



**एनएचपीसी लिमिटेड**  
(भारत सरकार का उद्योग)  
**NHPC Limited**  
(A Govt. of India Enterprise)  
ISO-9001, 14001 & IS 18001 Certified Company

डुगर जल विद्युत परियोजना (500 MW)  
Dugar HE Project (500 MW)  
लुज, किल्लार (पांगी), चंबा (हि.प्र.) 176323  
Luj, Killar (Pangi), Chamba, (H.P.)  
ई-मेल/E-mail: [dugarhep@nhpc.nic.in](mailto:dugarhep@nhpc.nic.in)  
Phone No: +91-8988136260

Ref / संदर्भ सं: एनएच/डीएचईपी/ 521

Dated / दिनांक : 06-07-2023.

डीएफओ, पांगी फॉरेस्ट डिविजन,  
केलार, चंबा,  
हिमाचल प्रदेश - 176323.

विषय: हिमाचल प्रदेश, जिला चंबा, पांगी वन विभाग के अधिकार क्षेत्र के अंतर्गत चिनाब नदी पर डुगर जल विद्युत परियोजना (500 मेगावाट) के निर्माण के लिए मेसर्स एनएचपीसी लिमिटेड के पक्ष में 211.8427 हेक्टेयर वन भूमि के डायवर्सन का प्रस्ताव।

Sub: Proposal for seeking prior approval of the Central Government under Forest (Conservation) Act, 1980 for non-forestry use of 211.8427 ha of forest land for construction of 500 MW Dugar Hydro Electric Project in favour of NHPC Ltd. Under Pangi Forest Division, Chamba District of Himachal Pradesh.

महोदय,

With reference to MoEF&CC Letter No. 8-15/2022-FC dated 26-06-2023 regarding above cited matter, the point wise replies to the observations are as follows:

i. The status of 04 CA sites namely Killar Dhar-1, Killar Dhar-2, Rogi and Findpar is not clarified by Forest Department/User Agency whether these sites are Waste Lands declared as (Un-demarcated) Protected Forests by HP Government Notification of 1952 or notified as Un-demarcated Protected Forests under IFA, 1927. This needs to be furnished with documentary proof.

**Reply: Observation pertains to DFO, Pangi.**

ii. It is noted that 12.505 ha area (Quarry site 1:- Upstream of Punto Hasku Bridge, Quarry site 2:- Downstream of Punto/Hasku Bridge, Quarry site 3:- Near Village Dharwas, Barrow Area 1:- Near Tail Race Outfall, Barrow Area 2:- Tail end of Reservoir near Findru Village) is proposed for quarry and borrow area in which mining will be carried out. However, the approved mining plan has not been provided and therefore the same needs to be submitted.

Reply: NOC for mining activities of the Project has been obtained from Mining Department vide letter dated 28-10-2020 (Copy enclosed as **Annex-I**).

For meeting the requirement of coarse and fine aggregates, three rock quarry sites such as Dugar Rock Quarries (DRQ) have been identified and marked as DRQ-01 (Quarry site 1:- Upstream of Punto Hasku Bridge), DRQ-2 (Quarry site 2:- Downstream of Punto/Hasku Bridge), and DRQ-6 (Quarry site 3:- Near Village Dharwas) and two River shoal deposits / Barrow area (FAS-01 Near Tail Race Outfall and FAS-02 Tail end of Reservoir near Findru Village) are proposed for quarrying of construction materials. For

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this purpose, total of 8.625 ha Quarry area and 3.880 ha Borrow area have been proposed for diversion of forest land under this forest proposal. The EIA/EMP Studies

has been carried out by independent Environment consultant and landscaping restoration plan of quarry area has been proposed under EMP. The EIA/EMP study was appraised / examined by Expert Appraisal Committee (EAC) of MoEF&CC, New Delhi in meeting held on 29-08-2022, where-in EAC has recommended for grant of Environment Clearance.

