

EXECUTIVE SUMMARY FOR

"TSOMGO PASSENGER ROPEWAY"

NOVEMBER 2015

AT

TSOMGO LAKE, DISTRICT EAST OF SIKKIM, SIKKIM



(Reference- TOR letter no. F. No. 10-12/2014-IA.III dated 17-12-2014)

Being Developed By:

TOURISM & CIVIL AVIATION DEPARTMENT, GOVT. OF SIKKIM

Gangtok, Sikkim

Prepared By:

M/S PERFECT ENVIRO SOLUTIONS PVT. LTD.

NABET Registered Vide List of accredited Consultants organization/ Rev 35/8th Oct 2015 at S.No.-116)

5th Floor, NN Mall, Mangalam Place

Sector 3, Rohini, New Delhi

Email: info@perfectgroup.com; Phone: 011- 47528467

EXECUTIVE SUMMARY

INTRODUCTION

Tsomgo lake (or Changu lake), one of the sacred lake of East Sikkim is located adjacent to Gangtok - Nathula Highway (Jawaharlal Nehru Marg) at a distance of 38 Km from the Capital City Gangtok. The lake is situated at an altitude of 3780 m.

Government of Sikkim (Tourism & Civil Aviation Department) in order to promote tourism, is installing a Passenger Ropeway at Tsomgo Lake, Gangtok, Sikkim.

The project had already been granted Environmental Clearance from SEIAA, Sikkim and the project work had started in 2011 and is 95% completed.

A legal notice was served against the project that Environmental Clearance was issued on basis of EIA Notification, 2006, instead of the notification no. S.O. 3067(E) dated 1st December 2009 according to which clearance from Ministry is required since the project is at an altitude more than 1000 m. The SEIAA examined the issue and suspended the EC.

The Project is a 625 m long aerial ropeway, covering an area of 8072 sq m (including Lower Terminal Station, Upper Terminal Station & ropeway corridor).

OBJECTIVE

- I. To facilitate Changu lake tourists to visit the mountain top and adore the panoramic scenery of the surrounding area.
- II. To promote tourism in the state of Sikkim.
- III. To facilitate the Government of Sikkim for generating added revenue to the state.

LOCATION OF THE PROJECT

Site Location

The Lower Terminal Point (LTP) has been developed in southern side of the lake on right side of the existing Alpine Café and the Upper Terminal Point (UTP) has been developed on the hill top.

Latitude and longitude of base station and terminal station are as follows:

Station	Latitude	Longitude	Elevation
Lower Terminal station (Near Changu lake)	27°22'26.44"N	88°45'28.42"E	3764 m
Upper Terminal Station (Hill top)	27°22'7.10"N	88°45'28.10"E	3994 m

Approach to Site

The site is easily accessible by the metalled Gangtok - Nathula Highway (Jawaharlal Nehru Marg) via local travel agencies / tour operator as well as taxis on hire basis from Gangtok.

The connectivity to Gangtok is given in the table below:

Transport	Station	Distance
Airport	Bagdogra Airport	126 Km
Railway Station	Siliguri Railway Station	114 Km
	New Jalpaiguri station	119 Km
Road	NH 31A	adjacent
	Gangtok is connected by road to Darjeeling, Kalimpong, Siliguri and also to all district Headquarters within Sikkim and can be reached via private buses, jeeps and taxis.	
Helicopter Service	Tourism department operates an 5/8 seater Helicopter service between Bagdogra and Gangtok.	

INFRASTRUCTURE AT SITE

No infrastructure is available at the hill top. *At LTP*, metaled *approach Road*, small rustic markets, shopping complexes, small restaurants, Electric poles, *parking*, army helipad, *etc. are available*.

Ropeway Towers & Terminal Stations (boarding & de- boarding, control room, store room, first aid counter, waiting room, toilets) of ropeway have already been constructed at LTP, UTP & along the corridor.

LANDUSE AT SITE

Total site selected for the development of Lower Terminal Point (LTP) and Upper Terminal Point (UTP) including ropeway corridor for the proposed ropeway project falls under the Kyongnosla Range. Mainly the land use is Forest cover. However, agricultural, built up, barren land, roads & trek path and water bodies, river/ canal also exists.

PROJECT DESCRIPTION

Particulars	Existing Details
TOTAL AREA	8072 sq m (0.80 ha)
CAPACITY	800 PPH
TECHNOLOGY	Mono Cable Continuously Circulating Gondola system
COST OF PROJECT	Rs. 9 Crores
LENGTH	625 m
LEVEL DIFFERENCE	230 m (Approx.)

