

COST-BENEFIT ANALYSIS of DUGAR HEP

Table-A: Cases under which a cost-benefit analysis for forest diversion are required

SN	Nature of Proposals	Applicable/Not Applicable	Remarks
1	All categories of the proposals involving forest land upto 20 ha in plains and upto 5 ha in hills	NA	These proposals are to be considered on case to case basis and value judgment
2	Proposal of defense installation purposes and oil prospecting (prospecting only)	NA	In view of National priority accorded to these sectors, the proposals shall be critically assessed to help ascertain that the utmost minimum forest land and above is diverted to for non-forest use
3	Habitation, establishment of Industrial units, tourist lodges/complex and other building construction.	NA	These activities being detrimental to protection and conservation of Forests, as a matter of policy, such proposals would be rarely entertained
4	All other proposals involving forest land more than 20 ha in plains and more than 5 ha in hills including roads, transmission lines, minor, medium and major irrigation projects, hydel projects mining activities, railway lines, location specific installation like micro-wave stations, auto repeater centres, TV tower etc.	Applicable	These are cases where a cost benefit analysis is necessary to determine when diverting the forest land to non-forest use in overall public interests.

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Table-B: Estimation of cost of forest diversion

SN	Parameters	Remarks
1	Ecosystem services losses due to proposed forest diversion	Economic value of loss of eco-system services due to diversion of forests land determined by State Forest Department as a Net Present Value (NPV) is <b>Rs. 23.16 Crore</b>
2	Loss of Animal husbandry productivity including loss of fodder	<b>Rs. 2.31 Crore</b> (i.e. 10% of NPV Cost)
3	Cost of Human resettlement	No displacement
4	Loss of public facilities and administrative infrastructure (Roads, building, School, dispensaries, electric lines, railways etc) on Forest land, or which would require forest land if these facilities were diverted due to the project	None of the public facilities and administrative infrastructure will be affected due to the project.
5	Possession value of forest land diverted	<b>Rs. 6.94 Crore</b> (i.e. 30% of NPV Cost)
6	Cost of suffering to oustees	None of the oustees will suffer from project establishment.
7	Habitat Fragmentation Cost	The relationship between fragmentation and forest goods and services is complex, for the sake of simplicity the cost due to fragmentation has been taken as <b>Rs. 11.58 Crore</b> (i.e. 50 % of NPV applicable as a thume rule)
8	Compensatory Afforestation and Soil & moisture conservation cost	The actual cost of compensatory afforestation and soil & moisture conservation and its maintenance is determined by State Forest Department is <b>Rs. 13.27 Crore.</b>
	<b>Grand Total</b>	<b>73.32 Crore</b>

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

Nature of Proposal		
SN	Parameter	Hydroelectric Project
1	Increase in productivity attributable to the specific project	<p>1. Net design energy (Annual) = 1758.40 GWH  Cost of saleable net design energy @ 4.43 / kWh  (Levelised tariff) Rs. = 778.97 Crore  Assuming O&amp;M life as 62 years,  Hence <math>778.97 \times 62 = \text{Rs. } 48296.14 \text{ crore}</math>  i.e. <b>Rs. 48296.14 cr. – 6278.49 cr. (13% benefit to State Govt.) = Rs. 42017.65 crore</b></p> <p>2. Sixteen Revenue villages would gain better road connectivity and the travel time would be reduced by an average of one hour  Total population of 4500 will be benefitted and with saving of 1 hr/day. Therefore, <math>4500 \times \text{Reduced time in travel by 1 hr} \times 30 \text{ days} \times 12 \text{ month} \times 70 \text{ years} @ \text{Rs } 35 \text{ per man hr} = \text{Rs } 396.90 \text{ Crore.}</math></p> <p>3. Population of 4500 person will be benefitted and gain of at least 60 man days/ year due to the better development of the hospital in the project area, Hence <math>365 \text{ days} \times \text{saving of 60 man days} \times 70 \text{ years} @ \text{Rs } 300/\text{day} = \text{Rs } 45.99 \text{ Crore.}</math>  <b>Rs. 42017.65 + 396.90 + 45.99 = 42460.54 Crore</b></p>
2	Benefits to economy due to the specific project	<p><b>Benefits to the State Economy</b>  The estimated cost of the project is Rs 3987.34 crores and all necessary finances for the implementation of the project through loans, debentures, its own income from previous projects or such other sources. As per the Memorandum of Understanding (MoU) and Implementation Agreement (IA), Government of Himachal Pradesh will get the Royalty Free Energy in the shape of free power @4% from 1<sup>st</sup> to 10<sup>th</sup> year, @8% from 11<sup>th</sup> to 25<sup>th</sup> year, 12% from 26<sup>th</sup> to 40<sup>th</sup> year &amp; 25% beyond 40 years and 1% additional free Power for LADF of the deliverable energy, period starting from the date of Scheduled Commercial Operation Date / Synchronization of the first generation unit, whichever is earlier.</p> <p>NHPC Limited shall be liable to deposit an equivalent amount of 100 units of electricity, per month for a period of 10 years, as per applicable subsidized tariff determined by Himachal Pradesh Electricity Regulatory Commission (HPERC) from time to time, with respective Local Area Development Committees (LADCs) of the districts and the balance amount equivalent to the quantum of subsidy with the State Government.</p> <p>NHPC Limited shall contribute 1.5 % of the cost of the project towards pre-commissioning Local Area Development Fund (LADF). In addition to this, NHPC shall also run Community Development Schemes and Corporate Social Responsibility programs for the villages within / around the Project site, entwined to cater to local area development including capacity / skill development of affected population, as per the objectives and policies.</p> <p><b>Benefits to the Local Economy</b>  NHPC Limited shall contribute 1.5 % of the cost of the project (Rs 3987.34 Crores) = <math>3987.34 \times 0.015 = \text{59.81 Crore}</math> towards pre-commissioning Local Area Development Fund (LADF).</p>

