IMPACT OF TEHRI DAM
LESSONS LEARNT

उत्तराखण्ड शासन

Prepared by
Water for Welfare Secretariat
IIT Roorkee

February 2008

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The publication is for creating an awareness and utlising the vast potential of water resources in the state of Uttarakhand

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PREFACE

Uttarakhand, the newly formed 27th state of the Republic of India is endowed with the largest and highest natural dam in the world, the Himalaya. Every year, huge amount of water is transported from the oceans as cloud, precipitates and gets deposited (in the form of snow) in the Himalaya. The snow then melts and feeds our rivers. Thus, Uttarakhand is blessed with abundant water resources and due to its growing demand, these resources need to be conserved and harnessed in the best possible manner for the benefit of the state and the nation.

Vide Govt. of Uattrakhand O.M. No.293/I/2004-034(3)/65/03 dated August 5, 2004 and No. 1129/I/2005-04(3)/65/03 dated March 3, 2005, a virtual centre of Excellence named as "Water for Welfare : An Uttaranchal Initiative" has been set up with the secretariat at IIT Roorkee. In the 3rd meeting of federation held on Nov. 24, 2005 at IIT Roorkee, it was decided that some special publications and promotional material on "Rehabilitation of Tehri dam and Lessons learnt, Effects of Tehri dam" are prepared and pasted on website (http://www.uttara.in/initiatives/wfw/intro.htm).

Two articles on such issue have been prepared to make people aware about the whole issue. The main feature of the dam is also highlighted. Rehabilitation policy of the State Govt. for this dam has been added. Govt. of India has come out with rehabilitation policy in the year 2002 and again with draft policy in the year 2007.

The readers are suggested to upgrade the information from the respective website of Ministries/departments.

We hope to receive the suggestions from readers for the improvement of this document. This special publication is planned to be distributed among users, NGOs, Colleges district libraries etc.

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TEHRI DAM AND HYDRO POWER

INTRODUCTION :

Tehri Hydro Power Complex (2400 MW), comprises the following components:
1. Tehri Dam & Hydro Power Plant (1000 MW)
2. Koteshwar Hydro Electric Project (400 MW)
3. Tehri Pumped Storage Plant (PSP) (1000 MW)

The Govt. in March, 1994 approved the implementation of Tehri Dam & HPP (1000 MW) along with committed works of Koteshwar HEP and essential works of Tehri PSP, as Stage-I of Tehri Power Complex. With the synchronization 4th unit of 250 MW in March-07, Tehri Power Station has become fully operation with installed capacity of 1000 MW. The Corporation entered into an era of providing much needed peaking power to the Northern Grid. This project has become the landmark and pride of the Nation as a whole.

The 400 MW Koteshwar HEP, was approved by Govt. in April,2000 and the work has progressed in right earnest and after completion of major excavation work in Dam & Spillway, Stiling Basin and Power Intake area, the concreting was started and is progressing in full swing.

Investment approval for Tehri PSP (1000 MW) has been accorded by the Govt. in July'06 at an estimated project cost of Rs. 1657.60 Cr. (at Dec'05 Price Level) with Debt Equity ratio of 70:30. The essential works of Tehri PSP have already been completed with Tehri Dam & HPP Stage-I. The process of award of major works is in progress.

Benefits from the Tehri Hydro Power Complex	
• Addition to the installed generating capacity in the Northern Region (1000 MW on completion of Tehri Stage-I)	2400 MW
• Annual energy availability (Peaking) (3568 MU on completion of Tehri Stage-I)	6200 MU
• Irrigation (additional)	2.70 Lac.ha.
• Stabilisation of existing irrigation (besides above)	6.04 Lac.ha.
• Additional Generation in downstream Projects	200 MU
• 300 Cusecs (162 million gallons per day) of drinking water for Delhi which will meet the requirements of about 40 lac people.	
• In addition, 200 Cusecs (108 million gallons per day) of drinking water for towns and villages of U.P. which will meet the requirement of 30 Lac people.	
• Flood Moderation	
• Integrated development of Garhwal region, including construction of a new hill station town with provision of all civic facilities; improved communication, education, health, tourism, development of horticultures, fisheries, and afforestation of the region.	

TEHRI DAM & HPP (1000 MW) (Under Operation)

The 1000 MW Tehri HPP comprises a 260.5 m high Tehri Dam, which is the highest Earth & Rockfill Dam in the Asian Region, 2 nos. Head Race Tunnels, an underground Hydro Power House Complex having four conventional Turbine/Generator sets of 250 MW each and Spillway System comprises Chute Spillway, 2 gated Shaft Spillways and 2 ungated Shaft Spillways. The Intermediate Outlet Level (ILO) shall enable water releases for irrigation purposes, when the machines are not in operation.

Tehri Dam & HPP STAGE – I (1000 MW)

All the four units (Unit IV, III, II & I) of 250 MW each have been commissioned during 2006-07 and 1000 MW Tehri Power Station is fully operational. Command Area has also started availing Irrigation Benefits and Drinking Water is being supplied to NCT of Delhi.