NO. OF GONDOLAS	20 Nos. (Up & Down)
NO. OF TRIPS/ Hr.	approx. 10 nos round trip per hour.
CABIN CAPACITY	6 seats
SOURCE OF POWER	Power Department, Government of Sikkim
POWER REQUIREMENT	150 kW
DG SETS	1 X 150 kVA
WATER REQUIREMENT	101 KLD
WASTE WATER GENERATION	92 KLD
STP CAPACITY	2 STPs of 55 KLD each
TOTAL SOLID WASTE GENERATED	967 kg /day

ALTERNATIVE STUDIES

Few alternative routes were assessed and the selected route was found most suitable since this is the most stable stretch & no tree cutting is required.

Seeing the available space, length of stretch, climatic conditions & terrain of the area, Mono-cable continuously circulating Gondola System is installed.

ENVIRONMENTAL SETTING

The study period for monitoring of the present environment was for three months i.e. March to May 2015. The EIA is based on baseline data collected during the monitoring season.

Air, Water, Soil and Noise sample were collected within 10 km detail study of the area.

Seismicity

As per the seismic map of East Sikkim available with SSDMA and as per National Disaster Management Authority's database, the project site is located in seismic zone IV which indicates high damage risk zone.

Climatology

- i. **Temperature:** Temperature of the area varied from 1.0 °C to 28.0 °C. The Average temperature varied from 12.0°C to 19.0 °C.
- ii. **Relative Humidity:** Humidity of the area varied from 10.0 % to 94.0%. The average humidity varied from 24.0 % to 25.0 %.
- iii. **Wind Speed:** Wind speed was in the range of 1.9 Km/hr to 29.0 Km/hr. The wind speed was almost close to each other during the whole study period. The average wind speed varied from 13.0 Km/hr to 16.0 Km/hr.

Ambient Air

The ambient air quality monitoring was done to assess the ambient air quality in one season. The Concentration of PM₁₀, PM_{2.5}, SO₂, & NO_x were found to be well

within the prescribed standards of NAAQS.

Noise

The noise levels were monitored in the core zone & buffer zone.

The day & night ambient noise level of core zone was found within the standard limit of Commercial area. Whereas the day & night ambient noise level of buffer zone was found slightly higher than the standard limit of residential area.

The noise level of Jawaharlal Nehru road was within the standard limit of commercial areas during day & night.

Water Environment

The source of water onsite & in buffer zone was the lake & spring water. Water samples were taken as per the Standard Methods (IS & APHA, 22nd Edition 2012).

The Surface water quality of the core zone (Lake) shows that all the parameters are within the limits for EPA discharge standards and CPCB Water Quality Criteria (Class of water 'A', 'B', 'C', 'D' & 'E') except BOD (6.0 mg/l) which is higher than Class 'A', 'B', 'C' of CPCB water quality criteria.

In buffer zone, parameters like conductivity, T.D.S., Total hardness, Calcium, Magnesium and Alkalinity are within the limits of drinking water standards.

Soil

Texture of soil of core zone is silt Loam. The colour of soil is Brown, pH ranges from 4.9 to 5.5.

Primary nutrient profile shows that soil is low in fertility due to the availability of low amount of nitrogen, Phosphorous and potassium. So, the addition of bio fertilizers will enhance the fertility of soil.

The texture of soil of buffer zone varies from silt loam to sandy clay loam. Colour is Brown to Dark brown, pH ranges from 4.5 to 5.9. Primary nutrient profile shows that soil is low in fertility due to the availability of low amount of nitrogen, available potassium.

Biological Environment

The complete stretch of ropeway falls under the Kyongnosla Range.

There are two wildlife sanctuaries falling under the 10 km radius of the project site which are:

Kyongnosla Alpine Sanctuary

Pangolakha Wildlife Sanctuary

The area is very rich in flora as well as fauna. Among important forests found in the sanctuary area are Sub-alpine, Mixed coniferous forest and alpine scrub and alpine pasture. Many rare and endangered medicinal plants are found.

There are following Schedule I species found in buffer zone: red panda, (*Ailurus fulgens*), leopard (*Panthera pardus*), Kalij pheasants, (*Lophurs leucomelana*), Himalayan Vulture (*Gyps himalayensis*), Musk Deer (*Moschus moschiferus*), Tibetan fox (*Vulpes ferrilatus*)

Socio economic condition

Only 6 villages were found within the 10 Km radius of proposed area which includes- Changu Village, Chipsu Village, Thegu Village, Kupup village, Gnathang village and Bhusuk Village.

