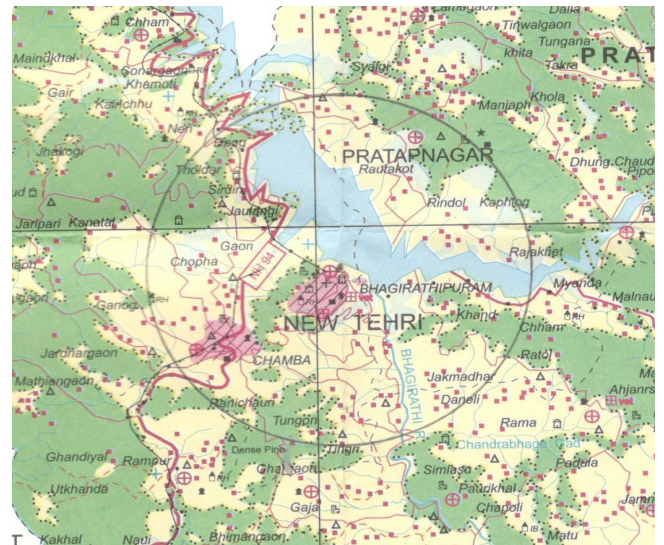




## UTTARAKHAND TOURISM DEVELOPMENT BOARD



### ENVIRONMENTAL IMPACT ASSESSMENT OF PASSENGER ROPEWAY FROM PANCH KOTI TO BORADI AT NEW TEHRI IN UTTARANCHAL



#### EXECUTIVE SUMMARY

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## EXECUTIVE SUMMARY

### 0.1 INTRODUCTION

Uttarakhand is the 27<sup>th</sup> state of the Indian union carved out from Uttar Pradesh on 9<sup>th</sup> November, 2000 and is located in northern part of India. It is known as the abode of the Gods with several highly venerated pilgrimage places of Kedarnath, Badrinath, Hemkund Sahib, Gangotri, Yamunotri, Jageshwar, Bageshwar, Rishikesh and Haridwar. The high peaks and the valleys make it the ideal spot for various adventurous activities like trekking, paragliding, river rafting and skiing. The state comprises of two region Garhwal in the west and Kumaon in the east, Garhwal consists of seven districts and Kumaon consists of six districts. Tehri Garhwal is one of the largest districts in the hill state of Uttarakhand with its administrative headquarters at New Tehri and is in Garhwal region.

The proposed ropeway project is located at New Tehri which is newly built well planned modern town nestles at a height of 1550 meters to 1950 meters overlooking the massive artificial lake and Tehri dam built on the Bhagirtahi river. The lake provides a hundred opportunities to the adventure lovers i.e. Scuba Diving, Angling, Canoeing, Rowing, Boating, Water scooter, speed Boating, Rafting, Kayaking, House Boat, Cruise boating, or any other water sports that might be thought. The project connects Panch Koti (Lake side) to Boradi (New Tehri). Panch Koti is developed for Rajiv Gandhi Adventure Centre, Open Air Theatre, Floating Jetties, Floating Marina, Vehicle Barge, Development of 800 to 1500 metres lake front, Eco Log Hut, Pocket Parkings, Barge Road and Gender based 144 bedded three storied hostel. Panch koti is already connected by boat jetties for the inhabitants on other side of the lakes. The proposed ropeway will serve the transport of local people as well as tourists from Panch Koti to New Tehri and vice-versa.

RITES Ltd. (A Government of India Enterprise) is appointed by Uttarakhand Tourism Development Board, as consultant, for the preparation of Environmental Impact Assessment (EIA) study for proposed Ropeway systems vide letter no. 2324/2-6-951/2015 dated 1<sup>st</sup> October, 2015 as per EIA Notification 2006 and subsequent amendments and Terms of Reference was issued by MoEF&CC vide File No. 10-25/2016-IA.III dated 4<sup>th</sup> May, 2016. The objective of the study is to facilitate the UKTDB to obtain prior environmental clearance from the Ministry of Environment, Forest and Climate Change (MoEF & CC), Government of India for the proposed ropeway systems.

The EIA study has been carried out as per the MoEF & CC guidelines and Environmental Protection Act 1986. The study is conducted following other acts and rules related water, air, noise, forest, wildlife, monuments and archeology, construction and solid waste and R & R act. EIA guidance manual for ropeway manual is followed during preparation of EIA report. Environment, Forest and Climate Change (MoEF & CC) is the nodal agency in the administrative structure of the Central Government for planning,

promotions, co-ordination and overseeing the implementation of India's environmental and forestry policies and programs. Central Pollution Control Board is responsible for pollution control throughout the country and State Pollution Control Board functions in consultation with the Central Pollution Control Board to control the pollution in their respective states.

**Approach and Methodology :** The basic concept is to ascertain the existing baseline conditions and assess the impacts as a result of construction and operation of the project. The changes likely to occur in different components of the environment viz. physical, biological/ecological, and socio-economic etc. have been studied, analyzed and quantified, wherever possible. The accurate analysis of assessment depends upon the reliable data generated/available on environmental attributes. The impacts are assessed for various phases of project cycle namely, Impacts due to project location, project construction, and project operation. The impacts are categorized as negative, positive or no impacts. The cost of management and monitoring programs are estimated on the basis of mitigation measures suggested for negative impacts and environmental monitoring programme during project construction and operation.

