BIHAR STATE TOURISM DEVLOPMENT CORPORATION LIMITED

DEPARTMENT OF TOURISM, GOVERNMENT OF BIHAR

Passenger Ropeway at Rohtasgrah Fort, Rohtas District, Bihar

Executive Summary

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EXECUTIVE SUMMARY

0.1 INTRODUCTION

Bihar is one of the oldest inhabited places in the world with a history of more than 3000 years. Bihar is home to many tourist attractions as well as to pilgrimage destinations like Gaya, Patnasahib, which are recognized as the most sacred places of worship for various religions including Hinduism, Buddhism, Jainism, Sikh and Islam. Bihar is visited by large numbers of tourists from all over the world with an annual footfall of more than 6 million. The Devi temple and Chaursan temple in the Rohtas District of Bihar are revered by the Hindu devotees and they are visited throughout the year.

The Chaurasan (Rohtasan) is an ancient temple of Lord Shiva. Though the temple has witnessed several attacks with iconoclasts probably having destroyed the roof and the main mandap, which housed the sacred lingam. Now only 84 steps are left, which lead to the temple constructed by king Harishchandra. In local language it is also said " Chaurasan Siddhi" because of its 84 steps. People from all walks of life visit the Devi Temple and Chaurasan (Rohtasan) temple all throughout the year. In the Hindi month of Shravan, there is a local fair in which local tribal people and surrounding area locales visit in about 10,000 numbers a day and do “Jalabhishek” or donate water on the centuries old Shivalinga at the Chaurasn temple. On Rakshabandhan Day or Rakhi Festival about 1,00,000 devotees visit the temple. To reach the Chaurasan temple tourist need to trek about 2000 damaged steps followed by 2km of plain area. This yatra can be a very tiresome and arduous journey for the visitor. Bihar State Tourism Development Corporation (BSTDC) was established in the year 1980 for the development of tourism in the state of Bihar and for commercialization of tourist resources available within the State. In this context, and to further attract tourism, BSTDC has decided to implement ropeway systems at 6 identified locations. Out of these six, a passenger ropeway system near the Rohtasgarh fort in Rohtash District of Bihar to facilitate the devotees of Chaurasan Temple and ease the commute of tourists to Rohtasgarh Fort will be develop.

RITES Ltd. (A Government of India Enterprise) is appointed by Bihar State Tourism Development Corporation (BSTDC) as consultant, for the preparation of Environmental Impact Assessment (EIA) study for the proposed Ropeway systems. An EIA study has been taken up as per the approved Terms of Reference (TOR) issued by Expert Appraisal Committee (EAC) of Ministry of Environment, Forest and Climate Change (MoEF & CC) for Environmental Clearance of the project vide File No.10-58/2020-IA-.III Dated 18th January 2021.

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, construction and solid waste and R & R act. EIA guidance manual for ropeway manual and Appendix-III of the EIA notification is followed during preparation of EIA report. Ministry of 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.

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 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

Proposed project is the development of the ropeway system to reach the Rohtasan temple in Rohtas District of Bihar. As the proposed project site is located in Kaimur Wildlife Sanctuary, which is an ecologically sensitive area and within 10 kms radius of the Jharkhand – Bihar State Border. Therefore, the proposed project attracts the general conditions of the said EIA notification and classified as Category "A" and requires environmental clearance from MoEF&CC.

Location and Connectivity: The proposed ropeway project is located at the Mouza Uchela, Thana No. 688, Khata No.276, Khesara No-941 and Mouza Rohtas Thana No. 680, Khata No.209 of Rohtasgarh village of Rohtas District of Bihar. Coordinates of the project site is 24°37'45.27"N 83° 56' 32.09"E to24°38'1.30"N 83°57'16.5"E. The Lower Terminal Point of the ropeway is easily approachable by the Road. NH-2C is 700 m away from the site from there is a single lane motorable road which connects the lower terminal point.

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Lower Terminal Point (LTP): Lower terminal point of the ropeway is located on Southwest side of Akbarpur Village on Akbarpur (Rohtas) to Jara Dag/ Nohatta Road near Forest Nursery (near Forest office/Police Station at Akbarpur village). Coordinates of the LTP is $24^0$38'1.30"N $83^0$57'16.5"E.

