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8 ECONOMIC AND FINACIAL ANALYSIS

8.1 ECONOMIC ANALYSIS

8.1.1 Investment Appraisal

The objective of the cost benefit economic analysis is to identify and quantify the benefits and costs associated with the project (Kohima to Jessami/Nagaland Border) Highway from Km 7.880 to Km 128.970, in order to select the optimum solution along with the economic viability in terms of its likely investment return potential.

This cost benefit economic feasibility study is carried out using the overall guidelines stipulated by the Indian Roads Congress (IRC) and the World Bank in their manuals like Economic Evaluation of Highway Projects in India (SP – 30, 2009) and, Manual for Road Investment Decision Model' (SP – 38,1992) and Manual for HDM - 4 Version 2, as these are accepted by the World Bank, Ministry of Road Transport & Highways (MORT&H), National Highways Authority of India (NHAI).

The cost – benefit analysis is carried out by using the Discounted Cash Flow (DCF) technique to obtain the Economic Internal Rate of Return (EIRR) and Economic Net Present Value (ENPV) for the proposed investments linked with the project. This is followed by a 'sensitivity analysis' carried out by increasing or decreasing the critical factors affecting the cost and benefit streams of the proposed project, in order to ascertain their effect on the economic feasibility indicators i.e. ENPV, EIRR.

8.1.2 "Without Project" Alternative

Strategy 1: In the HDM model analysis, this "Do Minimum Scenario" alternative will form the base strategy against which all other strategies will be compared. The proposed road Kohima to Jessami catering the present traffic has been considered as base case.

8.1.3 "With Project" Alternative

Strategy 2: Construction of Two Lane Highway from Kohima to Jessame.

This strategy forms a 'With Project' alternative and is compared to 'Without Project' alternative. By comparing the above alternatives, the net agency costs and net user costs and finally net project benefits, associated with the project during its analysis period are calculated, for the improvement option in order to arrive at Economic Internal Rate of Return (EIRR) and Economic Net Present Value (ENPV).

8.1.4 HDM Model Input Data

8.1.4.1 General

The following general input values have been considered for the HDM Model as presented in tables given below:

Table 8-1: General Inputs for HDM Model

Model Description:	
Run Date	24-12-18
Discount Rate (%)	12%
Analysis Period (years)	30
Calendar Year of Initial Year	2018
Length of Project	129.420 Km
Output Currency	Indian Rupees
Input Currency	Indian Rupees

Table 8-2 : HDM Input - Road Sections – Basic data

ID	Name	Speed Flow Type	Road Class	Climate Zone	Surface Class	Length (km)	Carriageway Width (m)	Shoulder Width (m)	MT
A-01	*From km 7.880 to km 30.600*	Single Lane	Primary	Sub tropical	Bituminous	22.72	3.50	0.50	271
A-02	*From km 30.600 to km 68.000*	Single Lane	Primary	Sub tropical	Bituminous	37.40	3.50	0.50	240
A-03	*From km 67.000 to km 131.894*	Single Lane	Primary	Sub tropical	Bituminous	64.25	3.50	0.50	194

Table 8-3 : Road Sections – Condition of Project Road

ID	Condition Year	Roughness IRI	Total Cracking	Ravelled Area (%)	Potholes	Edge Break	Rut
		Area (%) ACRA	ARV	(no./km)	(m²/km)	Depth (mm)	(m/km)
A-01	2015	8	30	40	12	40	1.0
A-02	2015	8	25	35	10	50	1.0
A-03	2015	6	20	30	8	40	1.0

Table 8-4 : HDM Input: Road Sections- Geometry of Project Road

ID	Speed Flow Type	Rise Fall (m/km)	Curvature Deg/km	Horizontal Super elevation (%)	Speed Limit (kmph)
A-01	Single Lane	10.00	200	3.0	20
A-02	Single Lane	15.00	250	3.0	20
A-03	Two Lane	20.00	300	3.0	30

Table 8-5 : HDM Input: Road Sections – Pavement Condition of Project Road

Material Type	Current Surface Thickness (mm)	Previous Surface Thickness (mm)	Last Re-Construction / New Construction Year	Last Rehabilitation Year	Base Thickness (mm)
Asphalt Concrete (AC)	30	100	1970	2012	250

8.1.4.2 Traffic

The assignable traffic likely to use the proposed project road has already been discussed in Traffic Chapter of this report. For the economic analysis, fast moving motorised traffic excluding two wheelers and non-motorised vehicles has been considered. The AADT of the two sections of the alternate route has been taken in the analysis.

8.1.4.3 Growth Rate

Traffic growth rates necessary to estimate traffic levels in future on project road are products of economic factors of the influence area and elasticity of traffic demand. Normal – most likely growth scenario has been considered for economic analysis presented in the table below**:**

Table 8-6 : Most likely Growth Scenario (in %)

Vehicle type	2017-21	2022-26	2027-31	Beyond 2031
Car	4.40	3.97	3.58	3.23
Two Wheelers	5.76	5.20	4.69	4.23
Bus	4.84	4.37	3.94	3.56
LCV	11.72	10.20	9.12	8.20
2AT	6.62	5.80	4.96	4.16
3Axle	5.00	5.00	5.00	5.00
MAV	5.00	5.00	5.00	5.00

8.1.5 Project Cost

8.1.5.1 Capital Cost

The capital costs of the new construction of the project road including the phasing of investment during the construction period have been calculated. The total capital costs (including road works, bridges, culverts and utilities, land acquisition, resettlement and rehabilitation, environment cost, utility shifting, quality and project development charges) at current prices with contingency costs for road works and structures have been considered.

