

**HIMACHAL PRADESH POWER CORPORATION LTD.**  
(A State Government Undertaking)



**ENVIRONMENT POLICY FOR HYDRO POWER PROJECTS**  
**May, 2017**

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## **CHAPTER 1: INTRODUCTION**

### **1.0 ABOUT THE CORPORATION:-**

Himachal Pradesh Power Corporation Limited (HPPCL) was incorporated in December 2006 under the Companies Act 1956, with the objective to plan, promote and organize the development of all aspects of hydroelectric power on behalf of Himachal Pradesh State Government (GoHP) and Himachal Pradesh State Electricity Board (HPSEB) in Himachal Pradesh. GoHP has 60% and HPSEB 40% share holding in HPPCL. Special Purpose Vehicles namely Pabber Valley Power Corporation (PVPC) and Kinner Kailash Power Corporation (KKPC), earlier owned by HPSEB, have been merged with HPPCL.

### **1.1 VISION:**

To fully utilize the allotted/assigned power generation potential in a sustainable manner.

### **1.2 MISSION:**

To bring prosperity in the State of Himachal Pradesh by harnessing the allotted/assigned hydro-electric power/energy potential in various river basins traversing the State.

### **1.3 AIM:**

To come up as a major power generating company of India with good managerial and technical capabilities.

### **1.4 OBJECTIVE:**

- i) To plan, promote, organize and execute Power Projects in Himachal Pradesh and outside the State in the following formats:-
  - a) Execution and commissioning of the allotted hydro electric power projects
  - b) Preparation of Detailed Project Reports (DPR) of new projects
  - c) Installation of Thermal Power Plants.
- ii) To enter into economically viable power purchase agreements.
- iii) To set standards for sustainable harnessing of power in hydro sector with specific focus on Resettlement and Rehabilitation process of oustees.
- iv) Ensuring of transparency, efficiency and accountability oriented functioning systems supported by ERP.
- v) Capacity building.
- vi) Assessment of self financing model for new projects.

## **1.5 FUNCTIONS**

- i) Execution and commissioning of the hydro power projects and sale of surplus power to different States and agencies/consumers
- ii) Preparation of Detailed Project Reports (DPRs) for new projects
- iii) Installation of Thermal Power Plants
- iv) Development of Non-Conventional / Renewable Energy projects
- v) Ensuring environmental and social safeguards at the power projects
- vi) To provide consultancy services on demand.

## **1.5 TARGET:**

To develop 861 MW Power Generation capacity by March, 2019 and 1238 MW by the year 2022.

## **1.6 ORGANIZATION:**

HPPCL is a fast upcoming power generating utility equipped with all the Technical and Organizational capabilities at par with other generating companies.

The organization is professionally managed and maintains totally independent functioning endowed with commercial orientation. A strong team of experienced professionals in the field of Hydro Power generation are engaged in a wide range of project activities.

Employees, the strength of HPSEB and HPPCL are constantly enduring to up-grade their skills and keep them updated on the technology front. Efforts are afoot to further strengthen the respective departments with skilled man-power and professionals of proven capabilities and credentials.

## CHAPTER 2: POLICY CONTEXT

### 2.0 PREAMBLE / BACKGROUND

India has now embarked upon a safe road of buoyant economy growing at a steady rate of 7.5% to 9% for the last two decades and promising to become the third largest economy in the World by 2051. The economic growth of a nation, however, directly hinges on the development of energy, which drives the wheels of the industry, agriculture and the transport system.

Presently the energy is principally developed through thermal (67%) and hydropower (25%) plants. But the thermal power plants release huge quantity of greenhouse gases due to burning of the coal. Besides causing massive air pollution, huge consumption of coal shortens the life of limited coal reserves (80 years) thus depriving the future generation of their rights to natural resources. The generation of power from wind is limited because of availability of required wind velocity in selected costal areas. Development of energy from sun, tide and biomass is unaffordable because of non-development of cost effective technologies. Development of Nuclear Power is constrained because the nation has very scarce uranium resources and technology for developing nuclear power from thorium has not been developed so far though India has abundant thorium deposits.

In view of these serious constraints, development of hydropower is the best bet because it is green, renewable, abundant and can be developed at an affordable cost. Its development in Himachal Pradesh has become indispensable as other options are limited because being a mountainous state, agricultural economy is marginal. Other sources of revenue generation e.g. tourism are also limited. Likewise the revenue from forest trees is also marginal because mature trees cannot be felled to keep the green cover intact. The compensation from Finance Commission is also meager in this regard. Presently Himachal Pradesh is power surplus and development of additional power will further boost the revenue accruals in the State exchequer.

Himachal Pradesh power sector agencies have completed the onerous job of surveying, identifying and assessing the entire hydropower potential in different basins and sub-basins of the State. The hydro power potential capacity and basin wise in Himachal Pradesh are presented in **Table 2.1 and Table 2.2** respectively. A hydropower map too has been prepared for the state which gives a peep into the on-the-shelf hydropower projects available for investment/development. In other words Himachal Pradesh is in the throes of a hydropower revolution. The brief classification of these power projects are given below as on 1.1.2013:-

**Table 2.1: Hydropower Potential (installed capacity wise) in Himachal Pradesh**

Sr. No.	Range in MW	Number of Projects
1	6 – 50*	114

2	51 – 100	22
3	101 – 200	23
4	201 – 500	13
5	501 – 800	6
6	801 – above	4
	<b>TOTAL</b>	<b>182</b>

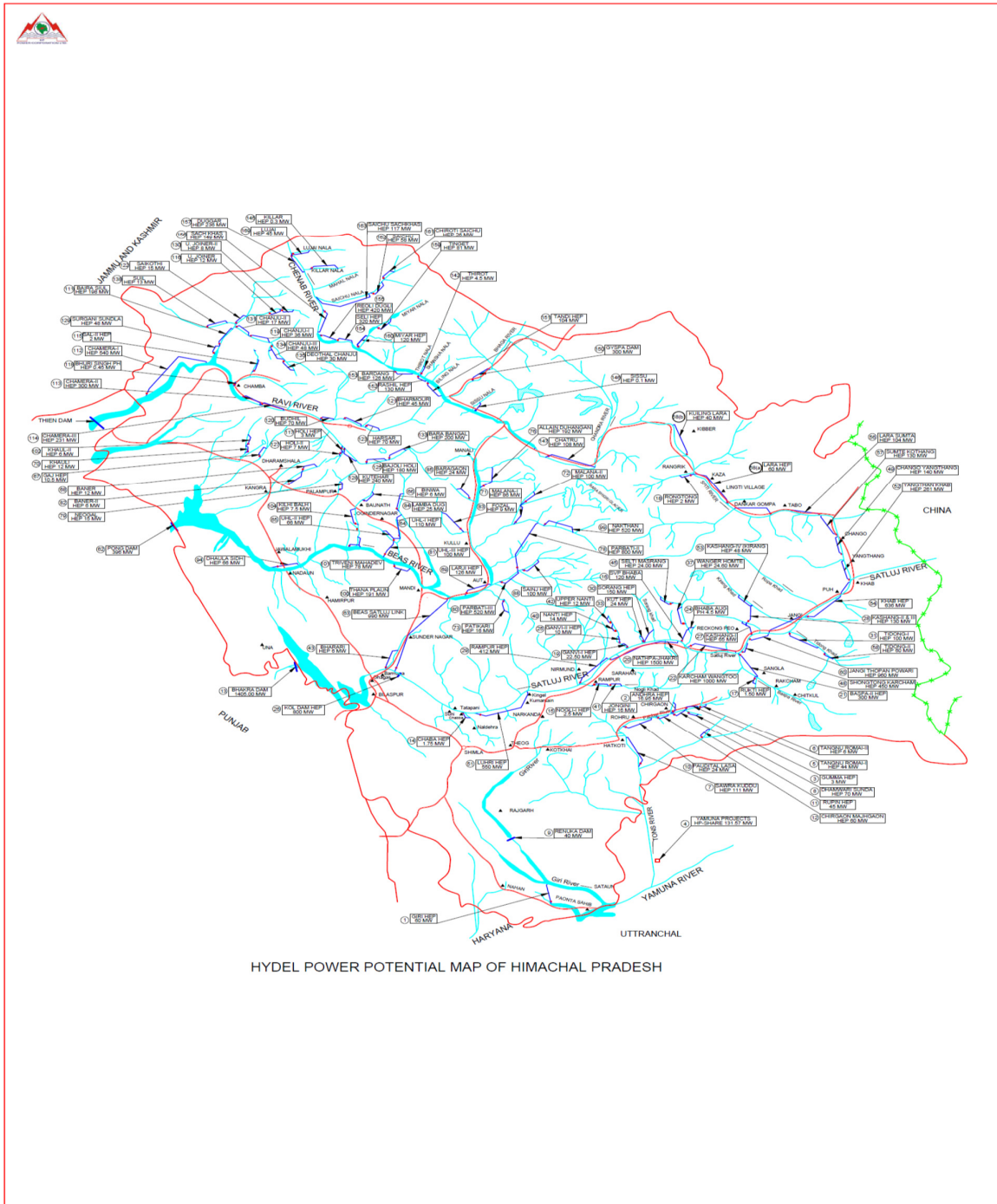
\* The list do not included the projects below 5 MW

**Table 2.2: Basin-wise Hydropower Potential in Himachal Pradesh**

<b>Sr. No.</b>	<b>Basin</b>	<b>Installed Capacity</b>
1.	Satluj Basin	10124.45
2.	Ravi Basin	2895.29
3.	Beas Basin	5564.08
4.	Chenab Basin	3701.64
5.	Yamuna Basin	778.17
	Total	23063.63

Obviously, in the given circumstances, Govt. of Himachal Pradesh has to plan and target early completion of all the hydropower projects (both under execution and in the planning stage).

Fig 2.1 Hydropower Map of Himachal Pradesh



Hydropower projects are basically of two types:-

- a) Storage schemes with dams and reservoirs
- b) Run-of-the-river schemes with minimal submergence

**a. Storage Schemes**

Projects with large dams and reservoirs also called Storage or Multi-purpose projects are taken up primarily for irrigation of agricultural land and generation of electricity is a bye-product.

These projects produce irreversible changes in the environment and ecology of the river basin and obviously such changes have to be balanced against the interminable benefits of the project and a fair trade –off has to be arrived at.

**b. Run-of-the-river schemes**

Run-of-the-river projects require only a diversion structure/barrage across the river/stream to divert a part of river flow through a tunnel to the powerhouse for generation of electricity and release the same back to the river. The barrage creates a small pond to regulate the flow of water to the powerhouse on daily basis.