## 0.2 PROJECT DESCRIPTION

**Location :** The proposed project site is located at New Tehri, the district head quarter of Tehri Garhwal and falls in Garhwal region of Uttaranchal. It is connected by road. Rail connectivity is from Haridwar (97 km) and Dehradun(114 km) while air connectivity is through Jolly Grant airport (93km) at Dehradun. The location with respect to Geographical Co-ordinates are :

Terminal	Latitude	Longitude	Elevation
Lower Terminal Point (LTP)	30°24'37.895"N	78° 27' 18.272" E	832 m
Upper Terminal Point (UTP)	30°23'2.5"N	78°26'31.5"E	1633 m

The project envisages construction of buildings at lower and upper terminals and at ropeway towers. Buildings provide basic infrastructure i.e. boarding/de-boarding of passengers, ticket counters, toilets, security, power supply etc.

**Need and Justification :** The people of other side of lake will reach New Tehri directly from Panch Koti and it will connect lake to Tehri town for the tourist. This will decongest road traffic and save transit time. Better infrastructure will boost up the economy of the area. Space availability, minimum possible infringement, Connectivity of stations, power availability etc are basic requirements of the ropeway system.

**Ropeway System :** The ropeway system would be Mono cable pulsed Gondola ropeway system which is selected based on Length, capacity and feasibility of the system. The design capacity of ropeway is estimated as 300 PPH. Salient features in brief are as

Sr. No.	Particulars	Description
1.	Line speed, m/sec	3.0
2.	Horizontal distance, m	3160
3.	Vertical rise, m	758.48
4.	Cabins	48 Nos of 4 seat capacity fully enclosed
5.	Location of drive gears	UTP
6.	Main drive motor	140 KW. AC. Variable speed, (0 – 1500 r.p.m.)
7.	Engine drive for emergency kW	50, Diesel Engine
8.	Line Rescue System	Vertical and horizontal
9.	Stand by D.G. set	320
10.	No. of towers	8
11.	Time of travel	18 min
12.	Relevant standard	IS 5228

**Control System :** The system consists of programmable controlled digital variable speed drive panel for smooth run and different sensors, safety devices, emergency stop push button to make the system complete safe. Automatic tripping of main drive motor in case of any safety fault is provided. Operator's control desk announces all faults, operating conditions etc.

**Communication :** The system consists of industrial type telephone system with loudspeaker and amplifier. The portable sets, wireless system and intercom system are for communication.

**Operation and Maintenance of Ropeway System :** Operation and maintenance of the ropeway system shall be carried out in accordance with the recommendation of manufacturer of the equipment such as Gear Box, Motors, coupling, control panels, carriage, hangers, cabins and haulage ropes etc.

**Manpower requirement :** 100 numbers during construction and 32 numbers during operation.

**Construction material and equipment/machinery :** Total requirement of construction material is estimated as 3446 Tonnes which will be transported to construction site at lower and upper terminal by 431 number of truckloads.

**Construction Schedule and project Cost :** The proposed passenger ropeway system are expected to be completed in a period of 30 months with an estimated cost of the project inclusive of consultant and Infrastructural developmental cost as Rs. 2,390 lakhs only. Estimated annual operation and maintenance cost at first year of operation is Rs. 196.37 lakhs.

### 0.3 ANALYSIS OF ALTERNATIVES

Two alternative analysis are considered for selection of ropeway alignment, one is from Khand Khala to Boradi and other is from Panch Koti to Boradi. Final selection was made considering the points of minimum use of forest land, consultation with project proponent, civil authorities, local administration and requirement/utility of proposed

ropeway system, Geological, Environmental and social aspects along the alignment and at terminal locations. Second option is selected on the basis of avoiding the forest land, minimal use of private land, no displacement of people and direct connectivity of lower terminal with boat jetties. Lake beatification at Panch Koti is in progress and basic infrastructure facilities like adventure centres, tourist huts, ferry jetties, boating etc. are getting implemented at the LTP. Kahand Khala LTP for first option is 2.5 km away from Panch Koti and there is space constraint for the development of additional infrastructure facilities. The ropeway construction is a cost effective, pollution free and environment friendly solution especially for townships located around hilly terrain when compared with other mode of transport i.e. roadways.

During DPR, UTP is shifted towards LTP near Dr B R Ambedkar Hostel reducing the length of ropeway and avoiding the steep slopes between UTP and first tower.

**Technology Alternatives** : Mono-cable Detachable Gondola System is selected for proposed ropeway system.

#### 0.4 ENVIRONMENTAL BASELINE DATA

Description of existing environmental setting within 10 km radius of the project area is collected for physical, biological and socio-economic data to assess the impacts of project on environment. Data have been compiled for Land Environment (Physiography, Geology, Seismicity and Soils), Water Environment (Water Resources, Water Use, Water Quality), Air Environment (Meteorology and Air Quality), Noise Environment (Noise Levels), Ecological Environment (Flora and Fauna) and Socio-Economic Environment (Demography, Socio-Economics etc)

**Physiography** : The physiography of the district is characterised by high mountain peaks, deep gorges and valleys. Major part of the area is inaccessible due to extremely rugged topography and dense forest cover. The altitude varies from 369 to 6672 m. The slope within the proposed project area is 150-300 metres per kilometer and elevation varies from 750 to 1800 m.