Upper Terminal Point (UTP): Upper terminal point is located near to Rohtasan (Chaurasan) Temple (at about 300 m distance from Rohtasan Temple on western side and situated at top of Plateau). From this area, devotees can easily approach to the main Temple. This area is falling under the jurisdiction of the forest department. Coordinates of the UTP is $24^0$37'45.27"N $83^0$56'32.09"E.

The project envisages construction of buildings at lower and upper terminals and construction of foundation 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 tourists at Rohtasgarh Fort and pilgrims at Chaurasan (Rohtasan) temple arrive at Akbarpur from Dehri-on-Sone covering a distance of 40 Km. From Akbarpur tourists cover about 1.5 km distance by dilapidated 2000 steps and a very arduous journey to reach wall of the fort. Here a big gate has been made for entry, which is called Merdaraghat. From this gate, it takes about 2 km to reach at Chaurasan Temple, near to which the ropeway upper terminal is proposed. Normally the devotees trek about damaged 2000 steps to reach Merdraraghat and then again 2 km on plain area to reach at Chaurasan temple situated amidst the hill From Chaurasan /Rohtasan temple tourists cover about 3 km kachcha pavement to reach at Rohtasgarh Fort. Ropeway will save the time and arduous journey of the tourist.

- The ropeway would not only save the ecologically sensitive area from vehicular pollution but also prove to be a major attraction for the tourists as visitors would be to get an aerial view from top.

Ropeway System: The ropeway system would be Monocable pulsed Gondola ropeway system which is selected based on Length, capacity and feasibility of the system. The design capacity of ropeway is estimated as 250 PPH. Salient features in brief are as under:

S. No	Item	Parameters
1	System	Monocable Pulsed Gondola system
2	Direction of operation	Clockwise
3	Capacity(Designed), Persons Per Hour	250 @ max speed
4	Line speed, m/sec	3.5
5	Horizontal distance, m	1302.114
6	Vertical rise, m	360.83
7	Inclined length, m	1351.184
8	Cabin capacity, seater	4
9	Alignment	Straight
10	Line gauge, m	4.0
11	Cabin Group spacing, m	450.33
12	No of cabins in line	12
13	No of cabins in stations	3+3
14	Total no. of cabins	18
15	Type of cabin	Semi enclosed cabin with lockable door, fabricated from Mild steel formed section and cladded with aluminium sheet duly painted
16	Travel time one way, sec	506
17	Rope	34 mm Dia, 6x19 Langs Lay, PP Core, 1770 Grade, MBL – 69 MT.

S. No	Item	Parameters
18	Location of Tension gears	Upper station
19	Location of Drive gears	Lower station
20	Main drive motor, HP	150
21	Engine drive for emergency, HP	40, Automotive engine with integral clutch
22	Line Rescue System	Vertical by ladder, safety belt and independent arrangement
23	Stand by D.G. set @ Lower station, KVA	200
24	Stand by D.G. set @ Upper station, KVA	15
25	Power supply at Lower and Upper Station	415V, 50 Cycles, 3 Phase by South Bihar State Power Distribution Company Limited (SBSPDCL)

Control System: Communication system should be available at all the terminal stations and should be interlinked. For this reason, 2.5 sq mm, multi pair armored weatherproof communication cable as per IS: 8130/84 is required. The wireless system will be provided to communicate while maintenance / rescue operation on line and for other reasons, when communication through telephone system will not be possible.
Operation and Maintenance of Ropeway System: At the Drive Stations, an operator's cabin should be provided within the station housing with access from within the station. Size of the cabin should allow fixing of all the operational control panels and levers within the easy reach of the operator, without any hindrance from the moving cabins and passengers.

Manpower requirement: 35 numbers during construction and 22 numbers during operation.

Construction Schedule and project Cost: The proposed passenger ropeway system is expected to be completed in a period of 24 months with an estimated cost of Rs. 12.65 Crores only.

0.3 ENVIRONMENTAL BASELINE DATA DESCRIPTION OF ENVIRONMENT

Description of existing environment conditions for the proposed project facilities in and around the project sites. RITES have carried out field studies to generate primary data on soil, water, air, meteorology and noise quality at the project site. Field study is also carried out for assessing the ecological status in the study area. Additional data, wherever necessary, is collected from various reports, literatures, books and maps, and through discussions with various stakeholders. The project study area is within 500 m radius from the project boundary as per EIA Guidance Manual, however 10 km radius of the study area is considered for the proposed ropeway to collect primary and secondary data and 15 km

area is considered for the Eco sensitive features around the project area. The primary data collection was carried out in the months of March-2021 to June-2021.

