

Tehri Dam

Tehri Dam is a multi-purpose rock and earth-fill embankment dam on the Bhagirathi River near Tehri in Uttarakhand, India. Tehri is located 200 miles north east of Delhi, in the state of Uttaranchal. With a height of 260 meters (855 feet), the dam is the fifth tallest in the world and the tallest dam of India. The Tehri Dam withholds a reservoir for irrigation, municipal water supply and the generation of 1,000 megawatts (1,300,000 hp) of hydroelectricity.

The construction of the dam started in 1978 and phase 1 was completed by 2006. The cofferdam was completed in 1996. The construction cost was \$1 billion. The owner of the dam is THDC INDIA Ltd. Tehri Hydro Development Corporation (THDC) is a joint venture of the Government of India and the state government of Uttaranchal. In 1986 an Indo-Soviet agreement brought Soviet expertise and aid of approximately \$416 million to the project. In 2001 the German export credit agency Hermes guaranteed loans to Voith Siemens Hydro to provide generating equipment for Tehri.

Tehri Development Project also includes the 97 meter high Koteswar Dam, under construction 14 miles downstream of Tehri Dam. The 400 MW Koteswar Dam will either completely or partially submerge 16 villages. It provides 270 million gallons of drinking water per day to Uttaranchal, Uttar Pradesh and Delhi. It also gives stabilization to existing irrigation on 600,000 hectares land.

From its inception, Tehri dam has been opposed due to concerns over its environmental and social impacts, and its ability to withstand earthquake damage. Tehri Dam officials have also been implicated in several cases of corruption. Tehri Hydro Power Complex (2400 MW), comprise the following components:

1. Tehri Dam & Hydro Power Plant (1000 MW)
2. Koteswar Hydro Electric Project (400 MW)
3. Tehri Pumped Storage Plant (PSP) (1000 MW)

History: The timelines for the Tehri Dam project are summarized as follows: 1961 - A preliminary investigation for the Tehri Dam Project was conducted. 1972- Design was completed with a 600 MW capacity power plant based on the study. 1978- Construction began after feasibility studies but was delayed due to financial, environmental and social impacts. 1986-Technical and financial assistance was provided by the USSR but this was interrupted years later with political instability. India was forced to take control of the project and at first it was placed under the direction of the Irrigation Department of Uttar Pradesh. 1988-The Tehri Hydro Development Corporation was formed to manage the dam and 75% of the funding would be provide by the federal government, 25% by the state. Uttar Pradesh would finance the entire irrigation portion of the project. 1990-The project was reconsidered and the design changed to its current multi-purpose. 2006 - Construction of the Tehri Dam was complete 2012 -. The second part of the project, the Koteswar Dam was completed. February 2016- The pumped storage power plant is slated for commissioning. Uttarakhand state's Tehri Hydroelectric dam is a massive 261-meter rock-and-concrete power plant that supplies large amounts of electricity as well as drinking and irrigation water to the greater part of northern India, including the country's second-most populous city of Delhi. It has also created a large reservoir that inundated the town of Old Tehri, along with approximately 110 villages, displacing between 50,000 and 100,000 people (Joshi 2006). The recently constructed city of New Tehri was designated for some of these displaced people who lost their homes and businesses. These people, accustomed to their long-established life along the Bhagirathi and Bhilangna Rivers, now adapt to a new environment on the side of a mountain which is not directly accessible to the river.

The Tehri Dam and the Tehri Pumped Storage Hydroelectric Power Plant are part of the Tehri Hydropower Complex which also includes the 400 MW Koteswar Dam. The complex provides irrigation to an area of 270,000 hectares (670,000 acres), irrigation stabilization to an area of 600,000 hectares (1,500,000 acres), and a supply of 270 million imperial gallons (1.2×10⁶ m³) of drinking water per day to the industrialized areas of Delhi, Uttar Pradesh and Uttarakhand.

Environmental Impacts:

The Tehri Dam has been the object of protests by environmental organizations and local people of the region. The construction of the dam has resulted in destruction of houses of thousands of people. The relocation of more than 100,000 people from the area has led to protracted legal battles over resettlement rights, and ultimately resulted in the project's delayed completion. Since 2005, filling of the reservoir has led to the reduced flow of Bhagirathi water from the normal 1,000 cubic feet per second (28 m³/s) to a mere 200 cubic feet per second (5.7 m³/s). This reduction has been central to local protest against the dam, since the Bhagirathi is considered part of the sacred Ganges whose waters are crucial to Hindu beliefs. At some points during the year, the tampering with Bhagirathi waters means this tributary stops flowing. This has created resentment among many Hindus, who claim that the sanctity of the Ganges has been compromised for the generation of electricity. Though the officials say 13 that when the reservoir is filled to its maximum capacity the flow of the river will again become normal.

In spite of concerns and protestation, operation of the Tehri Dam continues.

Impacts on the surroundings due to the dam are:-

- a. Change in the (i) water chemistry, especially with respect to dissolved oxygen and (ii) turbidity of water.
- b. Impact on biodiversity, i.e., flora and fauna of the area.
- c. 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. 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. Problem of water-logging and salinity of the land in the command area.

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

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
2. Catchment Area Treatment In order to reduce soil erosion (for reducing sedimentation in the reservoir), the Tehri Project had completed the Catchment Area Treatment (CAT) in the entire degraded catchment, in areas of 'High' and 'Very High' erosion class.
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.
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), Amphibia (Frogs & Toads) and Pisces (Fresh Water Fishes) due to proposed reservoir except on Tor-Putitora (Mahseer Fish). 15

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.

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.

MEASURES FOR SOCIAL IMPACTS:

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.

Urban

1. 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.
2. 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. 16
3. More employment opportunities due to high tourism potential and industries likely to come up due to excellent infrastructure available in NTT and surrounding areas.
4. 100 economically backward and houseless persons now have free housing at NTT, of which they would become owners.

Rural

1. The all-round development of the area would lead to prosperity, better infrastructure and better quality of life.
2. New road network and taped drinking water supply save the time of people which can be utilized for other works.
3. Due to the increase in land holding, i.e., against the existing less than 1 acre average rain fed land holding, to the allotted 2 acres well irrigated and developed land, yield and total income is expected to increase. 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.
4. Landless agricultural labors have also become owners of 2 acres of agricultural land and independent houses.
5. 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.