charges per vehicle (in ₹/ PCU per Journey): 65

Design Capacity (in PCU): 60000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2

Discounted payback Period (in years)	2	2	2	2	Discounted payback Period (in years)	2	2	2	2
Internal Rate of Return (in %)	67%	69%	72%	77%	Internal Rate of Return (in %)	67%	69%	72%	77%

Table 43: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-3 [Indore Dewas (Indore Bypass)]
 Project Capital Investment (in ₹ crores): 325
 Tollable Length (in KM): 45.05
 Expected Traffic per Day (in PCU/Day): 34246
 Toll charges per vehicle (in ₹/ PCU per Journey): 50
 Design Capacity (in PCU): 6600

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	8	8	7	7
Discounted payback Period (in years)	14	12	10	9
Internal Rate of Return (in %)	13%	15%	18%	23%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	8	8	7	7
Discounted payback Period (in years)	14	12	10	9
Internal Rate of Return (in %)	13%	15%	18%	23%

Table 44: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-3 [Jajau (Old Baretha)]
 Project Capital Investment (in ₹ crores): 1012.9
 Tollable Length (in KM): 41.8
 Expected Traffic per Day (in PCU/Day): 425284
 Toll charges per vehicle (in ₹/ PCU per Journey): 55
 Design Capacity (in PCU): 10

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate****Sensitivity Analysis with Changes in Key Variables****Sensitivity of the project with annual increase in traffic**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)		Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2	Payback Period (in years)	2	2	2	2
Discounted payback Period (in years)	3	3	3	2	Discounted payback Period (in years)	3	3	3	2
Internal Rate of Return (in %)	55%	57%	60%	65%	Internal Rate of Return (in %)	55%	57%	60%	64%

Table 45: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-3 [Khalghat -MP/Maharashtra Border(Sendhwa, Jamli)]

Project Capital Investment (in ₹ crores): 786.39

Tollable Length (in KM): 82.8

Expected Traffic per Day (in PCU/Day): 31026

Toll charges per vehicle (in ₹/ PCU per Journey): 95

Design Capacity (in PCU): 56000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	34	21	15	12
Internal Rate of Return (in %)	9%	11%	14%	19%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	34	21	15	12
Internal Rate of Return (in %)	9%	11%	14%	19%

Table 46: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-46(Old NH-3) [Pagara]
 Project Capital Investment (in ₹ crores): 1012.9
 Tollable Length (in KM): 51.7
 Expected Traffic per Day (in PCU/Day): 2104004
 Toll charges per vehicle (in ₹/ PCU per Journey): 65
 Design Capacity (in PCU): 10

Sensitivity Analysis with Changes in Key Variables
 Sensitivity of the project with annual increase in toll rate

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2
Discounted payback Period (in years)	2	2	2	2
Internal Rate of Return (in %)	64%	66%	69%	74%

Sensitivity Analysis with Changes in Key Variables
 Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	2	2	2	2
Discounted payback Period (in years)	2	2	2	2
Internal Rate of Return (in %)	64%	66%	69%	74%

Table 47: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-46(Old 3) [Purankhedi]
 Project Capital Investment (in ₹ crores): 759.98
 Tollable Length (in KM): 85.31
 Expected Traffic per Day (in PCU/Day): 2104004
 Toll charges per vehicle (in ₹/ PCU per Journey): 105
 Design Capacity (in PCU): 60000

Sensitivity Analysis with Changes in Key Variables
 Sensitivity of the project with annual increase in toll rate

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	1	1	1	1

Sensitivity Analysis with Changes in Key Variables
 Sensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	1	1	1	1

Discounted payback Period (in years)	1	1	1	1	Discounted payback Period (in years)	1	1	1	1
Internal Rate of Return (in %)	681%	683%	686%	691%	Internal Rate of Return (in %)	681%	683%	686%	691%

Table 48: Snapshot of Project NH-16 financial performance analysis

Project Name: NH3(old) NH52(New) [Rojwas]