Major Components of Projects are

Earth & Rock Fill Dam :

Type	:	Rock and Earth Fill
Height	:	260.5 m
Base	:	1128 m
Width at top	:	25.5 m
Length at the top	:	592 m

Tehri Reservoir

Water Spread	:	42 SQ KM
Gross Storage	:	3540 Miliion Cum
Live Storage	:	2615 Million Cum

Power House

Power House	:	Under ground
Cavern Size	:	197mx24mx63m
Type of Turbines	:	Francis
Rated Head	:	188 M
Speed	:	214.3 RPM
Installed Capacity	:	4x250MW
Annual Energy	:	3568 MUs

REHABILITATION OF TEHRI DAM AND LESSONS LEARNT

By S.C.Sharma, Former General Manager THDC Ltd.

1.0 BACKGROUND

The Tehri Dam project was prepared and submitted to Govt. of India in 1969. This project consisted of a 260.5m high clay core type rockfill dam with a side chute spillway on the right bank and an underground power house with an installed capacity of 600 MW (4x150) in the left bank abutment. The Project had been originally approved in June, 1972, as a State Sector Project for implementation by the Govt. of Uttar Pradesh.

The Project was technically cleared by the Central Water and Power Commission and finally the Planning Commission approved it on 02.06.1972. Administrative approval of the project was accorded by U.P. Government on 23.07.1976. However, the advance action on the project was authorized in year 1971, but till the year 1977-78 the pace of the construction of the project could not pick up due to paucity of funds.

Subsequently, without increasing the height of the Dam as earlier proposed, the installed capacity envisaged from the project was revised to 1000 MW in 1983 in view of requirement of more peaking power due to large thermal base coming up in the State. The revised project alongwith a concrete dam downstream of Tehri at Koteshwar with a Hydro Power Plant of 400 MW, was submitted to CWC in 1983 and the same was considered by T.A.C of Planning Commission in Feb. 1985, and CEA in August 1988.

Two lakes formed by 260.5m high Tehri Dam and 103 m high Koteshwar Dam will have a spread of 42 sq. km. and 2.65 sq. km. respectively at maximum full reservoir levels. Due to the submergence caused by these dams, the Tehri Town and 24 villages were to be fully affected, while another 88 villages would only be partially affected. In addition, 13 more villages were fully affected due to acquisition of land for the project works and the colony. Thus the Tehri Complex would affect a total of 37 villages fully and 88 villages partially, and also the Tehri Town which was also to be fully submerged. The people from these affected villages and Town were to be properly rehabilitated in the new environment.

In July 1988, the Tehri Hydro Development Corporation (THDC) was set up as a joint venture of the Government of India and Government of U.P. for executing the Tehri Project. The Govt. of Uttar Pradesh transferred the project works to THDC in 1989 while the rehabilitation work of the Tehri Project was transferred to THDC in February, 1990.

The Govt. of India, in March,1994, approved implementation of the Tehri Dam and Hydro Electric Project (1000 MW), which is the Stage-I of the Tehri Hydro Power Complex. The other two components, viz. PSP and Koteshwar Dam and HPP were taken up later.

2.0 REHABILITATION PLAN

The Rehabilitation Plan has been broadly divided into Rural Rehabilitation and Urban Rehabilitation. Affected families under Rural Rehabilitation are categorised as "Fully affected" or "Partially affected". The families whose 50% or more land is being acquired are treated as Fully Affected. Those families whose less than 50% land is coming under submergence are categorised as

"Partially Affected". In case of Urban population of Tehri Town, all 5291 families living in the Town as on the cut-off date of 06.06.1985, are treated as fully affected.

Under Rural Rehabilitation, there are 5429 Fully Affected families due to Tehri Dam, which are to be rehabilitated. Another 3810 rural families are Partially Affected and are not going to be displaced; they would be paid cash compensation for their land under submergence.

3.0 BROAD FEATURES OF REHABILITATION POLICY

The basic principles that had guided the formation of the Rehabilitation Policy are:

- Rural oustees to be compensated through allotment of agricultural land or cash in lieu thereof.
- The rural oustees should be settled in large blocks so that the fabric of their social life remains intact.
- Oustees or their representatives be involved to the extent possible in selecting the rehabilitation centers.
- To the extent possible, consideration be given to the preference of the oustees for settlement at a particular centre.
- Community facilities be provided at each of the rural rehabilitation centers at the cost of the project even if these did not exist at their earlier settlements.

4.0 IMPROVEMENTS IN R&R PACKAGE FROM TIME TO TIME

The rehabilitation work of the Project affected families was commenced by the Govt. of U.P. when the Project was under them. The Rehabilitation Policy including the location of New Tehri Town (NTT) had been evolved and decided by the State Government of U.P. after interaction with the representatives of the local population. After the incorporation of THDC, the rehabilitation work was handed over to the THDC in 1990. The policy as evolved by the State Government was fully adopted by the Corporation and later on the amounts of compensation were enhanced where necessary.

