

COST BENEFIT ANALYSIS (CBA)

Table – B: Estimation cost of forest diversion

SN	Parameters	Details (Rs. in Lakh)	Remarks
1	Ecosystem services losses due to proposed forest diversion	62.25	NPV (As per NPV calculation by DFO/Bilaspur office) @ Rs. 6,57,000/- per ha for proposed diversion of 6.91 ha Forest Land, and NPV @ Rs. 6,57,000/- per ha for Tunnel area, the economic value of loss of eco-system due to diversion of forest land shall be $=(6,57,000 \times 6.91)$ $+(6,57,000 \times 5.13 \times 0.5)$ $=Rs. 62,25,075/-$
2	Loss of animal husbandry productivity including loss of fodder	6.22	There is no major Animal Husbandry Activities in proposed area. Hence, 10% of Net Present value (NPV) has been considered which is Rs. 6,22,507/-
3	Cost of human resettlement	0	Since the area proposed for diversion is forest on Govt. land, there is no cost due to Human resettlement.
4	Loss of public facilities and administrative infrastructure (Roads, buildings, schools, dispensaries, electric lines, railways etc.) on which would require forest land if these facilities were diverted due to the project.	150.00	Since the area proposed for diversion is forest on Govt. land, there is no cost due to loss of public facility. However, for alternations to the existing infrastructure facilities like village Roads, Electric lines has been estimated as Rs. 1.5cr (lump sum) or as per actual which shall be spent as a part of the project.
5	Possession value of forest land diverted	18.67	Since the area proposed for diversion is forest on Govt. land, the possession value is kept as 30% of NPV i.e., 30% of 62,25,075/- $=Rs. 18,67,522/-$
6	Cost of suffering to oustees	0	Since the area proposed for diversion is forest on Govt. land, there will be no displacement of people in forest area. Hence there would be no cost of suffering to oustees

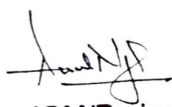
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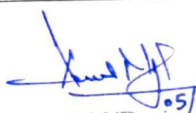
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SN	Parameters	Details (Rs. in Lakh)	Remarks
7	Habitat Fragmentation Cost	31.12	As per thumb rule, considering 50% of NPV, the Habitat Fragmentation Cost is 50% of 62,25,075/- = Rs.31,12,537/-
8	Compensatory afforestation and soil & moisture conservation cost	32.05	The cost of compensatory afforestation and soil & moisture conservation has been kept at Rs. 32.05 lakh (As per CA scheme given by DFO/Bilaspur office) by Forest Department, HP. As per undertaking (Checklist SN-12) given by the User Agency (i.e. in this proposal), and the user department has undertaken to pay the entire amount for compensatory afforestation in lieu of the forest area proposed to be diverted.
Total		300.31	


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Table – C: Existing guidelines for estimating benefits of forest – diversion in CBA

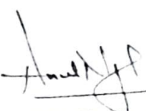
SN	Parameters	Details
1	Increase in productivity attribute to the specific project	<p>Tangible = Rs. 120384 lakh</p> <p>Non Tangible = Mobility is difficult and time taking in mountainous regions. The new rail link from Bhanupali to Beri will thus save time, fuel and people's energy. Saving of time and fuel itself shall help indirectly in increasing the productivity of the commercial and industrial activities for which transportation shall take place along the Railway line.</p>
2	Benefits to economy	<p>It is a proven fact that the infrastructure like railways bring prosperity and development to a region. At present, there is no Railway Infrastructure i.e. Broad Gauge Railway Line in the interior of the State of Himachal Pradesh. The project of construction of new railway line from Bhanupali – Bilaspur – Beri has economic and strategic importance for the region as well as for the Country. In addition, such infrastructure project shall also open new avenues for academics and research as it shall bring a vast learning experience which boosts the technical knowledge for engineers in various fields of specialization. The proposed new line shall not only connect the region with railway network of the Country but also shall be of strategic importance for the Country. With the construction of Broad Gauge Line, the region shall get a push for socio-economic development as variety of job opportunity shall open up for the local residence in the region. At present, there are Cement Factories at and around Barmana in District Bilaspur, HP. The faster as well as heavy haul of the important commodity shall be possible with the construction of new railway line. The area around the project area also consists of many locations of tourist and religious importance like Naina Devi, Manali, Kullu as well as academic importance like Mandi etc. which shall be fed with the construction of new railway line. In all, the regional growth in various social, economic as well as academic fronts shall be beneficial for the state and the nation.</p> <p>Tangible benefits = Rs. 57487.45 lakh.</p> <p>Non Tangible = Improving the accessibility shall help in regional economic development.</p>
3	No. of population benefited due to the specific project	<p>6596 persons from km 52.015 to 62.900.</p> <p>All those travelling by the rail can save on fuel and time, reducing pollution and carbon emission. For those residing on the region will be less exposed to air pollution than if a road would have been built.</p>
4	Economic benefits due to of direct and indirect	<p>Rs. 82560 lakh (Direct Employment during operation = Rs. 36480 lakh (80x40,000x12x95) + Direct Employment during construction = Rs. 9600 lakh (800x20,000x12x5) + Indirect</p>