Project Capital Investment (in ₹ crores): 1897.4

Tollable Length (in KM): 63.599

Expected Traffic per Day (in PCU/Day): 1081030

Toll charges per vehicle (in ₹/ PCU per Journey): 75

Design Capacity (in PCU): 60000

Sensitivity Analysis with Changes in Key Variables

Sensitivity Analysis with Changes in Key Variables

Sensitivity of the project with annual increase in toll rate

Sensitivity of the project with annual increase in traffic

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
	Hurdle Rate	8.70%	8.70%	8.70%		8.70%	Hurdle Rate	8.70%
Project Life	50	50	50	50	Project Life	50	50	50
Payback Period (in years)	1	1	1	1	Payback Period (in years)	1	1	1
Discounted payback Period (in years)	2	2	2	2	Discounted payback Period (in years)	2	2	2
Internal Rate of Return (in %)	101%	103%	106%	111%	Internal Rate of Return (in %)	101%	103%	105%

Table 49: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-3 [Baswant (Pimplegaon)]

Project Capital Investment (in ₹ crores): 940

Tollable Length (in KM): 55.161

Expected Traffic per Day (in PCU/Day): 37186

Toll charges per vehicle (in ₹/ PCU per Journey): 140

Design Capacity (in PCU): 59000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	8	7	7	6
Discounted payback Period (in years)	13	11	10	8
Internal Rate of Return (in %)	13%	15%	18%	23%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	8	8	7	6
Discounted payback Period (in years)	13	11	10	8
Internal Rate of Return (in %)	13%	15%	18%	23%

Table 50: Snapshot of Project NH-16 financial performance analysis

Project Name: 50 [Chandloi/ Rajgurunagar (MoRTH)]

Project Capital Investment (in ₹ crores): 127.6

Tollable Length (in KM): 29

Expected Traffic per Day (in PCU/Day): 32988

Toll charges per vehicle (in ₹/ PCU per Journey): 25

Design Capacity (in PCU): 45000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	7	7	6	6

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	7	7	6	6

Discounted payback Period (in years)	10	9	8	7	Discounted payback Period (in years)	10	9	8	7
Internal Rate of Return (in %)	16%	18%	21%	26%	Internal Rate of Return (in %)	16%	18%	20%	25%

Table 51: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-9 [Kawdipath(MoRTH)]

Project Capital Investment (in ₹ crores): 88.71

Tollable Length (in KM): 26

Expected Traffic per Day (in PCU/Day): 47130

Toll charges per vehicle (in ₹/ PCU per Journey): 25

Design Capacity (in PCU): 45000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	4	4	4	3
Discounted payback Period (in years)	4	4	4	4
Internal Rate of Return (in %)	32%	34%	37%	42%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	4	4	4	3
Discounted payback Period (in years)	4	4	4	4
Internal Rate of Return (in %)	32%	34%	37%	41%

Table 52: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-3 [Kharegaon(MoRTH)]

Project Capital Investment (in ₹ crores): 104.84

Tollable Length (in KM): 23.5

Expected Traffic per Day (in PCU/Day): 13400

Toll charges per vehicle (in ₹/ PCU per Journey): 29

Design Capacity (in PCU): 95000

Sensitivity Analysis with Changes in Key Variables				
Sensitivity of the project with annual increase in toll rate				
	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	36	21	15	12
Internal Rate of Return (in %)	9%	11%	14%	19%

Sensitivity Analysis with Changes in Key Variables				
Sensitivity of the project with annual increase in traffic				
	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	11	9	8
Discounted payback Period (in years)	36	21	16	12
Internal Rate of Return (in %)	9%	11%	14%	19%

Table 53: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-4 [Khedshivapur]
 Project Capital Investment (in ₹ crores): 1724.55
 Tollable Length (in KM): 80.7
 Expected Traffic per Day (in PCU/Day): 82234
 Toll charges per vehicle (in ₹/ PCU per Journey): 95
 Design Capacity (in PCU): 120000