4.1 IMPROVEMENTS BY HRC

On the demands for further improvements raised by the local population, the Government of India in September, 1996 constituted a committee viz. Hanumantha Rao Committee (HRC) to examine the Rehabilitation Policy of the Project and suggest further measures/improvements etc. The HRC submitted its recommendation to the Govt. in November 1997. The Govt. of India after examining the recommendations of HRC, accepted certain additional benefits/measures, which were incorporated in the Rehabilitation Policy of 1998.

The major recommendations of the Hanumantha Rao Committee, approved by the Govt. in regard to rehabilitation of the affected population include definition of family so as to make all major sons and major daughters who attained the age of 21 years on 19.07.1990 and dependent parent (Mother/Father) of the fully affected entitled land owner eligible for ex-gratia payment of Rs. 33,000/-, i.e. 750 days minimum agricultural wage each; grant of house construction assistance to the urban land owner families, linked with the progress of construction and shifting; allotment of one constructed shop to the shop owners, recognition of the right of people, living in the villages upstream of Tehri reservoir, over the water.

4.2 IMPROVEMENT AFTER HRC

After the Government decision of December 1998, on the recommendations of HRC, following measures/ benefits were also agreed by the Government of India in consultation with the State Government.

Rural

Enhancement of cash in lieu of land from Rs. 2 lakh to Rs. 5 lakh, house construction assistance to fully affected house owners be given @ Rs. 1 lakh; increase in cash grants for shifting and purchase of seeds and fertilizers; cash grants ranging from Rs. 80,000 to Rs. 1,20,000 for rural shop owners depending upon their location; liberalization of eligibility criteria for land allotment and made eligible, those land owners in rural area who sold their part land after 1978, but before issue of Section 4(1) notification under Land Acquisition Act.

Government has also allowed (i) reconstruction and relocation of public properties situated below EL 835 m in partially submergence villages, at higher level for population residing above submergence level; (ii) arrangement for Ferry boat and cable car services for cut-off area; and (iii) Heavy motor vehicle bridge across Bhagirathi river near Dobra village (this is in addition to two medium motor vehicle bridges).

Urban

Amount of house construction assistance revised, varying from Rs. 2.5 lacs to Rs. 4.5 lacs depending upon plot size; cost of flats and shops allotted to the entitled oustees at pre-1989 construction cost, development cost not to be charged; State government allowed in July'01 payment of cash grants to shop keepers of old Tehri Town ranging from Rs. 1 lakh to Rs. 3 lakh depending on category of shop, subject to the handing over of possession

5.0 REHABILITATION PACKAGE

Within the framework of the set principles, which guided the formation of Rehabilitation Policy, an attractive and a liberal rehabilitation package was evolved, which has been improved from time to time without changing its basic features.

a) Rural Package

Land Owner Family

- 2 acre, of developed irrigated land or half acre of developed irrigated land adjacent to Municipal limits of Dehradun, Haridwar or Rishikesh cities or cash of Rs. 5 lacs in lieu of allotment of land, as per their option.
- Compensation for acquired land as per Land Acquisition Act plus solitium. Even if acquired land is less than 2 acres, 2 acres of developed irrigated land is given, cost of which to be adjusted from the amount of compensation payable in respect of acquired land. If the cost of land acquired is more than the cost of allotted land, the oustees would be paid the difference of cost; and if it is less, difference in cost will not be recovered.
- Cost of house property/trees acquired to be evaluated at the PWD/Forest/Horticulture deptt. rates plus solitium. Further, ex-gratia equivalent to amount of depreciation, subject to a maximum of Rs. 50,000/- is payable. Minimum compensation in case of house is Rs. 1.00 lac.

- Allotment of residential plot of 200 sq. m. to each family at nominal cost.
- Cash grant for shifting is Rs. 5200/- and for seeds/fertilizers is Rs. 4960/-.
- Additional incentive grant of Rs. 15,000/- payable to those who shift within 6 months from date of award of compensation or date of allotment of land, whichever is later, after handing over their acquired property.
- All the eligible additional family members for fully affected rural families attaining the age of 21 years as on 19.07.90, and dependent parent (Mother/Father) would receive ex-gratia amount equivalent to 750 days of minimum agricultural wage per member.
- Cash grant ranging from Rs. 80,000/- to Rs. 1,20,000/- to each rural shop holder depending upon the locations.

Landless Agricultural Labourers

- Land free of cost as applicable to rural project affected families, on certification by the concerned District Magistrate.
- Ex-gratia grant to additional family members as applicable for fully affected land owner families.