Physiography: The study area forms a part of the Rohtas Plateau, flat plains running along the Kaimur Range. District has a general slop towards the north but the eastern narrow part of the district, along the river Sone, towards Sone (East). The major (northern) part of the district is a characteristically flat terrain without any undulation and rocky isolated patches in between. The general elevation of the flat terrain with respect to mean sea level is 80-90 m and the gradient is 0.60 m/km from south to north. Western side there are a hilly terrain where maximum elevation level is approx. 599 m.

Geology: Flat plain running along the kaimur range and land near to the rohtas plateau is a fertile plain of the son river. The mountrains found in the region is the extension of the Vindhyan range. The district has complex features having alluvium in the northern part to the sub-hilly region in the south. The district has a general slop towards the north but the eastern narrow part of the district, along the river Sone, towards Sone (East). The major (northern) part of the district is a characteristically flat terrain without any undulation and rocky isolated patches in between.

Soil: Soil of the district is highly fertile due to the fertile delta of the Son River. Most parts of the city comprises of thick and fertile alluvial soil. The soil in the Rohtas region has immense quantity of potash and lime. However, soil is deficient in Nitrogen, Phosphorous at certain places. The sub soil formation of the study area mainly comprise of two kinds of soils. Reddish brown gravelly sand with traces of clay occurs generally to 50 m depth and greyish brown gravelly sand soil occur in deeper part of the surface.

Land use pattern: The Agricultural land covers the majority of the land which is about 35.65% of the study area. The project site lies in the forest area, the second highest pattern of the landuse covering about 18.98% of the total land.

Seismicity: Project site lies in the Seismic Zone III indicating Moderate damage risk zone as per the IS: 1893-2002 (BIS, 2002) and corresponds to MSK intensity VII.

Water Environment: Rohtas/Sasram District is rich in the water resources like Ground water, Surface Water, Lake. The region receives a good amount of rainfall that repleneished the ground water of the region. Son River flowing in Rohtas district is the main source for the irrigation in the region. Sone River is flowing eastern side of the project site.

In order to assess the baseline water quality status of the study area, 2 Ground water samples, 2 Surface Water samples were collected. The results of water analysis are compared with IS: 10500-2012 Drinking Water Standards and CPCB standards for water quality. The ground water quality of the area is having the high calcium concentration, TDS, Alkalinity, and Hardness as this area is rich in the limestone. Due to high concentration of calcium and other parameters in water of this area can cause mineral build-up on plumbing

pipes and fixtures that can lead to lower water pressure and lower efficiency of electric water heaters; can cause build-up of deposits. People unaccustomed to water may experience gastrointestinal irritation from drinking the water. It can also affect the taste of the water making drinks like coffee taste bitter.

Meteorology and Air Environment: The climate of the district is sub-tropical monsoonic, characterized by hot summer, high humidity and dry winter. January is the coldest month when temperature reach up to 4°C. May is the hottest month of the year when temperature touches about 45°C. Generally temperature rises in the month of March and reach highest during the month of May. The district gets easterly wind from June to September, whereas westerly wind blows from October till May. The onsite average wind speed was observed 2.55 m s^{-1} with frequency of calm winds 13.47% during the study period.

The atmospheric concentrations of air pollutants are monitored at 3 locations for parameters $PM_{2.5}$, PM_{10}, SO_2 , NO_2 , 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 fall under any critically polluted areas notified 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 3 locations. The noise levels were compared with the Ambient Air Quality Standard in respect of noise. It was observed that noise levels during day and night time in the area are within the permissible limit of residential area.

Ecological Environment

Ecology: Primary data was collected through field survey along the alignment. Secondary data was collected from 15 km around the project

Flora: 114 trees are located in the project Right of way (RoW) i.e. 5 m on either side of centerline of alignment and proposed stations.

Fauna: Fauna were studied through primary survey along the alignment & terminal locations duly supplemented by secondary data to cover study area of radius 15 km around the alignment. Altogether 281 species of birds were recorded during present study. The strong plant-animal (birds) interaction was recorded on agro-ecosystem& forest ecosystem. Spotted dove, swift, Piegen, sparrow, house crow and common kingfisher were observed near surface water bodies & agriculture on the way to Rohtasgarh fort.

Ecological Sensitive Area within 15km: Ecological sensitive area within 15 km of alignment is Kaimur wildlife sanctuary and its ESZ.