Sensitivity Analysis with Changes in Key Variables				
Sensitivity of the project with annual increase in toll rate				
	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	10	9	8	7

Sensitivity Analysis with Changes in Key Variables				
Sensitivity of the project with annual increase in traffic				
	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	10	9	8	7

Discounted payback Period (in years)	19	15	12	10	Discounted payback Period (in years)	19	15	12	10
Internal Rate of Return (in %)	11%	13%	16%	21%	Internal Rate of Return (in %)	11%	13%	16%	21%

Table 54: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-50 [Moshi (MoRTH)]

Project Capital Investment (in ₹ crores): 127.6

Tollable Length (in KM): 29.79

Expected Traffic per Day (in PCU/Day): 50605

Toll charges per vehicle (in ₹/ PCU per Journey): 25

Design Capacity (in PCU): 45000

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in toll rate

Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	4	4
Discounted payback Period (in years)	6	6	5	5
Internal Rate of Return (in %)	24%	26%	29%	34%

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in traffic

Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)	
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	5	5	4	4
Discounted payback Period (in years)	6	6	5	5
Internal Rate of Return (in %)	24%	26%	29%	34%

Table 55: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-53 [Nandgaon Peth]

Project Capital Investment (in ₹ crores): 567

Tollable Length (in KM): 63.695

Expected Traffic per Day (in PCU/Day): 20623

Toll charges per vehicle (in ₹/ PCU per Journey): 95

Design Capacity (in PCU): 240

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in toll rateSensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in traffic

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)		Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%	Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	12	11	10	9	Payback Period (in years)	12	11	10	9
Discounted payback Period (in years)	NA	24	17	12	Discounted payback Period (in years)	NA	25	17	13
Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 56: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-6 [Sendurwafa]

Project Capital Investment (in ₹ crores): 424

Tollable Length (in KM): 72.056

Expected Traffic per Day (in PCU/Day): 19575

Toll charges per vehicle (in ₹/ PCU per Journey): 80

Design Capacity (in PCU): 42000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	37	21	15	11
Internal Rate of Return (in %)	9%	11%	14%	19%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	11	10	8
Discounted payback Period (in years)	37	22	16	12
Internal Rate of Return (in %)	9%	11%	14%	19%

Table 57: Snapshot of Project NH-16 financial performance analysis

Project Name: NH-6 [WEPL Mathani]

Project Capital Investment (in ₹ crores): 484.19

Tollable Length (in KM): 45.43

Expected Traffic per Day (in PCU/Day): 30717

Toll charges per vehicle (in ₹/ PCU per Journey): 50

Design Capacity (in PCU): 42000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	11	11	9
Discounted payback Period (in years)	NA	19	19	13
Internal Rate of Return (in %)	8%	12%	13%	18%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	11	9
Discounted payback Period (in years)	NA	31	19	14
Internal Rate of Return (in %)	8%	10%	12%	17%

Table 58: Snapshot of Project NH-16 financial performance analysis

Project Name: 6 [Baragarh (Barhaguda)]

Project Capital Investment (in ₹ crores): 909

Tollable Length (in KM): 80.2

Expected Traffic per Day (in PCU/Day): 24491

Toll charges per vehicle (in ₹/ PCU per Journey): 125

Design Capacity (in PCU): 12142

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%

Project Life	50	50	50	50	Project Life	50	50	50	50
Payback Period (in years)	12	11	10	9	Payback Period (in years)	12	11	10	9
Discounted payback Period (in years)	NA	26	17	13	Discounted payback Period (in years)	NA	26	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%	Internal Rate of Return (in %)	8%	10%	13%	18%

Table 59: Snapshot of Project NH-16 financial performance analysis

Project Name: 16 [Gudipada (Old Gangapada)]