The rural resettlement colonies are located in Dehradun & Haridwar Districts and have been provided with all civic facilities, like electricity, irrigation, piped drinking water, roads, schools, dispensaries, places of worship and community centres etc. There are around 14 rural resettlement colonies located in agricultural areas (6 in Dehradun Distt. & 8 in Haridwar Distt.) and provided with all basic facilities, better then any village in the Country.

b) <u>Urban Package</u>

- Land owners including *Nazul* land holders are given residential plot of various size (60, 100, 150, 200, 250 and 300 sq.m.) in proportion to their holdings at very nominal cost (ranging from Rs. 5 per sq. m. for plot up to 150 sq.m. to Rs. 150 per sq.m. for plots of size 300 sq.m.) at locations as per choice, in addition to compensation of house property as calculated in case of rural properties.
- House construction assistance, as grant to the land owners at following rates less compensation already paid;

  - 60 –100 Sq.m. plot holders - Rs. 2.50 lacs
  - 150-200 Sq.m. plot holders - Rs. 3.50 lacs
  - 250-300 Sq.m. plot holders - Rs. 4.50 lacs

- Ready to built houses/flats to entitled tenant who were residing prior to 06.06.1985, on subsidized cost at pre-1989 rates.
- Benap house owners who constructed house before 6.6.1985 are allotted either house/flats or plots (if available).
- Allotment of shop at cost in NTT/Dehradun/Rishikesh to those running shops at Old Tehri Town at pre-1989 rates.
- Compensation for “Saj-Sajja”, for shopkeepers.
- One shop to be allotted to shop owner who were not running shop(s) themselves in O.T.T.
- Cash grant of Rs. 3000/- to Rs. 4000/- for transportation of household effects and Rs. 1500/- to Rs. 2000/- for commercial goods. In addition, entitled families who hand over their acquired

properties and shift to new allotted sites within a period of 6 months from the date of allotment of plot/flat, an incentives grant of Rs. 12000/- per family would be paid.

- One room flat to EWS families free of cost, upto a maximum of 100 families.
- All additional eligible family members of entitled landowner families as per criteria defined under rural package, get ex-gratia amount equivalent to 750 days of minimum agricultural wage per member.

Cash option allowed in lieu of allotment of plots (Rs. 1.10 lac to Rs. 3.00 lacs), flat (1.00 lac) and shop (Rs. 0.25 lac to Rs. 0.60 lac).

The urban families are resettled at New Tehri Town (NTT) or at Rishikesh or Dehradun, as per their option. The NTT, newly developed, is at a height of 1350 to 1850 m., overlooking the proposed lake, with a panoramic view of the Himalayas. It has all the modern facilities for Education, Hospital, Financial Institutions, District Administration offices, Markets, Bus Stand & places of worship etc.

6.0 INSTITUTIONAL MECHANISM

As per government decision, R&R woks were transferred to the U.P. State Government in January 1999 for implementation, under control and supervision of Commissioner, Garhwal, with funds to be provided by THDC. With the formation of Uttaranchal State, R&R was being implemented by Uttaranchal/Uttarakhand State Government since January, 2001.

Subsequent to takeover, the Government of Uttaranchal have reconstituted the Co-ordination Committee under the Chairmanship of Commissioner, Garhwal, with CMD, THDC as the Co-Chairman and the District Magistrates of Tehri, Uttarkashi, Haridwar, Dehradun and other Government and non-Government officials as members. The Co-ordination Committee has now greater representation of the public representative; viz. MLA, Tehri; Chairman, Zila Parishad, Tehri and Chairman, Nagar Palika Parishad, Tehri. The Committee, inter-alia, deliberates and decides on the issues/measures needed for the implementation of programme of rehabilitation/resettlement of the affected families and coordinates amongst various Departments and organisations of the State Government and the THDC in the matter and for Project implementation.

7.0 MONITORING MECHANISM FOR REHABILITATION

Government of India has constituted a Project Level Monitoring Committee (PLMC) for conducting field visits to verify the satisfactory completion of various environmental safeguards stipulated at the time of Project clearance and other specific recommendations accepted by the Government.

Ministry of Environment & Forests, Govt. of India also constituted a High Level Inter Ministerial Review Committee (IMRC) headed by Secretary, MOEF and including Secretary, Ministry of Power, Secretary, Ministry of Social Justice, Secretary, Ministry of Water Resources also Chief Secretary of Uttaranchal and U.P. as Special Invitees, to periodically review the environment and rehabilitation and resettlement issues associated with the Tehri Hydro Electric Project and also review the recommendations of the Project Level Monitoring Committee.

8.0 GRIEVANCE REDRESSAL MECHANISM

A Grievance Redressal Cell under the Sub Divisional Magistrate, Tehri, is functioning in the Rehabilitation Directorate, Uttranchal Government for expeditious disposal of grievances received from PAFs. Further, Coordination Committee under the Chairmanship of Commissioner (Garhwal) set up by the State Govt. also redresses the specific cases/demands of the people.

