

HIGHWAYS AUTHORITY OF INDIA, MORADABAD

Aligarh-Moradabad Section of NH-93

Km 85.700 to Km 232.000

COST BENEFIT ANALYSIS

Annexure-VI (a)&(b)

A. PARAMETERS FOR EVALUATION OF LOSS OF FORESTS

Sl. No.	Parameters	Description
1.	Loss of value of timber, fuel wood and minor forest produce on annual basis, including loss of man hours per annum of people who diverted livelihood and wages from the harvest of their commodities.	Total 4542 trees will be affected due to the proposed project. Approximate timber & fuel value of these trees will be Rs. 2.39 Crores .
2.	Loss of animal husbandry productivity including loss of fodder.	There is no loss of animal husbandry in the proposed forest land.
3.	Cost of human resettlement.	There will be no human resettlement in the protected forest land.
4.	Loss of public facilities and administration infrastructures (roads, building, schools, dispensaries, electric lines, railways, etc.) on forest land of which would require forest land if these facilities were diverted due to the project.	No public facilities and administration infrastructures will be diverted on forest land due to project.
5.	Environmental losses to soil erosion, effect on hydrological cycle, wildlife habitat, micro climate upsetting of ecological balance.	Environment Loss Environmental value of 1 hectare of forest land with density 1.0 is estimated to be = 126.74 Lakh. Aligarh Division Density of forest area to be diverted = 0.3, value per hectare = Rs. 38.022 Lakhs Forest area for diversion = 7.4226 ha Total Loss = 2.82 Crores Bulandshahar Division Density of forest area to be diverted = 0.2, value per hectare = Rs. 25.348 Lakhs Forest area for diversion = 3.5760 ha Total Loss = 90.644 Lakhs Sambhal Division Density of forest area to be diverted = 0.2, value per hectare = Rs. 25.348 Lakhs Forest area for diversion = 32.7792 ha Total Loss = 8.31 Crores

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		Moradabad Division Density of forest area to be diverted = 0.2, value per hectare = Rs. 25.348 Lakhs Forest area for diversion = 14.4852 ha Total Loss = 3.67 Crores
6.	Suffering to ousters	Nil

1. Loss of value of timber, fuel wood:- **Rs. 2.39Crores**
2. Total Environment & Forest Loss:-**Rs.15.71Crores**
3. Project Cost (including Capital Cost & Cost of recurrent works): **Rs.415.06Crores** (As per enclosed **Annexure-D**)

Total Cost: Rs. 433.16Crores


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B. PARAMETERS FOR EVALUATION OF BENEFIT, NOTWITHSTANDING LOSS OF FORESTS

Sl. No.	Parameters	Roads, Transmission Lines & Railway Lines
1.	Increase in productivity attributable to the specific project	<p>Due to Up-gradation of the existing road there will be overall development of the project area and increase in productivity in terms of time saving due to improved road facility. Same is quantified/calculated using software HDM (calculation sheet is enclosed as Annexure-D). Quantified amount is given below:</p> <p>Motorized Vehicle Time Saving:- Rs.394.18 Crores</p> <p>Non-Motorized VOC & Time Saving:- Rs.6.82 Crores</p> <p>Total:- Rs.401.00 Crores</p>
2.	Benefits to economy	Savings in Motorized Vehicle Operating Cost = Rs.317.25 Crores
3.	No. of population benefited	Population of the surrounding districts e.g. Aligarh (36,73,889), Bulandshahr (34,99,171), Sambhal (2,20,813) and Moradabad (47,72,006) will be benefited. Hence, total nos. 1,21,65,879 population will be benefited due to the project.
4.	Employment potential	<p>With improvement in economy, more generation of employment opportunities.</p> <p>500 Permanent / Regular Employment (Number of persons) and 200000 Temporary Employment (Number of man-days) shall be employed during construction period for a period of 2 and half years.</p>
5.	Cost of acquisition of facility on non-forest land wherever feasible	Nil
6.	Loss of (a) agricultural & (b) animal husbandry production due to diversion of forest land	Nil
7.	Cost of supply of free fuel wood to workers residing in or near forest area during the period of construction	<p>Nil</p> <p>No fuel wood will be supplied to the workers during construction period. Contractor will supply LPG fuel for cooking and other purpose in the workers camp to the workers.</p>

1. Increase in productivity:- **Rs.401.00 Crores**

2. Benefits to economy:- **Rs.317.25 Crores**

Total Cost: Rs. 718.25 Crores


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COST BENEFIT RATIO

TOTAL PROJECT COST [as per Annexure-VI (b)]: **Rs. 433.16 Crores**

TOTAL BENEFITS [as per Annexure-VI (c)]: **Rs. 718.25Crores**

BENEFIT/COST RATIO:

(Total Benefit)/(Total Cost) = **718.25/433.16= 1.66**

The Cost Benefit ratio is greater than 1, hence the project is viable.