**Geology and soil** : The study area has the rocks of Lesser Himalaya and Central Himalaya. The repeated tectonic disturbances caused by different orogenic cycles has made the area geologically complex. The area lies in the Jaunsar group of Lesser Himalaya which comprises of different groups like Jaunsar Group, Blaini-Krol Group and Tal Group. The groups are subdivided into various formations like Bhilangana Formation, Rautgara Formation, Bijni Formation. The rocks of the Lesser Himalayan Zone show signs of multiple phases of deformation and metamorphism.

The soils of Lesser Himalaya, are generally shallow, excessively drained, thermic and loamy, moderately eroded and sandy soils. The soil within project area is sub-montane

soil of the order of alfisol as per US Soil Taxonomy. Five soil samples were collected in order to ascertain the quality and nature of soil within project study area. Analysis of results show that soil is medium loamy in texture, alkaline in nature and has normal conductivity level. The soil is fertile as indicated by NPK value which is within preferred limit. The heavy metals are within limits except cadmium which is slightly higher than preferred level. Organic carbon, sulphur, sodium and calcium are within preferred level for the fertility of soil. Content of magnesium, manganese, zinc and iron are more than the preferred level in soil.

**Land use pattern :** The term “Land Use” relates to the human activity or economic function associated with a specific piece of land, while the term “Land Cover” relates to the type of feature present on the surface of the earth. Satellite data of IRS LISS III sensor in Geo-tiff format was procured from NRSC, Hyderabad which is geometrically corrected and enhanced using principal component method and Nearest Neighborhood resampling technique to prepare the land use of the study area of 10 km radius and project influence area of 15 km radius. The satellite image is in the UTM 44N WGS84 coordinate projection system. All the processing and classification of the satellite images were performed in the ERDAS Imagine 9.1 software. As per land use classification, forest along with shrub and scrub covers more than 2/3<sup>rd</sup> of the area (78%) which follows the barren land of 14 %, rest of the area includes built up area of 4%, water body 2%, agricultural land 2 %.

**Seismicity :** Tectonic movements in the regions are observed due to thrusts and faults present in and around the state. Two regional tectonic features are Main Central Thrust (MCT) and the Main Boundary Thrust (MBT). As per the seismic zoning map of India as incorporated in Indian Standard Criteria for Earthquake Resistant Design of Structures IS : 1893-(Part I) 2002 : General Provisions and Buildings, the state is in seismic zones IV and V. The proposed project is in seismic zone IV.

**Water Environment :** Ground water is an important source of water in an area but due to hilly tracts, its utilisation in a major part of Tehri Garhwal district is much less than the desired level. The availability of surface water is evident from the drainage of the study area and is mainly controlled by the major perennial rivers like Bhagirathi, Bhilangana, Alaknanda and their tributaries like Bal Ganga and Dharma Ganga. Bhagirathi River flows from north to south and meets Alaknanda River at Devprayag. Bhilangana River flows from north east to south west and meets Bhagirathi River near Old Tehri.

5 water samples were collected from ground as well as surface water source and analysis was done for physical, chemical and biological constituents and the results of water analysis are compared with IS: 10500-2012 Drinking Water Standards. The water is of good quality having Total Dissolved Solids as 82 to 151 mg per litre, pH ranging from 7.49 to 7.96 and turbidity is less than 0.1 to 1.9 NTU. Some of the parameters like

Aluminium, Zinc and Arsenic are above acceptable limits but almost within permissible limit. Other parameters of interest in drinking water is within acceptable limits.

**Meteorology and Air Environment :** The dispersion and deposition of air pollutant are dependent on meteorological and topographical conditions of the area. The main parameters of meteorology are: Wind Speed, Wind Direction, Temperature, Relative Humidity, Rainfall, Cloud Cover . The latest meteorological data of 10 years i.e., 2005 to 2014 have been collected from the nearest observatory at New Tehri, Uttarakhand from Regional Meteorological Office, Shimla for mean Monthly Maximum and Minimum Temperature, Monthly Rainfall ,Monthly Average Relative Humidity, wind speed and wind direction. The climate in the district varies from cold temperate, tropical to sub-tropical and within the project area it is very cold in winter and pleasant in summer. Snowfall is quite common during the winter in these areas. Two broad wind patterns are observed in the district viz. north easterly to easterly (May to September) and south easterly to westerly (October to March). The average wind speed is minimum (0.8 km/hr) in December and maximum in July (4.1 km/hr) whereas the average annual wind speed is 2.3 km/hr. Wind velocity data collected for 10 years from 2005 to 2014 shows that maximum wind speed reaches to 16 kmph. The annual rainfall at Tehri Observatory is 1028.6 mm

The atmospheric concentrations of air pollutants are monitored at 5 locations for parameters PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>2</sub> , NO<sub>2</sub> , CO under ambient air quality monitoring (AAQM). The results obtained are analysed and compared with ambient air quality standards of Central Pollution Control Board (CPCB) and is found the results within the standards.

