CHAPTER: 9
ECONOMIC & FINANCIAL ANALYSIS

9.1 Introduction

Cost-benefit analysis attempts to assess the benefits of implementing a project to the society as a whole. The measurement of costs and benefits is intended to reflect the value of resources consumed by, or made available to the society as a whole and therefore excludes all transfer payments, such as import duties excise and sales tax, etc.

Costs and benefits are assessed by comparing a project case(s) with a base case (or without project) over the economic lifetime of the project, conventionally taken as 30 years. The costs and benefits are calculated for each year and then discounted at an appropriate rate of interest to obtain the standard measures of project benefit, such as net present value (NPV) and internal rate of return (IRR).

9.2 Economic Benefits

The principal economic benefits to road users arise from the reduction in vehicle operating costs (VOC), including the value of passenger and commodity time savings.

The reduction in vehicle operating costs and time values has been calculated using HDM 4 (Highway development and management) model.

9.3 Project Cost

The project cost has to take account of all expenditure over the life of the project and therefore includes:

.   Initial construction cost

.   Annual routine maintenance cost

.   Periodic maintenance cost

Estimated project cost has been detailed below:

Table No 9.1: Project Cost

Section / Description	Total Length in Km	Construction Cost (Rs. in million)
Hindon Elevated Road_Part A	10.15	1142

- Routine maintenance cost   0.30   million

- Periodic maintenance cost   1.0   million

- Toll Administration Cost   5.0   million per year per toll

The Capital costs, in financial terms, at the prevailing market prices have been computed as at the end of current financial year. The foreign exchange component in the total capital cost is insignificant and is considered almost zero, as all material, machinery and labour are available in India. Standard Conversion factor of 0.90 is used for converting market prices of road construction and maintenance inputs into economic costs.

9.4 HDM 4 Model Input Data

9.4.1 General

The following values have been considered for the HDM 4 Model input data:

Analysis Period   : 30 years

Construction Period   : 2.0 years (24 months)

Design Life   : 15 years

Salvage Value   : 15%

Discount Rate   : 12%

Investment Schedule   : 1st Year - 40%

                         2nd Year - 60%

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9.4.2 Characteristics of Existing Project Road

This is a green field alignment, hence existing road characteristics not applicable to the project.

9.4.3 Traffic Volume and Composition

Base year annual average daily traffic used for running HDM4 model is given table below.

Table No 9.2: Tollable Traffic

| Year | Car | Bus | | LCV | Truck | | |
		Mini	Full		2Axle	MAV (3-6 Axle)	More Than 6 Axle
2013	6592	51	278	472	154	64	11

9.4.4 Traffic Growth Rate

Traffic growth rate for the project road is taken as follows:

Table No 9.3: Project Growth Rate

Vehicle Type	Up to 2014	2015-2019	2020-2024	2025-2029	Beyond 2029
Car	8.81	8.36	7.95	7.58	7.25
2-W	7.58	7.24	6.94	6.67	6.43
Buses	4.86	4.77	4.69	4.62	4.55
LCV	10.62	10.2	9.83	9.5	9.2
2-Axle/ 3-Axle	7.01	6.61	6.26	5.94	5.66
MAV	13.95	13.63	13.33	13.07	12.83

9.5 Economic Analysis

The economic analysis for the project road has been carried out with flexible pavement design with traffic diverted on new road taken into consideration in the evaluation of EIRR and NPV. The annual stream of cost savings (VOC and value of time savings) "without" project and with project, have been developed through HDM 4 model. The results of the economic analysis "with time savings" are summarised in table.

Table 9.4: Economic Analysis Results

Project Road	EIRR (%)	NPV (Rs in million)
1. Hindon Elevated Road	19.8	9920

Economic analysis results show that project road is economically viable.

9.6   Sensitivity Analysis

Sensitivity Analysis has been carried out to examine the effect on economic viability of the project due to the changes in the levels of the key input factors. The sensitivity has been studied under the following change in conditions.

Condition I: 15% increase in project costs, while traffic volume remains unaffected as per demand estimates.

Condition II: 15% decrease in traffic volume, project costs remaining unchanged

Condition III: 15 % increase in the project costs and 15 % decrease in traffic – worst case scenario.

Sensitivity Analysis results are given below in table 9.6
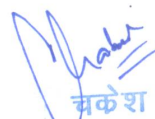
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Table 9.5: Sensitivity Analysis

Project Road	Condition	EIRR (%)	NPV (Rs in million)
Hindon Elevated Road	I	19.2	9541
	II	18.64	9403
	III	17.9	9233

9.7 Financial Analysis

The economic evaluation is the basic criterion in order to evaluate the financial aspects of the project and to justify its financial viability. Mainly, it is understood through cost-benefit analysis which quantifies the **socio-economic worth** of the project for its life period. The analysis pertains to aggregate the benefits as well as costs of the project at the market price during the span of life time and the values so obtained are discounted to get the present worth of the project. The overall analysis leads to evaluation indicating the feasibility of the project.