For approval of Mining Plan of above quarry sites and Barrow areas from Government of Himachal Pradesh on-line mining application has been submitted by Project to Geological Wing, Department of Industries, Govt. of HP. After examination of the proposal, State Geologist vide letter dated 26-09-2022 has framed a Committee comprising of Officers from Forest, PWD, IPH, HPSPCB and Mining under the Chairmanship of SDM, Pangi for Joint Site Inspection. The Joint Site Inspection for approval of mining plan has been conducted by the Committee on 02-06-2023.

Therefore, approval of Mining Plan of above quarry sites and Barrow areas from Government of Himachal Pradesh is under progress and will be submitted as soon as approval has been obtained from competent authority.

iii. A Mitigation Plan is required to be prepared to avoid the adverse impact on ecology and environment of the area due to mining in Hill Side Quarry sites.

Reply: The mitigation plan for restoration of quarry sites has been proposed under EIA/EMP Study. After excavation of the required material, these quarry sites will be restored using various engineering, bioengineering and biological measures. The copy of Mitigation and Restoration Measures Proposed in EMP is enclosed as **Annex-II**. The EIA/EMP Report was appraised / examined by Expert Appraisal Committee (EAC) of MoEF&CC, New Delhi in meeting held on 29-08-2022, where-in EAC has recommended for grant of Environment Clearance.

Hence, Mitigation Plan will be implemented to avoid the adverse impact on ecology and environment of the area due to mining.

iv. The trees of DBH >50 cm were also observed in the diversion area. These large-sized trees of Girth Class 121-150 cm and >150cm have not been recorded in Part-II, but these are mentioned in Enumeration list and cost of trees document. DFO concerned has recorded the Class IV (20-30 DBH) and Class V (10-20 DBH) category trees in Girth Class 0-30cm (i.e. Saplings Category) of Part-II in PARIVESH portal that seems incorrect. Therefore, saplings mentioned in Part-II may be reviewed properly and revise/rectify according to the Enumeration List and properly filled as per the category of Girth Class on PARIVESH portal.

Reply: Observation pertains to DFO, Pangi.

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4/6/23  
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v. The Cost Benefit ratio of the project has been calculated on previous NPV amount, therefore, the same is required to be calculated on revised rates of NPV in accordance with Ministry's Letter dated 06.01.2022. It may be rectified on PARIVESH portal.

**Reply: The Cost Benefit ratio of the project has been revised & enclosed as Annex-III and same has been uploaded on PARIVESH portal.**

vi. The cost of the project has been rectified as per CEA, Ministry of Power's letter No. CEA-SY-25-44/3/2020-PAC Division/74-115 dated 26.04.2022 on PARIVESH portal.

**Reply: The cost of the Project has been rectified to Rs. 398734 lac as per CEA, Ministry of Power's letter No. CEA-SY-25-44/3/2020-PAC Division/74-115 dated 26.04.2022 on PARIVESH portal.**

vii. There is a mismatch in density of vegetation class and NPV rates applied and hence error in the calculation of NPV Bill. This needs to be reviewed and rectified keeping in view the revised rates of NPV prescribed vide letter dated 06.01.2022.

**Reply: Observation pertains to DFO, Pangi.**

viii. As per the SIR, the proposed diversion area has presence of unique endemic tree of *Pinus gerardiana* and *Corylus spp.* These species need special protection from adverse impacts of the proposed HEP. The State Government shall submit its comments in this regard.

**Reply: Observation pertains to State Forest Department.**

ix. The IRO Shimla in the report has mentioned that the staff of Forest department was not present during the site inspection, which has been intimated by IRO, Shimla to the State Govt. vide letter dated 04.05.2023. The State shall submit a detailed report in this regard.

**Reply: Observation pertains to State Forest Department.**

Hope the above replies will satisfy the respective observations and after doing the needful action is re-submitted for approval of the competent authority.

धन्यवाद

Encl.: उपरोक्त अनुसार।

भवदीय,

(राजेश कुमार)

General Manager

महा प्रबंधक (प्रमुख)

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संतोष कुमार  
अ.प्र. (पर्या.)

