Vol 4 Issue 3 Dec 2014

ISSN No : 2249-894X

Monthly Multidisciplinary Research Journal

Review Of Research Journal

Welcome to Review Of Research

RNI MAHMUL/2011/38595 **ISSN No.2249-894X**

Review Of Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

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Review Of Research
Vol. 4 | Issue. 3 | Dec. 2014
Impact Factor : 2.1002 (UIF)
ISSN:-2249-894X

Available online at www.ror.isrj.org

ORIGINAL ARTICLE

SOCIO-ECONOMIC AND PHYSICAL IMPACT OF TEHRI DAM: A GEOGRAPHICAL REVIEW

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Abstract:

The Tehri Dam was taken up for the first time in 1949 and sanctioned by the Planning Commission in 1972. Located in the outer Himalaya (in Tehri, Garhwal district of present day Uttarakhand), the dam is planned to be fifth highest in the world with the height of 260.5 m. In the Garhwal region the most men migrate to the plains in search of jobs and mostly get recruited in the army or work as truck drivers. Women are the able-bodied men and take care of household needs, trudge long distances to get water, work on land, get fuel and herbs from the forests and earn additional income for household by doing side business. The dam located in a seismic fault zone. Between 1816-1991 the region has witnessed 17 earthquakes. The most intense public debate on the Tehri dam has centred on the issue of seismicity and dam safety. All socio-economic and physical impact of the dam has been studied and its georaphical evaluation has also been taken into consideration.

KEYWORDS:

Tehri Dam, Seismic Fault Zone, Socio-Economic; Physical Impact.

INTRODUCTION

The Tehri Dam Controversy is not new to the debate of development of infrastructural set up in northern part of hilly states that is basically Garhwal district of Uttarakhand. The controversy has been provoked based on three issues: the dam will displace many people and submerge several towns, this region is vulnerable to earthquake and the dam may be structurally faulty as to lead to one or if not lead to, facilitate one that may cause even more devastation as ever, and it will lead to the deaths of hundreds of thousands of people and destroy downstream towns of immense religious importance. All these concerns have provoked civil protests that have given rise to large agitation all across the nation. Apart from the above human rights concern there are environmental issues that contribute to the controversy. Thus there has been a controversy between 'development' and 'environment and safety of the masses'. The aim of this paper is to see Tehri dam construction in its various dimensions.

TEHRI DAM-A LOOKBACK

Tehri Dam-the third largest dam in Himalayan region after Bhakhra and Pong Dam, is located on Bhagirathi River in Garhwal district about 80 km upstream from Rishikesh (Figure 1.1). Although it is of immense developmental importance to the nation yet it has been the subject of wide spread protests all across the nation right from the time it was conceived in the year 1949. The project was planned and designed with

power generating capacity of 600 MW in 1972 based on a preliminary investigation in 1961. Studying its viability the project construction was started in 1978, but due to issues of environmental and resettlement was to be delayed even

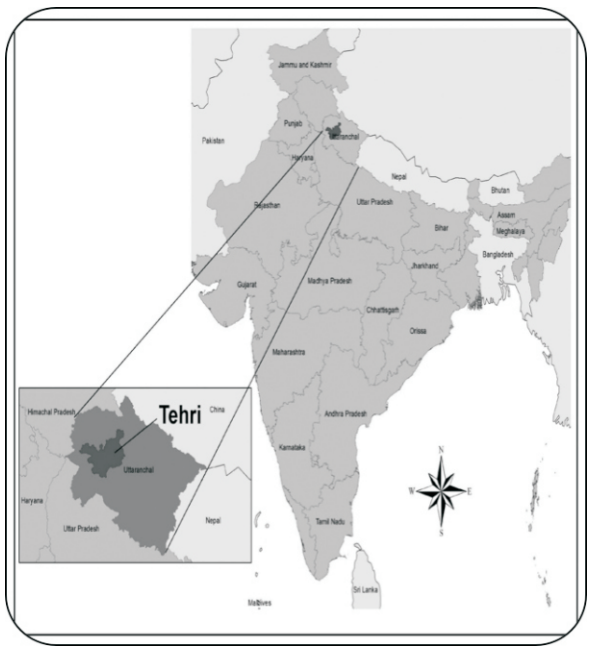


Figure 1.1

with ongoing administrative, social and environmental activities. The construction of the dam was agreed to by USSR in 1968 on turnkey basis supplying us with the technical and financial assistance, which they withdrew later due to political changes. Government of India then planned the progress of the dam on its own finance and technological resources. Initially, the Irrigation Department of Uttar Pradesh took the lead role to implement the project as the project envisaged to provide additional irrigation in UP.