Historical/Archeological Monuments: Rohtas Fort is a Historical/ Archeological monument is 2.5 km away from the project site.

Socio-Economic Environment:

The demographic, socio-economic conditions of district and project site with area of influence, methodology, social impacts, mitigation measures, quality of life, benefits of the project and major findings of public consultation and stakeholder consultation are discussed in this chapter. The secondary data was collected from census 2011 and other related documents as part of pre-survey activities. The primary data includes recording of village profile, public consultation and stakeholder consultation at village level. During survey it is reported that no private land, structures, community properties and families will be affected due to the construction of the proposed aerial ropeway project. However, there is no scope for Rehabilitation and Resettlement of families for the proposed project.

0.4 IMPACT ASSESSMENT AND MITIGATION MEASURES

The impacts on the various environmental components have been assessed during various phase of the project cycle namely due to the location, project design, possible accident, construction and operation.

IMPACT DUE TO POSSIBLE ACCIDENTS

Landslide: The area where ropeway is proposed is having minimum prone to landslides. Hence, there is no such impact is anticipated. **Earthquake:** Project site is located in the seismic zone III as classified in IS: 1893:2002 which indicates the project area comes under the moderate damage risk zone.

Wind & Cyclone: The project area falls under a zone where moderate wind & cyclone are observed. During storm or cyclone passengers inside cable cars will experience horizontal movement of the connection between the track cable and the gondola.

Cloud Burst: Chances of cloud burst impact will not anticipated as no dams are located in this region.

Fire Explosion: The Fire & explosion can cause suffocation due to harmful gases generation & panic in the minds of people that will lead to stamped at lower & upper terminal.

Electrical: The ropeway will run on electricity & hence electrical current can pass through cable cars & wires due to inadequate insulation or accidently.

IMPACT DUE TO PROJECT DESIGN

As the ropeway consists of cable cars, rope, big and heavy machineries, mechanical hazards can cause risks to people working in the area during construction phase & people who will travel through the ropeway in operation phase. Mechanical hazards are like drive/ return sheave shaft failure/ tension system failure, mount assembly parts failure, rollback, slippage/ fall of cabin, entanglement of cabin, swinging of cabin resulting in fall of passengers outside cabin, cabin derailment at station/ broken wires in service/ over speeding of ropeway, brake failure etc. may occur.

IMPACT DURING CONSTRUCTION PHASE

Impacts on Topography, Drainage: Development of stations and intermediate towers will change the topography and drainage of the area.

Impact on Soil: The excavation activity involved for foundation of building and tower will cause erosion of base soil & generation of excavated soil. Soil will be contaminated by oil spillage, digging and construction work. Construction work could lead to stockpiling on site which will lead to soil contamination during windy days & rainy days.

Impact on Landuse: Change in Landuse from Forest to Non forest purpose**.**

Impact on Water Environment: Increase of suspended solids concentration into the water will cause the undesirable taste to the water. Reduction of the photosynthesis process and increase of the water temperature by absorbing solar radiation may threaten the proper development of aquatic plants and lead to the eutrophication of the reservoir. Improper management of wastewater will cause the diseases shigellosis, typhoid fever, salmonella, and cholera. Depletion of Water resources.

Impact due to Solid Waste: Improper management of construction waste can cause the inconvenience on roads, choking surface drains, disrupting traffic. Labour camp at the site may lead to sanitation problems in the absence of adequate facilities. Hazardous waste mismanagement ultimately leads major impact on the health and contaminates the water, soil and air environment.

Impact Due To Influx Of People And Associated Developments:

The development of Ropeway will not distrurb the existing environment but will facilitate and provide an easy and fast access to the Temple.

Ambient Air Quality: SPM is expected to be the main pollutant associated with on-site roads (paved and unpaved), stockpiles and material handling.

Ambient Noise Quality: The project is expected to have large scale construction activities. Sources of noise emissions are expected from various construction equipments. Thus, based on the modelling results it can be concluded that all sensitive receptors (i.e. labour colonies) should be located beyond 125 meters from the noise generating source location during construction activities.

Vibration: Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations which spread through the ground and diminish in strength with distance.

Avoid impact pile driving where possible in vibration-sensitive areas. Drilled piles or use of a sonic or vibratory pile driver causes lower vibration levels where levels where geological conditions permit their use.