9.0 STUDIES/COMMENTS ON SOCIO ECONOMIC ASPECTS

9.1 STUDY BY ASCI, HYDERABAD

A Socio Economic Study of the families rehabilitated was conducted by the Administrative Staff College of India (ASCI) in March, 1993, who broadly concluded that the quality of life in respect of the re-settled families is far above and better than what was the situation before rehabilitation. Some of the findings includes :

- ✓ The value of assets of the oustees have increased after they got rehabilitated.
- ✓ Income from agriculture has increased after rehabilitation. No one is engaged as agricultural labour after rehabilitation.
- ✓ The annual income of the household after rehabilitation has risen by 34.67%.
- ✓ The new settlements are provided with pucca buildings with furnishings and electricity in Schools as against inadequate educational facilities provided earlier.
- ✓ The new settlements provide very good medical facilities which were not available to the rural house holds in the hilly area.
- ✓ Drinking water facilities have been provided in the new-resettlements and L.P.G. connections have been made available as against the traditional collection of water from springs and wood from forests in the hills.
- ✓ The new houses are bigger and modern
- ✓ Agricultural land allotted in consolidated holdings as against fragmented holdings earlier.

9.2 COMMENTS OF ESTIMATES COMMITTEE OF UP LEGISLATURE

The Estimates Committee of the U.P. Legislature has visited some of the resettlement colonies in 1989. The English version of an extract of their report as below, clearly brings out that the Tehri Rehabilitees at the new sites are enjoying facilities which are not available in other Indian Villages.

"The Committee during its visit inspected the resettlement colonies at Bhaniawala, Raiwala and Pathri Block. The Committee found that the facilities provided in these colonies are better than any village in the country. There are well laid roads. There is provision for street lighting. Provisions for Irrigation and Drinking water are available. Efforts have been made to provide the facilities of Hospitals and Schools."

10.0 EXPERIENCE GAINED ON R&R ASPECTS

Resettling Project-affected People (PAP) did not present any great obstacles to the development agencies in the initial years of planned development in the country. Land was then available to resettle people, who were displaced by development projects. Forests also could be cleared easily for the purpose, whenever needed. In those days, people genuinely believed that development projects would eventually usher in an era of prosperity for everybody, and were often willing to

make sacrifices for the larger good of the society. Therefore, they would take cash – then the usual form of compensation for properties acquired - hand over possession of their land for developmental uses, and move onto resettle at new places. This was the time when dams were hailed as the "temples of modern India", as projects that would transform a poor country into a rich one.

On the other hand the task of managing resettlement has now become a far more complex one. The circumstances under which planners and administrators operate have drastically changed. The number of people requiring resettlement has gone up. Land suitable for resettlement purposes is scarce. Land from the forest area, which has shrunk to a bare minimum, would not be possible in future to set aside to accommodate the displaced.

Therefore, people now perceive their own interests and those of the projects as essentially irreconcilable, and they are organizing to oppose projects that cause displacement. Their struggles are increasingly receiving external support from environmentalist groups, human rights activists, media networks, and others.

Owing to heavy population pressures, empty spaces where projects could be started without causing displacement are becoming increasingly scarce. To achieve development at a fast pace by investing in large infrastructure projects, privately owned lands, therefore, will have to be acquired on a scale much larger than before. A growing number of people who would lose their lands for the sake of development will need to be rehabilitated properly.

10.1 PROBLEMS FACED

A. Delay in construction of Project

As R&R was to be carried out *parri passu* with the construction of Project, therefore, the impact of delay in construction of project was on R& R and vice versa. Though R&R was started in the year 1976, it was delayed due to change in size and design of Project; State Government, who was earlier executing the Project, could not provide funds in time; THDC was created as a joint venture of Govt. of India and State Government; Project was finally cleared in the year 1994; thereafter agitations against the Projects by environmentalist picked up; ban on blasting was imposed by the Government; Uttarakhand agitation, delay in closure of Tunnel T3/T4 due to delayed shifting of population; court cases etc. The undue delay thus caused uncertainties for a long period of time resulting in the mental frustrations; social dis-organistion etc. The PAFs could not plan properly for the future for their own self and also for their children, who also became heads of other families in such a long period of more than 25 years.

B. Delay in R&R Activities

R&R work was first carried out by the State Government till 1989, then by the Project Authorities and again by the State Government after December 1998. Thus, implementation agencies were changed again and again. Since R&R activities had to deal with proceedings of land acquisition, non-availability of land in rural resettlement, agitation, frequent changes in R&R packages, ban on shifting in 1996 resulted into hesitation of PAFs even when ban was lifted in 1997, ultimately people started shifting after 2000. Thus, the land acquisition process was scattered for over a period of about 25 years resulting in payment at varying rates of land acquired. For expediting the land acquisition process, THDC made several requests for acquisition of land by the State Government in submergence as well as in resettlement areas. Ultimately the problem was sorted

out by the joint efforts of the Uttaranchal (now named as Uttarakhand) after its formation and Government of India by diverting the forest land in the districts of Dehradun and Hardwar.

C. Confusion on employment to PAFs

A large number of circulars were issued from time to time regarding employment in the Project, contradicting with each other. These confusing circulars have resulted into frequent agitations and stoppage of transportation of the construction material for the Project.

