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File No: - FP/HP/IRRIG/155846/2022
Date of Proposal: - 26.05.2022

Check List No. 29

Cost Benefit Analysis Calculations

Table 1: Estimation of Cost for Cost Benefit Analysis

Sl.	Particulars	MoEF Guidelines	Reserve forest compensation (In Rs. Lakhs)
1	Ecosystem services losses due to proposed forest diversion	Economic value of loss of ecosystem services due to diversion of forests shall be the net present value (NPV) of the forest land being diverted. **Calculation attached as annexure-A**	410.09
2	Loss of animal husbandry productivity, including loss of fodder	To be quantified and expressed in monetary terms or 10% of NPV applicable whichever is maximum. **Calculation attached as annexure-B**	41.00
3	Cost of human settlement	To be quantified and expressed in monetary terms as per approved R&R plan.	200.00
4	Loss of public facilities and administrative infrastructure (Roads, buildings, schools, dispensaries, electric lines, railways, etc.) on forest land, which would require forest land if these facilities were diverted due to the project	To be quantified and expressed in monetary terms on actual cost basis at the time of diversion.	Nil
5	Possession value of forest land diverted	30% environmental cost (NPV) due to loss of forest.	123.03
6	Cost of suffering of oustees	The social cost of rehabilitation of oustees (in addition to the cost likely to be incurred in providing residence, occupation and social services as per R&R plan) be worked out as 1.5 times of what oustees should have earned in two years had not been shifted.	Nil
7	Habitat fragmentation cost	50% of NPV applicable as per thumb rule	205.04
8	Compensatory afforestation and soil & moisture conservation cost	The actual cost of compensatory afforestation and soil moisture conservation and its maintenance in future at present discounted value.	190.27
	Total		**1169.43**

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Table 2: Estimating benefits of forest diversion in CBA

S. No.	Parameters	MoEF Guidelines	Descriptions	Cost (In Rs. Lakhs)
1.	Increase in productivity attributable to the specific project	To be quantified and expressed in monetary terms avoiding double counting.	Due to lack of irrigation facilities in the area, farmers are unable to grow good crops in a scientific manner. With the ground water recharge due to proposed project, the farmers can grow rotational crops which will improve their income and overall economic growth of the area. Thus, had the water available from this project been used for irrigation, it would have been very beneficial. This comes out to be Rs. 467.51 Lakhs. **Calculation attached as annexure-c**	467.51
2.	Benefits of economy due to specific project	The incremental economic benefit in monetary terms due to the activities attributed to the specific project.	The overall output of the business established in the vicinity of the area will be increased as the project will attract tourism. The area will be developed by tourism department by providing tourist attraction for wild life, picnic spots, gardens etc. This place will be of great tourist attraction as the area is very near to Kapal Mochan-tirath. Increase in productivity with respect to tourism. Increase in District GDP/per capita income[1] would be a direct indicator for benefit to the economy. This comes to Rs.4258 lakhs at 8% NPV rates. **Calculation attached as annexure-D**	4258.00
3.	No. of population benefited due to specific project	As per DPR	Nil	Nil

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4.	Economic benefits due to direct and indirect employment due to the project	As per DPR	200 employees during the construction phase will be employed for a period of two years. During the construction period approx. 120000 man-days will be generated and after the construction indirect employment will be generated due to development of shops along the project road. 120000 man-days will be benefitted in terms of salary and wages @ Rs.500/day = Rs. 600lakhs	600.00
5.	Economic benefits due to Compensatory afforestation	Benefits from such Compensatory afforestation accruing over next 50 years monetized and discounted to the present value should be included as benefits of the compensatory afforestation for benefits of CA the guidelines of the ministry for NPV estimation may be consulted.	Considering the total forest diverted area for CA i.e. 31.72 ha and the NPV of forest the total Economic benefit would be Rs.489.66 Lakhs once the total CA is done and similar benefits are accrued as in forest areas. As provided by forest department.	489.66
			Total	**5815.17**

Table 3: Benefit/Cost Ratio

Total Benefit	5815.17
Total Cost	1169.43
Benefit/Cost Ratio	**4.97**

Sub Divisional Officer
Sarasvati Heritage Sub Division No. 2
Jagadhri

Executive Engineer
Sarasvati Heritage Division No. 1
Jagadhri

Saurabh
Divisional Forest Officer,
Nahan Forest Division,
Nahan, H.P.