Further implementation of the dam was taken ahead by joint venture of Central government and the Government of UP. Here on the share of equity investment was decided upon as 3/4th by the Central Government and 1/4th for the state government in the Hydropower component, whereas the irrigation component was agreed to be financed solely by the state government of UP (Picture 1). It was in 1990 that the project was revised from initial 600MW to new 2400 multipurpose

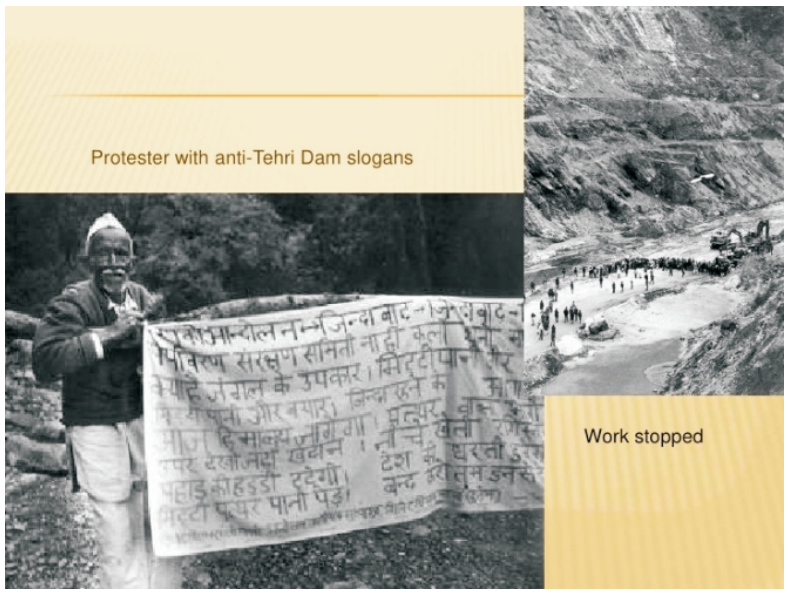
Picture 1 Tehri Dam

project to be developed in three stages at the time when the Ministry of Environmental and Forest gave the project a conditional clearance to continue the project. The revised project was planned to be developed in following stages.

- ❖ The Tehri Dam and Hydropower Plant just downstream of old Tehri town (1000 MW) with a surface area of 42 sq km at full reservoir level of 830m.
- ❖ The Koteshwar Dam and Hydropower Plant at about 22 km downstream of Tehri main dam. (400 MW)
- ❖ The Tehri Dam and Hydropower Plant (1000 MW), which aims to lift the water from, lower Koteshwar Dam to upper Tehri Dam mostly during off peak hours to generate 1000 MW of power during peak hours.

TEHRI DAM AMIDST PROTESTS

The dam construction had been a matter full of contentions between locals, environmentalists and other social workers, and the government. The Tehri Bandh Virodh Sangharsh Samiti (TBVSS) formed 1978 under the presidentship of VD Saklani, the Chipko activist Sunderlal Bahuguna along with several others took forward the movement against the dam construction on the cost of around 85,000



Picture 2 A protester with anti dam slogans

people (Picture 2). The Tehri Bandh Virodhi Sangharsh Samiti (TBVSS) founded on January 24, 1978 went to the Supreme Court. The Supreme Court gave a verdict against the petition. When the Environmental Appraisal Committee (EAC) refused to give clearance to the project, the movement got further momentum. All in vain as it did not stop the project.

The October 20, 1991 earthquakes measuring 6.6 on the Richter scale forced to review the project and the design. The fact that there was seismicity in the region mobilised support for the movement. Yet the construction work continued. The first major protest took place on December 14, 1991 when hundreds of people took hold of the dam site and halted the work for 75 days. Sunderlal Bahuguna sat on a 45 day fast unto death and this compelled the PM to review the project and declare a moratorium on blasting. The protest weakened with time. May experts refer to the Tehri project as 'Kamdhenu' which means the cow of plenty where everyone involved-the contractors, transporters, and politicians, benefitted. In the last decade the anti-Tehri dam could not sustain itself even after being termed as 'Himalay Bachao Aandolan'. Also it could be pointed out that there is not a single reference to the Tehri dam in the report of the World commission on dams.

The opposition turned to environmental factors in the monsoon period of 1978 when a massive landslide dam-burst occurred in the upper catchment of the river producing devastating floods up to quite a distance downstream of the dam site. This amplified the risk of seismicity of the region. The report of the governmental working group stressed on the issue of seismicity in the Himalayan region. The main parameters on which the protest was based included the question of adequate compensation and resettlement for the displaced population, higher rates of siltation and the life span of the dam and on the seismic risk associated with the large dams.