The socio economic conditions w.r.t. housing, electricity, sanitation, education and occupation were found better than many of the rural areas.

Drinking water facility was available through the lake in Changu village & spring supply in all the other villages.

ENVIRONMENTAL MANAGEMENT PLAN

An Environment management cell will be created and specific responsibilities will be assigned to various members. Environment will be managed as described below:

Land Environment

During Construction Phase

The project site falls under Kyongnosla Range (forest land). 0.8237 ha of land has been diverted for non-forest purposes.

To prevent rock instability & landslides, the foundations were dug manually and no blasting was done.

Separate storage yards with hard paving for waste storage, used oil storage, lubricating oil storage & other raw material storage was made to avoid disposal of waste, oil leaks, etc.

During Operation phase

The impacts during the operation phase include waste disposal, leakage from machineries, runoff near pillars & soil erosion causing instability of land.

The waste disposal will be limited to the stations. Proper collection bins will be provided at the terminal stations by the ropeway management.

Lubricating oils for ropeway machineries & used oil generated from DG sets, machineries etc. shall be collected properly in leak proof containers to avoid leakage & spillage of oil on ground & contamination of soil.

Collection of rainwater & proper channelization of runoff shall be done to avoid soil erosion & weakening of pillars.

Atmospheric Emissions

During Construction Phase

The only impact on Air Environment seen was the fugitive emissions like particulate matter etc. that were generated due to activities like excavation, drilling, transportation & handling of equipments and materials, etc.

Air Quality was being managed by Coverage & storage of construction material & other raw materials, Excavated soil, top soil, generated & collected dust at separate & covered place. Under construction buildings were kept covered with

a green cloth. Water sprinkling was done regularly to settle down the dust generated during construction activities.

During Operation Phase

Although, Ropeway operation is an environment friendly non-polluting transport system, the main source of pollution will be the ropeway machineries. Adequate Stack height above the roof of terminal stations shall be provided to discharge the effluent gases from machineries at a certain height.

Water Management

Water requirement during construction as well as operation phase shall be met by overflow of the lake.

Construction Phase

Total 13 KLD water was required during the construction Phase mainly used for curing, domestic, flushing, sprinkling & other construction purposes. The waste was being properly stored & disposed to avoid slurry formation & discharge to water courses in the vicinity. Runoff was being collected & reused in sprinkling & curing purposes, to minimize the utilization of fresh water. Toilets already exist at the LTP whereas Septic tanks followed by soak pits were made available at the hill top to ensure no discharge of wastewater in open or near watercourses.

Operation Phase

Total water requirement has been estimated to be 101 KLD. Water shall be used mainly for flushing, drinking, hand washing and horticulture purposes. Total quantity of wastewater generation will be 92 KLD. The generated sewage will be treated in the 2 STPs (based on FAB technology) of 55 KLD capacity each. The treated water will be reused for flushing & miscellaneous purposes.

Storm Water management

Construction Phase

Storm water runoff from the construction site was not allowed to flow down the hill. The construction material & construction debris were kept in a stored place so as to avoid mixing with the runoff.

During Operation Phase

Maximum collection of rain water shall be done and the stored water shall be reused wherever possible.

Drainage network has been developed in the terminal stations to ensure the proper drainage of the storm water. Regular cleaning & maintenance of the same shall be done.

Noise & Vibrations Management

Construction phase

The noise emission sources include construction machineries / equipments, other construction activities like hammering, drilling, etc. and traffic.

Standard methods and machinery were used and were installed on anti-vibration pads. Manual cutting & drilling operations were followed. The construction

activities were performed during the day time only. Temporary noise barriers were provided around the construction area.

Operation Phase

Source of Noise & vibrations will be the DG sets, ropeway machineries and traffic movement in the area.

Acoustically enclosed DG Sets have been bought and installed on proper anti-vibration pads. The DG sets will be used as a stand-by only at the time of power failure. Similarly, other ropeway machineries have been kept in closed rooms & installed over anti vibration pads. Proper maintenance of the ropeway will be done to ensure low or no noise and environmental impacts.

Solid and Hazardous Waste

Construction Phase

Solid waste during construction includes Construction Waste & Debris, Excavated materials, Municipal Waste which includes *Organic Waste & inert waste* and Hazardous Waste.