THDC had constantly pursued the issue and taken up the matter at various forums. Even the Hanumantha Rao Committee had recognized the THDC's point of view and stated as follows in its report:

"It is recognized that the THDC does not have large scale employment opportunities, as its requirements are limited and mostly in the specialised categories."

Further, the Committee has also mentioned in its report that "the Committee is of the view that the existing policy of giving preferences in the employment to the Project Affected Persons, particularly in the category of workmen and supervisors, may be continued."

Government has also accepted these recommendations of Hanumantha Rao Committee.

It is further pointed out that the contractors of THDC were also giving preferences in employment to these local people, besides, petty contracts were also awarded mainly to the local people.

D. Difficulties in availability of land for resettlement

Lot of efforts were made by THDC as well as State Government Officials, even at the level of Coordination Committee, but the land availability could not be explored, as the people, who already got meager land due to population pressure did not want to become landless/job-less. Whenever the proposals for land acquisition were initiated, the host population started agitations and ultimately at a number of occasions, the proposals had to be cancelled/withdrawn. Ultimately the State Government of Uttaranchal and Government of India agreed for diversion of forest land for developing the resettlement colonies.

E. Good package attracted more people to become displaced

With the passage of time and pressure from all categories, the R&R package of this project became very attractive and therefore during last few years of the Project completion, more and more people started demanding their displacement on one pretext or the other. Dobra, Asena and Devri village are the few examples.

10.2 STRENGTHS/OPPORTUNITIES

- Proximity of resettlement colonies to urban centers have given the PAFs opportunities to improve their lot in many ways; access to jobs- more jobs can be found in a city/towns than in isolated relocation center – access to business opportunities and access to better educational facilities.

- With the spiraling real estate prices in the area, their properties are now worth many times more than what they actually had earlier, giving them a sense of real affluence.

- The people in their colony do not miss their former village traditions because the entire village moved as one group to the mew settlement. Thus, the social network has remained intact.

10.3 LESSONS LEARNT

a) Following surveys should be carried out at the initial stage, i.e., before designing the R&R package:

   i. Socio-economic/Demography Survey before the Project is taken up.
   ii. Survey for recognizing the needs of self-employment / Income Generating Schemes.
   iii. Survey for recognizing the facilities affected in the cut-off area from reservoir and in the areas above the submergence.

b) R&R package should be evolved keeping the results of surveys in mind and by associating affected groups, district authorities, economists, social scientists and the State Government representatives.

c) Although a sound policy is a prerequisite for achieving success in resettlement and rehabilitation, a policy by itself cannot guarantee success. It is important to formulate a detailed resettlement action plan (RAP) that provides information under the following broad heads: RAP objectives, project design, project-affected people (PAP) eligibility, estimates of population entitlement, PAPs and hosts, assessment of resettlement sites, development of resettlement sites, income restoration program, budget for R&R Programme, implementing agency, grievances redress mechanism, participation, and monitoring and evaluation.

   A resettlement action plan requires basic information on project-affected people and other aspects for its preparation. Therefore, it is important that baseline surveys are first conducted. Reliable information on income levels of project-affected populations and their socio-cultural background is required to design appropriate R&R package.

d) Rehabilitation should be conducted in two phases :

   - Phase-I (land for Project works, colony, borrow areas, etc.) – Physical possession of vacant land required for colony and infrastructure development to be handed over by the State Government after clearance of Stage-I activities and establishing commercial viability of Project. Possession of vacant land required for Project works, borrow area etc. should be handed over immediately after Project clearance.
   - Phase – II (land for reservoir submergence) – Process for land acquisition for reservoir submergence should be started alongwith the land acquisition in phase-I. Vacant possession of land should be handed over by State Government within two years of the Project sanction.

e) Compensation for houses should be based on prevailing plinth area rates of the type of construction of the houses acquired, so that PAF can construct a suitable house for him. The payment to be released in phases and should be linked with the progress of construction and shifting.

f) Preference in employment can be given in new vacancies in the categories of Workmen & Supervisors from the district in which Project is to be constructed. The practice of filling entire vacancies from the submergence area in all categories is not justified as this will reduce the efficiency of the orgnisation and may create other problems in future. Hanumantha Rao Committee has also recognized this fact and recommended only preference in employment in the categories of Workmen and Supervisors.

EFFECTS (IMPACTS) OF TEHRI DAM

By S.C.Sharma, Former General Manager THDC Ltd.

1. INTRODUCTION

The probable effects of human activities regarding the use of environmental resources on natural environment is called environmental impact, and the assessment and evaluation of environmental effects of human activities are called environmental impact assessment (EIA). Thus, EIA is an instrument to identify and assess the potential environmental impacts of a proposed project, evaluate alternatives, and design appropriate mitigation, management and monitoring measures. EIA should also be conducted for social environments, i.e., impacts of project on human beings.