Because of the minimal/limited volume of the pondage, these projects bring only notional changes in the local environment and ecology of the region and minimal dislocation of families. Fortunately most of such changes, even though small, are mitigable. Some serious environmental issues come up only during the construction phase with localized effects. Every run-of-the-river project involves construction of long tunnels. Accordingly environmental issues primarily concern the air pollution caused by underground excavation and movement of vehicles during haulage of excavated rock material, and muck disposal besides the noise pollution.

Incidentally in Himachal Pradesh, all the hydropower projects with few exceptions (both present and future) are based on run-of-the-river principle and therefore, do not pose any major threat to the fragile eco-system of the river basins and sub-basins in the long run. But still HPPCL has adopted a very holistic and cautious approach in addressing these environmental issues quite adequately to stave off any possibility of environmental degradation and also to instill a feeling of confidence in the minds of the affected communities.

HPPCL has embarked on an enormous program of harnessing hydropower potential. It is therefore necessary to prepare a document delineating its policy on providing environmental safeguards to be adopted during the execution of these projects. This document will serve to educate the general masses about the fact that the impending hydropower revolution is eco-



friendly and sustainable. This document is a commitment of HPPCL to address and mitigate adverse impact likely to impinge on the environment and ecology of the project area.

The HPPCL Environment Policy document, therefore, has been motivated by the above considerations and is intended to mainstream environmental concerns of the project activities. It briefly describes the key environmental challenges currently and prospectively facing the state, the objectives of environment policy, normative principles underlying policy action and mechanisms for implementation and review. It has been prepared through a process of extensive consultation with experts, as well as diverse stakeholders.

This Environment Policy document, therefore, will serve as a beacon light to the engineers for harmonious execution of projects so that these finally blend well into the local surroundings / environment with minimal disturbance to the ecology and giving no cause of complaints to the locals due to deprivation of any local resource. The dominant theme of the policy is that while conservation of environmental resources is necessary to secure livelihoods and well-being of the people at large but simultaneously use of natural resources (hydropower wealth in the present case) is also of fundamental necessity to foster their prosperity such that conservation of environment and its base not only remains intact but improves through additional inputs of environment management plans and people continue to draw their livelihood as before on sustainable basis. The policy also seeks to stimulate partnerships of different stakeholders, i.e. public agencies, local communities, academic and scientific institutions, the investment community, and international development partners, in harnessing their respective resources and strengths for environmental management.

### CHAPTER 3: KEY ENVIRONMENTAL CHALLENGES – CAUSES AND IMPACTS

According to Newton's third Law of Motion "to every action, there is an equal and opposite reaction". Therefore, every project however beneficial and essential to human growth, brings about some changes/side effects. It now depends upon the ingenuity of engineers and environmentalists to gauge the effect of such changes and take mitigating measures to antidote the adverse effects using latest scientific and technological tools / innovations.

As briefly stated in the preamble that most of future hydropower projects, in Himachal Pradesh are run-of-the-river schemes and hence will bring only marginal changes in the environment scenario / status of the locality and affect the livelihood of the people only notionally. But HPPCL will stick to its promise to address and mitigate most of impacts. In fact, it goes a step further as it undertakes to improve the existing environment (ongoing degradation) of the entire catchment area of the river reach or the tributary (whose flow is being diverted to the powerhouse) through the Catchment Area Treatment Plan (CATP) by investing huge funds. This parallel project of catchment area environment improvement will lessen the environment impact of the proposed projects and the existing downstream projects as well. For example, a series of soil conservation measures in the catchment area will reduce the silt load in the river/tributary flow, which, in turn, will ensure long life of the turbines and reduce the closure days of the powerhouse due to increased silt concentration during the monsoon season. Also, the Catchment Area Treatment Plan will restore the overall ecology of the catchment area to its pristine glory and stop the ongoing degradation process as well. In this way the entire State will be converted into a single well protected big bio-reserve one day when all the hydropower projects are complete and commissioned.

The potential impacts on the local environment and ecology by a hydro electric project based on run-of-the-river principle can be divided into two categories-

- a) Impacts limited to construction phase
- b) Impacts extended to the operation phase

These two categories are described in following details:-

**a. Impacts limited to construction phase**

The run-of-the-river projects involve the construction of following key structures-

- i) Diversion structures and Intake works at the site of the project including water impoundment.
- ii) Desilting chambers
- iii) Water conductor system (WCS)
- iv) Powerhouse and contingents structures
- v) Tail race outlet

All these five components are major underground / surface structures. These structures involve drilling and excavation of huge quantities of rocks. The excavated rock is taken out by dumpers and dumped at selected sites in a scientific manner. These structures also require huge amount of concrete for their construction. The quality of rocks taken out of the tunnel varies from site to site and is reused for the preparation of coarse aggregates for concrete mixing as much as possible. Balance concrete requirement is met by mining the required material at suitable locations preferably in the close vicinity of the project site. These construction operations throw-up the following environmental issues:-

- i) Air pollution caused by blasting of rocks during drilling of tunnels.
- ii) Air pollution caused by mining and crushing of rocks to produce aggregates for concrete manufacturing.
- iii) Air pollution (dust) caused by the movement of trucks / dumpers.
- iv) Pollution generated from the residential colonies of workers and the staff.
- v) Disposal of excavated material at suitable dump sites.
- vi) Attendant health risks to the workers due to exposure to air pollution inside the tunnels and the project sites.
- vii) Pollution due to oil and lubricants and silt flow from tunnels.

Explosives are used for blasting of rocks both inside the tunnel or the hard rocks at the quarry sites. This blasting process gives rise to obnoxious fumes inside the tunnels. These fumes are expelled out by supply of fresh pressurized air inside the tunnel from an air compressor through flexible tubes. Therefore the fumes caused by explosives affect the ambient air quality both inside and outside the tunnel. Workers (using masks) are allowed to enter the tunnel after a gap of two hours when all the blast gases have been expelled and they are not exposed to health risks.

The movement of trucks and dumpers at low speeds inside the tunnel also release / exhaust  $\text{No}_x$ ,  $\text{So}_x$  and  $\text{Co}_2$  gases. These too are expelled by the supply of fresh air. Sensors are put inside the tunnels as indicator of safe air quality to ensure zero / minimum health risks to the workers.

Blasting of hard rocks in open-mine-blasting cause additional problems of –

- i) Travel of shock waves affecting the stability of adjoining buildings (if any),
- ii) The sound of blast frightens the wild life and birds to compel them to leave their natural habitat and migrate elsewhere.

Therefore, the selection of site of hard rock at the right location helps in minimizing these effects and decided accordingly. Creation of artificial sound barriers also blunts the adverse impact due to high noise levels. The air pollution caused by stone crushers (mostly dust pollution) for manufacturing coarse aggregates is also

significant which can be effectively checked by installing sprinklers and other devices.

The residential colonies of labour and staff cause both water pollution (toilets and washing of clothes) and solid waste problems. But both issues are easily manageable by constructing sewage treatment and solid waste recycling plants.

Dumping of huge quantities of excavated rocks is also an environment management issues. An innovative approach is needed to select suitable sites (as near as possible) so that the dump site can be used for some other useful purpose in harmony with the natural surroundings e.g. playground, stadium etc. All efforts shall be made to reuse the maximum quantity of excavated rock to manufacture concrete aggregates after conducting necessary tests on the strength of the rock material.

### **EFFECT ON SPRINGS**

There is a general belief among the people that construction of tunnels affects the flow of springs on the ridge though this effect has not been scientifically established. In order to guard against this possibility, it is necessary to prepare a list of springs with their discharge on the ridge along the alignment of the tunnel. The list will classify the springs that are squarely used by the people and the grazing animals for drinking and other purposes. The flow pattern of these springs will be monitored during the excavation of the tunnel to establish the link between the excavation work and any disturbance in the flow pattern of the springs.

#### **b. Impacts during Operation Phase**

- i) The long term impacts of a run-of-the-river project are primarily caused due to pondage and the withdrawal of water into the tunnel and changing the hydrology or the flow regime of the stream in the downstream. Extent of pondage depends upon the height of the barrage, width of the channel and the slope of the river. The maximum height of the barrage adopted so far is 24.0 m. The slope of the river in upper reaches is 16 to 20 m / km. Hence the stretch of the reservoir would be maximum upto a length of 1.5 km in the upstream for big power projects (400 to 1000 MW). The immediate possible impact of this storage would be submergence of a part of the forest cover; of course the right selection of the site can ensure the minimum damage. Accordingly, compensatory afforestation will have to be undertaken to make up for this loss. The dislocation of population will be limited to few families only because residential structure are generally located above the barrage level.
- ii) The next potential impact will be the loss of flow in the downstream during the dry weather. The affected stretch would be between the barrage site and the tail race

outlet. Obviously, it will be a loss of face of the river in the stretch once the entire dry weather flow is diverted into the tunnel. The crux of the matter is that users (humans and animals) in the downstream are deprived of the water use so essential for their livelihood. Therefore a minimum flow must be constantly spilled over / released from the barrage to meet the daily needs of the consumers in the downstream even if it amounts to loss of power generation. Therefore fixation of adequate ratio for releasing water in the downstream in the policy document will sustain a legal right on the people in the downstream and also ensure a continuous life and face of the river. This aspect is also being looked after by MoEFCC while granting Environment Clearance.

iii) Siltation Problems

Most of the rivers and their tributaries are generally steep in nature. Therefore there is no scope for silting of pond / reservoir during the monsoon season when all the gates of the barrage are opened and pondage effect is totally lost. Silting will take place only when the gates are closed and flow is reduced significantly. But this silt will be scoured as soon as the next burst of flood flow comes a few days after. So there is a cycle of silting and scouring over the entire rainy season of 3 to 4 months and deposition of silt over a period of time is almost negligible. The flow during the lean period rarely contains silt and that is taken care of by the silt excluders. Silt carried out by the flow towards the tunnel is retained by the desilting chambers. If the concentration of silt in the flowing water increases beyond acceptable limits, the powerhouse has to be closed.