The proposed ropeway site is not coming under critically polluted areas identified by Central Pollution Control Board.

**Noise Environment :** The impact of noise can lead to effects such as noise induced hearing loss and annoyance depending upon the loudness of noise level. Noise level survey is conducted at the project area with an objective to establish the baseline noise levels and assess the impacts of the noise expected due to the proposed development. Noise level survey is conducted at 5 locations. At all the location ambient noise level is within prescribed limit given by Central Pollution Control Board.

### **Ecological Environment :**

An ecological study of the ecosystem is essential to understand the impact due to project development activities on the existing flora and fauna of the area. The ecology of the area is compiled from various sources of secondary information i.e. district forest office, census hand book, gazetteer and visual inspection during the field visits for a study area of 10 km radius.

**Flora :** The plant life of Tehri Garhwal can be divided into six main categories of tropical dry deciduous forests, Sal forests, Chir forests, oak deodar, fir and spruce forests, and finally the Alpine pastures. Major tree species within project area are chir, willow, sal,

deodar, oaks etc and brahmi and ashwagandha the medicinal plants. Cornel, Figs, Kaiphal, Mulberry, Kingora, Raspberry, Blackberry, Currants, Medlars, Gooseberries, Hazelnuts, Apples, Pears, Cherries, Apricots, Plums, Peaches, Oranges, Limes, Bananas, Pomegranates and Walnuts are the fruits of the area.

**Fauna** : The areas are full of rich animal life which includes mammals, reptiles, piscines and birds. The forests are full of animals like Monkey, Langur, Wild-Cat, Goat, Pig, Fox, Wild-Dog, Black Bear and the Flying Squirrel.

The avian species consist of Pheasants, Kalij, Koklas, Cheers, Monal, Wild Fowls, Harial, Parrots, Chatak, Papiha, Haldu, Neelkanth, Pigeons, Partridges, Kala Titar, Chakor and Neora. The reptile population is represented by Cobra, Russell's viper, and Ancistrodon himalayanus, Rat Snake, Leech and Blood-Sucking Lizard. Aquatic life includes mahseer, rohu, shoyan, asela, magnera etc.

**Eco-sensitive Areas** : There is no eco sensitive area within 15 km radius of the study area.

**Field study report** : The proposed project site is predominantly occupied by Revenue forest. The tree enumeration is done during joint inspection with forest department within the corridor of 10 m width. The total number of trees are 345 covering 23 species of trees, out of which only 46 number of trees have girth less than 30 cm.

**Historical/Archeological Monuments** : There is no ancient archeologically important monument in the project area.

### **Socio-Economic Environment :**

The proposed project involves construction activities at lower and upper terminals and at tower locations within ropeway corridor for which about 3.465 Ha of land acquisition/transfer is anticipated. Land use of area for ropeway include settlement, agricultural land, revenue forest and barren land. 28 number of families are identified for getting affected due to private land acquisition of 1.765 Ha.

**Tehri Garhwal District** : Tehri Garhwal district has total population of 618931, rural population 548792 and urban population 70139 (Census, 2011). The district has a population density of 170 inhabitants per square kilometer. The population growth rate over the decade 2001-2011 was 1.93%. Tehri Garhwal district has a sex ratio of 1078 females for every 1000 males and a literacy rate of 75.10%. The structure of the district administration is planned into tehsil, sub-tehsil, development blocks, village panchayat and villages. **Socio-Economic Profile within the Project Area** : The villages covered under the project is Bourari, Dobra Lagga Jashpur, Godmu, Jakh, Kutha, Koti, Balsi. All the villages have infrastructures of school, electricity, water supply (tap water/hand pump), public distribution system,

**Socio-Economic Survey** : Primary data for the study collected through field visit, consultation with the local people, questionnaire survey and stakeholders. Secondary data collected from the available publications of Central / State government, census handbooks and various other projects related documents. Out of total approximately 28



families, 06 families were consulted and contacted to fill up the schedule questionnaire to make a social profile for the analysis purpose. 100% of the PAFs surveyed have own pucca houses, legal electric connection, LPG connection while 83.33% have legal water supply connection. All PAFs had state sponsored documents for availing benefits and for identities. 100% of the PAFs have their names in voter list, held ration cards, Aadhar Cards and operational bank accounts. However no families were categorized as below poverty line.

The interviewed families of project affected people constitute 52.08% male and 47.92% female out of which 35.42% are in age group below 18 years and 18.75% above 60 years. 60.50% are married and 10.42% are widow. 8.33% population is illiterate while 43.75% is graduate or post graduate. Nuclear families are predominant consisting of 66.67%. 83.33% population is of general category and 16.67% belong to Scheduled Caste. 100% of the family is of Hindu community.