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Annexure-A

Calculation of NPV:-

Forest Land	31.72 Ha
Eco class of the forest	Class V
NPV rate of Class V Forest	1005210/- per hactare
NPV value of Forest Land	31.72x1292850= Rs. 410009202/-

Annexure-B

Loss of animal husbandry productivity, including loss of fodder is maximum of followings:-

1. 10 % of NPV = 41.00 lacs

2. Quantified in monetary terms:-

Surface forest land	31.72 ha
Forest cover	Sub Tropical Broad Leaved Hill Forest
Eco-Class of the forest	Class-V
Rate of fodder production	Rs. 4514/ha/yr
Economic value of fodder production.	4515x31.72=143216

Loss of animal husbandry productivity, including loss of fodder is 41.00 lacs.

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Annexure-C

YEAR	Production (GDP Per capita in Sirmaur District of HP)
2018	33982.00
2019	34661.64
2020	35354.87
2021	36061.97
2022	36783.21
2023	37518.87
2024	38269.25
2025	39034.64
2026	39815.33
2027	40611.64
2028	41423.87
2029	42252.35
2030	43097.39
2031	43959.34
2032	44838.53
2033	45735.30
2034	46650.00
2035	47583.00
2036	48534.66
2037	49505.36
2038	50495.46
8% of GDP Per capita in Sirmaur District of HP	**4258.40 Cost (In Rs. Lakhs)**

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Annexure-D

Notional Irrigation Benefits have been worked out as under:

Net usable water during depletion period (at 50% dependability) from the water stored in the AdiBadri Dam Reservoir and AdiBadri Dam water stored in the spare capacity of Sarasvati Reservoir = 767.13 ha-m

Let notionally 1/3rd of water is used in Kharif and 2/3rd in Rabi crop.

Therefore water used for Rabi Crops = 767.13 X 2/3=511.42 ha-m

Rabi Discharge:-

Thus available water for Rabi crops = 511.42 ha-m = 511.42 ha-m x 4.087 CS – days

= 2090.17 CS- Days

No. of full supply days for Rabi = 67

One CS of water when runs for 67 days, it can irrigate (1000/2.4) x 0.62 x 0.60 =155 Acre Rabi Crop

Thus 67 Cs-day water can irrigate 155 Acre Rabi Crop

Total water in Rabi season = 2090.17 CS- Days

Thus net Notional Rabi irrigation = (2090.17 *155)/67 = 4835.5 Acre or 1957 Ha

It is propose to achieve 100% notional irrigation in Rabi.

Thus CCA = 1957 x 100/100= 1957 Ha

Rabi crop benefits = Rs. 20498 / ha (Figure agreed by NABARD for NABARD Financial Projects)

Total Rabi crop Notional Irrigation benefits = 20198 x 1957 = 395.27 Lacs

Kharif crops:

Water proposed to be notionally

Used in Kharif season = 567.13-511.42= 255.71 Ha-m

Thus availability of water for Kharif = 255.71x4.087=1045 CS-Days

No. of full supply days for Kharif period= 95 days

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Kharif Discharge= 1045/95=11 CS

One Cusec can irrigate = (1000/2.4)x0.62 x0.40=103.3 Acres

Therefore possible Notional irrigation in Kharif =11x103.3=1136.3 Acres or 460 Ha

Intensity of irrigation = (460/1957)x 100 =23.5%

Net Kharif Benefits = Rs. 15704 per Ha

Total Notional Kharif Benefits =15704x460=72,23,840 say 72.24 Lakhs

Total Notional Irrigation Benefits = 395.27 + 72.24 = 467.51 Lakhs