Reg d.  
"Annex-I"

NO:Ind/Bhu/Chamba/ Misc- 499  
Office of the Mining Officer, Chamba  
District Chamba (H.P)

Chamba

Dated: 28-10-2020

To

The General Manager  
Dugar HE Project (NHPC)  
Parbati Complex P.O. Nagwan  
Distt. Mandi (H.P)

Sub: Regarding NOC for Dugar HE Project, Tehsil Pangi Distt. Chamba.

Sir,

In reference to your office letter no. NH/DHEP/HOP-02/2020-21-120-22 dated 25.7.2020 on the subject cited above.

In this context, it is submitted that this office have no objection regarding mining activities in the mentioned area during the construction of Dugar HE Project (449 MW) at Tehsil Pangi District Chamba except the area having Kh.no. 266/1 measuring to 1-10-00 bighas in Mohal/Mauza Sach in Tehsil Pangi, which have already been auctioned by the department for collection of minor mineral to meet out the requirement of development activities in sub division.

Mining Officer  
District Chamba (H.P)

शेखर कुमार

28/10/20

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appropriate size and transport of the aggregates, and transport of materials to the nearby drainage channels. The quarrying for rock material in the proposed project would lead to the removal of vegetation cover, topsoil and leave the area barren. After the completion of mining activity, these areas will be restored to their normal habitat conditions.

Similarly, excavation and transportation of fine aggregates from the riverbed will cause visual impact because of the removal of a significant part of the riverbed. The extraction of construction material from riverbeds may also affect the river water quality due to an increase in the turbidity levels. This is mainly because the dredged material gets released during one or all the operations mentioned below:

- Excavation of material from the riverbed
- Loss of material during transport to the surface
- Overflow from the dredger while loading
- Loss of material from the dredger during transportation

The cumulative impact of all the above operations will lead to an increase in turbidity levels. Good dredging practices can, however, minimize turbidity. It has also been observed that slope collapse is the major factor responsible for the increase in turbidity levels. If the depth of cut is too high, there is the possibility of slope collapse, which releases a sediment cloud. This will further move outside the suction radius of the dredged head.

#### **10.2.6.2.1 Mitigation and Restoration Measures**

Quarrying for construction materials will require **12.505 ha** area (see Table below). Frequent trips for blasting, excavation will also disturb the adjoining forests in the proposed quarry and borrow areas.

S. No.	Facility	Area (ha)
1	Quarry area	8.625
2	Borrow Areas	3.880
	<b>Total</b>	<b>12.505</b>

As seen from **Figures 10.14, 10.15, and 10.16**, the exposed face of three proposed rock quarries viz. DRQ-01, DRQ-02, and DRQ-06 are characterized by steep gradients/slopes varying between 35% and 70% at certain places. The main rock is quartzite schist with pegmatite and schist at DRQ-01 and DRQ-02 while at DRQ-06 it is gneiss with bands of pegmatite and schist.

The general plan to minimize the degradation of the area due to mining for construction material would be as follows:

- Photographically record quarry faces before excavation.
- Building of garland drains around quarry site to capture the runoff and divert the same to the nearest natural drain.
- Construction of concrete guards to check the soil erosion of the area.
- The pit formed after excavation be filled with small rocks, sand and soil.

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- Grass slabs to be placed to stabilized and to check the surface runoff of water and loose material.

The traditional measures adopted for landscaping of the quarry sites after quarrying are:

**a. Filling of depressions**

Removal of rocks from quarry sites for different construction works will result in the formation of depression and/or craters. The depressions are to be filled by the dumping materials consisting of boulders, rock, gravel, and soil from nearby plant/working sites, followed by compaction to prevent subsidence, porosity, and permeability, and to increase the capacity of fill on site. Compacted inert waste material helps retarding percolation to the quarry base and the adjacent watercourse.

**b. Laying of the topsoil**

The depressions/ craters filled up with rock aggregates will be covered with topsoil. The topsoil will then be covered with geo-textiles like coir, jute, or other locally available bio-degradable material.

**c. Construction of breast walls**

Breast walls are generally constructed at the base of filled-up depressions of quarry sites to provide the necessary support, particularly where there are moderately steep slopes. At the top of the fill, cast concrete strip foundation and erect a random dry-stone rubble wall along the established and/or designed location of field boundaries; place the subsoil simultaneously on the lower sides of the terraces.