**Income :** 33.33% has range income Rs. 27000 - Rs.50,000, 16.67% has range income Rs. 50,001 - Rs.1,00,000, 33.33% has range income Rs.1, 00,001 - Rs.2,00,000, 16.67% has range income Rs. 2,00,001 & above, however no one is identified below the line of poverty. The highest number 50% and above earned their income from business/self employment, 33.33% were from agricultures and least 16.67% secures their income from jobs.

**Public Consultations :** The venue for the public consultation was fixed at the Daradungi, Boradi, Ganesh Chowk, and Mandi Boradi near upper terminal of the ropeways. The public consultations for this project were held from 10<sup>th</sup>- 15<sup>th</sup> September, 2016 by RITES team. The response of the participants was quite positive however participants, taxi drivers and owners were apprehensive about the project. As they felt that the project would be great land mark to the project area but suggested to install another ropeway from Chhamun to Chamba. The participants also suspected that the proposed project may affect taxi operation in futures. All the participants assured their all support to make the project successful and desired to work in the project work and take some petty contract in the work. Participant suggested that the fare for commutation should be lower for the local people.

## 0.5 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact of the proposed ropeway project is assessed on the basis of project activities and existing environmental condition for land, water, air, ecology and socio-economics.

### IMPACT ON LAND ENVIRONMENT

**Displacement of People :** No displacement of people is anticipated.

**Change in Land Use :** About 3.33 Ha of land will be required from settlement, agricultural, barren and revenue forest land to construction of ropeway out which 1.765 Ha pertains to private land of 28 families.

**Impacts on Topography :** The terminal stations and tower sites will be levelled as per the topography of the region and hence no significant impact is anticipated on topography and drainage of the area. The impact will be short term and insignificant.

**Impact on Slope Erosion/Landslides :** There is no occurrence of landslide incidences within the ropeway corridor as was discussed with local people and as was assessed during the site visit. Good vegetation cover provides less soil erosion and hence the stability of slopes and prevention of landslides.

**Risk due to Earthquakes :** The project area falls under seismic zone IV as per the Seismic Zoning Map of India. Necessary seismic factors (horizontal and vertical ground acceleration), as per relevant Indian Standard Code (IS: 1893 – Part – 1: 2002) shall be adopted. All components of structures shall be designed for seismic zone IV to ensure the safeguard against earthquake risks.

#### **Impact due to Solid Waste**

**During Construction :** Inorganic/inert solid waste generated during the construction phase like waste concrete and mortar, left over aggregate and debris etc. shall be recycled for use in the base layers of paved area. The excavated overburden will be used for filling and will be compacted. The chemical wastes and waste oils and solvents during maintenance of equipment and machinery are less in quantity and will be stored and disposed off as per standard norms. 10.0 kg of municipal solid waste generated from 100 workers will be disposed on municipal solid waste management sites.

**During operation :** 168 kg per day generation of solid waste at lower and upper terminals during construction will be disposed off on municipal solid waste management sites located at 2.5 km from upper terminal.

**Impact on Existing Features :** The ropeway is eco-friendly transport system, hence no significant impact on existing features are anticipated. During construction, impact on road infrastructures are anticipated due to transport of construction material and during operation, increase in tourist flow will have impact on existing infrastructures like restaurant, hotel etc.

**Impact on existing features within 1 km radius :** No ecologically and environmentally sensitive receptors are existing within 1 km radius, hence no impact is anticipated.

### **IMPACT ON WATER ENVIRONMENT**

**During Construction :** Total water consumption during construction is 20 KLD, out of which 3.6 KLD is expected as waste water which will be disposed off through septic tank cum soak pit. Mobile toilet will be provided for the tower locations.

**During Operation:** The total water requirement is estimated as 68.40 KLD, out of which 61.56 KLD will be generated as sewage which will be treated in existing sewage treatment plant in New Tehri. Sewage at lower and upper terminal will be connected to existing sewer line of the city.

### **IMPACT ON AIR ENVIRONMENT**

**Impact during Construction :** Peak pollution load during construction due to use of machinery and equipments and transport of materials is estimated in kg per hour for PM10 as 0.07, NO<sub>x</sub> : 0.83, SO<sub>2</sub> : 0.08 and CO : 0.32 which will be minimised by alternate use of construction equipment and machinery.

**Impact during Operation :** Pollution load due to standby DG set is estimated in kg per hour of PM10 as 1.06, NO<sub>x</sub> : 11.78, SO<sub>2</sub> : 1.12 and CO : 4.53. The state has 24 hour electricity supply, hence pollution due to DG set is not anticipated. However, pollution due to traffic load will be increase marginally due to operation of ropeway, since New Tehri already tourist.

### **IMPACT ON NOISE ENVIRONMENT**

**Impact during Construction :** Sources of noise during construction is concrete mixer, crane, genset, drilling machine etc which has noise level of 75 dBA at 1 m distance as per CPCB, truck has noise as 89 dBA at 7.5 m distance. Simultaneous use of construction machinery would be preferred for less impact of noise due to short duration of noise exposure. Due to limited construction activities, impact of noise is almost insignificant.

**Impact during Operation :** There is 24 hour power supply in Uttaranchal, hence noise due to DG set is rarely anticipated. All the D.G. Sets shall be placed in recommended acoustic enclosure or with silencers and Periodic maintenance.