9.8 Project Life

For evaluating the **benefits** as well as **costs** incurred by the project road, it is obvious that a certain time period has to be considered for the overall project life. Though project once implemented has a long life if a proper maintenance is carried out from time to time, it is also understood that the project will continue to benefit the society even after the expiry of the project life. The financial viability has to be explored for a period of 20 years with maximum Viability Gap Funding (VGF) of 40%. In order to reduce the VGF, a **20 year** time period has been considered for the project. This will begin after accounting **two years** for project preparation and construction.

9.9 Project Priorities

This is a preliminary stage of the assessment of the project viabilities based on the available data from the secondary sources and realistic assumptions. At present the Report has to

be submitted elaborating the broad strategy to structure the project in order to restrict the likely viability gap funding not exceeding 40% of the capital cost of the project.

It is obvious that the construction of the **project road** is the urgency of need in totality for the overall functional operation of the facility. It is understood that the construction will be completed in approximately **two years time period** and at the same time all the components of improvement are not uniform. Considering the financial constraints as well as evaluation of all the components of the project including development of sectoral components, their effectiveness, socio-economic and environmental aspects, the implementation program can be **prioritized** while sub-dividing cost heads.

The **new alignment** of the project is necessarily to be considered at the first priority as there is no traffic hindrance and at the same time will reduce the traffic load in urban areas. Other priorities can be fixed based on the availability of materials and further on the analysis of conditions.

9.10 Tollable Traffic

The vehicles which can be charged are car/jeep/taxi, bus standard, LCV/mini bus, truck standard, truck multi-axle, truck articulated and tractor with trolley. Mode-wise traffic has been projected to 2019, 2024, 2039 & 2033 as presented in table no. 9.2. It has been assumed that 80% traffic will be tollable barring 20% as government or other non-tollable vehicles.

9.11 Financial Evaluation

9.11.1 Financial Cost

The financial evaluation is mainly concerned with ways and means of financing the project by floating bonds or levying toll to cover the financial cost. Total financial cost of the project has been estimated at 2013 price which is Rs. 10050 millions. The financial cost of the project will incur over a period of **2** financial years. The same is phased out as follows:

(i) 1st year (2014) (60% of Cost)

(ii) 2nd Year (2015) (40% of Cost)

9.11.2 Project Benefits

The major source of funding the project is to charge the road users who are reaping the benefits of the improved facility. This covers almost all the users except slow moving vehicles and two-wheelers considering them as local traffic. The MoRT&H has issued guidelines for charging road users @ Rs./Km for different modes as circulation in 2008 and the same has been escalated @ 5% per annum.

Mode	Toll Rate (Rs/km)	
	2007-2008	2013-2014
Car	0.65	0.87
Bus	2.20	2.95
LCV	1.05	1.41
Truck	2.20	2.95
MAV	3.45	4.62
Articulated	4.20	5.63

These rates have been derived to be used for levying toll tax to the road users. For the project road length, the toll tax rates have been calculated and projected to the project life span.

9.11.3 Generation of Resources

The weighted average traffic mode wise has been projected to the horizon year of the project life. The toll tax rates have been multiplied with the number of modes of traffic. The following factors have been assumed for assessment of the resources generated by toll tax.

1. Traffic volume has been projected as per table no 9.3

2. Toll Tax has been escalated @ of 5 % per annum

3. 80% of traffic has been considered as tollable traffic

4. As per MOSRT&H, the toll tax (Rs/km) at 2008 price is Car= Rs. 0.65, Bus= Rs. 2.20, LCV/Tractor=Rs. 1.05, Truck=Rs. 2.20, MAV = Rs. 3.45 and MAV-Articulated = Rs. 4.20.

9.11.4 Cost-Benefit Analysis

The project life has been considered **20 years** from 2013 to 2033 A.D. including project preparation and implementation time period of 2.0 financial years. Accordingly, **total financial cost** including maintenance cost has been spread over 20 years. The cost stream is escalated at the rate of 5% per annum.

The benefits will start occurring after the completion of construction work. The benefits divided in 5 years intervals from 2013 to 2033 A.D. have been interpolated and then spread over the project life for every year as shown in attached appendix.

The total financial cost is **Rs. 11424 million** (including 25% extra for contingencies) at 2013 price which has been spread in 2.0 financial years from 2014 to 2015 and thereafter yearly maintenance cost will occur up to 2033.

The costs as well as benefits have been spread over 20 years and cost-benefit streams have been formulated at the current year price. Both the streams of cost as well as benefits have been discounted at the rate of **12%** per annum and aggregates are calculated indicating **Net Present Value** and **Internal Rate of Return** of the project.

The total net present cost of the project is **Rs. 11424 million** where net present benefits after adjusting for maintenance cost and toll operating cost are **Rs. 584 million** indicating the **Net Present Value** of the project as **Rs. -10330 million**. The cost stream and benefits stream are used to drive the **Internal Rate of Return** (IRR) of the project with a maximum VGF of 40% indicated the Negative **FIRR**.

9.12   CONCLUSION

As per financial analysis, the **Net Present Value (NPV)** of the project is **Rs. -10330 millions** and FIRR is negative even at **Maximum VGF of 40%**.

So it ensures that the project implementation is financially unviable and should be taken on TOD basis as it will improve the socio-economic condition of the area.