ENVIRONMENTALLY BENIGN SHP DEVELOPMENT IN THE HIMALAYAN REGION

by

A. K. Goel, Program Manager, REPSO / India, Winrock International, New Delhi, INDIA

The Himalayan region which separates the Indian peninsula from the central Asia has great religious, ecological and environmental importance. The entire Himalayan region has a rugged and undulating terrain. The snow covered peaks and deep valleys coupled with long ridges and saddles makes it one of the most complex terrain in the world. Through the ages, Himalayas, most part of which remain covered with forest and snow, has not only played a crucial role in protecting the environment and ecology of the Indian sub-continent but has also provided food and energy to the vast population living in the region and in the adjoining plains.

In Himalayan region the forest remained the main source of fuel, fodder and timber & snow as a main source of perennial rivers. Most of the population in this region lives near perennial sources of water and is largely dependent on agriculture and forest for their livelihood. Rapid growth in population and their dependence on forest for energy needs has resulted in large scale deforestation endangering the environment and destabilizing the echo-system.

Development of Himalayan region requires comprehensive and qualitative utilization of local natural resources covering soil, forest, minerals, flora & fauna, water and snow etc. Water and energy are two important requirements of the people for their survival and the Himalayan region has both of them in abundance from the single source (streams and rivers flowing in steep gradient). Perennial hilly streams and rivers have huge hydro power potential which not only fulfill local energy requirement of towns but supply electricity to the adjoining plains.

Efforts to exploit Small power potential in Himalayan region was started in India way back in 1897 when first mini hydro electric scheme was installed near Darjeeling, followed by Shimla, Dehradun and Nainital etc. After independence more mini / micro hydel plants were installed in Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, West Bengal and the north eastern states of India. The basic objective of these schemes was to provide electricity for lighting purpose. With the increase in electric demand "coal and oil" based power plants of bigger capacity started supplementing the electricity requirements of the towns located in Himalayan region. The reversal in this approach came about a decade back when issues related to environment and ecology came in to prominence, Emission of excessive carbon dioxide and global warming became one of the important issues, which forced the planners to think development by exploring hydro power in an environmentally benign manner.

Poor infrastructural facilities, isolated settlements hostile weather, illiteracy and poor agricultural yield have forced the local population to exploit the forest in indiscriminate way. Electricity is the source of energy which can meet the energy requirement in domestic sector (cooking, lighting, water and space heating etc.), agricultural & drinking water, cottage & other industries. The generation of electricity from hydro sources and it's consumption is a non residual process which does not pollute the environment and in no way effects the echo-system. The electricity generated near the place of consumption in a decentralized manner will obviate the need of long transmission and distribution lines which otherwise would create many problems, jeopardizing the very purpose of development without destruction.

Small hydro electric power schemes have received a great deal of attention from many points of view; first as a sizable and easily utilisable source of renewable energy and secondly, as a moderate investment method for providing electricity in under developed areas. Thousands of villages in hill areas are located near perennial streams. Small hydel schemes can fulfill their energy requirement for lighting, cooking, heating, cottage industries and irrigation. It will not only help in conserving local forest wealth and echo-system of the area but will drastically reduce the emission of carbon dioxide etc. due to reduced burning of fuel wood.

Energy and water crises is increasing at an alarming rate during last 20 years. As the illegal felling of trees continue despite a number of steps taken by the Govt. of India, these deplicating forest can not provide sufficient fuel to the local population. As the forest cover disappears, the water retaining capacity of top soil decrease making the hill slopes further barren. The increased run off creates problems of soil erosion and land slides with scouring in lower regions and floods in plains. The reduction in water retention capacity of the soil has given birth to floods and draught. Many streams, which were carrying sufficient water for the rural population for ages in hill area has dried up creating havoc to the local population. They now have to walk several kilometers to fetch water for drinking and other purposes. Deforestation has thus created problems not only for environment, but also making life system difficult. The problem is not likely to be solved without integrated management of energy and water resources is the hill region. The energy requirement in rural hill areas are mainly for :

- Domestic, commercial and public lighting.
- Cooking, water and space heating.

- Small and cottage industries like grain grinding, oil expelling, rice dehuxing, cloth weaving, carpet making, wool and fruit processing industry etc.
- Medium sized industries based on local raw materials.
- Irrigation and drinking water.