The waste was collected at a separate place and was not disposed off on land. Biodegradable Waste & inert waste was collected by Pokhari Sangrakshan Samiti for further disposal. Recyclable waste was given to authorized vendor. Excess soil has been used in leveling & backfilling purposes. Top soil has been preserved to be used for landscaping near UTP and LTP & along the corridor. The hazardous waste was stored in leak proof containers & was given to authorized vendors.

Operation phase

Solid waste will be generated by ropeway users, employee, etc. The 967 Kg/day of waste will be generated and treated by composting method. Hazardous waste will be the used oil & other oil leakages from DG sets and other machineries, which is calculated to be approximately 5-7 It/ month. The waste oil generated from D.G sets and other machineries shall be stored in HDPE containers and will be given to recycler authorized.

Ecological Environment

Construction Phase

Diversion of 0.8237 ha of forest land for non-forest purpose has been done with prior approval. There were no trees enroute in the ropeway corridor & only herbs & shrubs have been cut for the development of terminal stations.

State Govt. shall raise compensatory afforestation over 1.65 ha of degraded forest land identified at Yali Reserve Forest for which Funds (15 lacs) have already been deposited to the Forest department.

Noise which could had impacted the flora & fauna was minimized by using the noise barriers & mitigation measures.

Operation Phase

Plantation is proposed around the LTP, UTP, under the corridor of ropeway & in other open spaces, to enhance the terrestrial ecology of the area. Ropeway is an environment friendly transportation method, efforts shall be made to ensure

minimum or no disturbance to the ecology of the area.

The alignment has been selected by keeping in sight that no infringement to habitation will be caused.

Socio- economy Management

Construction Phase

There were no negative impacts seen on socio economy during the construction phase. Instead, the project had positive impacts to the socio-economy by providing indirect employment opportunities in the area.

No displacement or R & R plan was needed as no human habitat exists at the installed stations area for ropeway or in the corridor of the ropeway.

Operation Phase

The project will need skilled & semi-skilled staff for the ropeway operation & hence will enhance employment in the area.

This recreational facility will attract more tourists to visit this place & increase in tourists will benefit the existing shops, yak porters, cafés present in the area. Only positive impacts are seen due to this project.

Corporate Social Responsibility

As per the companies act, at-least 2% of the average net profit in the last three years will be spent under a Corporate Social Responsibility Program, the activities of which shall include:

- i. Drinking Water Facility
- ii. Waste management
- iii. Sanitation
- iv. Toilet facilities
- v. Medical Aid Facilities

Rs. 18.5 lacs will be borne by the owner on the above mentioned CSR activities.

Traffic Management

The ropeway project will attract tourists and hence will lead to cumulative yearly increase in traffic. But, since there are no accommodation facilities present at the project site, the tourists stay at Gangtok City and visit Changu Lake as a part of their itinerary.

There are two government parking spaces available for parking of vehicles out of which one is under construction. The space is sufficient enough to accommodate the vehicles of the visitors.

Moreover, the visit to Changu lake is based on permit systems being near to Nathula border. Hence, the permit based system will help in management of one time load on the area in terms of traffic as well as in terms of environment load.

COST OF EMP

The cost of project is estimated to be about Rs. 9.0 crores.

Rs. 87.5 lacs of estimated capital cost & Rs. 8.6 lacs/year of estimated recurring cost shall be spent on Environment Management Plan.

ENVIRONMENTAL MONITORING PLAN

An Environment Monitoring Plan was followed for construction phase & is also prepared for the operation phase which will provide a mechanism to address the adverse environmental impacts of a project during its execution.

Regular monitoring of pollutants will be undertaken during the operational phase of the project and the monitoring locations will be finalized in consultation with the SPCB.

An internal monitoring team shall be constituted for implementing the Monitoring plan.

RISK ASSESSMENT

Ropeways are liable to suffer from environmentally induced threats as well as human -caused occurrences.

Risk Analysis

Natural Occurrences- The project site is located in seismic zone IV which indicates high damage risk zone. As per the landslide hazard map, the area is medium to highly prone to Landslides. Landslides may occur at the project site, if, slope stability is not maintained. As per Flood Hazard map of India, the site falls under medium flood prone area. The project is installed near Changu Lake which itself could be a source of flood in the region. The project area falls under a zone where high wind & cyclone is seen.

Human Caused Occurrences- Fire can mainly be caused due to electric spark in electrical room, fire in the surrounding forest area, fire in fuel storage places, etc. The ropeway will run on electricity & hence electrical current can pass through cable cars & wires due to inadequate insulation or accidentally. The technical failures can cause risks to people working in the area during construction phase & people who will travel through the ropeway in operation phase. Consequences of the discussed hazards may result into accident. War, crisis & terrorists can cause panic among public and staff.