### **IMPACT DUE TO VIBRATION :**

**Impact due to construction :** Trucks/vehicle movement, rock drilling, use of construction machinery and equipment will generate vibration but will be within acceptable limits.

**Impact during Operation :** DG set is standby and will be used in case of power failures. Precautionary measures for the construction of foundation of DG set will be taken to avoid the vibration during construction.

**Impact due to Wind Pressure :** As per Indian standard, the wind speed should not be more than 150 km/hr during operation of aerial ropeway.

### **IMPACT ON BIOLOGICAL ENVIRONMENT**

Impact due to disturbance and pollution during construction will limited and short term and have no impact on habitat. Secondly, construction works require very limited space. Total loss of biomass is anticipated as 87.86 m<sup>3</sup> due to cutting of 345 number of trees falling within corridor.

### **SOCIO- ECONOMIC IMPACTS**

There is no loss of structures. 1.765 Ha of private land is required to be acquired for the use of constructing the ropeway, due to which 28 number of families are getting affected. Ropeway project will have impact on existing infrastructures due to increase in tourist, better employment opportunity etc. Deployment of labours outside of the area

may create cultural conflicts. No indigenous people are getting affected. No impact on historical and archeological monuments are anticipated.

**POSITIVE IMPACTS :** The positive impacts of the projects are Increase in Tourism Potential, better employment Opportunities, improvement in Aesthetics, Better connectivity to 15 trans lake villages, revenue Generation, cheaper Mode of Transport, reduced distance and saving of time and re-utilisation of land.

## **0.6 ENVIRONMENTAL MONITORING PLAN**

**Water Quality:** The project authorities shall establish a procedure for water quality surveillance and ensure safe water for the consumers. Minimum 3 samples shall be tested around the project site for drinking water quality parameters as per BIS: 10500. Water monitoring should be carried out at least three times a year to cover seasonal variations by any Government or recognized private agency. Water quality should be analyzed by applying the standard methods. Water quality shall be monitored before starting the construction, during the construction phase, and for at least one year after the completion of the project. The cost for water quality monitoring is estimated of Rs. 3.30 lakh.

**Air and Noise Quality:** To assess the effectiveness of air and noise pollution control, ambient air quality and noise levels shall be monitored during the construction and for at least one year after the completion of the project. The Parameters to be monitored for air quality are PM10, PM2.5, SO<sub>2</sub>, CO, and NO<sub>x</sub> at least three locations. The frequency of air quality monitoring will be Once in Month for Three Season in a Year. Ambient Noise Quality will be monitored at least three locations. The frequency and duration for noise quality monitoring is same as air. The cost for air and noise quality monitoring is estimated of Rs. 5.94 lakh.

**Soils Quality:** Soil near to the construction area shall be monitored to ascertain presence of soil pollution due to construction activities. The parameters to be monitored are pH, Texture, Total Organic Matter, Nitrogen, Phosphate, Moisture Content, Sodium, Potassium, Calcium, Chloride, Magnesium, and Electric Conductivity. The frequency of soil quality monitoring will be once in Season for at least three locations. The cost for soil quality monitoring is estimated of Rs. 2.64 lakh.

**Establishment of Environmental Cell:** The project authority shall establish an Environmental cell in the initial stage of the project. The division shall have one Environmental Engineer/Officer. The task of the environmental Engineer/Officer shall be to supervise and co-ordinate environmental concerns, monitoring and implementation of mitigation measures. The officer will monitor the environmental works in coordination with the Project Director. Cost of such a division has been estimated as Rs. 22.00 lakh.

## ENVIRONMENTAL COST

The environmental and social costs towards implementation of environmental management plan and mitigation measures during pre-construction, construction and operation of the proposed project is estimated of Rs 333.49 Lakh out of which 123.99 lakh is towards environment and 209.50 Lakh is for social cost.

## 0.7 RISK ANALYSIS

Risk assessments include detailed quantitative and qualitative understanding of risk, its physical, social, economic and environmental factors and consequences. Risk assessment encompasses the systematic use of available information to determine the likelihood of certain events occurring and the magnitude of their possible consequences. The causes of risk may be:

Cable slipped out of the rails at the tower from the upper station can cause the carriages to be knocked off. The accident took place due to negligence.

Cabin lost its hold with the cable and collided with the another one cabin of ropeway car and hit another on the way,

Hill collapsed midway and trolleys were dangling in the air.

Snapping of Rope wire,

Power system failure,

Collision with entering station: operator failed to slow the vehicle down upon entering the station it causes collision of the ropeway car at the entering station, and

Holding capacity of soil/Geology

**OPERATION AND MAINTENANCE:** A systematic routine maintenance and inspection schedule, based on maintenance and inspection plan, which shall be specified by the designer, shall be developed and set down in writing by the manufacturer of the passenger ropeway. The schedule shall include the specification of lubricant and frequency of lubrication of each element involving moving parts. It shall stipulate that parts showing excessive wear shall be replaced immediately. Condemning limits or tolerances shall be defined. It shall include a schedule for checking and tightening all bolts, especially on rope attachments. Where appropriate for any passenger ropeway, suitable records of the rates of deterioration (such as corrosion, erosion, etc.) shall be maintained. During a periodic inspection, a Safety Officer may inspect towers, sheave assemblies, brakes and braking functions, and the operation of main drives, auxiliary drives, and evacuation drives where applicable.