iv) Hydrological and limnological effects

Damming the river and creating a lake brings about environmental changes in the hydrology and limnology of the river system. The extent of change of course depends upon the size (volume) of the pond so created. As already stated, the maximum stretch of a pond likely to be created by the barrage is 1.5 km in case of big run-of-the-river projects in H.P. Consequently, the hydrological changes accompanied will also be minimum. The effect is negligible in case of projects put across streams where pond stretch is hardly 200 m because of steep slope of the stream in the upper reaches. The condition of aquatic biota gets improved on the upstream side because of the detention of flow and degrades on the downstream in a long stretch due to reduction in the flow. The opposite effects are almost balancing. Since pondage does not cause stagnation, the problem of decomposition of organic matter and reduction of dissolved oxygen (DO) level is virtually off-set. The possibility of growth of aquatic weeds such as water lettuce, water hyacinth, weeds and algal mats etc. are also off-set. The chances of anaerobic decomposition are also minimal. This is also possible because low flow during the day is stored only for 18 hours and

released in full during the next six hours of peak demand. Thus stagnation of water is not more than 18 hours. The constant rise and fall in the pond / reservoir level does not permit the development of anaerobic decomposition in such a short period. Also, a minimum flow, based on scientific assessment, is constantly released downstream. So, the water in the pond is never stagnant in true sense of the word. Since the entire stored water is released everyday during peak hours so the possibility of creation of dead flow pockets in the reservoir is zero as it is a case of batch flow system. In fact the bed of the river is rocky in nature and rarely contains heavy growth of grass. The chances of anaerobic decomposition of the bottom grass are almost absent. The impact on water table will not be noticeable because all the projects are in cascading pattern along the main river and tributaries and slopes are very steep. The seeped water will reappear as soon as there is a sudden draw-down in the reservoir level. So water level fluctuations are only diurnal.

v) Fisheries and Wildlife

Riverine fisheries usually decline due to change in the river flow. The river flow covers full width and depth of the channel section during the monsoon season only and the fish life is in full bloom during this period. However, the flow is substantially reduced during the lean period (end October to May) and the dry weather flow largely depends upon the snow melt and the sporadic rainfall in the valley / catchment area. It has been observed that as a result of joining of large number of streams and tributaries even the dry weather flow is adequate enough in the three major rivers of the State (Satluj, Beas and Ravi) to prolong / maintain the aquatic life. But situation differs (on case to case basis) in respect of tributaries and streams and the fish / aquatic life is affected due to the natural flow variations. Therefore, the construction of a barrage and diversion of flow in the tunnel will affect the aquatic life in the downstream reach upto the tail race outfall in the following manner:

- i) During rainy season the impact is non-existing as a result of diversion of partial flow in the tunnel for the purpose of power generation.
- ii) During the lean flow period, diversion of total flow in the tunnel will affect the aquatic life particularly the fish in the downstream stretch substantially. That is why a minimum flow is calculated with scientific tools sufficient to maintain the aquatic life and is mandated to be released over the weir to safeguard against the aquatic loss.
- iii) The creation of pond at the barrage has a high positive impact in resuscitating the fish life as most of the fish population travels downstream on the pool side and the pool provides sufficient space for its accommodation. In fact the pool becomes a fish pond during the dry weather period.

- iv) Subsidiary bunding of the river / tributary / stream channel at intermediate points in the downstream stretch will further provide a boost to the sustainability of aquatic life uniformly / longitudinally.
- v) Projects across tributaries and sub-tributaries only improve the fish / aquatic life during the dry weather season as a result of creation of water pools at the barrage site / subsidiary bunds. This is because the fish / aquatic life in the streams becomes virtually non-existent during the non-monsoon period as the low discharge (unlike in case of river flow) is unable to cover the full width of the channel (assessment of fish life intensity will be carried out to determine the extent of loss of aquatic life in the stretch as a result of reduction of flow over the barrage upto the Tail Race Tunnel. Likewise the assessment of additional flow added to the river due to joining of streams in the same stretch will also be carried out).

The adverse impact on Wildlife occurs mostly when there is a loss of habitat. This possibility does not arise because the bed of the river is rarely the habitation hub of the wild life and consequently pondage at the barrage site will affect the wild life in the least. On the other hand, it will promote wildlife because animal population residing in the vicinity will use the pond water for bathing and drinking purposes particularly during the summer season and will not migrate elsewhere. The project site too will be so located that the lake formed upstream of the barrage maintains the safe prescribed distance from the wildlife Protected Areas. Aquatic fauna including water fowls, reptiles and amphibians are likely to increase because of the ponded water. This life will not be decimated on the downstream because a minimum flow, based on requirements, will always be released for the aquatic life to survive.

This discussion indicates that run-of-the-river hydropower projects alter the ecosystem only marginally and there is minimal loss of resilience in the ecosystem. The loss of environment resource base as a result of creation of the pond at the barrage can result in affecting the lives of the river side communities mostly due to loss of forest. But this possibility will arise only on a minor scale even in case of bigger projects (400 MW and above) where height of barrage is 24.0 m and stretch of the reservoir is 1.5 km. But even there, the R and R Policy will be so designed that affected families are adequately compensated. However it has been observed that growth of forest is generally dense above the barrage level.

### **ENVIRONMENTAL ECONOMICS**

There is a detailed and cumbersome process for obtaining Environment Clearance for all hydroelectric projects from Ministry of Environment, Forest and Climate Change (MoEFCC), GoI. Environment Clearance is granted in two stages. In the First Stage/pre environmental clearance, Terms of Reference (ToR) are fixed by

Expert Appraisal Committee (EAC) of MoEFCC for preparation of Environment Impact Assessment (EIA) Report and Environment Management Plan (EMP) which provides mitigation measures of environment impacts assessed in EIA report. EIA/EMP are prepared by only the accredited institutions listed by MoEFCC. Second Stage or Final Environment Clearance is granted by MoEFCC after detailed scrutiny of EIA/EMP report of each HEP by the EAC of MoEFCC/SEIAC.

### **ECONOMIC BENEFITS TO THE PROJECT AFFECTED FAMILIES**

HPPCL has framed people friendly Rehabilitation & Resettlement (R&R) Plan which constitutes various welfare R&R schemes. R&R Plan is being implemented in five ongoing Hydro Electric Projects (HEPs) of HPPCL which are under construction stage. The detail of all such welfare R&R schemes by HPPCL is given below:

#### **Name of Schemes:**

1. ITI Scheme
2. Merit Scholarship Scheme
3. Training cum Awareness Camps
4. School competition Scheme
5. Sports Tournament Scheme
6. CBO Involvement Scheme
7. Self Employment Scheme
8. Medical Fund Scheme
9. Forest Right Scheme
10. Minor Mineral Scheme
11. LADF (Local Area Development Fund)
12. RR Grants
13. Other RR Activities

For sustainable development, HPPCL is committed to finance the Catchment Area Treatment (CAT) Plan, Compensatory Afforestation (CA) scheme and Net Present Value (NPV) in respect of forest land diverted for construction of HEPs.

These activities are adding to the overall sustainable development of all Hydro Electric Project undertaken by HPPCL and to the prosperity of the State. In addition, HPPCL is committed to release minimum 15% of lean season discharge as Environment Flow for fulfilling environmental functions of river; and will provide fish passes in all its diversion structures as far as practically feasible



## **CHAPTER 4: OBJECTIVES OF THE ENVIRONMENT POLICY**

There is a perception in a section of the society that hydropower projects bring adverse and irreversible changes in fragile eco-system causing loss to the resource base and even trigger natural disasters like earthquakes. Many projects have been held in abeyance in some of the States due to agitations triggered by such a perception. Hydropower projects based on run-of-the-river concept are generally not ecology changers but are relatively eco-friendly. These projects bring about minor disruptions in the eco system and most off the changes are easily mitigable and finally the project blends well in the mountainous setting. On the other hand, these projects have become indispensable for interminable revenue generation and improving the overall health of the economy of a hill state. Nature in its own wisdom compensates people of hilly region in terms of hydropower potential in lieu of deficient agricultural economy. Therefore, it is essential that people must know that hydro-power projects are basically the engine of growth and back-bone of the State's economy so essential for their livelihood and prosperity. These are temples of a modern resurgent State and hot-spots of modern tourism. Hence hydro power potential of the state should be harnessed as expeditiously as possible.

However, immense benefits accruing from hydro-power projects must reach the people or the local community whose livelihood has been affected due to the project. They desire a special prize / bonanza over and above what they get under the R and R policy. R and R policy has been suitably amended to share a part of the economic returns of the project with the project affected families. Once people become both stakeholders and share holders in a power project then they are likely to stop raising frivolous objections against the project.

In view of this background, the principal objectives of the HPPCL Environment Policy for the hydro-projects are outlined below. These objectives relate to current perceptions of key environmental challenges. They may accordingly evolve over time:

### **1. Education and awareness about the utility of hydro power projects**

- i. To intimate / educate people that like agriculture in plains, hydro-power generation is the main stay of the economy of a hill State and eradication of poverty and flow of prosperity is directly hinged on the exploitation of hydro-power potential. Hence, it is the endeavor of the State Govt. to harness this wealth as quickly and expeditiously as possible without affecting the environment regime of the area.
- ii. To intimate/educate people that the run-of-the-river projects are basically green, sustainable and highly eco-friendly. They bring minimal changes in the local environment or ecology and that too mostly during the construction phase and the adverse impact on environment is marginal and easily mitigable through a series of remedial steps.

## 2. Conservation of Environmental Resources

- i. Himachal Pradesh is fortunately endowed with forest and biodiversity wealth and the entire state is in the lap of an ecologically sensitive bio-sphere. Any change in the ecology may trigger climatic changes. Therefore, the state is not in a mode of blind exploitation of hydropower potential and is seriously concerned to protect and conserve the ecological system and resource (flow of springs) and invaluable natural and manmade heritage which are essential for life support, livelihoods, economic growth and a broad conception of human well-being. HPPCL is earnest to abandon or reduce the capacity of any project if it is found to affect the fragile eco-regime of any sensitive zone.
- ii. To ensure that affected communities whose existing resource base is affected in one way or the other are adequately compensated either by replicating the lost resource base (compensatory afforestation) or by economic benefits on annuity model.
- iii. To ensure that the project as far as possible is in harmony with the local environment and perfectly blending with the existing hilly surroundings or natural environments and does not become a sore point
- iv. To ensure that environmental concerns have been adequately addressed, ingrained and become inescapable part of the hydropower policy of the State.
- v. To ensure that the impact on environment is barest minimum during the construction phase by controlling the pollution at source, using efficient machinery (vehicles, generators) and maximum possible recycling of excavated rocks in concrete work and adopting other suitable mitigating measures.
- vi. To ensure that the location of the project is so selected that adverse environment impact even though mitigable on all accounts is minimum even if the cost-benefit ratio has to reduce.