The capital costs (financial) of the project road have been converted into economic costs by using a standard conversion factor of 0.90, to construction costs (road works and structures). The economic cost of land acquisition, R & R, environment coat and utility shifting has been taken as the same as financial cost, without resorting to shadow pricing or assessing opportunity cost in any other alternative. The project costs considered for flexible pavement (Perpetual), over the construction period, is shown in the table given below:

Table 8-7 : Project Cost Taken in Analysis (In Crs.)

Type of Pavement	Civil Cost with Centages	LA and R&R Cost	Envn. Cost (3% of Civil Cost)	Utility Cost (1% of Civil Cost)	Financial Cost	Economic Cost	Economic Cost per Km
Flexible	1498.84	349.42	6.91	5.86	1861.04	1711.15	14.08

Table 8-8 : Cost Phasing (%)

Year	FY 2019	FY 2020	FY 2021
Cost Phasing	30	40	30

8.1.6 Routine and Period Maintenance

The various maintenance costs have been divided into two parts: routine and periodic maintenance. The salient features and construction policy for the both types of are mentioned below. Routine and Periodic maintenance has been taken as given in table below.

Table 8-9 : Annual operation and Maintenance Cost

Maintenance Type	Lane	Flexible Pavement (in INR Cr/km/annum) in FY 2023
Routine Maintenance	Single Lane	0.02
	Two Lane	0.04
Periodic Maintenance	Single Lane	0.20
	Two Lane	0.38

Other maintenance: additional operational expenses associated with project such as traffic signposts, lighting etc., are considered as annual charges and included in routine maintenance costs. For annual supervision & administration charges, it has been assumed that the arrangement under 'without project' will continue for the 'with project' situation.

8.1.7 Road Users Cost

The economic cost inputs that are required for estimating road user costs are:

- Price of selected (popular) models, by vehicle type
- Tyre prices
- Fuel cost including oil
- Crew cost (wages of drivers / assistants)
- Time costs for :
  - Passengers
  - Freight (holding cost)

The cost of vehicles and tyres were collected from the manufacturers, and dealers. All the transfer payments such as sales tax, excise duty and octroi are deducted from the financial

cost to arrive at the resource cost.

A pilot survey has been conducted to estimate the wages of drivers and their assistants. The crew cost is estimated with 2400 hours of work time per annum. With respect to maintenance and labour costs, local workshops have been contacted to assess the annual wage bill and assuming 2400 hrs of work per annum, the labour costs have been calculated per hour.

The value of passenger time has been calculated based on the average annual income of passenger collected with the assumption of 2400 hours of work time per annum. About 30 percent of the trips are assumed to be made during non-work hours. Finally, a weighted average of time value per hour has been calculated. Time saving values applicable to 1990 (IRC SP: 30 - 1993) have been adopted. Based on the above considerations, the economic costs estimated for different VOC components are presented in table below:

Table 8-10 : Vehicle Characteristics, Utilization Data and Economic Unit Costs

Basic Characteristics	**Car (NT)**	**2-Wheelers**	**Mini Bus**	**Bus**	**LCV**	**2-Truck**	**3-Truck**	**MA-Truck**
A. Vehicle Characteristics								
Gross Vehicle Weight (t)	1.5	0.4	5.0	10	5.0	15.7	20	30
ESAL Factor Per Vehicle	0	0	1.00	1.0	4.50	4.50	4.50	4.50
Number of Axles	2	2	2	2	2	2	3	4
Number of Tyres	4	2	4	6	4	6	10	14
Number of Passengers	3	1	20	40	0	0	0	0
B. Vehicle Utilization Data								
Service Life (Yr.)	10	10	10	10	10	10	10	10
Hours Driven per Yr.	1400	1200	2000	2200	2000	2200	2400	2000
Km Drive per Yr.	50000	22000	50000	65000	75000	80000	85000	85000
Annual Interest Rate (%)	12	12	12	12	12	12	12	12
C. Economic Unit Costs								
New Vehicle Price (Rs.)	419255	41700	650000	1314530	1114860	1374790	2239270	2562740
New Tire Price (Rs.)	1251	1000	4373	20000	4373	20000	20000	20000
Maintenance Labour (Rs./hr.)	60	60	60	60	60	40	40	40
Crew Cost (Rs./crew-hr.)	0	0	100	150	80	100	100	100

Basic Characteristics	**Car (NT)**	**2-Wheelers**	**Mini Bus**	**Bus**	**LCV**	**2-Truck**	**3-Truck**	**MA-Truck**
Passenger Time (Rs./pa-hr.)	100	60	60	50	0	0	0	0
Cargo Time (Rs./veh-hr.)	0	0	0	0	60	100	60	120
Petrol Price (Rs./ kg.)	45							
Diesel Price (Rs./lt.)	40							
Lubricants Price (Rs./kg.)	200							

8.1.8 Economic Evaluation

8.1.8.1 Economic Cost

The life cycle economic benefits and costs, ENPV and EIRR are calculated considering:

- VOC savings as a project benefit and
- With all savings (VOC and Travel time) as a project benefit.
- Agency capital costs
- Agency recurrent costs

Economic analysis of the project road has been carried out and the summary of findings is attached in table below:

Table 8-11 : Summary of Base Case (NPV and EIRR) of Project Road

Details	**EIRR (%)**	**NPV Discounted 12 % Discount Rate (Rs. million)**
Base Case	-1.50%	-12775.31

8.1.9 Project Sensitivity

Sensitivity analysis carried out for the project road analysis option using the following scenarios:

- Base Costs and Base Benefits
- Base Costs plus 15% and Base Benefits – Case I
- Base Costs and Base Benefits minus 15% – Case II
- Base Costs plus 15% and Base Benefits minus 15%- Case III

The project road is economically not viable and hence sensitivity analysis is not required.