The main activities involved in EIA are :

(i) Identification of likely impacts.
(ii) Conduction of baseline studies to collect various available information related to the particular impact.
(iii) Impact prediction and assessment.
(iv) Impact interpretation or evaluation.
(v) Identification of monitoring requirements and mitigating measures.

2. ENVIRONMENTAL IMPACTS OF TEHRI DAM

The Project has identified both positive and negative impacts. Efforts were made to get full advantage of positive impacts by formulating suitable schemes.

As we know that dam is essentially an artificial wall constructed across a river which converts a running water ecosystem into a lake type ecosystem. This causes some changes in basic riverine ecosystem. Therefore, thorough studies were got conducted for the likely negative impacts of dam and its reservoir, through expert agencies. Mitigating measures, where necessary, were taken on likely negative impacts.

Probable impacts identified for detailed studies were :

a. Likely change in the (i) water chemistry, especially with respect to dissolved oxygen and (ii) turbidity of water.

b. Likely impact on biodiversity, i.e., flora and fauna of the area.

c. Likely obstruction of movements of migrating fish species during breeding season.

d. Rivers carry a lot of sediment, which on construction of a dam, will be locked up behind the dam wall. The collected silt in the reservoir eats away the capacity of the reservoir. This impact of reducing the capacity and life of reservoir was studied.

e. Likely impact of water accumulation on the upstream side of the dam, which causes inundation of land including forest-land.

f. Since 109 villages (full or partial) and Tehri town (full) were affected and the residents were to vacate their ancestral homes and agricultural fields, a scheme was prepared, to resettle these people, with the idea to improve their living standard, keeping their social bonds intact.

g. Likely problem of water-logging and salinity of the land in the command area.

The studies on all the above likely impacts were got conducted through the expert organisations. The studies included the parameters as mentioned in para 1 above.

3. MITIGATING MEASURES TAKEN ON ASSESSED IMPACTS

Based on the impact assessment studies, various mitigating measures were designed. In order to mitigate probable impacts following measures/safeguards were taken:

A. MEASURES FOR ECOLOGICAL IMPACTS

1. Compensatory Afforestation

Forest land of 4193.813 ha. were diverted for construction of Tehri Dam Project and Koteshwar Project (in the downstream of Tehri Project). This forest-land included the land used in construction of Project, Project colonies, resettlement colonies and filling of reservoir. Against this, Project has completed the compensatory afforestation in an area of 4586.07 ha. in Lalitpur and Jhansi District. In addition, for 1358.20 ha. forest-land diverted in second phase for rural resettlement, the compensatory afforestation has been carried out in 2716.40 ha. of degraded forest-land of Khanpur forest range in Haridwar District.

2. Catchment Area Treatment

In order to reduce soil erosion (for reducing sedimentation in the reservoir), the Tehri Project had completed the Cathcment Area Treatment (CAT) in the entire degraded catchment, in areas of 'High' and 'Very High' erosion class. The total degraded area treated is 52,204 ha. (including 44,157 ha. of forest land and the 8047 ha. of agricultural land). The CAT works included the works of afforestation, soil conservation, treatment of agriculture land, farm forestry, horticulture etc. The main objective of CAT works was to check soil erosion and resultant siltation in the reservoir.

3. Command Area Development

Command Area Development Plan had been implemented by the Irrigation Departments of the State Governments of Uttarakhand and U.P. In order to mitigate the likely problem of water-logging and salinity, the network of field channels and drains were developed. The canal networks are utilized to irrigate 2.7 lac ha. additional area as well as stabilize existing irrigation area in 6.04 lac ha.

4. Flora

In CAT works, the species as recommended by Botanical Survey of India (BSI), based on their flora study of the area, have been planted. A Botanical Garden in an area of 14.28 ha. has also been established and plantation of special species coming under submergence has been completed, so as to preserve important flora of the region.

5. Fauna

Faunal studies were got conducted through Zoological Survey of India (ZSI), for fauna affected due to formation of reservoir. As per ZSI studies there will be no adverse impact on mammals, Aves (Birds), Reptiles (Snakes and Lizards), Ambhibia (Frogs &

Toads) and Pisces (Fresh Water Fishes) due to proposed reservoir except on *Tor-Putitora (Mahseer Fish)*

As suggested by ZSI, action plan for possible mitigation of *Mahseer* fish was framed. The implementation of this action plan was taken up with the National Research Centre on Cold Water Fisheries (NRCCWF), ICAR, Bhimtal. The *Mahseer* Fish Hatchery and fish Farm have been developed and is in operation.

The faunal study have also pointed that the formation of proposed reservoir with a massive water exposure on about 42 sq. km., a large number of migratory birds may be attracted to the area, thus adding to the aesthetic and tourism aspect of the Project. Therefore, as suggested in the study report, the periphery of the reservoir have been suitably planted by bushes, shrubs and trees. This will help not only in the rehabilitation of Aves (Birds), but will also attract other groups of animals. The bushes, shrubs and undergrowth have therefore been provided as ideal shelter to snakes and lizards also.