Project Capital Investment (in ₹ crores): 385.83

Tollable Length (in KM): 76.665

Expected Traffic per Day (in PCU/Day): 27783

Toll charges per vehicle (in ₹/ PCU per Journey): 70

Design Capacity (in PCU): 40,000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	9	8	7	7
Discounted payback Period (in years)	15	13	11	9
Internal Rate of Return (in %)	12%	14%	17%	22%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	9	8	8	7
Discounted payback Period (in years)	15	13	11	9
Internal Rate of Return (in %)	12%	14%	17%	22%

Table 60: Snapshot of Project NH-16 financial performance analysis

Project Name: 316

[Paat Sahanipur(Pipli)]

Project Capital Investment (in ₹ crores): 524.9

Tollable Length (in KM): 54.15

Expected Traffic per Day (in PCU/Day): 24786

Toll charges per vehicle (in ₹/ PCU per Journey): 85

Design Capacity (in PCU): 40,000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	26	18	14	11
Internal Rate of Return (in %)	10%	12%	15%	20%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	11	10	9	8
Discounted payback Period (in years)	26	18	14	11
Internal Rate of Return (in %)	10%	12%	15%	19%

Table 61: Snapshot of Project NH-16 financial performance analysis

Project Name: 16[Panikholi]

Project Capital Investment (in ₹ crores): 372

Tollable Length (in KM): 74.5

Expected Traffic per Day (in PCU/Day): 29585

Toll charges per vehicle (in ₹/ PCU per Journey): 85

Design Capacity (in PCU): 40,000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50

Payback Period (in years)	7	6	6	6	Payback Period (in years)	7	6	6	6
Discounted payback Period (in years)	10	9	8	7	Discounted payback Period (in years)	10	9	8	7
Internal Rate of Return (in %)	16%	18%	21%	26%	Internal Rate of Return (in %)	16%	18%	21%	26%

Table 62: Snapshot of Project NH-16 financial performance analysis

Project Name: 16 [Sergarh]

Project Capital Investment (in ₹ crores): 444.83

Tollable Length (in KM): 62.641

Expected Traffic per Day (in PCU/Day): 33232

Toll charges per vehicle (in ₹/ PCU per Journey): 60

Design Capacity (in PCU): 40,000

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in toll rate**

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	10	9	8	7
Discounted payback Period (in years)	19	15	12	10
Internal Rate of Return (in %)	11%	13%	16%	21%

Sensitivity Analysis with Changes in Key Variables**Sensitivity of the project with annual increase in traffic**

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	10	9	8	7
Discounted payback Period (in years)	19	15	12	10
Internal Rate of Return (in %)	11%	13%	16%	21%

Table 63: Snapshot of Project NH-16 financial performance analysis

Project Name: 5A [Srirampur]