Presently for lighting in rural hilly areas, fire wood or kerosene are mainly used. The use of electricity is limited, because large number of the villages are still unelectrified and even in electrified villages, the electric supply is erratic and unreliable. It is necessary that electrification of the entire rural hill areas be done to provide continuous electric supply in a qualitative manner. Further the prices of electricity need to be kept low, so that the rural hill people may afford it. Electrification need to be done in such a way that further deforestation does not take place, jeopardizing the very purposes. One of the important factors of utilization of any other source of energy for cooking, other than fire wood is cost and therefore, all alternative cooking fuels require heavy support to bring them with the affordable cost to the local residents.

Water crises has created many problems for people and animals. The Himalayan region has numerous rivulets, and small & big rivers. During the rainy season these streams carry lot of water along with fertile soil etc. creating floods and land slides. During dry season , the smaller streams carries very little water or no water (this is due to deforestation as water retention capacity of top soil got reduced), creating tremendous hardship to the local residents and to the flora and fauna of the area.

Small water conservancy projects having small dams & coupled with mini / small hydel schemes (catchment area from 10 sq. k.m. to 100 sq. k.m.) shall have multi purpose advantages, many of these are :

- Small hydro schemes can be implemented utilizing the water and head created by small dams. Cascade micro hydro stations can be planned for generating additional electricity at cheap cost.

- Flood protection by reducing the peak discharge.
- Prevention of soil erosion in lower catchment of stream.
- Will create springs in the lower catchment area replenishing spring and ground water, thus increasing lean period discharge.
- Development of fisheries in the mini reservoir so created.
- Creation of additional facilities for tourist recreation.
- Improved drinking water & irrigation facilities.

Construction of small dams 5-20 M height shall be labour intensive, mostly utilizing local materials, such as soil, sand boulders, rocks etc. These may be over-flow or sluiced embankment dams. In U.P. hill alone over 750 micro water sheds have been identified. It has been estimated that construction of 250 to 300 mini dams in U.P. hills covering catchment area from 10 to 100 sq. k.m. will create about 2-4 billion cubic meter water storage and will generate 10,00,000 KW of electric power through small hydro power stations.

The experience gained during the last decade in investigation, implementation of few isolated schemes here and there has little impact on the development of Himalayan region. The existing policies, approach and technology warrants drastic change to achieve the goal of speedy development without destruction. The task is enormous which needs inputs from all sides and barriers from none. As the source of water and electricity is same, small / mini / micro hydel schemes needs to be recognized as the focal point for integrated development of the Himalayan region. The experience so far gained indicates failure on many fronts including lack of political will, lack of finance, technical problems and poor local participation. The area being scarcely populated needs micro level planning at the grass root level. Peoples participation is the key for the success of any activity oriented towards their development.

The main issue relates to the Govt. policy and support which till date has been lacking for small hydro power development in the Himalayan region of India. The remote Himalayan areas being scarcely populated has very little political implications in our democratic society. Low availability of minerals or raw materials for industrial production and little market for consumption of products made the Himalayan area insignificant for business activities. "So called" ban on forest exploitation have resulted in stoppage of timber trade. It is really a uphill task to develop Himalayan region where neither the politician nor businessmen have substantial stake and interest.

In the early seventies strategic importance of India of Himalayan region forced the Govt. to think about the development of infrastructural facilities, specially roads to meet the security requirements. Even at this juncture nobody planned the integrated development of the area in a sustainable manner. The result was large scale and indiscriminate deforestation required for construction of road followed by large scale felling of trees and their export which was prompted by better accessibility provided by these roads. Better accessibility expedited tourism and pilgrimage activities further over-burdening the weak & fragile Himalayan eco-system.

During this period many mini / micro, hydro-electric power station were constructed close to important towns and pilgrimage centres to supply electricity for lighting purpose. Within 10 to 15 years, the demand for electricity during evening / peak hours has grown so fast that many of these towns and pilgrimage centres were connected to the main grid lines and subsequently these mini / micro hydro electric station were operated at sub-optimal level or closed down for want of Govt. support. The main reason for sub optimal operation or their closure was availability of power from grid poor maintenance of plants and equipments, high cost of generation and low utilization. There had been other problems like :