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	employment due to the project	Employment = Rs. 36480 lakh (320x10,000x12x95)). i.e. in above formula:- Benefit= Person x Salary x Total months in a year x Total Year
5	Economic benefits due to Compensatory Afforestation	The cost of compensatory afforestation and soil & moisture conservation has been kept at Rs. 32.05 lakh (As per CA scheme given by DFO/Bilaspur office) by Forest Department, HP.


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Summary of Cost-Benefit Analysis for the Project


SN	Cost (in Lakh)	Benefit (in Lakh)
1	Ecosystem Service Loss Rs. 62,25,075/- = Rs. 62.25 lakh	Total direct and indirect employment generation during construction and operation stage shall be Rs. 82560 lakh
2	Loss of Animal Husbandry including Fodder Rs. 6.22 lakh	Economic Benefits due to Compensatory Afforestation = Rs. 32.05 lakh Area of compensatory land will be- 14 ha
3	Possession Value of Forest Land Rs. 18.67 lakh	Benefits to Economy due to Project Rs. 57487.45 lakh
4	Habitat Fragmentation Cost Rs. 31.12 lakh	Tangible increase in productivity = Rs. 120384 lakh
5	Construction cost of project Rs. 116625.63 lakh	
6	Cost of supply of free fuel wood to workers residing in or near forest area during the period of construction. Construction period - 5 years Number of labours at peak time - 800 Per head cost of fuel - Rs.20.00 per day Total cost =Rs.292.00 lakh	
	Total = Rs. 117035.89 lakh	Total = Rs. 260463.50 lakh

$$\text{Cost Benefit Ratio} = \frac{\text{Benefit}}{\text{Loss}} = \frac{260463.50}{117035.89} = 2.22$$


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Name of Project: - 62.9 Km Bhanupali-Bilaspur-Beri New Railway Line project in the State of Himachal Pradesh. (Phase-IV, From km 52.015 to km 62.900)


Cost Benefit Ratio Chart

Sr. No.	Particulars	Amount in Lac (Rs.)	Remarks
1	Total cost (Investment incurred)		
(A)	Construction Cost of the Project	116625.63	Estimated cost from Ch. Km 52.015 to km 62.900
(B)	N.P.V. amount to be deposited @ Rs 6.57 lac / Ha for 6.91 hectare and @ 6.57 lac/Ha for 5.13 hectare (Tunnel/Notional area)	62.25	As per details from forest division Bilaspur
(C)	Compensatory afforestation Substitute / Alternative plantation cost to be Deposited – for 6.91 ha affected Forest land. Total area required for CA = $2 \times 6.91 = 13.82$ ha i.e., 14 ha Cost of CA = 32.05 lac	32.05	
(D)	Environmental losses; (Soil erosion, effect on hydrological cycle, wildlife habitat, microclimate upsetting of ecological balance) Density of forest area = 0.25 (Avg). Value per hectare = Rs. 31.68 lac (@ Rs.126.74 lac per hectare for density 1.0). Forest land = 6.91 ha Environmental loss = $31.68 \times 6.91 = \text{Rs. } 218.90 \text{ Lac}$	218.90	
(E)	Cost of supply of free fuel-wood to workers residing in or near forest area during the period of construction. Construction period – 5 years Number of labours at peak time – 800 Nos. Per head cost of fuel – Rs. 20 per day Total cost = Rs. $(800 \times 20 / 100000) \times 365 \times 5$ in lac	292.00	
(F)	Cost of Greenhouse gas emitted during construction – 4.17 lac ton CO ₂ is likely to be emitted due to the use of construction materials; Monetary value as per Certified Emission Reduction (CER) rates @ Rs. 367.89/tCO ₂ = 4.17×367.89	1534.10	
(G)	Other cost if any – (For 0.5 ha. @ Rs. 1.42 lac per ha. for road side / blank patches plantation, etc = 0.5×1.42 lac)	0.71	
	Total cost	118765.64	