IMPACT ON BIOLOGICAL ENVIRONMENT

Impact due to Project Construction

Birds: Potential impacts on birds include degradation of nesting and/or feeding habitat in the short term resulting in habitat changes but after construction period is over the habitat will be rejuvenate. Construction may cause impact on food sources for birds. The predominant bird species observed at project site are spotted dove, swift, Pigeon, Sparrow, common kingfisher and house crow. No migratory birds observed during field survey. There is a possibility that some groups of resident birds avoid the alignment area and move to other areas of Sone River.

Mammals: No schedule I or REET species were observed along proposed alignment. There may be some mortality of small, common species during construction. Many species will move away from the areas of disturbance, returning after habitat re-instatement.

Impact due to Project Operation

Impact on birds: Generation of noise due to movement of ropeway will likely affect resident birds; some birds may be attracted towards Ropeway for food.

SOCIO- ECONOMIC IMPACTS

There is no loss of structures, no loss of agriculture land and no loss of crop yield due to non acquisition of private land. During construction 35 persons will be deployed while in operation, 22 persons are likely to be posted. No cultural conflicts are anticipated since area is accustomed due to multicultural interfaces due to large number of tourists coming from different corners of the country. No impact on indigenous people is anticipated. The project will improve the quality of socio-economic life of the local communities in a broader perspective. The proposed passenger ropeway is envisaged to boost up the better connectivity for the enhancement of tourism potential.

0.5 ANALYSIS OF ALTERNATIVES

Three alternative alignments have been studied for the selection of ropeway alignment.

Alt- 1: Lower Terminal Point (LTP) on Southern side of Akbarpur Village on Akbarpur to Jara Dag/Nohatta Road, near Brick Kiln (at about three km from Akbarpur village) and Upper Terminal Point (UTP) near Rohtasgarh Fort (situated at top of Plateau). This alignment will be single section overflying the Boundary wall of Rohtasgarh Fort. From UTP, Rohtasgarh Fort will be nearer, but Rohtasan (Chaurasan) Temple will be located about 2.2 km away.

Alt- 2: LTP on Southern side of Akbarpur Village on Akbarpur to Jara Dag/ Nohatta Road near Culvert (at about 1.5 km distance from Akbarpur village) and UTP near Rohtasan (Chaurasan) Temple (situated at top of Plateau). This alignment will be single section overflying the local Nallah and boundary wall of Rohtasgarh Fort. UTP here will be almost equidistant both from Rohtasgarh Fort and from Rohtasan (Chaurasan) Temple.

Alt- 3: This is not a direct alignment and consists of two sections as under:

Section – I: LTP on South West side of Akbarpur Village on Akbarpur (Rohtas) to Jara Dag/ Nohatta Road near Forest Nursery (near Forest office/Police Station at Akbarpur village) and UTP near Rohtasan (Chaurasan) Temple (at about 300 m distance from Rohtasan Temple on western side and situated at top of Plateau).

Section – II: LTP at Rohtasan (Chaurasan) Temple and UTP near Rohtas Fort (368 m away from the fort) and crosses valley and boundary wall at two places. UTP of Section I and LTP of Section II are located on the same plateau, which can be nominated as Intermediate Terminal Point (ITP). Both the sections will not be aligned and there will be an angular displacement between the two alignments.

Technology Alternatives: Monocable pulsed Gondola system is recommended for this ropeway.

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. Considering the surface and perennial drains near to the site 5 monitoring locations for surface water and 4 locations for ground water are selected for the purpose of assessing the measure implementations. Water monitoring should be carried out at Four times in a year (Pre monsoon Once in a year for 25 parameters) and Post monsoon 3 times (10 Parameter). The cost for water quality monitoring is estimated of **Rs. 7.8 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, SO2, CO, and NOx. The frequency of air quality monitoring will be Once in Month for Three Season in a Year. Four Monitoring locations are selected for assessing the noise quality of the area. As part of the environmental management, equipment brought on site for construction purposes is checked to determine whether it meets noise generation guidelines. The frequency and duration for noise quality monitoring is same as air. The cost for air and noise quality monitoring is estimated of **Rs. 12.15 Lakh.**

Soil Quality: Soil near to the construction area shall be monitored to ascertain presence of soil pollution due to construction activities. Soil will be monitored near to the material storage, Labour Camp, Akbarpur Village, UTP. The cost for soil quality monitoring is estimated of **Rs. 0.80Lakh.**

Ecological Monitoring: The avifauna and mammals monitoring is consider for 3 seasons in a year for 2 years. The monitoring will be done near UTP, LTP, Surface water pond near Rohtas village & Near Sone River. During operation phase the avifauna and mammals monitoring is consider for 3 times in a year for 3 years. The estimated environmental monitoring cost during operation phase is Rs 28.00 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 Head. Cost of such a division has been estimated as **Rs. 37.07 Lakh**.