Project Capital Investment (in ₹ crores): 586.92

Tollable Length (in KM): 76.588

Expected Traffic per Day (in PCU/Day): 15974

Toll charges per vehicle (in ₹/ PCU per Journey): 120

Design Capacity (in PCU): 40,000

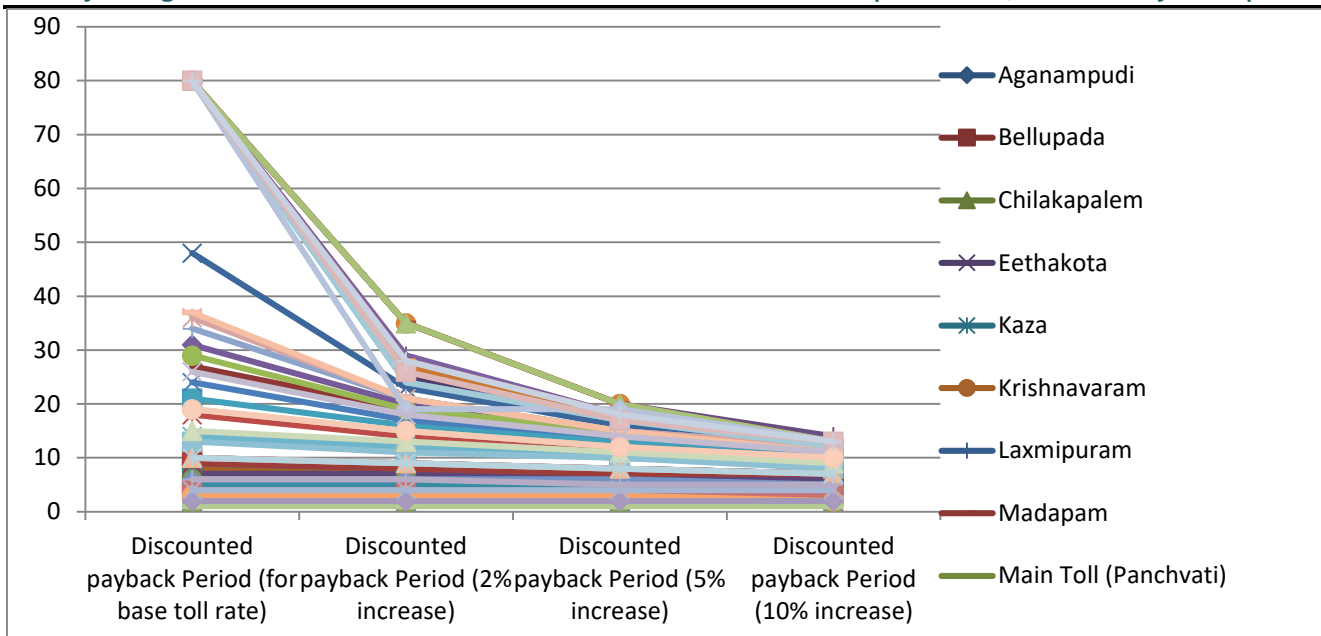
Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in toll rate

	Base toll rate (in ₹ per vehicle)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	10	9
Discounted payback Period (in years)	NA	28	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%

Sensitivity Analysis with Changes in Key VariablesSensitivity of the project with annual increase in traffic

	Expected Traffic per Day (in PCU/Day)	annual increase(2%)	annual increase(5%)	annual increase(10%)
Hurdle Rate	8.70%	8.70%	8.70%	8.70%
Project Life	50	50	50	50
Payback Period (in years)	13	12	10	9
Discounted payback Period (in years)	NA	28	18	13
Internal Rate of Return (in %)	8%	10%	13%	18%

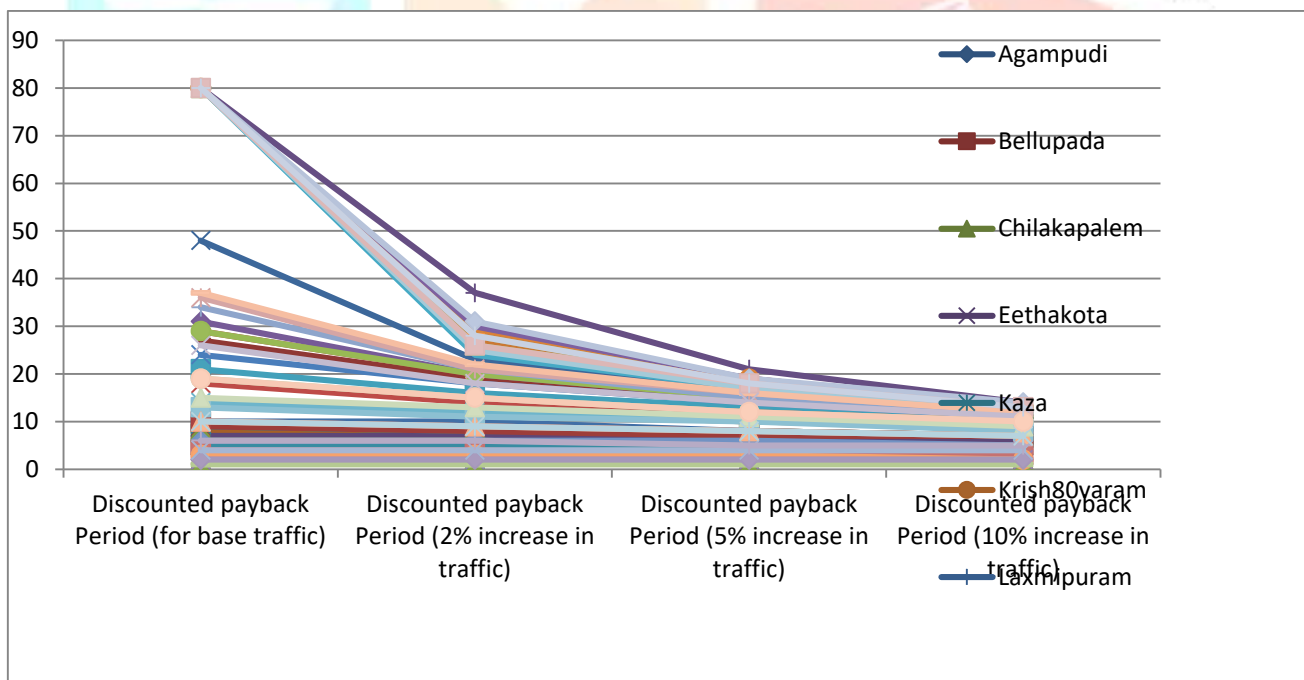
SENSITIVITY ANALYSIS OF DISCOUNTED PAYBACK PERIOD OF THE PROJECTS WITH ANNUAL INCREASES IN TOLL RATE:



INTERPRETATION:

From the graph we can clearly see that on increasing the toll rate by 2%, there is a reduction in payback period. The recovery time is reducing slightly, but the reduction curve is not that steep, except for a few projects. For most of the projects the curve is flattened and it gets more flat, when there is further increase in toll rates by 5% and 10% respectively. This shows that on increasing the toll rates, there is no major reduction in payback period.

SENSITIVITY ANALYSIS OF DISCOUNTED PAYBACK PERIOD OF THE PROJECTS WITH ANNUAL INCREASES IN TRAFFIC FLOW RATE:



INTERPRETATION:

On increasing the traffic also, there is not much reduction in payback time, except for a few projects. Increase in traffic flow rate is also giving similar results, as we can get from increasing toll rates for the recovery of amount that is invested (payback period).

VI. FINDINGS AND CONCLUSION

1. Toll rate has a significant relationship with capital investment and tollable length., which means toll rate is dependent on both these factors. Highway projects with more initial capital investment have more toll rates compared to other projects. Similarly, highway roads with more tollable length have high toll charges

- comparatively.
2. In order to check the sensitivity of the projects with respect to changes in key variables (toll rate, traffic) and how it affects the discounted payback period, both toll rate and traffic were increased by 2%, 5% and 10% respectively. This resulted in only a minor reduction in discounted payback period except for a few projects. For traffic also, results were similar to that of toll rate, increase in traffic rate do change the payback period and reduced it but to a very minor extend.
 3. Discounted payback period of projects with less IRR value is very high, most of the projects in the sample with IRR = 8% or less, and no change/ increment in toll rates and traffic are not able to recover the amount even in 50 years (assumed project life taken in the study).

CONCLUSION:

Increment in toll rates by Government and other private players is not acceptable as we have seen in sensitivity analysis part, even after increasing the toll rates there is no major change in payback period. Though there is a slight change which can be achieved by the change in traffic rate, as increase in traffic flow rate is also giving similar results, as we can get from increasing toll rates. So, increase in toll rates is not acceptable, as every year in India road traffic is increasing with faster rate

VII. LIMITATIONS

1. One major limitation of this study is that the assessment is done on the basis of information which is available in public domain and therefore needs verification.
2. Apart from that the data available is not sufficient, initial investment capital is there but there is no mention about the operations and maintenance cost, which is a major counting factor for highway road assessment.
3. Nature of data is secondary, the quality of study would have been better if the data was primary in nature.
4. During sensitivity analysis while increasing one key variable, we have considered other factors to be constant, which is technically not possible.

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