6. Water Quality Maintenance

The water quality modeling study had been carried out, which concluded that no specific measures are required and there would be no adverse effect on the water quality due to impoundment. However, the work on water quality monitoring on Tehri Reservoir, both upstream and downstream is being carried out at 5 monitoring stations.

The water quality study also concluded that Dissolved Oxygen (D.O.) and Biological Oxygen Demand (BOD) in whole of reservoir are expected to remain within permissible limits desired for drinking water resources.

Another mathematical model study on water circulation concluded that water in reservoir remains under dynamic circulation throughout the year and does not remain stagnant.

7. Green Belt

A green Belt have been planned to be created along the rim of the reservoir between 850 m above MSL and 1050 m above MSL. The idea for developing the green belt is to check soil erosion and resultant siltation of the reservoir; to protect and regenerate the vegetation in the rim area; to increase the natural beauty of the landscape.

8. Impact on Human Health

A comprehensive study of the potential health impacts of Tehri dam was conducted. National Malaria Eradication Programme (NMEP) and Malaria Research Centre (MRC) carried out detailed field investigations of the area. Action-plan for preventive/mitigation measures is being implemented.

Dust pollution in project area were kept under control by regular sprinkling of water. Dust pollution levels were also monitored at the project site and habitat area by conducting the study on the samples so collected.

B. MEASURES FOR SOCIAL IMPACTS

1. Better Quality of Living

In order to achieve the objective of 'better quality of life' following steps were taken through R&R programme. The idea is to ensure that settlers are provided opportunities to become established and economically self sustaining in shortest possible period.

a. Urban

i. Better quality of living. Urban population was provided better facilities like better and wider road network, sewerage system, hospital with enhanced capacity, stadium and other amenities, scope for expansion, planned growth.

ii. Larger school buildings with hostel accommodation will enable their management to enhance their capacities. A larger University campus has been constructed in addition to a college keeping in view the future needs of the region.

iii. More employment opportunities due to high tourism potential and industries likely to come up due to excellent infrastructure available in NTT and surrounding areas.

iv. 100 economically backward and houseless persons now have free housing at NTT, of which they would become owners.

b. Rural

i. The all round development of the area would lead to prosperity, better infrastructure and better quality of life.

ii. New road network and taped drinking water supply save the time of people which can be utilized for other works.

iii. Due to the increase in land holding, i.e., against the existing less than 1 acre average rainfed land holding, to the allotted 2 acres well irrigated and developed land, yield and total income is expected to increase.

iv. Due to payment of House Construction Assistance to PAFs, the PAF have been able to construct better houses, which has resulted in improvement in their living standards.

v. Landless agricultural labours have also become owners of 2 acres of agricultural land and independent houses.

vi. People who will not be shifted (above the reservoir level) shall be benefited due to Catchment Area Treatment, tourism, fishery development and horticulture, apart form infrastructural development.

vii. As most resettlement colonies are on important locations/on important highways, PAFs have opened their shops, which are helping them in generating more income. Such people are in a position to turn displacement into an opportunity to get even more richer than they were.

viii. The resettlement sites are located on important routes of Dehradun and Haridwar districts which helps in adopting self employment works.

2. Employment & Income Generating Schemes

A. Employment

i) For employment in the THDC, preference was given to the dependents of the project affected families, particularly in the category of workmen & supervisors, subject to vacancies and their meeting the necessary laid down qualifications and experience requirements.

ii) Apart from this, the contractors deployed on the Project a sizable work force form the local area.

iii) In order to provide gainful employment to the local population, THDC awarded small value contracts to the local people.

iv) For treatment and soil conservation work in the Catchment Area, the forest and other concerned departments, have employed more persons.

v) With the construction of the New Tehri Town at a high altitude, formation of reservoir, better road network etc., it is expected that there will be an all round development in the area, which will further enhance the employment opportunities due to setting up of new non-polluting industries, better tourism opportunities through developmental activities, which will in turn help in generating indirect employment in commercial ventures, like boating, transport, vehicle repair shops, business, hotel industries and several other indirect activities.

vi) With a view to encourage the dispossessed families taking to useful vocations, like poultry farming, floriculture, pisci-culture, animal husbandry, handicrafts, khadi work etc. the Government agencies have taken up various self-employment / income generating schemes.

B. Income Generating Schemes

Since it was not possible to give direct employment to all unemployed youth from PAFs in the project. A group was formed in THDC for helping the resettled families to take advantage of various schemes of Self-employment and Income Generation being implemented by various Govt. and Semi Govt. agencies. The group organized various activities for the benefits of PAPs as under ;

i) Organized awareness camps at Athoorwala and Khand Raiwala so that PAPs should come forward as rural entrepreneurs. The group invited the officials of various State/Central Government agencies like Khadi Village & Industry Commission, State Horticulture & Food Preservation Deptt., State Sericulture Deptt., State Fisheries Deptt., Lead bank & Poultry Deptt., etc. During these camps PAPs were given detailed knowledge about various existing schemes, training activities, loaning procedure etc.