Environmental Cost: The environmental costs towards implementation of environmental management plan and mitigation measures during pre-construction, construction and operation of the proposed project is estimated of **Rs. 85.82 Lakh.**

0.7 ADDITIONAL STUDIES

Public consultation has been carried out with the help of local investigators and community leaders through community meetings with the villagers at project influence area. The consultation process involved participants with various occupation and age group. During consultation, the issues regarding general perception about the project, connectivity, transportation, access to basic facilities, labour availability, access to road, income opportunity and other positive impacts of the project have also been discussed. Two public consultations were conducted in Babhantalav (2 km) and Nagatoli village (5 km) located in the project influence area near to the Upper terminal. One stakeholder consultation was conducted with the former Mukhiya of the project influence area. About 40 villagers from both the village have participated in the consultation.

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 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. Holding capacity of soil/Geological aspects, flood, soil erosion and seismicity are also considered during identification of risk.

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.

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 equipment's, 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.

On-site Disaster Management Plan: This plan includes assignment of duties and responsibility to officers, communication mechanism, cabin evacuation plan etc. Important contact numbers are displayed at prominent places and instructions regarding safety measures are communicated to the tourists.

Off-site Disaster Management Plan: Disasters happens all of a sudden like earthquake, flash flood, snow avalanche, landslide etc. In such a situation, an off site emergency disaster management plan is required for rescue operation which includes shifting of passengers to a safer place and providing medical facilities etc.

0.8 PROJECT BENEFITS

The proposed passenger ropeway is envisaged to boost up the better connectivity for the enhancement of tourism potential. This project will add up the new infrastructure to the area facilitating the local people as well as tourist visiting the Chaurasan Temple. This project will improve the basic facilities and resources of the villagers, better connectivity, employment opportunity, increase livelihood opportunities, increase tourism potential, control the labour migration. Being the eco-friendly mode of transport, carbon credit benefit is anticipated.

0.9 COST BENEFIT ANALYSIS

It is expected by the development of new ropeway will give economic return to the state. By encouraging more tourists throughout the India come to Himachal Pradesh, it is belief it will increase the demand for local industries especially in hotel and resorts, restaurants. The project has IRR of 16%. This level of return may be just sufficient to get nullify the same.

0.10 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. Environment management plan during construction and operation phase of the project is as follows and the cost of the Environmental management plan is Rs 178.51 Lakhs.:

Ecology & Biodiversity Management

Compensatory Afforestation: About 114 trees are likely to be affected (All 114 trees are likely to be transplanted) due to construction of proposed project. Estimated cost of planting new trees, their maintenance & transplantation is about 16.96 Lakhs.

Net Present Value (NPV): The net present value of the 1.33 Ha of forest land diverted comes the Subclass of forest is 5B/C2 –Northern Dry Mixed deciduous forest and 5/E2-Boswellia forest. Estimated cost of planting new trees, their maintenance & transplantation is about 52.43 Lakhs.

CAMPA Fund: The proposed project is located in kaimur wildlife sanctuary. Compensatory Afforestation Fund Management and Planning Authority (CAMPA) are meant to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses. Estimated cost diverted for CAMPA fund will be 69.39 Lakh.

Conservation plan for wildlife: The NPV component of the amount deposited with CAMPA fund should be utilized for wildlife conservation purposes in Rohtas Range of Kaimur wildlife sanctuary preferably in the sanctuary area surrounding the ropeway.

Waste Water Management and Water Conservation: The waste generated during construction and operation is 1.6 KLD and 5.5 KLD respectively. This waste water will managed through Mobile toilets during the construction phase and during operation Biodigester has been proposed. To recharge the ground water level 1 Rain water harvesting pit at LTP and 1 Rain water harvesting tank at UTP will be constructed.

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. In addition to that Solar power plant has been proposed to reduce the power load.

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.

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. 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.

Noise Control Measures: Construct noise barriers, such as temporary walls or piles of excavated materials between noisy activities and noise-sensitive receivers**.**

Oil Spill control/Management: To control the oil spill from equipment and machinery routine inspections/ckeck 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.

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 **Rs 2.5 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.

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