DEVELOPMENT-US VS. THEM

If we start from the beginning of the possible impacts and discrepancies in the lives of people, the first would be inundation of the human settlements and the agriculturally productive land followed by the uncertainty of desired compensations in terms of so called maintenance of living standards at least at the same level as before rehabilitations. The national policy in India stipulates that the "living standards of those displaced should be maintained at least at the same level, if not improved to what they were prior to their involuntary displacement". There are uncertainties regarding the rehabilitation and compensation that has generated serious opposition from common masses. The environmental Appraisal Committee (EAC) in its report observed that since initially the project authorities proposed to acquire forest land for rehabilitation purpose but with the promulgation of the Forest Conservation Act, 1980, forest land earmarked for the project are no longer available. Thus there is an increased sense of uncertainty in the minds of the oustees as to where will they be rehabilitated. There was an arising need to sort this issue of displacement and compensation through negotiated agreements. If the Himalayan waters are economically essential for the plains it should be adequately paid for by the consumers. There should not be an attempt to make the upstream people sacrifice their economic interest as that will only complicate the displacement and compensation question.

To my mind it is relatively well-off/resourceful people who gain in the process of rehabilitations than the ones who are destined to live on agricultural produce. The displaced population also has to suffer on part of their domestic needs, which earlier were available within the village itself. For that matter "Michael Cernea (2000) in her work on displacement and resettlement points out that forced displacement and being ousted from one's land and habitat carries with it the risk of becoming poorer than before. Landlessness, joblessness, homelessness, marginalization, food insecurity, increased morbidity and mortality, loss of access to common property and social integration, were the eight risks which she proposed, to which Muggah (2000) and Downing (2000) added loss of community services and violation of Human rights later".

GENDER IN DISPLACEMENT

Vandana Asthana, adds another less realized dimension of the issue the gender in displacement, as women form very important part of economy of hilly villages economy. As she points out in a study conducted in the Garhwal region the most men migrate to the plains in search of jobs and mostly get recruited in the army or work as truck drivers. Being a money order economy, the task of planning the household and the community is left to the women. Women are the able-bodied men and take care of household needs, trudge long distances to get water, work on land, get fuel and herbs from the forests and earn additional income for household by doing side business. Women form an integral part of the hill ecosystem. Women in Uttarakhand are the backbone of the mountain society staying in a labour intensive and demonetized system of economy the people thus displaced are left exposed to the vagaries of cash economy and profit earners, and intermediaries of their own.

LIFE OF THE RESERVOIR

Sedimentation rate is the major factor in the assessment of the economic performance and efficiency of the dams. The sedimentation involves both the suspended material and the bed load. Due to the geological and climatic peculiarities, the Himalayan Rivers carry some of the highest sediments loads in the world. One very important and popular impulse of the anti-dam movements was use of facts and figures, scientific methods and techniques to challenge a project where project also claimed to be based on scientific assessment. Not only in TBVSS, but various other articles brought out these concerns and analyzing technical social and environmental variables, the life of dam was found to be 61.4 years and expected to be 30-40 and 50 in some other findings.

This divergence in the calculation of the sediment load and the lack of knowledge of a convincing mechanism for calculating the impact of a single large flood events on the nature of sediment transportation, makes the estimation of the life of dams in the Himalayas little different from an informed guess. Ignoring the nature of Himalayan watersheds, other geological processes contribute overwhelmingly to the generation of the sediment load. This cannot be reduced by any kind of catchment area treatment. The EAC pointed out that 'the project authorities have taken the stand that the 1978 (the year of the major landslide dam burst in the upper catchment) siltation was unusual. This highlights the fact that in the Himalayan context sediment generation is much more dependent on the large events like the landslides than the uniform soil erosion related processes. Also in other major Himalayan dams like the Pong in Himachal Pradesh or

Ram Ganga in UP have been silted up at rates four to five times higher than the assumed rates. Since a high sediment load means a lower economic life of the dam, this may not be a worth going for option.

Big or Small- Sustainability of Mega Dams in Himalayas

The dam basically a clay core type earth and rock filled and forms one of the largest Dams in the world. The supporters of the large dams claim that the dams of this kind (earth and rock fill) are naturally more earthquake resistant than concrete dams due to their large inertia, a high degree of flexibility and sustainability. Impacts of large dams include

- Large scale submersion and thus displacement and a remote possibility of satisfactory rehabilitation.
- These projects were planned much before the recent worldwide concern on satisfactory rehabilitation, information sharing, environmental appraisal, catchment treatment and other factors. And in approving the projects not much consideration were given to social and environmental impacts, in fact much of the paper work remains far from the real even if the things are considered.
- Storage loss due to siltation, fertile command area loss due to water logging, salinity cost, time spill over across plan period, chronic under utilization of irrigation and the greater possibility of future havoc in an area susceptible to seismicity.