## 3. Good Governance

- i. To apply the principles of good governance (transparency, rationality, accountability, reduction in time and cost, participation and regulatory independence) to the management and regulation of environmental resources.
- ii. To ensure higher resource flows, comprising finance, technology, management skills, traditional knowledge and social capital for environmental conservation through mutually beneficial multi-stakeholder partnerships between local communities, public agencies, the academic and research community, investors, and multilateral and bilateral development partners.

iii. To ensure that project is finished within time (leaving no scope for disputes / delays by the contracting agencies through good governance) so that exposure of people to pollution is reduced to minimum during the construction phase and economic efficiency is also bettered simultaneously because of the early returns from the project. In the State of HP, CAT Plan is implemented by State Forest Department against the funds released by Hydro Electric Projects.

4. Regeneration of Catchment Area

To take up special environment improvement project of the catchment area and improve its environmental status which is undergoing slow degradation due to natural weathering agencies and then to restore it to its pristine glory. Also adopt soil conservation measures to ensure minimum silt load to the stream. This activity will be deemed as the soul of all hydropower projects because indirectly it will help in converting the entire state back into a single blooming and stable bio-reserve.

5. Livelihood Security

To ensure minimal damage to environmental resources and quality for all sections of society, and in particular, to ensure that communities, which are most dependent on environmental resources for their livelihoods, are assured secure access to these resources. Also to launch additional welfare scheme under the obligations of the concept of Corporate Social Responsibilities (CSR) so that dependence of communities on environment resources for their livelihood grows less and less with the passage of time such that the execution of the project is looked more as a boon than a liability / malady to their social and economic setting.

## CHAPTER 5: PRINCIPLES

This policy has evolved on the fundamental principles of development process / strategy in the country i.e. project meets the criteria of sustainability (based on green principles) and respects ecological constraints, imperatives of justice ensuring benefits going to all sections of society on equitable basis.

The objectives stated in the previous chapter are to be realized through various strategic interventions by different public authorities at State and Local Government levels. These strategic interventions beside existing environmental legislations must be based on certain set principles depending upon their feasibility and relevance. Therefore following Principles may accordingly guide the activities of different actors in relation to the implementation of the policy. Each of these principles has an established genealogy in policy pronouncements, jurisprudence, International Environmental Law or International Practice.

### 1. Sustainable Development Concerns

- a) The project meets the criteria of sustainability (based on green principles and renewability of resource) and people in the vicinity of project site continue to lead a healthy, productive and unaffected life in harmony with the nature.
- b) Project effectively meets the development, environmental needs of present and future generations.
- c) In order to achieve sustainable development, environmental protection shall constitute an integral part of the hydro-power projects.
- d) Where there are credible threats of serious or irreversible damage to key environmental resources, economic indispensability of the project shall not be used as a reason for postponing cost effective measures to prevent environmental degradation. In other words, environmental concerns will always override the economic returns of the project.

### 2. Minimum Environmental Setbacks

Project will be so sited and designed that its setting and execution cause minimal disruption in the existing ecology of the area and there is minimum use of energy and materials during the construction. All efforts will be made to make the maximum possible use of excavated rock for the construction work. The dump yards for the rock material will perfectly blend with the natural surrounding and if possible put to some use by the local community e.g. play-ground or a shopping complex. Whatever environmental/ecological changes have been brought about as a result of the execution of the project will be restored / mitigated (e.g. compensatory afforestation), to cause zero environmental loss in

the final analysis. The project site will be further developed as a hot-spot tourist complex to promote tourism in the state.

### 3. Economic Efficiency and Economic Viability of the Project

The famous hydropower engineer Late Dr. K. L. Rao (Minister for Irrigation and Power Govt. of India in early 60s) had once stated that “No power is costlier than absolutely no power.” Therefore, in the present scenario of power crunch and depleting resources all renewable energy projects have been deemed to be economically viable. Hydro power projects enjoy greater viability as compare to wind and solar power projects, where high investments are required.

Water being a renewable resource, the economic viability of a project is tested by two parameters i.e. Power Load Factor and Pay-back Period. These two parameters have almost acquired a set value of 43% and 10 years respectively for run-of-the-river hydropower projects located across rivers in northern India. Therefore, the economic viability of a hydro power project is tested against these two values at the design stage itself. These factors will be further improved for all the downstream projects if a storage project is constructed in the upstream reaches across the main river e.g. proposed Khab project in river Satluj.

But the economic efficiency of the project is evaluated in the background of redressal of environmental concerns also. In other words, a project will be deemed as economically efficient if it causes minimum disruption in the existing environment setting and all environmental disturbances have been restored / safeguarded to leave behind no trail of environmental damage.

Therefore, the effort of HPPCL would be to site the project in such a way (simultaneously taking adequate environmental safeguards) that there is bare minimum environmental loss and the project remains green and sustainable even during the operational phase. Effective implementation of Catchment Area Treatment Plan (CATP) together with the Environmental Management Plan (EMP) will further reduce and bring down the environmental loss within acceptable limits.

Further implications of this Principle are as follows:

- a) Cost Minimization: Cost of every project has two components i.e. the fixed cost and the variable cost. The variable cost can be optimized and adjusted by judicious use of resources and innovative technologies. Cost minimization leads to saving of resources which further leads to improvement of environment. Efficiency of resource use may also be accomplished by the use of policy instruments that create incentives to minimize wasteful use and consumption of natural resources. The principle of efficiency also applies to issues of environmental governance by streamlining

processes and procedures in order to minimize costs and delays. So HPPCL will strive hard to reduce the variable cost by taking following measures

- i. Recycling of the excavated rock for manufacturing concrete aggregates
- ii. Reuse of poor quality muck for developing parks and road pavements
- iii. Construction / resurfacing of durable roads up to the project site before the start of the project
- iv. Use of efficient machinery and updated technologies for tunneling and concreting work

b) Entities with “Incomparable Values”

Significant risks to human health, life, and environmental life-support systems, besides certain other unique natural and man-made entities, which may impact the well being broadly conceived, of large numbers of persons, may be considered as incomparable in that individuals or societies would not accept these risks for compensation in money or conventional goods and services. A conventional economic cost-benefit calculus would not, accordingly, apply in their conservation without consideration of direct or immediate economic benefit.

c) Integration

Integration refers to the inclusion of all possible environmental considerations for environmental and ecological sustainability in the project planning and project design. This also includes the integration of the social and natural sciences in environment related policy research, and the strengthening of relevant linkages among various agencies at the Central, State and Local Self Government levels. Therefore all the environmental impacts (both short and long term) likely to arise as a result of the proposed project are thoroughly envisaged and crystallized at the planning stage itself and remedial or mitigating measures are proposed accordingly as necessary safeguard so that once the project is finalized and approved, it radiates a green outlook. For example, total use of huge amount of excavated rock from the underground structures (zero dumping) either for concrete aggregates or in road embankments will add the green character to the project.

d) Precautionary Principle

It is preferable to prevent environmental damage from occurring in the first place, rather than attempting to restore degraded environmental resources after the act.

e) Environmental Offsetting

There is a general obligation to protect threatened or endangered species and natural eco-systems that have direct or indirect bearing on sustaining the livelihoods, or general well-being of the co-existing communities. If for exceptional reasons of overriding public interest such protection cannot be provided in particular cases, e.g. felling of few hundred trees of low girth due to submergence cost-effective offsetting measures must be undertaken by the proponents of the activity, to restore as nearly as may be feasible, the lost environmental services to the public.

## **CHAPTER 6: STRATEGIES, ACTIONS AND POLICY INITIATIVES**

The foregoing statement of policy, objectives and principles are to be realized by concrete actions relating to key environmental challenges. Himachal Pradesh is on the way to becoming the first Hydropower State of India by 2022 when all the projects would be commissioned and 15000 MW of additional power would be generated. In that case, the entire state would look like a big power house of green and renewable energy. Any person concerned with environmental conservation would instantly feel that commissioning of approximately 120 hydropower projects would totally transform ecological face of the state. But that would not be so because all the power projects have been planned on the run-off-the-river model with minimum environmental interventions / disturbances. Project-wise these interventions have a set pattern and are easily restorable / mitigable. HPPCL intends to have a robust environment policy to ensure that execution of these projects takes place in complete harmony with the nature and operate on sustainable basis for all the stakeholders.

The policy will have three major planks:

- 1) Siting of project ensuring minimal environmental setbacks and the project finally blending in complete harmony with the natural surroundings.
- 2) Complete abatement of pollution during construction phase and providing beautiful landscaping around the project site so that the project also becomes a source of tourist attraction.
- 3) To stop the ongoing natural degradation of the catchment area due to anthropogenic or natural reasons and to restore and regenerate its biodiversity and ecology to its pristine glory through the implementation of well designed environment management plan (EMP).

The selection of site will be carried out by a duly appointed site selection committee to achieve the objective of minimal environmental set-backs. Justification of site selection will be adequately explained in the Detailed Project Report (DPR). Complete abatement of pollution during the construction stage will be ensured by the site engineers under the watchful eyes of the monitoring committee of the project, State Pollution Control Board and the MOEF. The degrading process of the catchment area will be stopped by implementing a robust Catchment Area Treatment Plan (CATP) for which the funds will be deposited by HPPCL with the Forest Department of the State.

Since all the projects traverse the entire state, accordingly by 2020, Himachal Pradesh will not only become a renewable energy power house but a new biodiversity reserve also. This is the main holistic objective of this environmental policy document.

In order to achieve this sublime, subtle and holistic objective, HPPCL will work on the following action plan which will be a combination of regulatory and infrastructural framework. The



directions contained in this document will be applicable to all the projects covered both under Public and Private Sectors.

**A. Regulatory Actions:**

Present legislative framework is basically contained in the umbrella Environment Protection Act, 1986; the Water (Prevention and Control of Pollution) Act, 1974; the Water Cess Act, 1977; and the Air (Prevention and Control of Pollution) Act, 1981. The law in respect of management of forest and biodiversity is contained in the Indian Forest Act, 1927; the Forest (Conservation) Act, 1980; the Wild Life (Protection) Act, 1972; and the Biodiversity Act, 2002. There are several other enactments, which complement the provisions of these basic enactments.

Besides this, every hydropower project falling in the 25 – 50 MW range is required to seek environmental clearance from the State Environment Authority. A project with higher capacity will seek the environmental clearance from the Ministry of Environment and Forest (MOEF) Govt. of India. The environmental clearance is granted after a comprehensive EIA study has been undertaken and documented in the form of a report followed by a thorough public hearing. Once the documents are in order, the State Environment Authority or MOEF, as the case may be, grants clearance with a set of conditions which ensure a commitment from HPPCL for restoration / mitigations of adverse impact likely to be caused by the execution of the project. As a double check, the HPPCL has to go again to the State Pollution Control Board to seek NOC ('Consent to establish' the project). The Board again sets its own conditions to be implemented during execution of the project which are more or less on similar lines of the conditions imposed by MOEF while granting the environmental clearance. Once the project is ready and fit for commissioning, HPPCL will have to go again to the State Pollution Control Board to seek 'consent to operate'. This NOC provides another opportunity to the Board to oversee if the conditions stipulated in clearance letter of Environment Authority or MOEF and the NOC of the Board itself have been duly complied with and there has been no deviation and adverse impact on the environment in any form as a result of the execution of the project. This shows that there is least chance of any environmental infraction under this straight-jacket process of seeking various clearances at different stages.