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		<p>In addition to this, NHPC shall also run Community Development Schemes and Corporate Social Responsibility programs for villages within / around the Project site, entwined to cater to local area development including capacity / skill development of affected population, as per the objectives and policies.</p> <p>720000 Man days (1000 Man power for 24 months) would be generated due to the direct employment of labors including locals during pre-construction stage @ 400/Man day = <math>720000 \times 400 = \mathbf{28.80 \text{ Crore}}</math>.</p> <p>5,550,000 Man days (2500 Man power for 74 months) would be generated due to the direct employment of labors including locals in the construction of the project. <math>5,550,000 \times 500 = \mathbf{Rs 277.50 \text{ Crore}}</math></p> <p>80 labors/month will get the employment during O&amp;M stage to fulfill the requirement of various casual jobs for 62 years assuming average @600/day = <b>Rs 107.13 Crore</b></p> <p>Local contractors will be engaged for suitable jobs and 20% of the Construction cost will be carried out by them. Assuming 15% as their profit margin for the contract works, <math>\text{Rs } 3987.34 \times 20\% \times 15\% = \mathbf{Rs 119.62 \text{ Crore}}</math></p> <p>Local Transport vehicles will be utilized during construction period, Assuming 1% as the total value and 20% as the profit margin, the total benefits would be <b>7.97 Crore</b></p> <p><b>Indirect Employment</b> Indirect Employment to locals in terms of the Support business to satisfy the needs of manpower deployed in the project during Pre-Construction, Construction and Operation and Maintenance periods: Pre-Construction: Rs 4000/- per month from 1000 labors for 2 years- <b>Rs 9.60 Crores</b> Construction: Rs 4000/- per month from 2500 labors for 6 years- <b>Rs 72 Crores</b> O&amp;M: Rs 4000/- per month from 80 labors for 62 years- <b>Rs 23.80 Crores</b></p>
3	No of Population benefited due to specific project	4500, considering direct and indirect benefits
4	Economic benefits due to of direct and indirect employment due to the project	<p>6120000 Mandays during Pre-construction (1000 Man power for 24 months) and at construction stage (2500 Man Power for 74 months)</p> <p>2232000 Mandays during operation stage. (80 Man power as casual labors for 744 months)</p> <p><b>Indirect Employment</b> Indirect employment to locals in terms of the support businesses to satisfy the needs of manpower deployed in the project during Pre-construction, Construction and Operation and Maintenance (O&amp;M) periods.</p>
5	Economic benefits due to Compensatory afforestation	The forest area which required to be diverted for the project is 211.842 hectare. The compensatory afforestation will be done on the area of approx. 423.684 hectare, where about 466000 plants will be planted at a cost of Rs. 13.27 Crore. Due to this

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afforestation, not only green cover will increase but the density of forest will also increase. The money spent on compensatory afforestation will lead to indirect benefits to the local population as they will be employed for the plantation and thereafter maintenance of the afforestation area. Due to this afforestation decrease the pollution levels and increase the carbon credits.

Benefits from Project		
LADF		
Increase in Productivity	Rs Crores	59.81
Pre-Construction Labour Cost	Rs Crores	42460.54
Construction Labour Cost	Rs Crores	28.80
Operation and Maintenance casual jobs	Rs Crores	277.50
	Rs Crores	107.13
Local Contractor Profit	Rs Crores	119.62
Local Vehicles Profit	Rs Crores	7.97
Indirect Employment in Pre-Construction	Rs Crores	9.60
Indirect Employment in Construction	Rs Crores	72.00
Indirect Employment in O&M	Rs Crores	23.80
Benefit to the State of Himachal Pradesh	Rs Crores	6278.49
$(1758.40 \times 10^6 \times 4.43 = 778.97 \text{ Cr./yrs})$ $(778.97 \text{ Cr} \times 62 \text{ yrs} = 48296.14 \text{ Cr})$ $(48296.14 \text{ Cr} \times 13\% = \text{Rs. } 6278.49 \text{ Cr})$		
<b>Total Benefits</b>	Rs Crores	<b>49445.26</b>

Benefit/Cost Ratio:

Total Benefit	49445.26 Crore
Total Project Cost	3987.34 Crore
Benefit cost ratio	12.40

### Benefits to the Environment

The project would replace the carbon emissions to the extent of power generation, which is equivalent to the estimated energy generation of 1758.40 MU in 90% dependable year.

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