**SAFETY MANAGEMENT PLANS:** Under a safety management plan, the licensed contractor will be required, as per terms and condition of licensing, to submit the names of the people and their corresponding qualifications that will provide service and maintain the installed passenger ropeway equipment. Contractors will need to have this safety management plan in place at each area where passenger ropeways or passenger conveyors are operating.

**ELECTRICAL PROTECTION:** All overhead electrical power transmission wiring shall be so protected that, in case of collapse or breakage of the power line, it will not come into contact with chairs, cars, cables, or passengers.

## **0.8 DISASTER MANAGEMENT PLAN**

The main aim of the disaster management plan is safety of the passenger, quick response to accident and treatment to casualties, evacuation of passengers to safe area, bring the disaster under control within short time and investigation of accident and prepare prevention plan.

**Preventive Action:** Once the likelihood of a disaster is suspected, action has to be initiated to prevent a failure. Manager responsible for preventive action should identify sources of repair equipments, materials, labour and expertise for use during emergency.

**Emergency Action Committee:** To ensure co-ordination action, an Emergency Action Committee should be constituted. The civic administrator may be the Chairman of this Committee.

**Emergency Measure:** The emergency measures are adopted to avoid any failure in the system. The aim of Emergency Action Plan is to identify areas, population and structures likely to be affected due to a catastrophic event of accident. The action plan should also include preventive action, notification, warning procedures and co-ordination among various relief authorities.

**Rescue Operation:** Aerial ropeways shall be equipped with adequate and sufficient facilities which shall be readily available to clear the line of passengers and return them within a reasonable time to a terminal, or location, where access for emergency services is available. Sufficient numbers of trained persons for carrying out the rescue operation (the rescue crew) shall be on duty when the aerial ropeway is in operation.

## 0.9 ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan spells out the set of measures to be undertaken during project construction and operation to mitigate or reduce the adverse environmental impacts and bring them to acceptable levels based on the proposed Environmental Management Plans. The most reliable way to ensure the implementation of EMP is that these plans are integrated into the overall project planning and implementation to make them as an integral component of the project.

### PRE-CONSTRUCTION STAGE

The pre-construction measures need to be incorporated in the planning process. Some of these shall be included in design and budgeted for.

**Compensatory Afforestation :** 345 trees are getting affected out of which only 46 number of trees are with girth less than 30 cm. (Refer Chapter 4 on Biological Environment). As a compensatory measure, a sum of Rs 6,80,340/- is kept into provision for plantation of trees in degraded forest and open government land.

**Energy Conservation Measures :** The efficient lighting arrangement is produced by making the system of lighting as energy efficient, cost effective and high quality of light. Automatic control systems, localized switching, use of daylight, adequate maintenance schedule, awareness by training to staffs are the energy conservation measures. ECBC, 2007 and National Building Code, 2005 is followed to conserve the energy.

**Construction Material Management :** The construction material storage site is to be regularly inspected for the presence of uncontrolled construction waste and to set up procedures for mitigating the impacts. The scheduling of material procurement and transport shall be linked with construction schedule of the project.

**Borrow area Management :** No requirement of borrow area is anticipated for the project.

**Solar Energy :** Rooftop solar panel is proposed to generate solar energy, a non-conventional source of energy.

## CONSTRUCTION STAGE

**Air Pollution & Dust Control measures :** Provisions for sprinkling of water may be requirement to control the dust pollution. Idling of delivery trucks will be prevented and material will be transported in covered truck. Low emission construction equipment and machinery will be used. Loose earth will not be left exposed.

**Water Supply and Sanitation :** 4.5 KLD Water will be supplied from Public Health Engineering Department and waste water will be disposed off through septic tank cum soak pit and mobile toilets will be provided at the location as per requirements.

**Oil Spill control/Management :** To control the oil spill from equipment and machinery routine inspections/check up is mandated and good house keeping will be provided. Temporary cement/metal platform will be provided below the construction machineries at maintenance site to capture the spill and the platforms should be at sufficient height to avoid the littering.

**Solid Waste Management :** Municipal solid waste of 10 kg per day generated during construction will be collected in container at site which will be disposed off at municipal solid waste management sites.

**First Aid Health System :** All necessary first aid and medical facilities will be provided to the workers.

**Training :** The training programmes should be extended to the workers for their active participation in the project implementation especially following the guidelines for safety, measures of disaster prevention, action required in case of emergency, fire protection, environmental risk etc. The cost of training is kept as 2.0 Lakhs.

**Soil Erosion Control :** Construction will be avoided in monsoon. The excavated soil will be stabilized immediately after the excavation or debris should be sent to disposal site as the earliest to make the site clean and to prevent soil erosion.

## OPERATION STAGE

**Air Pollution Control :** Good quality fuel, adequate stack height and periodic maintenance are requirement to control the air pollution. Road should be properly maintained to prevent dust pollution. Plants serves as sink, green belt will be developed at LTP and UTP.