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2	Benefits from km 52.015 to km 62.900 of Railway line. Taking age of Railroad as 100 Years	Estimated benefits / per year in Rs lac	Total benefit during the life of the created development in Rs lac
2.1	<p>Direct Economic Benefits -</p> <p>a) from Passenger traffic – for proposed running of intercity express train between New Delhi - Beri</p> <p>Benefit @ fare Rs. 426 per passenger for 51830 passengers annually for AC Class = Rs. 2,20,79,580.</p> <p>Benefit @ fare Rs. 127 per passenger for 6,73,790 passengers annually for II Class = Rs. 8,55,71,330.</p> <p>Benefit @ fare Rs. 112 per passenger for 65700 passengers annually for Unreserved Class = Rs. 73,58,400.</p> <p>Total benefits = Rs. (2,20,79,580+8,55,71,330+73,58,400) = Rs. 11,50,09,310.</p> <p>Pro rata basis benefits per year for 10.885 Km = Rs. 11,50,09,310 x 10.885/62.900 = Rs. 19902644.50/</p> <p>(Cost for 95 years i.e. excluding construction period of 5 years.)</p>	199.02	18906.90
	<p>b) Benefit for proposed running of 2 pairs of MEMU between Nangal Dam to Beri.</p> <p>Benefits @ fare Rs. 14 for 1000 passenger per day per MEMU annually</p> <p>Total benefit = Rs. (14 x 1000 x 2 x 365) = Rs. 1,02,20,000</p> <p>Pro rata basis benefits per year for 10.885 km = Rs. 1,02,20,000 x 10.885/62.900 = Rs. 1768596.18</p> <p>(Cost for 95 years i.e. excluding construction period of 5 years.)</p>	17.69	1680.55
	<p>c) Goods traffic – Anticipated inward goods traffic like coal, gypsum, Iron core, fly ash, Sugar, Wheat, Rice etc.</p> <p>Benefit of Inward traffic @ Rs. 833.37 lac per year.</p> <p>Anticipated Outward goods traffic like Cement, Maize, and Vegetable etc.</p> <p>Benefit of Outward traffic @ Rs. 1411.16 lac per year.</p> <p>Pro rata basis benefits per year for 10.885 km = Rs. (1411.16+833.37) x 10.885/62.90 = Rs. 388.42 lac</p> <p>(Cost for 95 years i.e. excluding construction period of 5 years.)</p>	388.42	36900
	Total direct benefits		57487.45


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2.2	Social Benefits - a. Direct Employment - Benefit of employing labours (permanent) for annual maintenance and operation staff. Manpower employed = 80 no @ Rs. 40000 per month (average) Cost of 95 years i.e. excluding construction period of 5 years (as the total project from km. 38.300 to km 52.015 will be completed in 5 years)	384	36480
	b. Direct Employment (during construction period) = 800 Nos. @ Rs. 20000 per month (average). Cost for 5 years of construction period.	1920	9600
	c. Indirect employment due to business development e.g. market, tourist, transportation etc. = 320 (4 times of direct employment assumed) @ 10000/- per month for a period of 95 years (as the total project from km. 38.300 to km 52.015 will be completed in 5 years))	384	36480
	d. Social upliftment of each class of society in entire project area = 6596 persons from villages in project area @ Rs. 8000 per month for a period of 95 years. Rs 8000 per month is extrapolated from Gross National Income per capita assuming 2.5% of it may be contributed due to the project (Source-Human Development report, 2015 by UNDP). Productivity is likely to increase due to improvement in educational and health facility and most importantly mobility and accessibility. (1320 family will be benefitted by assuming 5 persons per family)	1267.20	120384
	Total Social benefits		202944