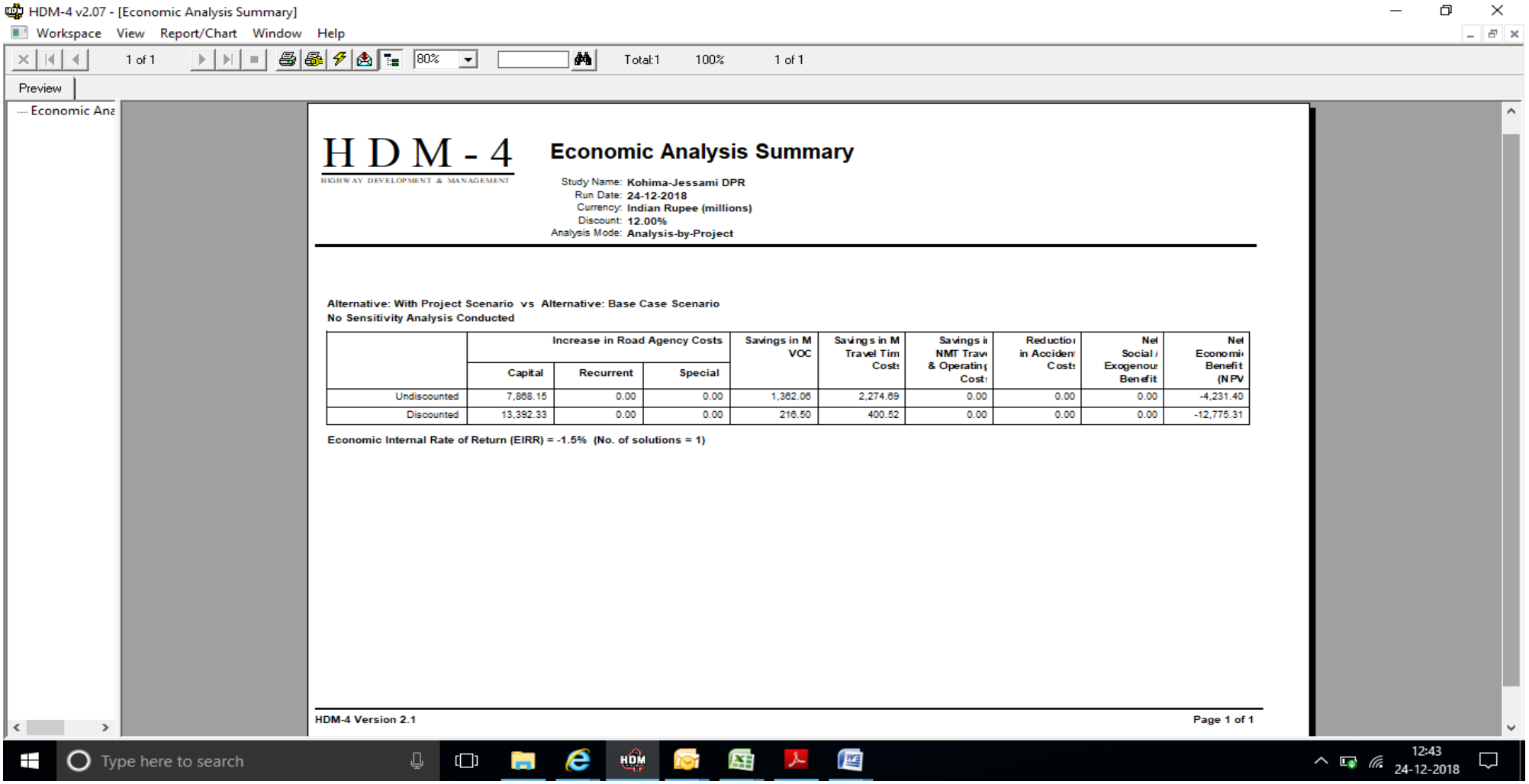
8.1.10 Project Viability

The economic internal rate obtained was return is negative due to the very less traffic on the project road. Further, the project road falls under the hilly terrain and hence the project cost

is also on considerably higher side. Hence, savings are on lower side comparatively the cost of the project. But considering the project location, the development of the project road will be useful for people along the project road and also within the Project Influence Area.

Therefore, to facilitate faster future developments within the Project Influence Area and from strategic point of view (connevtivity to Manipur), the development of the existing Project Highway to Two Lane with hard Shoulders could be undertaken on EPC mode on priority.