In order to expedite clearances/NoC from Regulatory Authorities, HPPCL would set up a broad based separate cell which will excel in skills (based on access to information and use of information technology tools) to seek timely clearances from the concerned authorities. The cell will be designated as Environmental and Social Management Unit (ESMU). It will be responsible for precise and meticulous scrutiny of various documents and facilitating presentations before different authorities to seek timely environment

clearances. ESMU will also be responsible for guiding the consultants for the preparation of comprehensive EIA and EMP documents such that EMP when implemented meets all the targeted objectives and restore the ecology of the area to its pristine glory. It will also identify entities of “Incomparable Values” in the catchment area through the eyes of EIA study document that may enforce HPPCL to change the site. It will also monitor the Action Taken Report (ATR) for projects allotted. It will also update its knowledge and skills by having interaction with other agencies engaged in the execution of similar projects e.g. NHPC, SJVN etc. to ensure timely compliance of all the conditions set out in the clearance order during the execution of the project.

EMSU/HPPCL will study and analyses the causes of general aversion of villagers against the construction of run-off-the-river hydropower projects. Their opposition and affrontery is solely based on unfounded fears of environmental catastrophes and dislocation of families accompanying the proposed power projects. Consequently their opposition to the projects is more out of ignorance than by design. Therefore, HPPCL will spearhead an aggressive educative campaign to make people aware of the interminable benefits of the run-off-the-river hydropower projects and their indispensability for the economic prosperity of the State with minimal / notional environmental side effects.

EMSU/HPPCL will also make recommendations to the State Govt. to introduce special incentive schemes so that people become supporter of such projects and come forward to request the Govt. to set up more and more hydro power projects in their respective area.

**B. Substantive Actions:**

1. Conservation of Environmentally Sensitive Zones

Environmental Sensitive Zones may be defined as areas with identified environmental resources having “Incomparable Values” which require special attention for their conservation. HPPCL shall strive to site its projects such that the ecology of any environmentally sensitive zones or high value conservation areas is least affected. These identified zones may consist of such features as eco-sensitive zones, sensitive wetlands, Ramsar sites, wildlife sanctuaries and National Parks. If any such zone falls in the catchment area of the project then special area development plan (which will be a separate chapter in the environment management plan) will be framed on scientific lines with adequate participation by the local communities in order to conserve and enhance the resources without impeding legitimate socio-economic development of the area.

HPPCL is already conscious of this conservation necessity. It made adjustments in the identified hydropower projects at Sainj and Nakthan to avoid high value

conservation areas and reduced the generation capacity of the projects. HP Govt. also abandoned some of the projects proposed to be located in the eco-sensitive zones or near major cities or places of public interest. In fact it has already decided to ban the construction of hydro power projects in one of the stream i.e. Tirthan to preserve the Rainbow Trout fish. HPPCL will continue to follow this policy in its future programme also.

2. Biodiversity, Traditional Knowledge and Natural Heritage:

Conservation of genetic diversity is crucial for development of improved crop varieties resistant to particular stress, new pharma products, etc., apart from ensuring the resilience of ecosystem. Traditional Knowledge (TK), referring to ethno-biology knowledge possessed by local communities, is the basis of their livelihoods, and also a potent means of unlocking the value of genetic diversity through reduction in search costs.

Natural heritage sites, including endemic “biodiversity hotspots”, sacred groves and landscapes, are repositories of significant genetic and eco-system diversity, and the latter are also an important basis for eco-tourism. They are nature’s laboratories for evolution of wild species in response to change in environmental conditions.

Following measures are to be taken to preserve the Bio-diversity of any prospective project site. It may be clarified that in no case the biodiversity consideration will be sacrificed for the financial potential of the project

- i). Strengthen the protection of areas of high endemism of genetic resources (“biodiversity hotspots”), while providing alternative livelihoods and access to resources to local communities who may be affected thereby
- ii). Pay explicit attention to the potential impacts of development projects on biodiversity resources and natural heritage. In appraisal of such projects by cost-benefit analysis, assign values to biodiversity resources at or near the upper end of the range of uncertainty. In particular, ancient sacred groves and “biodiversity hotspots” should be treated as possessing “Incomparable Values”.

3. Use of Economic Principles in Environment Decision Making

Basically run-off-the-river hydropower projects generate renewable energy and help to conserve the existing environment resource base. In fact these projects enliven the remote / untouched areas with construction and operational activities

and promote tourism and bring remote virgin areas into the mainstream. Therefore the necessity of the project has to be looked and evaluated with this background and appraised accordingly. The generation and creation of renewable energy resource is basically equivalent to a new environment resource. This is because generation of equivalent power presently in India is possible mainly by installing more thermal power plants in which case generation of massive amount of air pollution and CO<sub>2</sub> emissions may trigger climate change besides depleting the non renewable coal reserves making them scarce for the future generations. The hydropower projects on the other hand will earn huge carbon credits in the international market. These facts need to be brought to the notice of clearance / clearing authorities so that they can adopt a more facilitative, flexible and proactive attitude while granting various clearances / NOC in a quicker mode. The only incidental condition for hydro power project has to be that they don't submerge any source of Incomparable Values e.g. species of high genetic value.

### **C. Infrastructural Measures**

#### **1. Site Selection of the Project**

Proposed site of the project will be decided by a site selection committee to ensure that the proposed project brings about minimum environmental setbacks. The committee will prepare a detailed report on various alternative sites and give cogent reasons for zeroing in on the proposed site. Hydro power projects are mostly located in hilly terrains some of which could be landslide prone and operations like tunneling, blasting, road construction etc. can trigger landslides during the execution phase. Therefore, all such consideration like seismicity, submergence of flora and fauna and archeological sites due to the construction of project will be duly highlighted in the report (role of geologist).

#### **2. Construction of all weather – durable roads before the start of the project**

Project sites are located mostly in far flung areas. These sites are accessible through village roads up to a point. The village roads are often found damaged and don't provide smooth run to the vehicles. The execution of the project entails movement of heavy vehicles which the village roads may not be able to bear without further damage to their structure. So the movement of the vehicles not only damages the existing roads further but also generates lot of dust and air pollution. The situation during the rainy season will further complicate the matters. Hence HPPCL would ensure the resurfacing / reconstruction of the

existing village roads completed in the interest of the project. Efforts will be made to ensure that the concerned agency completes the reconstruction work on priority basis within the stipulated time frame. HPPCL will extend the village road from the terminal point up to the project site. The contractor will also construct the durable roads at the project site for to and fro movement of vehicles for dumping of excavated rock to minimize the air and dust pollution before the start of the project. This condition will be explicitly reflected in the work agreement.

3. Compensatory Afforestation

Hydropower projects require clearing of the forest area for construction of various project structures. The construction of a barrage / weir creates pondage in the upstream and leads to submergence of trees. Incidentally, the river beds for all major rivers and their tributaries in Himachal Pradesh consist of hard bed rock with scant forests. HPPCL will, nonetheless, formulate an appropriate methodology for assessing and restoring the environmental values of forest trees by preparing an inventory of actual number of trees (and their species) likely to be submerged along with significant presence of flora and fauna if any. Trees of high indigenous genetic diversity would be treated as entities with “Incomparable Values”. Accordingly the project site will be so selected that trees of Incomparable Values are avoided. HPPCL will be committed to fund the Compensatory Afforestation programme of State Forest Department/MoEFCC. Plantation of suitable varieties / species will be done along all the approach roads leading to the project sites. Attention will also be paid to organize a project of voluntary plantation near the project site and the down stream areas to improve the over all ecology in the neighborhood.

4. Wildlife

The status of Wildlife and Forestry in a region is a fairly accurate index of the State of Ecological Resources and thus of the natural resource base of human well being. This is because of the interdependent nature of ecological entities (the web of life) in which wildlife is a vital link. Moreover several charismatic species of wildlife embody “Incomparable Values” and at the same time comprise major resource base for sustainable eco-tourism.

Conservation of wildlife, accordingly, involves the protection of entire ecosystem. However, in several cases, delineation of and restricting access to such Protected Areas (PAs), as well as disturbance by humans on these areas has led to man-animal conflicts. While physical barriers and better policing may temporarily reduce such conflict, it is also necessary to address their underlying causes. These may largely arise from the identification and delineation of PAs, as

well as the loss of traditional entitlements of local people, especially tribals, over the PAs. There is also a strong need for creation of corridors to ensure proper genetic flows across habitats. Since wildlife does not remain confined to particular areas, there is also need to ensure greater protection, and habitat enhancement outside the PAs. Therefore the Environment Management Plan (EMP) for HPPCL Projects close to Wildlife Protected Areas shall incorporate provisions for protection and conservation of wildlife.

## 5. Pollution Abatement

Pollution on hydropower projects is generated in three forms.

a) Air Pollution

b) Water Pollution

c) Pollution from Solid Wastes

a) Air Pollution: As already stated, air pollution is caused mostly during the excavation of rocks inside the tunnel. This takes place in two phases 1) Blasting of rocks and 2) vehicular emissions during to and fro movement of vehicles for the carriage / haulage of excavated rocks. These two sources of air pollution make the environment inside the tunnels inhalable for workers even with the use of masks. The vehicular emissions can be drastically reduced if the tunnel surface is built smooth at uniform grade and kept in semi-dry conditions. It will be a good idea if concrete blocks of adequate strength are laid within the tyre widths of the tunnel or the surface is leveled and graded like a water bound macadam road. Experiments will be made to translate this idea into reality.

The air pollution caused by blasting of rocks and emissions of vehicles will be lessened / mitigated by providing efficient and well designed ventilation system so that smoke generated by blasting operations and the movement of vehicles is expelled out by the fresh air quickly and the air inside the tunnel at any time meets the standards of ambient air quality. This will be possible when both blow-in and blow-out systems of ventilation are introduced. The blow-out system will be installed at the T-point of the Adit and the tunnel and the expelled air will be released in a direction outside the Adit such that it doesn't mix with inflow air of the blow-in system. The system will be designed appropriately for each tunnel and will be made part of the contract with the executing agency. The executing agency will submit a comprehensive design prepared by a reputed agency in the field of air ventilation in tunnels.