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HDM-4: Discounted Net Benefit Streams (HIGHWAY DEVELOPMENT & MANAGEMENT)

Study Name: FFSR BASE CASE

Run Date: 17-11-2016

Currency: Indian Rupees (millions)

Discount rate: 12.00%

General Data

- **Pavement Option** : Rigid Pavement has been considered for proposed two lane with paved shoulder carriageway configuration of existing single lane road.
- **Construction Period** : Construction period for the project has been assumed as 30 months year starting from December 2016 to September 2017.
- **Investment Schedule** : For construction period, the distribution of cost for each year is given as below:
1st Year – 30%
2nd Year – 40%
3rd Year – 30%
- **Analysis Period** : 30 years (2016 to 2045)

DESCRIPTION		INCREASE IN ROAD AGENCY COSTS (Millions)		SAVINGS IN ROAD USER COSTS (Millions)		
S. No.	ANALYSIS YEARS	CAPITAL WORKS	RECURRENT WORKS	MT VOC	MT TIME	NMT TIME & VOC
1	2016	1,205.30	0.00	0.00	0.00	0.00
2	2017	1,514.94	0.00	0.00	0.00	0.00
3	2018	1,098.04	0.00	0.00	0.00	0.00
4	2019	0.00	20.06	28.94	53.44	1.62
5	2020	0.00	17.69	40.48	78.62	1.81
6	2021	0.00	15.58	74.18	116.48	2.47
7	2022	93.53	13.70	124.98	168.99	3.12
8	2023	0.00	0.00	178.69	217.58	3.96
9	2024	0.00	11.52	198.00	232.03	4.40
10	2025	0.00	10.17	190.14	222.68	4.24
11	2026	0.00	8.98	182.85	211.93	4.13
12	2027	87.29	7.91	172.39	201.50	3.83
13	2028	0.00	0.00	162.60	191.72	3.55
14	2029	0.00	7.10	153.45	182.55	3.28
15	2030	0.00	6.34	144.77	173.94	3.02
16	2031	0.00	5.66	140.33	166.33	2.99
17	2032	56.60	5.06	132.72	158.84	2.77
18	2033	0.00	0.00	125.61	151.84	2.56
19	2034	0.00	4.03	118.97	145.30	2.35
20	2035	0.00	3.59	112.43	139.18	2.16
21	2036	0.00	3.21	110.09	133.91	2.17
22	2037	39.30	2.87	104.73	128.68	2.00
23	2038	0.00	0.00	99.78	123.84	1.85
24	2039	0.00	2.29	95.19	119.36	1.71
25	2040	0.00	2.04	90.77	115.23	1.57

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26	2041	0.00	1.82	89.02	111.73	1.57
27	2042	23.54	1.63	85.30	108.32	1.44
28	2043	0.00	0.00	82.58	105.29	1.32
29	2044	0.00	1.29	73.01	96.66	1.21
30	2045	-121.75	1.26	60.51	85.80	1.12
Total		3,996.78	153.82	3172.51	3941.76	68.23

Operation & Maintenance Cost: For Two Lane with Paved Shoulder Road

Routine Maintenance Cost: - Rs. 4.2 lakhs per km per year

Periodic Maintenance Cost: - Rs. 27.0 lakhs per km/6 years

Note: A conversion factor of 0.90 has been used to convert financial cost into economic costs for HDM analysis.

- Discount Rate : 12%
- Salvage Value : 15%

A. Project Cost (Discounted at 12%)


1. Capital Works: Rs. 3,996.78 Millions
2. Recurrent Works: Rs. 153.82 Millions

Total Project Cost: Rs. 4150.60 Million

B. Savings in Road User Costs

1. MT VOC: Rs. 3172.51 Millions
2. MT VOC TIME: Rs. 3941.76 Millions
3. NMT TIME & VOC Rs. 68.23 Millions

Total Savings: Rs. 7182.50 Million


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