Safety & Preventive Measures

- General safety measures like display of Information & sign boards; proper operation manuals, design verification, test certificates; supervision; regular examination of components; inspection by chief ropeway inspector; regular maintenance of ropeway and ensuring safety of staff in operating procedures shall be adopted.
- Special attention has been given to the structural design of foundation, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete, and structural steel. Designing of the ropeway terminals & towers have been done in accordance with that capable of bearing Seismic

Zone V impacts.

- The slope stability in the area where ropeway is proposed shall be maintained at 45°.
- Proper drainage system has been installed. Structures are built in such a way that no harm occurs to the people & structures due to flooding.
- For fire safety, flammable substances shall be avoided & extinguishers, hose reels, & hydrants should be strategically placed.
- The Gondolas will be provided with door lock which cannot be opened by the passengers.
- Protection against over speeding of cabins and against reversal of rotation will be provided.
- Grip Testing Devices, Line safety devices, rope catchers, electric protection system and emergency push buttons shall be provided.
- The ropeway system will be provided with minimum of two braking system; Emergency Brake and Service Brake. Both brakes should be capable of functioning automatically as per operational and program logic of control system OR manually, in case the need arises.
- Each station will have a medical facility provided for emergency situations.

Rescue Arrangement

- *Chair Rescue* shall be carried out by the rescuers who will reach the cabin from the nearest tower with all the equipments and then the passengers are lowered down to the ground level with the help of rescue chairs being operated manually.
- *Diesel engine* with independent drive, so that the ropeway system can be operated at reduced speed to bring stranded cabins to the terminal stations in case of failure of electrical power supply or main motor.
- *Auxiliary Drive* with diesel engine enables the passengers to be evacuated in the event of power failure.

Disaster management Plan

Proposed ropeway shall involve Level-1 and Level-2 emergencies. However, in case of natural calamity such as earth quake, it may have Level-3 emergency.

A definite plan will be made for marshalling passengers for safe loading and unloading. Assembly points and evacuation routes for workers and general public in case of emergency shall be demarcated.

No ropeway shall be operated without a functioning dedicated communication system.

Direct contact with district administration and District Disaster Management Authority (DDMA) shall be established for any update on forecast (warning). An in-house Disaster management Cell consisting of rescue team & first aid team shall be made. Regular training & mock drills shall be practiced to the staff & personnel involved. A Central Control Room shall be established for

communication with Government agencies in case of emergency.

PROJECT BENEFITS

The Tsomgo Passenger Ropeway project will prove to be a big advantage to the local people, the environment, the visitors of the site and the state.

Benefit to Local People- The ropeway will provide direct or indirect employment to the local people of the area (peoples from nearby habitations) as person will be required for technical and administrative functions.

Benefit to Environment- Being environment friendly, there will be least generation of any type of pollutants and as the human intervention would be restricted to terminal stations only, hence the corridor would remain largely undisturbed and unpolluted. Moreover, the concerned officials could easily take up monitoring of the environment and weather conditions in the surroundings more frequently and at regular intervals with ease.

Benefit to Visitors- Many of Changu lake tourists could not reach the hill top & enjoy the landscape of the lake & surrounding area due to the hard & tough trek conditions and as the trek can only be covered on foot. By the installation of ropeway, every visitor can reach the mountain top & enjoy the breathtaking view.

Benefit to State- The ropeway will be an added attraction in the area & will attract more tourist to the place & hence will help in increasing the economy of the state.

CONCLUSIONS

The study brings out the following points:

- Existing ambient air quality, water quality and noise levels are mostly within acceptable norms and will continue to remain so, upon implementation of the proposed mitigation measures.
- Risk to flora, fauna and soil is negligible due to effective implementation of EMP.
- Socio-economic benefits are envisaged due to creation of direct/indirect employment and benefits to visitors by ease of the transportation way to the hill top.

Thus, it can be concluded on a positive note that after the implementation of the mitigation measures and Environmental Management Plan, the normal operation of the project will have negligible impact on environment and ropeway itself is an environment friendly mode of transportation. Moreover, it would increase the tourism in the area hence employment & revenue and hence the economy of the state. Hence, it will benefit the locals (in the form of employment), the visitors of the place (in the form of convenience & comfort), state (in the form of economy) and the environment (preservation of its pleasant nature).