The HDM output sheets are shown in figures below: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HIGHWAY DEVELOPMENT & MANAGEMENT
Economic Analysis Summary
Study Name: Kohima-Jessami DPR
Run Date: 24-12-2018
Currency: Indian Rupee (millions)
Discount: 12.00%
Analysis Mode: Analysis-by-Project
Alternative: With Project Scenario vs Alternative: Base Case Scenario
No Sensitivity Analysis Conducted
Increase in Road Agency Costs
Capital
Recurrent
Special
Savings in M VOC
Savings in M Travel Tim Costs
Savings i NMT Trav & Operatin Cost
Reductio in Acciden Costs
Nel Social / Exogenou Benefit
Nel Economi Benefit (NPV
Undiscounted 7,868.15 0.00 0.00 1,362.06 2,274.69 0.00 0.00 0.00 -4,231.40
Discounted 13,392.33 0.00 0.00 216.50 400.52 0.00 0.00 0.00 -12,775.31
Economic Internal Rate of Return (EIRR) = -1.5% (No. of solutions = 1)
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8.2 Financial Analysis

8.2.1 Introduction

The purpose of financial analysis is to optimize the project from the perspective of its financial feasibility as a PPP project considering the cost of developing the project and the expected revenue stream over a period of time. It also includes study of different scenarios from the Concessionaire's perspective and to assess whether the Concessionaire gets a reasonable return on his equity.

The analysis builds on several important elements:

- The technical options developed in the preceding sections of this report.
- The traffic and toll rate forecast developed in the preceding sections of this report.
- Assumptions (Debt Financing, Taxation, O&M Estimates, etc.) as shown in the coming sections.

Discounted Cash Flow (DCF) method has been used in financial analysis. The cost of equity ranges from 12% to 18% based on sector of the project[1].The analysis has been carried out to assess the viability of the project based on threshold Equity IRR of 15% which is also in line with NHAI Circular[2]

The capital cost of the project packages for financial analysis comprising of cost of civil works for roads, culverts, bridges, road furniture etc. The cost of land acquisition, utility shifting, environmental management, resettlement and rehabilitation etc. is not included in the financial analysis as per the prevailing norms of PPP Projects.

8.2.2 Concept and Methodology

Discounted Cash Flow (DCF)
Discounted Cash Flow (DCF) Analysis is a method of valuing a project, company, or asset using the concepts of the time value of money. All future cash flows are estimated and discounted to give their present values (PVs) – the sum of all future cash flows, both incoming and outgoing, is the net present value (NPV), which is taken as the value or price of the cash flows in question. DCF analysis is the most widely accepted valuation method in the fields of investment finance, real estate development, and corporate financial management.

Internal Rate of Return (IRR)
The Internal Rate of Return is related to the NPV but it is expressed as a percentage. The IRR is that rate of return at which the NPV from the investments will become zero. It should be compared with the investor's required rate of return.

- If **IRR = the desired rate of return:** means the project repays original investment + the desired rate of return.

[1]*Survey by EY, India's Cost of Capital*
[2]*Appraisal of PPP Projects – Standardize the formulation and appraisal parameters – NH37012/09/2009-H*

- If **IRR > the desired rate of return:** means the project repays original investment + a better return as compared to the desired rate of return.
- If **IRR < the desired rate of return:** means a worse return as compared to the required rate.

If the IRR is higher than the required rate of return of the investor, it means the project is attractive to that investor (since the project offers a higher return). If the IRR is lower than the required rate of return of the investor, it means that the investor would not be interested in pursuing the project.

Project-IRR and Equity-IRR

Project IRR = Rate of Returns to all Investors (has to be compared with the Weighted Average Cost of Capital). IRR of the post-tax discounted project cash flows (Project IRR) is considered as basic indicator of financial feasibility of a project, which indicates whether the project is capable enough to ensure a return equivalent to the weighted average cost of capital. The surplus and deficit in the Project IRR as compared with the weighted average cost of capital directs a "Go" or "No Go" decision for the project respectively.

Equity IRR = Rate of Returns to Equity holders (Has to be compared with the rate of return required by the investor on its equity). IRR of the post-tax discounted equity cash flows (Equity IRR) is considered as indicator of surplus generated from project, which indicates whether the project is capable enough generate surplus after ensuring desired return on the Concessionaire's equity. This indicates whether the project is attractive enough for the private sector investors.

Decision Rule for Project Viability (P-IRR and E-IRR)

Two of the most important decision rules for project viability are:

- Project IRR should be greater than the weighted average cost of capital
- Equity IRR should be greater than 15% (assumed desired rate of return for investors)

8.2.3 Financing Mechanism

The section presents the project structuring options based on consultant's experience for similar projects

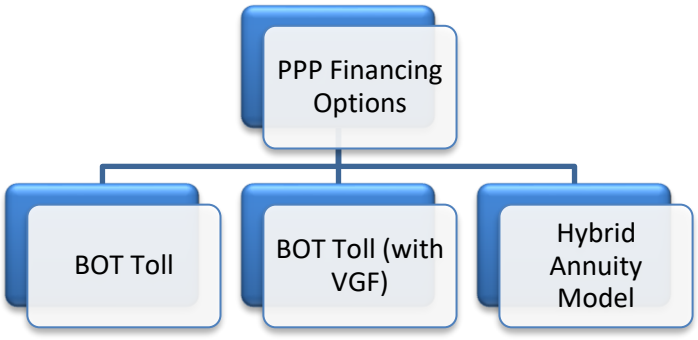

Figure 8-1: PPP Financing Options

Option 1: BOT Toll

Build-Operate-Transfer Toll (BOT Toll) model allows the developer to design, build and operate the highway and recover its equity through collection of toll. The toll rates are pre-

defined as part of the Concession Agreement (CA). The developer will be allowed to collect the toll for a pre-defined period as part of the CA.