**d. Diversion of runoff**

Provision of an effective drainage system to avoid the infiltration of run-off and surface waters into the ground of quarry sites.

Though the above described are broadly recommended for rehabilitation of quarries after the mining operation of over at the site, however, it is recommended that the project proponent undertake detailed site surveys and formulate appropriate engineering measures after ascertaining the steepness of the slope and extent of depression formed after the excavation.

However, during quarrying operations, standard mitigation measures against erosion and sedimentation, noise, and air pollution will be taken, especially for the use of explosives. The most important mitigation measure during blasting and excavation will be to keep noise and dust levels under control by installing noise dampeners, use of sprinklers, and controlled blasting. At the end of the exploitation, quarries will be rehabilitated.

Generally, rehabilitation includes re-establishment of vegetation, restoration of natural watercourses, avoidance of flooding of the excavated areas, achievement of stable slopes, and avoidance of features, which would otherwise constitute a risk to health and safety or a source

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of environmental pollution. However, revegetation of bare slopes does not seem feasible in these quarries owing to steep slope face and almost complete absence of any soil cover which is a prerequisite for the establishment of any vegetation cover.

After the quarrying activity is over, the site will be splattered with the leftovers of rocks and boulders. These boulders and rocks can support the growth of mosses and lichens, which will act as ecological pioneers and initiate the process of succession and colonization. The boulders of moderate size will be used to line the boundary of a path.

As the tentative cost of landscaping and restoration of quarry sites covering a total area of 8.625 ha (with an average total width of 229 m and length of 1034 m) cannot be estimated till a detailed engineering plan to stabilize the disturbed area of three quarries is formulated by the project proponent to be prepared during pre-construction activities a lumpsum amount of **Rs.50.00 lakh** have been earmarked for the same.

### **10.2.6.3 Construction Areas & Project Colonies**

The proposed Dugar HEP would involve the construction of the dam, powerhouse, adits, diversion tunnel, residential and staff colonies, roads, batching plants, etc. These activities will result either in the modification or destruction of the existing landscape of the area. It is therefore imperative that after the project work and related activities are over restoration work should be carried out in these disturbed areas to bring them back to their similar or near-similar pre-construction conditions and land use. **8.78** ha will be disturbed due to the acquisition of land for the construction of colony area, office colony, and construction facility area.

#### **10.2.6.3.1 Aggregate Processing and Batching & Mixing (BM) Plant**

To meet the total requirement of aggregate to produce the concrete for the project 2 nos. of Aggregate Processing Plants (APP) of capacity 120 TPH & 240 TPH for crushing, screening, and washing of coarse and fine aggregate have been proposed. Considering the total quantum of concrete about 11.3 lakh cum including shotcrete two batching & mixing plants, one of 90 cum/h capacity for Powerhouse, TRT areas, etc. and other of 180 cum/h are proposed to be used for catering the concrete production requirement of Dam, Plunge pool, etc. of the project. The Aggregate Processing Plant (APP) and Batching & Mixing (BM) Plants have been proposed to be located on the right bank on the d/s of Dam area as shown in **Figures 10.12 & 10.13**.

#### **10.2.6.3.2 Workshops**

Several workshops for construction-related activities have been proposed on the right bank of Chenab River downstream of the dam and their location on the map is shown in **Figure 10.12**.

##### **i. Heavy Equipment Maintenance (HEM) workshop**

Since servicing and repairing facilities are not available near the project area, a fully equipped self-sufficient Heavy Equipment Maintenance (HEM) workshop shall be established to provide

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## 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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 नं. १०० (हि.प्र.)-१७५१२१



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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21/12/21  
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 Nagwain, Dist. Mandla (M.P.)-775121

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. Rs. <b>48296.14 cr. – 6278.49 cr. (13% benefit to State Govt.)</b>  <b>= 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></p> <p>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	<p>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</p>

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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	49445.26

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.

संतोष कुमार

4/1/20

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