The pollution caused by blasting of stones at the quarry-site, stone crushers and diesel generator of the blow-in system will be controlled strictly in conformity with the requirements prescribed by the State Pollution Control Board while issuing the NOC (Consent to Establish) to the HPPCL.

The age of vehicles also has a bearing on the volume of emissions. So it will be ensured that the vehicles used by the contractors for the haulage of material are in good condition. The condition will also be incorporated in the contract agreement between the HPPCL and the executing agencies.

- b) **Water Pollution:** The contractor has to employ a large force of skilled workers at his project site and accordingly he has to set up a residential colony with prefabricated structures. HPPCL will also set up its residential colony for its staff to reside on permanent basis. The contractor will be asked to provide one unit for three persons with an attached W.C. The system of common toilets of the entire workforce will be disallowed as it leads to poor maintenance and creation of unhygienic conditions. The contractor will be allowed to discharge the waste into a septic tank cum soakage pit if the work force is less than 100 persons. Otherwise he will be directed to provide for a proper sewage treatment plant for treating the waste water to a level of 20 ppm of BOD or as per conditions set by the State Pollution Control Board. The treated effluent will be recycled to irrigate the green plants in the surroundings rather than discharging directly into the stream.

Surveillance shall be kept to see that labour community does not cause any damage to the Wildlife inhabiting in the adjoining area. The Labor Camps will be provided with LPG and other fuels to minimize biotic pressure on the nearby forest area.

- c) **Solid Waste Management:** The Labor Colony will also generate some solid waste daily. This solid waste will be collected into three pits. First pit will be used for storing the organic waste. The second pit will be used for storing the paper and plastic waste and the third pit will be used for storing the metallic waste. Paper, plastic and metallic wastes will be disposed off to the rag-pickers. The composting of manure will be carried out by installing pre-fabricated vermi-culture compost plants.

6. Landscaping and Restoration of Dumping and Quarry Sites

Excavation of rocks from tunnel and other structures leads to generation of huge quantity of rock materials. The type of rock encountered during excavation is of both good and poor quality. Good quality rock can be used for manufacture of

concrete aggregates. Poor quality rock can be used for filling of local depressions, pavement of road surfaces and other structures like park, residential colony, playground etc. The balance quantity of poor quality rock will have to be dumped in scientifically designed predetermined dumping sites. The dumping sites will have to be explored by conducting intensive survey of the area. Efforts will be made to locate the dump sites away from the river beds. In case it is unavoidable, the dump sites may be located along the river beds where the cross section of the river / tributary is very wide so that the flow regime of the flowing water is not restricted and dumped material is not swept away during the high flood discharge by keeping its baseline well above the highest flood level (HFL). Accordingly the dump sites will be strengthened by wire-crates coupled with retaining walls and buttress beams. The dump site will be properly turfed with grass so that the scar of the dump site becomes invisible and looks as part of the river regime. The dump sites elsewhere will also be designed accordingly with stable slopes and turfed with grass and flower beds, so that whole structure adds to the ambience of the site. The quarry sites or private dumping sites e.g. Playgrounds, Children Parks will be properly landscaped. HPPCL will also reclaim areas near the project sites for landscaping and giving aesthetic value addition so that the whole project site truly resembles a beautiful tourist complex with wide green belts having flowers and plants. Plantation and ambient landscaping will also be carried out near the residential colonies and adjoining areas. Dumping of excavated material along the river banks shall be the last resort after exhausting all possibilities of dumping it elsewhere.

Following measure will be taken to ensure safe execution of the project with environmental safeguard in view:

- i). All steps shall be taken to prevent land slides to ensure slope stability and also to ensure that no damage to the roads, human life and flora and fauna is caused.
- ii). The dumping area of muck disposal shall be stabilized and re-claimed and plantation of suitable species shall be provided / grown over the dumping areas at the cost of user agency under the supervision of State Forest Department. Stabilization and reclamation of such dumping sites shall be completed as soon as the excavation work is over before the commissioning of the project. Preferably use of geo-textile materials shall be made for stabilization of muck at the dumping sites. This technology will also be used for reclamation of mining areas.



- iii). HPPCL / Contractor shall ensure that muck does not roll down the slopes. All such areas where muck has rolled down the slopes shall be rehabilitated at the cost of the contractor under the supervision of the State Forest Department.
- iv). The material in the dumping site will be retained by constructing stone crates at the base. If the dumping site is located within the river cross section, the concrete retaining walls will be constructed upto the HFL of the river flow.

7. Locations of Quarry-sites

A fresh quarry-site is needed when quantity of good quality stone excavated from the tunnels is not sufficient to meet the requirements of manufacturing of concrete aggregates. Therefore power producer has to locate a new quarry-site of good quality stone to meet the requirements of concrete work. Consequently, quarry-site will be located as close to the project site as possible to optimize the cost of haulage of the stone metal. Simultaneously, it should be located as far as possible from any residential colony or building complex or wildlife sanctuary. Accordingly the quarry site will be located and fixed by a site selection committee. The committee will prepare a detailed report to give the reasons for selecting the particular site conforming to all the siting parameters. The contractor shall provide all the safeguards to control the air and noise pollution as prescribed in the EMP documents.

The quarrying operations for the excavation of stones / boulders shall be stopped as soon as construction works of the project are complete. Thereafter the site will be restored and rehabilitated such that it does not leave a scar in the overall environment setting of the area.

8. Mandatory Downstream Discharge Release

HPPCL will ensure that a minimum flow, based on scientific assessment is discharged in the downstream of the barrage site to maintain stream's longitudinal aquatic lifeline / connectivity besides fulfilling hydrological functions of the river / stream and restoration of riparian rights of the downstream population (both human and animal) dependent on the river flow in the stretch between the barrage site and the tail race outfall. This minimum flow will also prevent the loss of face or identity crisis of the river, a concept that triggers most of the agitations against the project. HPPCL will release either the minimum statutory discharge (15%) or scientifically assessed discharge based on environmental requirements whichever is more. HPPCL will install automatic flow measurement devices to release and monitor the desired quantity of flow volumetrically.

9. Provision of Fish Ladder

Impounding of flowing water due to the constructions of dam / barrage may affect the migration of fishes for breeding and feeding purposes. Fish always migrate to adjust to diurnal temperature variations besides feeding and breeding requirements. Therefore, it is necessary to provide a fish pass where feasible to facilitate the migration of fish populations from one end to the other, whether or not recommended by a Fisheries Study. Hence, the minimum flow to be released downstream will be passed through the fish ladder. Efforts will be made, wherever possible, to set up fish farm to increase the productivity of fishes by developing ex- situ culture of fishes. An inventory of existing fish hatcheries will be prepared to ensure their protection during operation phase of the project.

Efforts will also be made to build stone masonry bunds of appropriate height in succession to create pondage for the fish life as well as environmental considerations aimed at improvement of hydrological regime (including ground water recharge) at suitable distances each along the affected stretch. Cost of such stone masonry bunds will be marginal and will form part of the project or its operational cost. These bunds may be washed down during the floods and shall be rebuilt during the lean period so that a continuous ribbon of interconnected pools is created and maintained. This will improve aesthetics of the channel besides providing for better environmental functions.

10. Ropeways for Surge Shaft Top

It has been experienced that a large number of trees have to be felled during the construction of the road to the top of Surge Shaft because of following a route of steep slope. The road is required to reach the top to take the heavy machinery. This road is needed further only for conducting inspections as the excavated rock falls down at the base through the pilot-hole itself. Once the project is commissioned, this road has practically no use. As such, as far as practicable and feasible, HPPCL would explore the possibility to use ropeways to take the machinery to the top. This would help save trees, which in turn, helps prevent global warming and climate change.

11. Health Check up of Workers

A large number of skilled workers have to work inside the tunnels during drilling, blasting, haulage and concreting operations. All these workers are exposed to dust and air pollution of vehicles even if they use masks all the time. It is very essential that health status of each worker is examined and closely monitored because of the apprehension of incidence of lung diseases. This will be possible

if the contractors employ well qualified doctors on regular basis who should carry out the following activities

- i) Prepare a health card for each worker before start of the project to disallow workers of pre-existing lung diseases from engagement at the project.
- ii) Determine the lung functions of each worker on monthly basis (There is a software program of this activity).
- iii) Take X-ray of chest of each worker once in three month to discover the incidence of lung disease if any due to constant exposure to environmental pollution inside the tunnels.

The contractors will also set up dispensaries that would contain normal medicines and first-aid equipment (B.P. apparatus, ECG machine, device to checkup ear, nose, throat (E.N.T) problems) and will be under the control of a qualified doctor. The contractor will also ensure that a well equipped Ambulance Vehicle with proper certificate issued by the CMO will be stationed at each major site. It will also be the legal responsibility of the most senior site engineer to ensure that the contractor has completed all these requirements of medical facilities and check-ups and these are conducted on scientific and regular basis.

12. Environment Management Plan (Enhancing and Conserving Environment Resources)

One way to compensate the environmental loss (if any) due to the execution of a run-of-the-river hydropower project is to enhance and conserve the environmental resources within the catchment area of the project. This effort will yield great environmental dividends because but for the execution of the project the degradation process of the catchment area would have gone unnoticed indefinitely. Therefore a hydro-power project provides a great opportunity to initiate this process as a quid-pro-quo. This process of regenerating the catchment areas of all hydropower projects will be indirectly building / converting all the entire catchment areas of four rivers (Satluj, Beas, Ravi and Yamuna) and their tributaries into a single bio-reserve block covering the entire state. This will be a great achievement and credit for this achievement goes to the policy of the State to exploit its total hydropower potential.