Option 2: BOT (with VGF)

In case where the project revenues aren't enough for the Concessionaire to recover its equity, highway project becomes unviable on BOT Toll model. The project sponsor (the Government/ Authority) provides a grant called the Viable Gap Funding (VGF) to meet a part of the construction costs. The Viability Gap Funding Scheme of the Government of India for Financial Support to Public Private Partnerships in Infrastructure, provides financial support of up to 40% of the Total Project Cost in the form of grant (one time or deferred) to infrastructure projects undertaken through public private partnerships with a view to making them commercially viable.[3]

Option 3: Hybrid Annuity Model (HAM)

Another model for the proposed project is the Hybrid Annuity Model, which is being used heavily in financing highway projects. HAM is a mix of the EPC (engineering, procurement and construction) and BOT (build, operate, transfer) Annuity Model. As per the model, the government will contribute to 40% of the project cost in five equal instalments linked to milestones. The balance 60 per cent is arranged by the developer.

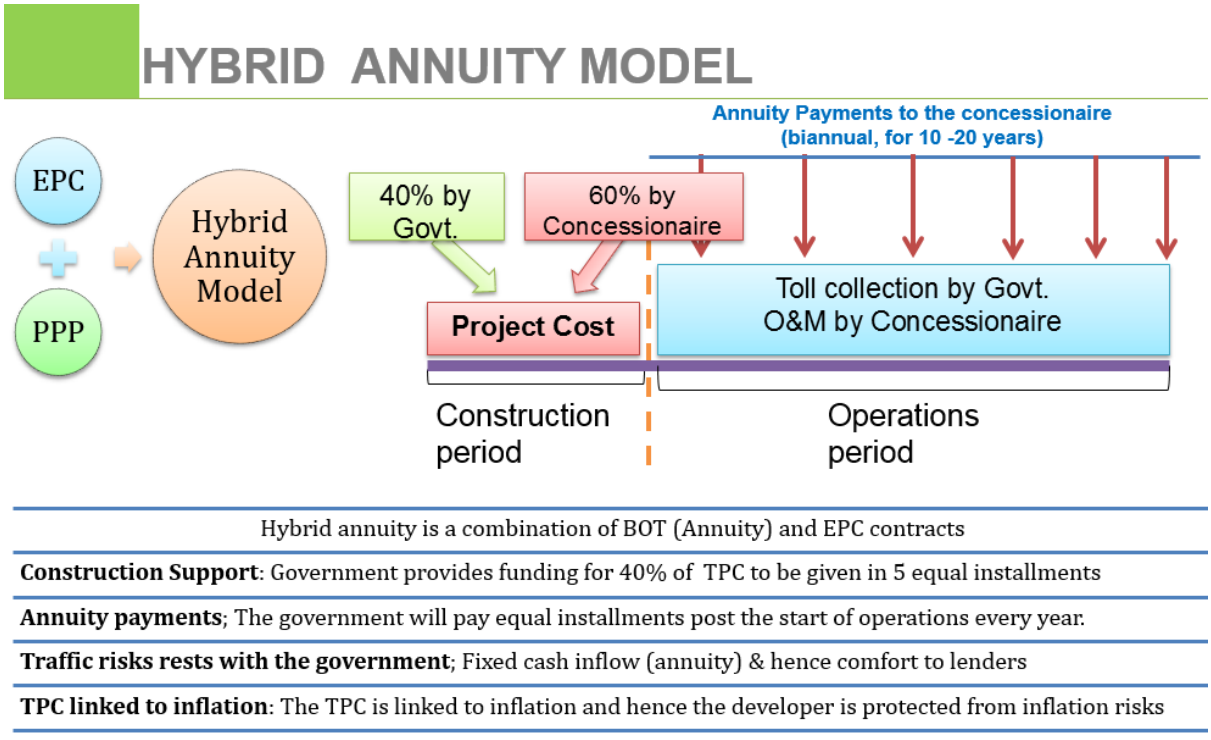

Figure 8-2: Hybrid Annuity Model (HAM)

8.2.4 Highway Sections & Capacity Analysis

The Project Highway passes through mountainous and steep terrain. Based on physical characteristics and major junctions within the stretch and considering the above mentioned traffic generation/diversion points, the project highway is divided into three homogeneous

[3]https://www.pppinindia.gov.in/faqs#q5

sections for the purpose of analysis and presentation of traffic and travel characteristics. The details are as following:

Table 8-12: Homogeneous Traffic Section

Sl. No.	Section from		Section to		Length (km)
	Place	Chainage	Place	Chainage	
I	End of Kohima Bypass	km 7.880	Chakhabama	km 30.600	22.720
II	Chakhabama	km 30.600	Pfutsero	km 68.000	37.400
III	Pfutsero	km 68.000	Jessami	km 128.970	60.970

Capacity and design service volumes for various lane configurations are specified in IRC: 64 – 1990, 'Capacity of Roads in Rural Areas', IRC-SP: 73-2015 'Manual of Specifications and Standards for Two-laning of Highways with paved shoulders'. The project highway passes through hill terrain predominantly. The design service volume standards for LoS B and LoS C considered as per guidelines are given in table below.

Table 8-13: Design service volume standards

Road	Shoulder Type	Plain Terrain	Rolling Terrain	Hilly Terrain
Single Lane	Earthen shoulders	2000	1800	1600
Intermediate lane	Earthen shoulders	6000	5700	5200
2 Lane	Earthen shoulders	15000	11000	7000
	Paved shoulders	18000	13000	9000

The traffic projections on the project highway do not demand for the 2-laning in the near future.