**Water Supply and Sanitation :** During operation, water requirement is 68.40 KLD. And wastewater generation is estimated as 61.56KLD which will be disposed by connecting to municipal sewer line.



**Solid waste disposal :** 168 kg per day of solid waste will be managed by collecting, storing and transporting the waste to solid waste management site of municipal corporation systematically and scientifically.

**First Aid Health System :** All necessary first aid and medical facilities will be provided at Lower and Upper terminals. The provision and maintenance of suitably equipped first aid facility has to be borne by the Tourism Department.

### **REHABILITATION AND RESETTLEMENT OF THE PROJECT**

No displacement of any people is anticipated, hence resettlement and rehabilitation is not anticipated.

**Compensation for Land :** 1.765 Ha of private land is to be acquired for which compensation of Rs 88.25 Lakh is estimated and balance 1.700Ha of Government land will be processed for transfer by district administration.

**Compensation for House Building :** Three structures on private land and eight structures on government land are getting partially affected due to air space use above the structures which will be compensated.

**Compensation for Commercial Structures:** The structure identified under the structure is part of the private school. The estimated cost for the structure is **Rs. 75,000/-**

**Compensation for Religious Structure:** No religious structures are getting affected.

**Unforeseen Impact Liabilities:** Some unforeseen impact liabilities may be found at later stage and may require some budget to deal with the impacts identified. The estimated cost for such impacts have been kept **Rs. 4,00,000/-**

**Compensation for Crops :** No Compensation for crops is anticipated as no agricultural land is getting affected.

**R & R Cost :** Compensation for land cost, building structures and other provisions are kept as **Rs 180 Lakh.**

### **Community Development Program (CDP)**

**Livelihood Enhancement Works :** Horticulture and Medicinal Plants: The works under this sub-head shall be support for growing fruit trees and medicinal plants for which a budgetary provision of **Rs. 3.50 Lakhs** shall be made available for this purpose.

**Gender Support :** The committee constituted in consultation with the beneficiaries shall identify the requirements of the gender issues for which as estimated budgetary provision of **Rs. 3.00 lakh** shall be made for this purpose.

**Infrastructure Development Support :** Works like toilet, approach road to the human settlements, renovation for community-building etc. shall come under this head and an estimated budgetary provision of **Rs. 17.00 lakhs** has been kept for this head.

**Education Assistance :** A provision of **Rs. 6.00 lakhs** has been made for education assistance program. The budget shall be used to upgrade school building, class room materials, support to attract children to the class room and reduce lack luster condition of the class room.

### **CDP COST ESTIMATE**

The estimated budget for livelihood enhancement works, gender support, infrastructure development support, education assistance under community development program is kept Rs. 29.50 Lakhs.

### **0.10 PROJECT BENEFITS**

Project benefits include increase in Tourism Potential and subsequently the Employment Opportunities. The beauty of the hilly terrain is enhanced with construction of ropeway to add up in improvement of the aesthetics of the area. Ropeway is better mode of transport in hilly terrain like metro train in plain city area which provides good connectivity with revenue Generation. Reduced distance and saving of time is one of benefits accrued from ropeway. Ropeway is aerial, hence with the corridor of impacts people are not displaced if it is not at tower or terminal locations, hence utilization of land is still anticipated. Being the eco-friendly mode of transport, carbon credit benefit is anticipated.

### **0.11 CONCLUSION**

New Tehri is on the way to Gangotri and Yamunotri and one of the asia's tallest Tehri Dam is located here at the confluence of Bhagirathi and Bhilangana rivers. New Tehri is developed as a substitute of old Tehri submerged in Dam in a well planned manner. Its altitude varies from 1600 m to 1950 m. It is well connected by road and is connected through rail from Haridwar, Rishikesh and Dehradun. The nearest airport is Jolly Grant in Dehradun at a distance of 93 km. Population density of Tehri Garhwal is 170 inhabitants per square kilometer and is in lower side when compared with population density of India of 382 inhabitants per square kilometer as per 2011 census and forest cover is 58.95%. Surkanda Devi, Buda Kedar Temple, Sem-Mukhem temple and Chandrabadani temple are religious places in the district at a distance of 33 km, 60 km, 129 km and 101 km respectively from New Tehri. The Khatling Glacier is a famous trekking site of the Tehri District situated at a distance of 62 km from New Tehri. New Tehri is district Head Quarter of Tehri Garhwal district with all the infrastructures. People of other side of the lake was disconnected due to construction of Tehri Dam. Boat jetties are available at Panch Koti, but people still face difficulty to reach New Tehri via Khandkhala 2.5 km from Panch Koti.

In view of above, proposal for construction of Passenger Ropeway will certainly boost up the infrastructure of the city and attract tourist to come at New Tehri. The ropeway is eco-friendly mode of transport with less land requirement as compared to road construction. Construction is not throughout the corridor, it is only at terminals and tower locations. Hence, it is concluded to recommend the passenger ropeway from Panch Koti to Boradi at New Tehri in Uttarakhand.

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