In order to achieve this objective, a comprehensive and detailed Environment Impact Assessment (EIA) study is conducted during the investigation stage of the project to identify probable impacts (positive as well as negative) on environment and ecology of the influenced project area. Basically it is a Cumulative

Environment Impact Assessment Study and also addressing the positive impact on climate change. Based upon this study another comprehensive report is prepared which addresses all the environmental concerns and proper mitigative measures discussed so far in these chapters to antidote / counter the likely adverse impact on environment as a result of the execution of the project. This document will be known as Environment Management Plan (EMP). This report will be prepared by reputed agencies that highlight total ground realities. Implementation of this plan will take place simultaneously with the execution of the project so that at the time of the commissioning of the project all environmental setbacks are thoroughly mitigated and the project finally fits harmoniously with the Nature. This report will clearly delineate following aspects along with financial estimates mitigation of the measures

- I) Catchment area Treatment Plan
- II) Resettlement and Rehabilitation Plan
- III) Compensatory Afforestation Scheme
- IV) Greenbelt Development Plan
- V) Wildlife Management, Development and Biodiversity Conservation Plan
- VI) Muck Management Plan
- VII) Restoration Plan for Quarry-sites
- VIII) Landscape and Restoration Plan
- IX) Health Management Plan
- X) Provision for subsidized fuel
- XI) Solid Waste Management Plan
- XII) Disaster Management Plan
- XIII) Environment Monitoring Plan
- XIV) Development Plan for Fisheries in Streams and River
- XV) Economic Assessment
- XVI) Summary of Impacts and Conclusion

HPPCL will provide to the consultant Model ToRs fixed by MoEFCC/SEIAA for preparation of a comprehensive EMP documents. The selected agencies / institutes/consultant will prepare the EMP document on the basis of ToRs after conducting intensive surveys of the entire catchment area of the project site and give complete details of the degradation process already set-in and the mitigation

measure along with specifications of various issues e.g. siting parameter for Quarry-site or specifications of sound barriers to be installed at the quarry-sites. The EMP document will be studied and got approved from MoEFCC/ State Environment Impact Assessment Authority (SEIAA). The EMP will consist of guidelines, directions and recommendations in very precise and specific terms.

#### Catchment Area Treatment Plan (CATP)

Catchment Area Treatment Plan is the soul of all activities of the EMP for ecological restoration of the catchment area to its original glory. The severity of degradation process of catchment area may be due to various anthropogenic and natural reasons that might be existing prior to the planning of the hydro power project. Continuous soil erosion of the free draining portion of the catchment area may result in excessive sedimentation at the barrage site thereby reducing the efficiency of the project.

The State Govt. has embarked upon a robust program of executing all the hydropower projects to exploit the total hydro power potential by 2030. Therefore the summing of catchment areas of all these projects will constitute the total basin area development of the entire state. Therefore after completion of the projects, the topography of the entire state will be converted into a single biodiversity sphere.

In view of the importance of the Catchment Area Treatment Plan the agency must highlight the causes of degradation process of the catchment area and suggest its clear cut recommendations. This chapter of this document must have the following details:

- i) Physiographic / topographical details i.e. slope, drainage net, glaciation process, snow bound area existence of soil zones and their erodibility, slopes etc.
- ii) Ecological Aspects – types of forest, their species and density, biodiversity, genetic information, flora and fauna etc.
- iii) Hydrological details – Hydrograph of the channel, major contributory drains / channels and their hydrographs, silt load by actual measurement, inventory of springs along the tunnel route etc.
- iv) Existence of Sensitive Zones
- v) Existence of Wildlife sanctuaries /National parks/Protected Areas
- vi) Precise details of soil conservation measure
- vii) Water harvesting

- viii) Population details and their dependence upon environmental resources
- ix) Catchment Area Treatment Plan to develop the area into a complete biodiversity reserve / biosphere

The Govt. of India mandates preparation and implementation of CAT plans for all hydro power projects above 10 MW capacities. The Govt. of Himachal Pradesh on the other hand has made it mandatory to invest 2.5% of the total project cost in the CAT plan (as per TEC). The GoHP has also issued guidelines for investment of 1% of total CAT plan expenditure / cost as Payment for Environmental Services (PES) to upstream communities. Concept of PES is innovative and well aimed at adapting to climate change induced variations in watershed functions. The catchment area treatment plan shall be completed within five years from the start of the project.

The main problem in the implementation of the Catchment Area Treatment Plan is that funds deposited by HPPCL are not utilized by the Forest Department simultaneously within the execution phase of the project. This is because the deposited funds first go to CAMPA and it takes long time for these to reach the Field Officers.

Also the Forest Department has to prepare its annual plan to execute CATP based on actual ground conditions. Therefore the provisions in the annual plan may find deviation from the provisions made in the CATP chapter of the Environment Management Plan (EMP). It is therefore very essential that a copy of Annual Plans be shown to HPPCL to satisfy itself about the adequacy of measures proposed to be taken to regenerate the ecology of the catchment area to its full measure and get the technical concurrence / approval.

13. Correlation between Drilling of Tunnels and Flow of Springs

There is a deep seated belief among the people of Himachal Pradesh that drilling operations inside a tunnel affect the flow of springs on the ridge located along the tunnel alignment. Since the elevational difference between the tunnel ceiling and the springs is very large, this belief lacks scientific credence. However, it is desirable that field engineers will prepare an inventory of springs located along the alignment of the tunnel and their flow pattern be studied during the progress of the tunnel drilling. The list of springs should be divided into two categories

- a) Springs used by the community for consumptive use.
- b) Springs not used by community for any purpose.

In case the flow of any spring belonging to category (a) is found to be deficient or stopped then HPPCL will make some alternative arrangements to compensate for the loss of flow to avoid any harassment to the users.

14. Imparting Environment Education and Training

It has been observed that field engineers, contractors and workers display varying degree of ignorance and insensitivity about the implications of environmental setbacks and the required safe guards. Many contractors and even workers falsely believe that working in tunnels for 5 years helps in developing sub-clinical immunity against the lung disease. Likewise some myths have been created about serious environmental set-backs as a result of execution of run-off-the-river hydro power projects. It is very essential that such misconceptions be dispelled at the earliest. This will be possible if an environmental education training program is introduced to help the engineering staff, contractors and workers to increase their level of consciousness, sensitivity and environmental safety. Short courses will be arranged by HPPCL on a regular basis. This training will have a profound effect on the mentality of the workers of all categories.

This training can be further extended to people of the adjoining villages to make them aware of the utility and essentiality of hydro power projects and the true extent of their side effects both positive and negative on the surroundings and their livelihoods. This awareness will help in removing their misgivings about the adverse environmental impacts due to the execution of hydropower projects and make them more cooperative and become partners in progress.

Access to environmental information is the principal means by which environmentally conscious stakeholders may evaluate compliance by the concerned parties with environmental standards, legal requirements, and covenants. They would thereby be enabled to stimulate necessary enforcement actions, and motivate compliance. Access to information is also necessary to ensure effective, participation by public in various consultation processes, such as for preparation of environmental impact assessments, and environment management plans of development projects.

Once the officials of HPPCL and contractors are trained through short but frequent training schedules they will be mentally charged and tuned to be compliant to environmental imperatives e.g. construction of STP or putting air quality sensors inside the tunnels.

15. Research and Development

In order to rapidly advance scientific understanding of environmental issues, it is necessary to promote properly focused research by competent institutions. A continuous engagement with the scientific community, in government, academic, and private institutions, will provide important insights for policy making and regulation including in the field of multilateral negotiations, and help realize deeper and broader skills in the field of multilateral negotiations, and help realize deeper and broader skills in the scientific community. Hydropower projects consume huge quantities of concrete and steel. Therefore the most important aspect of research would be to arrive at an optimum design so that project consumes minimum amount of material and that too as far as possible from local resources. The prime objective should be to develop the project as green as possible. The new technologies can help in reducing the quantity of concrete and steel.

Key areas of research are as follows (not in order of priority, which is changeable over time):

- Taxonomies of living natural resources
- Research leading to better understanding of ecological processes and pathways
- Research which provides direct inputs to policy making
- R and D in technologies for environment management and clean production

The following actions would be taken:

- Periodically identify and prioritize areas for research.
- Establish a research programme in priority areas within the Government, with expected outputs clearly specified.
- Encourage research in priority areas outside the Government, with necessary financial and institutional support.

16. Miscellaneous/General Activities

Following activities will be initiated by HPPCL to ensure foolproof measures / environmental safeguards during the planning and execution phases of the project and introduce the concept in Clean Development Mechanism (CDM)

- i) Explosives to be used for blasting of rocks should be stored as per Guidelines / Rules of Storage and Handling of Hazardous Materials for observing necessary safety standards.



- ii) All efforts will be made to maximize the use of excavated rock for manufacturing of concrete aggregates. The quality testing of encountered rocks should be got done from reputed laboratories. The views of the Geologist shall also be ascertained for correct interpretation of the test results. The advice of Concrete Research Institute of India Faridabad should also be ascertained to utilize the rock of moderate quality in the mix design.
- iii) A complete geological record shall be maintained about the type of rocks encountered during drilling operations and a sound geological report will be prepared accordingly. This report will be of immense value in studying the rock formations in this region and predicting the quality of rocks to be encountered during future projects.
- iv) All efforts will be made to explore the areas where the poor quality rocks can be used for different purposes and reduce the number of dump sites as far as possible. There is always a great demand for poor quality rock to be used for filling of depressions in the college / school campuses, developing of parks / playground / stadiums and pavement of roads.
- v) Sensors will be installed inside all the underground structures for constant monitoring of air quality. These will be specifically checked before allowing the workers to enter the tunnels after the blasting operation.
- vi) HPPCL will make all efforts to minimize adverse impacts on the natural environment by consciously economizing on the requirement of resources including land for civil structures.
- vii) HPPCL shall remain fully conscious of the need to conserve the natural resources and hence, it shall avoid ecologically sensitive areas, eco-sensitive zones, dense forest, Wildlife Sanctuaries and National Parks as far as possible. In case traversing forestland is unavoidable, clearance from the forest authorities shall be obtained under the Forest (Conservation) Act, 1980 and under all other relevant laws and regulations relating thereto. Main acts that have bearing on the working of HPPCL are – India Forest Act, 1927; FCA, 1980; Wildlife (Protection) Act, 1972.
- viii) Apply efficient and safe technological practices and standards and it shall strive to keep itself updated on the same.

- ix) Ensure total transparency in dealing with all the stakeholders i.e. the concerned government agencies, local communities, individual landowners and employees with their involvement through a well-defined public disclosure and public consultation process as well as dissemination of relevant information about the project at every stage of implementation.
- x) Maintain high standards of corporate responsibility not only towards communities but also towards the consumers and the civil society.
- xi) HPPCL shall strive to move towards using modern tools like GIS/GPS for a precision in route alignment with the larger picture in view while finalizing the route.
- xii) For finalizing the proposed site, all possible efforts shall be made to avoid forest area or to keep it to the barest minimum. Whenever it becomes unavoidable due to the geography of the terrain or heavy cost involved in avoiding it, different alternative options shall be considered to minimize the requirement of forest area. It shall obtain prior clearance from competent authorities and abide by the relevant guidelines, including the directions of the Supreme Court from time to time.
- xiii) Alternative arrangement for fuel wood, heating and cooking shall be made to meet fuel wood requirement of the labor so that it does not cause damage to adjoining forests. If necessary, fuel wood supply will be done only from authorized sources.
- xiv) Construction techniques and machinery selection shall be made with a view to minimize ground disturbance. The equipment creating high noise level shall be got replaced immediately.
- xv) HPPCL shall adopt good practices and shall always strive for a high standard of house-keeping for its substations and ancillary facilities.
- xvi) HPPCL shall incorporate the best technical practices to deal with environmental issues in its working.
- xvii) HPPCL shall ensure compliance of all the conditions of clearances and shall review the same periodically to take advance remedial actions.
- xviii) All the labourers to be engaged for the construction works shall be thoroughly examined by Health personnel and adequately treated before issuing them work permit.