8.2.5 Civil Cost

The base civil construction costfor the project inclusive of all applicable taxes, has been assessed as following:

Sl. No.	Option Description	Civil Cost (INR Cr)
1	2 Lane with Hard Shoulder	1280.86

8.2.6 Assumptions for Financial Analysis

Phasing of Capital Expenditure

It has been assumed that the Highway shall be constructed in a period of 36 months (3 years). The consultants have assumed the dates for various milestone activities as provided in the following table:

Table 8-14: Implementation Schedule

Milestone Activity	Assumed Date	FY
Agreement Signing Date	16-05-2019	2020
Appointed Date[4]	11-11-2019	2020
End of Construction	10-11-2022	2023

The phasing of Capital Expenditure (CAPEX) is assumed to be equally distributed over the 36 months in the following fashion:

Table 8-15: CAPEX Phasing

	FY 2020	**FY 2021**	**FY 2022**
Construction Phasing	15%	50%	35%

Capital Structure, Cost of Capital and Financing

Financing of BOT projects is typically done through a combination of debt and equity. The typical Debt-Equity ratio for infrastructure projects in India is 70: 30 and the same has been considered for the analysis. The cost of debt has been assumed to be 10% (based on the current MCLR of various Indian banks) and the cost of equity as 15% (as per Industry practice).

Table 8-16: Capital Structure and Cost of Capital

	Proportion	**Cost**
Debt	70%	10%
Equity	30%	15%

Depreciation

Large infrastructure capital projects are depreciated over its usable life. Following depreciation rates have been used for the purpose of financial analysis:

Table 8-17: Depreciation rules

Depreciation	
As per Companies Act	Straight line method: Depreciated over the O&M Period
As per Income Tax Act	10% (WDV method)

Taxation

The applicable tax has been applied for financial analysis:

Table 8-18: Tax Rates

	Corporate Tax Rate	MAT Rate
Base	30.00%	18.50%

[4]180 days for financial closure

	Corporate Tax Rate	MAT Rate
Surcharge	12.00%	12.00%
Total (Base +Surcharge)	33.60%	20.72%
Education Cess	3.00%	3.00%
Net Tax Rate	**34.61%**	**21.34%**

8.2.7 Total Project Cost (TPC)

Further, the following costs have been taken into consideration to arrive at the Total Project Cost (TPC) as per the NHAI Circular[5] "Updating the cost norms in respect of National Highways Projects":

- Contingency Expenses:
- Financing and Documentation Cost
- Pre-operative expense:
- Escalation Cost
- Interest During Construction (IDC)

8.2.8 Operation and Maintenance (O&M) Estimates

The Operation &Maintenance Cost have been assumed for the Highway as following:

Table 8-19: O&M Assumptions - I

Cost Head	**Assumption**	
Routine Maintenance Cost	***Configuration***	***(in INR Cr/km/annum)***
	2 lane	0.025
Major Maintenance Cost	0.25	

**These assumptions are taken from the Ministry of Road transport & Highways letter no. RW/NH/-37011/02/2010/PPP (Vol.II) on "Standard Parameters for financial analysis of BOT (Toll) and BOT (Annuity) projects". These numbers were further escalated at a rate of 5% per annum to factor inflation.*

Table 8-20: O&M Assumptions - II

Other Operational Expenditures	**Assumption (2018-19 prices)**	**Precedence**
Electricity and Patrolling Expenses (INR Cr/ km/ annum)	0.02	Consultant's experience from due diligence of similar highway assets
Toll Plaza Maintenance (INR Cr/ toll plaza/ annum)	1.65	Consultant's experience from due diligence of similar highway assets
Insurance Expenses (as a % of TPC/ annum)	0.10%	Consultant's experience from due diligence of similar highway assets

[5] *RW/NH-24036/27/2010-PPP dated 10th Aug 2016*

8.2.9 Toll Revenues

Location of Toll Plazas

The Project Highway is divided into two sections for toll revenue estimation purpose. First toll plaza is proposed near km 13.000 for first section from km 7.880 to km 75.000 and second toll plaza is proposed near km 85.000 for section from km 75.000 to km 128.970 after considering the guidelines for locating toll plazas and optimization of toll revenue. Table below depicts the locations of toll plazas and tollable length.

Table 8-21: Location of Toll Plazas and Tollable Lengths

Toll plaza Number	Proposed Chainage	Village / Location	Tollable Section	Tollable length (km)	Tollable PCUs
TP-1	km 13.000	Near Chidema	km 7.880 to km 75.000	**67.120**	331
TP-2	km 85.000	Near Pfutsero	km 75.000 to km 128.970	**53.970**	246

Location of Toll Plazas

The toll revenue (based on most likely traffic scenario) consideredfor the purpose of financial analysis in provided in the table below:

Table 8-22: Toll Revenue Projections (in INR Crores)[6]

Year		Revenue from TP-1	Revenue from TP-2	Total Toll Revenue
Apr-22	Mar-23	1.11	0.70	**1.81**
Apr-23	Mar-24	1.20	0.77	**1.97**
Apr-24	Mar-25	1.34	0.86	**2.20**
Apr-25	Mar-26	1.50	0.95	**2.45**
Apr-26	Mar-27	1.66	1.07	**2.73**
Apr-27	Mar-28	1.81	1.18	**2.99**
Apr-28	Mar-29	2.02	1.31	**3.33**
Apr-29	Mar-30	2.20	1.44	**3.64**
Apr-30	Mar-31	2.44	1.60	**4.05**
Apr-31	Mar-32	2.69	1.77	**4.46**
Apr-32	Mar-33	2.98	1.95	**4.93**
Apr-33	Mar-34	3.28	2.16	**5.43**
Apr-34	Mar-35	3.61	2.37	**5.98**
Apr-35	Mar-36	3.98	2.63	**6.61**