2.3	Ecological Benefits Railway will provide an alternate and reliable mode of transport with lesser pollution. Saving of carbon emissions compared to existing route (by NH-205) will be 223.8 tCO ₂ per year. Rate of carbon credit @ 367.89 CO ₂ Rs. /tonne CO ₂ . Hence savings of CO ₂ in monetary terms for 95 years.	0.82	77.9
			77.9
	Total Benefits		260509.35
	Cost-Benefit Ratio = Benefits/Investment =	2.19	

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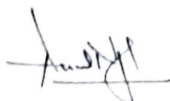
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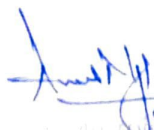
Parameter for Evaluation of loss of Forests:-

The parameters for the evaluation of 'costs' incurred due to a project for which a cost-benefit analysis must be done is provided in the guidelines to this Act, issued by MoEF.

Nature of Proposal: - Linear Diversion of Forest Land for Railway Project.

SL.No.	Parameters	Roads, Tr. Lines & Railway Line
1	Loss of Value of timber, fuel wood and minor forest produce on an annual basis, including loss of man hours per annum of people who derived their livelihood and wage from the harvest of these commodities.	Nil (There would be loss of timber to some extent but compensatory afforestation shall be done as decided by the forest department.)
2	Loss of animal husbandry productivity including loss of fodder	Nil
3	Cost of human resettlement	Nil
4	Loss of public facilities and administrative infrastructure (Roads, Buildings, Schools, Dispensaries, Electric lines, Railways etc.) on forest land. Or which would require forest land if these facilities were diverted due to the project.	There would not be any loss of facilities falling along the proposed alignment. However any unforeseen facility shall be relocated without interrupting existing facilities. RUB shall be provided across road crossings within the Railway ROW along with temporary diversion of road.
5	Environmental losses; (Soil erosion, effect on hydrological cycle, wildlife habitat, microclimate upsetting of ecological balance.)	Density of forest area = 0.25 Value per hectare = 31.68 lac (@ 126.74 lac per hectare for density 1.0) Forest land = 6.91 ha. Environmental loss = Rs 218.91 Lac
6	Suffering to oustees	Nil


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Name of Project: - 62.9 Km Bhanupali-Bilaspur-Beri New Railway Line project in the State of Himachal Pradesh. (Phase-IV, From km 52.015 to km 62.900)

Parameter for Evaluation of Benefit, notwithstanding loss of Forests:-

The parameters for the evaluation of 'benefits' provided by a project for which a cost-benefit analysis must be done is provided in the guidelines to this Act, issued by MoEF.

Nature of Proposal: - Linear Diversion of Forest Land for Railway Project.

SL.No.	Parameters	Roads, Tr. Lines & Railway Line
1	Increase in productivity attributable to the specific project.	Tangible= Rs 120292.80Lac Non Tangible =Mobility is difficult and time taking in mountainous regions. The new rail link from Bhanupali to Beri will thus save time, fuel and people's energy. Saving of time and fuel itself shall help indirectly in increasing the productivity of the commercial and industrial activities for which transportation shall take place along the Railway line.
2	Benefits to economy.	Tangible = Rs 57487.67Lac Non Tangible =Improving the accessibility shall help in regional economic development.
3	No. of population benefited	6596 persons from Km. 52.015 to Km. 62.900. All those travelling by the rail can save on fuel and time, reducing pollution and carbon emission. For those residing on the region will be less exposed to air pollution than if a road would have been built.
4	Employment potential	Rs. 82560 lac (Direct Employment during operation = Rs. 36480 lac (80x40,000x12x95) + Direct Employment during construction = Rs. 9600 lac (800x20,000x12x5) + Indirect Employment = Rs. 36480 lac (320x10,000x12x95)). i.e. in above formula:- Benefit= Person x Salary x Total months in a year x Total Year
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 rehabilitating the displaced Persons as different from compensatory amounts given for displacement.	Nil
8	Cost of supply of free fuel-wood to workers residing in or near forest area during the period of construction.	Construction period – 5 years Number of labours at peak time - 800 Per head cost of fuel – Rs. 20 per day. Total cost – Rs. 292 lac

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