- Wide seasonal variation in discharge available for power generation.
- Frequent damages in the water conductor system due to adverse geology, land slides, slips etc.
- Damages in the turbine runners due to heavy silt in water during period of high discharge.
- Low base load and high peaking demand.
- High cost of operation due to engagement of disproportionate staff by the electricity boards.
- Poor monitoring and no flexibility in managerial systems.
- Low priority at State level for repair or refurbishment of mini / micro hydel schemes in comparison to extension of grid lines.
- Poor availability of the fund for operation and maintenance. (The revenue of electricity collected from consumer was transferred to the centralpool and not utilized for O & M of the scheme).
- Lack of participation from the beneficiaries and local population.
- Low plant load factor due to non synchronization of the schemes with the available grid lines.
- Non-linkage of the mini / micro hydel scheme with other developmental and income generation schemes.
- Poor realization and heavy subsidy to the consumers for electricity charges in the (through grid) electrified area. (Though, the electric supply from grid is erratic and seldom available but the consumer were not willing to pay reasonable price even if they are assured of quality power from small hydro projects).

Today, the issue of environment has become so prominent that all developmental activities, even related to the creation of better environment such as small / mini / micro hydel scheme were subjected to excessive scrutiny. The procedure for land acquisition and forest clearance become so tedious and time consuming that the implementation of small hydel project drastically slowed down and the implementation time of these schemes increased to 3 to 4 years.

The pace of integrated development in the Himalayan region through small hydro power projects can be expedited, by providing various promotional avenues, adopting latest technology and ensuring local participation.

- Creation of separate cell at district level and nodal department at State level for integrated development of Himalayan region through Small Hydro Power Projects (SHP).
- The procedure of land acquisition for SHP projects and associated lines (upto 5 hectare) should be made simpler so that land is made available within a reasonable time.
- Forest land (if required) upto 5 hectare should be allotted for these projects at district level without any interference from state or central Govt.

- These projects do not envisage any consumptive use of water, therefore, SHP projects should be kept outside the purview of water right rules and regulations. However, it is to be ensured that existing water use is not disturbed by SHP.
- Infrastructural facilities such as roads, bridle paths, telecommunication should be created / strengthened by the Govt. to provide better access for speedy implementation and proper maintenance of the SHP projects. This will generate other economic activity in the nearby area.
- Training of local population for operation and maintenance of the scheme and their involvement in the implementation process from the beginning.
- Linking of literacy, health and socially oriented programme.
- Linking SHP schemes with water conservancy project. This will have multi dimensional effect on the growth of the economic activities in the influenced area.
- The use of efficient electric appliances for domestic, industrial and commercial sector, needs to be encouraged during off peak power consumption periods. This will help in reducing pressure on forests. Use of solar cooker with electrical back up have been found successful in villages electrified through SHP.
- Creation of SHP development bank to provide long term soft loans to the institutions, Entrepreneurs and Cooperatives.
- Preparation of master plan by identifying potential location of SHP projects.
- Special incentives to local industrial units using power from SHP Projects and employing local people.
- Adoption of State of art technology for implementation of the scheme. Robust, efficient and reliable equipment should be installed.
- Maximum utilization of local resources and manpower should be ensured in construction of these schemes.
- Formation of local grid by linking cluster of schemes. This will ensure better utilization of each scheme and reliable electric supply to consumers.
- Promotion of power intensive and high value addition, small industrial units near the project sites.

Renewable Energy Project Support Office, (REPSO) of Winrock International, a mission driven organization, seeks to serve the Indian renewable energy movement with the objective of improving the life of the masses, through environmentally sustainable models ensuring clean energy forever and for all. REPSO has given prominance to small / mini hydro power sector for the development of Himalayan region in an environmentally benign manner. REPSO India has identified for barrier for speedy implementation of mini / small hydro power projects in Himalayan region, these includes :

- Lack of funds and will in the Govt. organizations to implement SHP.
- Apathy of Govt. sector to accept Private SHP.
- Inadequate private sector experience in handling various commercial and technical issues (PPA, financial clouser, silt problem etc.).
- Poor infrastructure in SHP potential area specially road & telecommunication.
- Lack of Hydrological data.
- High silt load carried by Himalayan streams

REPSO India is working with developers, consultants, Govt. agencies and users etc. for the development of SHP projects. These projects are facilitated by providing technical and financial advisory / consultancy services and financial cost share for feasibility studies for selected pioneering projects. REPSO India is undertaking activities regarding Hydrology of unguaged streams, best practice manual for construction of SHP projects, advisory services for silt problems and study on renovation of existing small hydropower projects.

Conclusion :

Small / Mini / Micro hydro schemes needs to be considered in larger perspective and these stations should not only be viewed as a source of electricity but should be acknowledged as nucleus for overall development of the hilly areas covering political, industrial, social and economic activities in an environmentally benign manner.