[6]*Feedback Analysis*

Year		**Revenue from TP-1**	**Revenue from TP-2**	**Total Toll Revenue**
Apr-36	Mar-37	4.36	2.92	**7.27**
Apr-37	Mar-38	4.82	3.21	**8.03**
Apr-38	Mar-39	5.28	3.56	**8.84**
Apr-39	Mar-40	5.88	3.95	**9.83**
Apr-40	Mar-41	6.45	4.36	**10.81**
Apr-41	Mar-42	7.10	4.83	**11.93**
Apr-42	Mar-43	7.92	5.33	**13.26**
Apr-43	Mar-44	8.79	5.91	**14.70**
Apr-44	Mar-45	9.63	6.56	**16.19**
Apr-45	Mar-46	10.69	7.35	**18.04**
Apr-46	Mar-47	11.86	8.16	**20.03**
Apr-47	Mar-48	13.18	9.08	**22.26**
Apr-48	Mar-49	14.54	10.11	**24.65**
Apr-49	Mar-50	16.23	11.22	**27.46**

8.2.10 Summary of Financial Analysis Results for BOT Toll Model

Table 8-23: Financial Analysis BOT Summary

	Option 1A	**Option 1B (with 40% VGF)**
Project Description	2 Lane with Hard Shoulder	2 Lane with Hard Shoulder
Pavement Type	Flexible	Flexible
Construction period (months)	36	36
Civil Cost (2018-19 Prices) in INR Crore	1280.86	1280.86
Total Project Cost (TPC) in INR Crore	1603.37	1603.37
Concession period in years	30	30
VGF	0%	**40%**
Project IRR	Negative	Negative
Equity IRR	Negative	Negative
Average DSCR	Negative	Negative
Weighted Average Cost of Capital (WACC)	9.99%	6.00%
Conclusion	Not Viable	Not Viable

8.2.11 Recommendation

It is concluded based on result of financial analysis on BOT Toll mode (presented in table 1.12 above), the project is not achieving equity IRR of 15%, even after providing Viability Gap Funding of 40%, hence, as per NHAI Policy Matter Technical (161/2014) decision taken on file no. NHAI/CMC/Policy Issues/ 2014/1 dated on 24.07.2014, the consultant recommends to implement this project on EPC mode.

However, for the benefit of the client, we have undertaken financial analysis on Hybrid Annuity mode (HAM). The result of the same is provided in section below. Based on result of financial analysis on Hybrid Annuity Mode, the client may decide to implement project on Hybrid Annuity Mode instead of EPC, as deemed fit.

8.2.12 Hybrid Annuity Model

As an additional option, project was analyzed on Hybrid Annuity Model for PPP projects. Hence, the project financials have been worked out as per the Model Concession Agreement for PPP in Hybrid Annuity Projects issued in November 2015 by Government of India.

Key Assumptions

The main assumptions made for undertaking the financial analysis are as follows:

- **Civil Cost:** The EPC/civil cost of the project has been considered as 1280.86 Crores
- **Period of Analysis:** The construction period for the project has been assumed as 36months. Total concession period including construction period is considered as 18 years (3 Years Construction Period + 15 Years Operation Period)
- **Project Phasing:** The development phasing for the Project has been considered is given in following table:

Table 8-24: CAPEX Phasing

	FY 2020	**FY 2021**	**FY 2022**
Construction Phasing	15%	50%	35%

- **A Debt-Equity** ratio of 70:30 has been assumed.
- **An inflation factor** of 5% (and hence, price index multiple of $(1.05)^n$, where 'n' is number of years from appointed date, is considered. This factor is used to ascertain year on year escalation in O&M Costs*.
- **Bid variable** for the project is considered to be the **Bid Project Cost** and **O&M Cost** (for first year) as determined by various bidders at the time of bidding.
- 40% of **Bid Project Cost** as bid by the Concessionaire adjusted to price index multiple will be payable to the Concessionaire by the Authority in five equal instalments during construction period. Remaining 60% of the same will be payable over next 15 years of operation period along with applicable interest and O&M support.

- An interest component is considered to be payable to the concessionaire at the rate of Bank Rate **(6.75%) plus 3%** on outstanding balance of the Completion Cost after payment of annuity every six months till the end of concession period. Such interest amount is payable along with every biannual instalment of annuity payment as per the provisions of Model Concession Agreement.
- **Operation & Maintenance Cost, Depreciation, Taxation:**As assumed in the base case analysis, earlier.

Total Project Cost (TPC) Calculation

These assumptions taken as per MORT&H Circular dated 10thAugust 2016. The Total Project Cost is calculated in below table:

Table 8-25: HAM – TPC Calculation

Total Project Cost (TPC) Calculation		
1	Civil Construction cost	1280.86
2	Escalation	64.04
3	Contingency expenses @ 1% Total civil cost	12.81
4	**Total EPC cost (1+2+3)**	**1357.71**
5	IDC	83.85
6	IC/Pre-Operative Expenses	13.58
7	Financing Charges @1% of debt	5.41
8	Centages over EPC Cost (5+6+7)	**102.84**
	Estimated Project Cost (4+8)	**1460.55**

The Bidding parameter consists of two parameters:

a. Bid Project Cost (BPC) and
b. O &M payment for the 1st year

Bids would be evaluated on the basis of the lowest assessed Bid Price (the "Bid Price"). The Bid Price shall be summation of (a) Net Present Value (NPV) of Bid Project Cost during the Concession Period and (b) NPV of O&M cost (the "O&M Cost") during the O&M Period, required by a Bidder for implementing the Project and shall be paid as per the provisions of Article 23 of the Concession Agreement. For a project to be financially viable the Equity IRR should be a minimum of 15%.