- xix) Restoration of construction area including dumping site of excavated materials should be ensured by leveling, filling up of burrow pits, landscaping etc. The area should be properly treated with suitable plantation.
- xx) Plantation along the roads should be done.
- xxi) Noise pollution from project activities shall be controlled and kept within the standards prescribed by the State Pollution Control Board.
- xxii) Project activities shall not hamper the smooth flow of traffic on the existing roads;
- xxiii) Six monthly monitoring reports should be submitted to the MOEF and its Regional Office Chandigarh for review.

## **17. RELEVANT POLICIES**

The policy framework is contained in the following:

- National Environment policy, 2006
- HP Hydropower Policy 2007
- National Conservation Strategy and Policy Statement and Environment and Development, 1992
- Policy Statement for Abatement of Pollution, 1992
- Wildlife Conservation Strategy, 2002
- National Forest Policy, 1988
- EPA 1986 and EIA notification there under.

In addition, India is party to several International Treaties and Convention relating to environment. HPPCL is fully conscious of the above-mentioned policy framework, including trans-boundary issues, and it shall abide by the relevant requirements in its operations.

## **18. Post Construction EIA**

In order to assess the final impacts (positive as well as negative) of the hydro power projects on the ecosystem, and to assess the effectiveness of the management plans implemented, HPPCL will also concentrate on the post-construction Environment Impact Assessment studies at selected commissioned projects. For this purpose, HPPCL will use Remote Sensing technology integrated with Geographical Information Systems (GIS). This study report will help in dispelling all the doubts harbored by various stakeholders including the

project affected population against the hydro power projects as ecology changer and environment spoiler.

19. Monitoring of Compliance

Implementation of the most of the conditions is ingrained in the contract document between the power producer and the executing agencies. Still there are initiatives which have to be independently taken up by HPPCL e.g. preparation of durable roads up to the project site before the start of the project work to minimize dust pollution during movement of project vehicles on the road.

The GoHP has been engaged in a policy of self-regulation and monitoring by the project authorities to create a spirit of hydropower development which is Environmentally Sustainable, Socially Just and Economically Viable giving opportunities to project developers to be responsible to the nation and civil society. However, simultaneously, it has been monitoring their environment related works on regular basis. It has been able to sensitize the agencies and is helping them to move towards achieving acceptable levels of environmental and social safeguards. Needless to say that it has been receiving meaningful help from civil society organizations, concerned citizens and of course copious help from a very sensibly sensitive judiciary. In addition, implementation of provisions of Environment Management Plan (EMP) are also monitored by State Pollution Control Board, MoEFCC, GoI and International Funding Agencies of the Projects by scrutinizing quarterly/half yearly monitoring and safeguard compliance reports of the project proponents. Six monthly compliance status reports of the conditions imposed in Environment Clearance and Forest Clearance are also monitored by MoEFCC.

20. Grievance Redressal Mechanism

To address grievance and facilitate conflict resolution following mechanism will be adopted:

For running the project construction activities smoothly with minimum impediments from the local communities particularly the MPAF and PAF, it is necessary to facilitate conflict resolution, minimize complaints and redress the grievances that may occur. Although the Project Implementing Unit (PIU) generally attempts to resolve such issues yet it is advisable to constitute separate committees for the same. As such, Grievances Redressal Committees (GRC) should be constituted for each project to address various grievances at the local level.

It is therefore suggested that GRC at project level may be constituted by you with following as members under the chairmanship of Head of Project.

1. One member from MPAF.
2. One member from local district administration.
3. One Pradhan from the Project Affected Panchayats.
4. One member from field level R&R Staff.

Grievances which are not redressed by Project Implementing Unit (PIU) will be brought to the Grievances Redressal Committees. The GRC will review all grievances of affected persons. The main responsibility of GRC is to provide support to Affected Persons (APs) on problem arising from land/property acquisition. GRC has to maintain record of AP's grievances, categorize & prioritize the grievances & resolve them. The GRC would inform the Project Management Unit about serious cases and also about chronic cases that have remained unresolved for more than one month".

#### **Relevant Para's from Hydropower Policy 2006**

The Company, if ROR Project, shall ensure minimum flow of 15% water immediately downstream of the diversion structure of the Project all the times including lean seasons from November to March, keeping in mind the serious concerns of the State Govt. on account of its fragile ecology and environment and also to address issues concerning riparian rights, drinking water, health, aquatic life, wild life, fisheries, silt and even to honour the sensitive religious issues like cremation and other religious rites etc. on the river banks. However, the companies are at liberty to install mini hydel Projects to harness such water for their captive use, for their utilities, systems and colonies.

#### **Page 72, Para xiv**

The State Government has decided not to execute 210 MW Baspa-I HEP in Sangla Valley in Distt. Kinnaur, 126 MW Chamba HEP in distt. Chamba, 99 MW Gharopa HEP in Kullu Valley and 25 MW Gara Gossain HEP alongwith eight mini Hydel Projects in Tirthan Valley in Kullu distt. to conserve ecology, environment and also to protect the wild life, aquatic life and the trout rearing activities. In addition, the State Government may allow the natural flow of some of the portions of the rivers in the State in order to exhibit the existence of such river in its pristine beauty before it disappears through the maze of tunnels and thus obliterate its very existence.

#### **Page 78, Para xxiv**

The Company shall be required to follow environmental related issues concerning disposal of blasting muck and soil etc. In Himachal Pradesh, because of the peculiar topography, the availability of land is scarce to have dumping sites. The Company shall use such material for the Project as may be found suitable for the construction and the remaining material shall be allowed to be used by other development departments like PWD, I&PH and several others for the execution of their area developmental schemes including the

channelization of river waters by the concerned development agencies. Not only that, even private crusher owners etc. and other private users shall also be allowed to use such material from the site free of cost. The prescribed norms will be available with the Pollution Control Board.

The Company agrees not to dump such material on the Project site or any other inappropriate place which flows downstream rivers causing serious environmental concern, which shall attract punishment under various laws of Pollution Control Board.

The Company shall ensure that the material excavate from the site shall be dumped in the area duly approved by the Ministry of Environment & Forest, GoI/State Pollution Control Board.

**Page 78, Para xxv**

In case of any existing facilities including but not limited to, irrigation systems, water supplies, roads, bridges, buildings, communication system(s), power systems and water mills are adversely affected because of the implementation of project, the company shall be responsible for taking remedial measures to mitigate such adverse effects. The cost of the above remedial measures shall become the part of the Project cost. Such facilities shall be mutually identified and agreed upon between the Company and the State Government. The Company shall not interfere with any of the existing facilities till an alternate facility, as identified, is created.

**Page 79, Para xxvi**

The Company shall ensure to protect the water rights of the local inhabitants for drinking and irrigation purposes etc. by verifying the revenue entries and activities of I&PH department so as to ensure that such rights are not infringed upon. Any dispute in the matter shall be referred to a committee to be appointed by the State Government involving Irrigation & Public Health and Revenue Departments. However, the decision of the State Government shall be final and binding on all the parties. The Government of Himachal Pradesh shall have the right for withdrawal of water from the river course for the consumptive use of pumping or by gravity for the purpose of potable water supply and irrigation to the affected villagers.

**Page 79, Para xxvii**

The IPP shall give an undertaking to the Fisheries department of the local area that wherever feasible, rearing of fish shall be promoted by the IPP in consultation with the Fisheries Department in the Project area at the time of final implementation of the Project.

**Page 79, para xxviii**

The Company shall make suitable financial provisions for mitigation of adverse impacts as per the approval EIA plan, Environment Management Plan and mitigation of degradation of environment due to disturbance of eco-system in watershed area, at the cost of Project.

**Page 233 Para 4.7**

**Up-gradation of Road and Bridges:** The First Party may, at the request and cost of the Second Party, construct, widen and strengthen such roads and bridges within the State of Himachal Pradesh as are considered reasonably necessary by the First Party. The First Party permits the Second Party to construct the roads, bridges, culverts as considered necessary for the project in the project lands. The First Party may also permit the Second Party to construct the roads, bridges, culverts as are considered reasonable necessary by the First Party in the interest of the Project on a case-to-case basis.

**Page 246, Para 5.9.2**

The Second Party shall ensure that the residential camps for all categories of manpower are situated at safer locations by taking into consideration the occurrence of probable flash floods and other eventualities like cloudbursts etc. The Second Party shall also ensure the well interconnectivity of the whole Project area through effective communication and transportation arrangements.

**Page 246, Para 5.9.3**

The Second Party shall ensure that all the Project vehicles and the access to road s are properly maintained and fully safe for use.

**Page 248, Para 5.12: Compensatory Afforestation**

**Page 248, Para 5.13: Catchment Area Treatment Plans**

**Page 248, Para 5.14: Environmental Impact Assessment**

**Page 248, Para 5.15: Disaster Management Plan**

**Page 248, Para 5.16: Maintaining Ecological Balance**

**Page 249, Para 5.17: Ensuring Flow of Water**

**Page 249, Para 5.18: Protection of Fish Culture**

**Page 249, Para 5.19: Fishing, Recreational and Navigational Rights**

**Page 249, Para 5.20: Water requirement for construction**

**Page 249, Para 5.21:**

**Dumping of Excavated Material:** Para is reproduced as “The Second Party shall follow environmental related issues concerning disposal of blasting muck and soil etc. In Himachal Pradesh because of the peculiar topography, the availability of land is scarce to have dumping sites. The Second Party agrees to use such material for the Project and the remaining material shall be allowed to be used by other development departments like PWD, I&PH and several others for the execution of their area developmental schemes including the channelization of the river waters by the concerned development agencies. Not only this, even private crusher owners

etc. and other private users shall also be allowed to remove such material from the site free of cost. The prescribed norms shall be available with the Pollution Control Board.

The Second Party agrees not to dump such material on the Project site or any other inappropriate place which flows further to downstream and rivers causing serious environmental concern, which shall attract punishment under various laws of Pollution Control Board. The Second Party shall ensure that the material excavated from the site shall be dumped in the area duly approved by the MOEF, GOI/State Pollution Control Board”.