But the supports of big dams believe the mega projects to be more sustainable and positive on cost and benefit front. On the other hand there are people who emphasize more on small to medium dams of low height, which according to them are more sustainable and suitable for local and the development around. Here according to this point of view the technology should be improved upon so much so that the output from small projects as well as the cost of the dams coupled with sustainability could be maintained in long run.

The Question of Seismicity and Dam Safety

The most intense public debate on the Tehri dam has centred on the issue of seismicity and dam safety. The seismic vulnerability of the Himalayan plate boundary is known to all and is widely accepted as well. On the basis of the risk associated with the possible damage of life and property, there has been this protest that questions the mind and the intentions behind this project. The occurrence of a major earthquake in 1991 in the upper catchment areas of the dam has further strengthened the opposition on the environmental basis. Thus the feasibility of realising the hydrological dream of storage in the Himalayan Rivers will be cut short by the seismological realities.

The National Geophysical Research Institute (NGRI) had reported in 1984 that creation of large reservoir in the region which was already critically stressed might induce rock failure and, resultantly, a possible major earthquake with its rupture zone traversing the dam site cannot be ruled out. A number of major landslides are present along the Bhagirathi River, the prominent ones being at Kangsali, Dobra and one upstream of Siyasu. The first two slides coincide with the suspected location of major tear faults which have caused widespread shearing of the bedrock. The entire Himalayan zone is geo-dynamically very sensitive, reflected in its seismicity and instability. Many of the faults and thrusts of the Himalayas have given rise to earthquakes, some of them of very high magnitude. KS Valdiya, a geologist feels that “the much-faulted central sector of the Himalayan Himachal, Garhwal and Kumaon have remained seismically quiet for quite for some time (20 years) with regard to higher magnitude earthquakes” and thus region being a seismic gap not ruptured by big earthquakes, progressively build up pressure inside which if intensified with hydraulic pressure may result in devastating consequences. The region, in spite have vast majority of projects (more than 2000) that have been built or are being constructed /planned to be constructed in this zone of Himalayas. The strongest environmental critique has been based on the possible unsustainability of the Tehri Dam in the earthquake prone Himalayas.

The above analysis of the possible reasons that led to the long lasting and widespread protest shows that there are innumerable uncertainties and dangers related to the Tehri dam project (TDP). Apart from the above opinion there are some positive points as well that led to the completion of the project.

- The creation of Tehri dam has created dramatic social, economic, and cultural changes in the community and region. Some of the relocated people have enjoyed benefits directly related to their relocation, with many of the new settlements having obtained significant improvements in infrastructure.
- The improving status of women in the relocated rural communities is a clear improvement, brought about by better access to education, though for some it may be the opposite.
- The water and electric outputs that the dam has begun generating should have positive effects on the entire

region.

CONCLUSION

The Tehri debate brought us face to face with the triangular inter-linkage of people, environment and development. The biggest questions that arise out of the debate are the questions of rehabilitation and displacement, sedimentation and siltation and life span of reservoir and the question of seismicity. Hydrological advantages of the Himalayan Rivers have to be economically utilized and the management of water resources is necessary at the best. The development of effective economic instruments to compensate and rehabilitate the displaced people is another important issue where policy makers need to ensure their life style at least as it was before. Though taking in view the developmental stance there was not much one could do regarding the dam as some of the experts proposed that there could have been a large number of small dams in place of a big dam, which could not have been possible as many small dams would have needed a large dispersed space and the loss would've been much greater.

We would not support the idea of big dams but the assessment of the impact on the population, the natural unpredictability in terms of some hazards which we can prevent on our part, least disruption of the ecological social and cultural life of the people and a larger benefit of the human. Coming to the alternatives to big dams, we must appreciate the limits in this regard. Irrigation is highly land augmenting in low and medium rainfall conditions of the tropics. The dry land technology cannot be very land augmenting here because it is suited to temperate regions where crops have low evapo-transpiration needs. There are limits to groundwater-based irrigation and it is being realized now that this is more of a complementary than an alternative source of irrigation in a technically. Alternative in terms of the technological progress which is least harmful (environment friendly) should be considered before going ahead with the big Dams. Development as we say is pro people the benefits of the progress should serve everyone equally not only some.

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