Conclusion

To achieve a target IRR of 15%, following is the optimal combination of Bid Project Cost and First Year O&M Quote:

Table 8-26: HAM Financial Analysis Results

HAM Financial		
Bid Project Cost	1652.73	INR Cr
First year O&M Cost	11.24	INR Cr
NPV of (Bid Project Cost + First Year O&M Cost)	1481.70	INR Cr

E-IRR	15.00	%
P-IRR	11.19	%

**The results are obtained after carrying out simulations (varying the bid project cost and the first year O&M quote. It may be noted that any variation in the above mentioned assumptions or the structure of the project, the results may vary significantly). The O&M Cost has been fixed so as to match the profile of O&M expenditures over the year.*

The Bidding Variables have been set as following in order to achieve the same. Simulations have been carried out in order to achieve the minimum NPV of Bid Project Cost and O&M Cost. A bidder can play with the above two parameters and still get the same NPV.

Table 8-27 : Profit & Loss Statement – HAM Case

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Revenue	**62.52**	**128.99**	**133.86**	**139.85**	**145.73**	**151.29**	**157.18**	**162.24**	**168.79**	**175.33**	**182.82**	**191.58**	**201.86**	**214.05**	**228.97**
Annuity	1.84	7.54	12.69	19.49	26.84	34.57	43.39	52.22	63.43	75.75	90.28	107.56	128.16	152.79	182.76
Interest	53.85	107.28	106.29	104.74	102.48	99.49	95.69	91.03	85.41	78.64	70.55	60.93	49.46	35.79	19.48
O&M Payments	6.83	14.17	14.88	15.62	16.41	17.23	18.09	18.99	19.94	20.94	21.99	23.09	24.25	25.46	26.73
Operating Expenses	**14.3**	**20.4**	**20.8**	**21.2**	**21.7**	**24.7**	**25.2**	**25.7**	**26.3**	**26.8**	**30.7**	**31.4**	**32.1**	**32.8**	**33.6**
Routine	1.7	3.8	4.0	4.2	4.4	4.6	4.9	5.1	5.4	5.6	5.9	6.2	6.5	6.8	7.2
MMR Cost	9.3	9.3	9.3	9.3	9.3	11.8	11.8	11.8	11.8	11.8	15.1	15.1	15.1	15.1	15.1
Other (Lighting, insurance, misc.)	3.3	7.4	7.6	7.8	8.0	8.3	8.5	8.8	9.1	9.4	9.7	10.1	10.5	10.9	11.3
PBITDA	**48.25**	**108.55**	**113.04**	**118.62**	**124.06**	**126.60**	**132.00**	**136.55**	**142.54**	**148.50**	**152.11**	**160.21**	**169.80**	**181.25**	**195.41**
less Book Amortization amount	46.66	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19	100.19
PBIT	**1.59**	**8.37**	**12.85**	**18.43**	**23.87**	**26.41**	**31.81**	**36.36**	**42.35**	**48.31**	**51.92**	**60.03**	**69.62**	**81.07**	**95.22**
less Interest on Senior Loan	25.16	53.32	47.58	41.02	34.45	27.89	21.33	14.77	8.20	1.85	(0.00)	0.00	0.00	0.00	0.00
PBT	**(23.57)**	**(44.95)**	**(34.73)**	**(22.58)**	**(10.58)**	**(1.48)**	**10.48**	**21.59**	**34.15**	**46.46**	**51.92**	**60.02**	**69.62**	**81.07**	**95.22**
less Taxes	0.00	0.00	0.00	0.00	0.00	0.00	2.24	4.61	7.29	10.37	27.86	31.80	36.00	40.60	45.85
PAT	(23.57)	(44.95)	(34.73)	(22.58)	(10.58)	(1.48)	8.25	16.99	26.86	36.09	24.06	28.23	33.61	40.46	49.37

Construction Support, Annuity, Interest and O&M Payments

Table 8-28: HAM Pay-out – Construction Support

Payment milestone	Price index	Construction support
1st	213	140.5
2nd	218	143.8
3rd	223	147.1
4th	226	149.6
5th	230	152.1
Total		733.1

**all figures in INR Cr*

Table 8-29: HAM Year-wise Pay-outs – Annuity, Interest and O&M

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Annuity	1.84	7.54	12.69	19.49	26.84	34.57	43.39	52.22	63.43	75.75	90.28	107.56	128.16	152.79	182.76
Interest	53.85	107.28	106.29	104.74	102.48	99.49	95.69	91.03	85.41	78.64	70.55	60.93	49.46	35.79	19.48
O&M	6.83	14.17	14.88	15.62	16.41	17.23	18.09	18.99	19.94	20.94	21.99	23.09	24.25	25.46	26.73
Total	62.52	128.99	133.86	139.85	145.73	151.29	157.18	162.24	168.79	175.33	182.82	191.58	201.86	214.05	228.97

**all figures in INR Cr*

Table 8-30: Summary of all payments in HAM

HAM Pay-outs - Summary	
Construction Support	733.10
Annuity	1103.20
Interest	1163.76
O&M Payments	298.50
Sum Total	**3298.56**

**all figures in INR Cr*