

Pre-feasibility Study and Orientation of Gravity Goods Ropeway in Meghalaya



SUBMITTED TO:
International Centre for Integrated Mountain Development (ICIMOD)
Meghalaya Rural Development Society (MRDS)

SUBMITTED BY:
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1. Introduction

1.1 Background

The Livelihood Improvement Projects for the Himalayas in Meghalaya, a joint venture of the International Fund for Agricultural Development [IFAD] and the State Government of Meghalaya, was launched in the state in 2004 with the registration of the Meghalaya Rural Development Society¹ (MRDS) in June 2004. MRDS is agency responsible for implementing the project in the state².

The project aims to enhance the capabilities of local people to select appropriate livelihood opportunities, access required financial resources, and manage new technologies and institutions at the village level. It also aims to increase income through more sustainable income generating cultivation system and the establishment of non-farm enterprises at the micro and small-scale level; and establishment of effective and appropriate delivery system for inputs and for the maintenance of assets and resources, with emphasis on micro finance, saving and thrift, and micro-insurance products, along with access to business.

As on March 2008, as many as 32564 households spread over 582 villages located in five of the seven districts -other than West Khasi Hills and West Garo Hills- of the state has been covered by the project.

One of the major problems in implementation of the project is the state of poor road connectivity in some rural areas of the state. Many of the villages/habitations, particularly the habitation with less than 250 households which accounts for 56 per cent of the total habitations, are still not connected with good roads. As of 2008, 47 per cent of the habitations were not yet connected by all weather roads, while the percentage of habitations with less than 250 populations that are still unconnected is much higher at 67 per cent. (See table A and B in Annex 3).

Access to roads and transportation services is very essential for the social and economic development of the rural areas, which is a challenge to MRDS efforts to improve existing livelihood of the people and introduce new appropriate livelihood opportunities.

Since the linking of these unconnected villages particularly those with small population and located in remote areas through good all weather roads may not be possible in the near future, MRDS is considering introducing ropeways to facilitate the movement of agriculture produce and other essential commodities and goods from these unconnected villages to the nearest motorable roads or markets.

¹ Registered under the Societies Registration Act of 1860 as a non for profit organization

² Similar project to protect the fragile Himalayan ecosystem is being carried out in the state of Uttranchal

However, unlike the diesel operated bi-cable ropeways that have been installed in the border villages of Meghalaya³, Gravity Goods Ropeway (GGR), an alternative technology is being considered.

Gravity ropeway is an inexpensive and simple means of transportation. It operates simply by gravitational force without the use of external power. The trolley at the upper end with its weight pulls up the trolley from the lower end. A steel wire rope supports the trolley and another steel wire rope controls the trolley. A flywheel with bearing and bracket is used as a brake. Tapping the wire rope is the means of communicating between the upper and lower ends. The operator at the upper end strikes the wire rope with a stick to send a wave signal through the wire rope to the operator at the lower station. The operator at the lower station then applies the hand brake to control the flywheel.

The introduction of gravity goods ropeway (GGR) is expected to overcome some of the problems facing the existing ropeways such as difficulties in the arrangement of trained personnel to attend to and repair breakdowns of the diesel operated machine and the high operational costs of diesel which has rendered many of the ropeways in the state non operational.

MRDS has identified two villages for the possible installation of the gravity ropeway. One of the villages is Nongtraw in Laikhroh-Khatarshnong block in the district of East Khasi Hills and the other is Thuruk in Saipung block in the district of Jaintia hills. Although both the villages are not connected by all weather motor able roads their similarity ends there. While Nongtraw lies close to the Shillong - Cherrapunji state highway, Thuruk is located far from the nearest all year motor able road. Besides, the two villages have very different socio-economic characteristics which are discussed in chapter 2.

Prior to the initiation of the pre-feasibility study by Practical Action, MRDS had undertaken a quick “dip-stick” type study on the possibility of introducing a GGR in both of these locations. Practical Action had developed the format for this study and based on the positive preliminary analysis, the assessment team have been directed to conduct the pre-feasibility in these two locations. The details of the preliminary assessment are available at Annex 4.

1.2 About Gravity Ropeways

The mechanics of the gravity ropeway is very simple, like a pulley system. It consists of two trolleys, rolling over two separate steel wire ropes (track rope)

³ There are as many as 44 such ropeways in the state and it takes around 8 lakhs rupees per k.m. to install one (as in September 2004). The ropeways are constructed by the Border Areas Development Department of the state government and are generally run and managed by the Village Ropeway Transport Cooperative Society. See

suspended from two separate towers. These two trolleys are connected to a single looped wire rope of smaller diameter (hauling rope), in between, two track ropes, at two different extreme levels by means of a cable ties. This hauling rope passes around a cast iron sheave at each extremity.

When the laden trolley rolls down by its own weight along one-track rope from upper station, another trolley with lighter weight at bottom station hauls up along the next rope. A flywheel brake is fitted at lower station to regulate the speed of the moving trolleys.

As a rule of thumb, the weight ratio of downward and upward moving load is 3:1. However, the ratio varies according to the site condition and accuracy in installation. So, the proper loading ratio per site should be carefully evaluated after the gravity ropeway comes in operation.

Theoretically, loading ratio and velocity of trolleys at each point along route corresponding to the loading ratio can be obtained from the following relation.

Let us suppose m_1 be the mass of downward moving trolley with load and m_2 be mass of upward moving trolley with load. Here m_1 is always greater than m_2

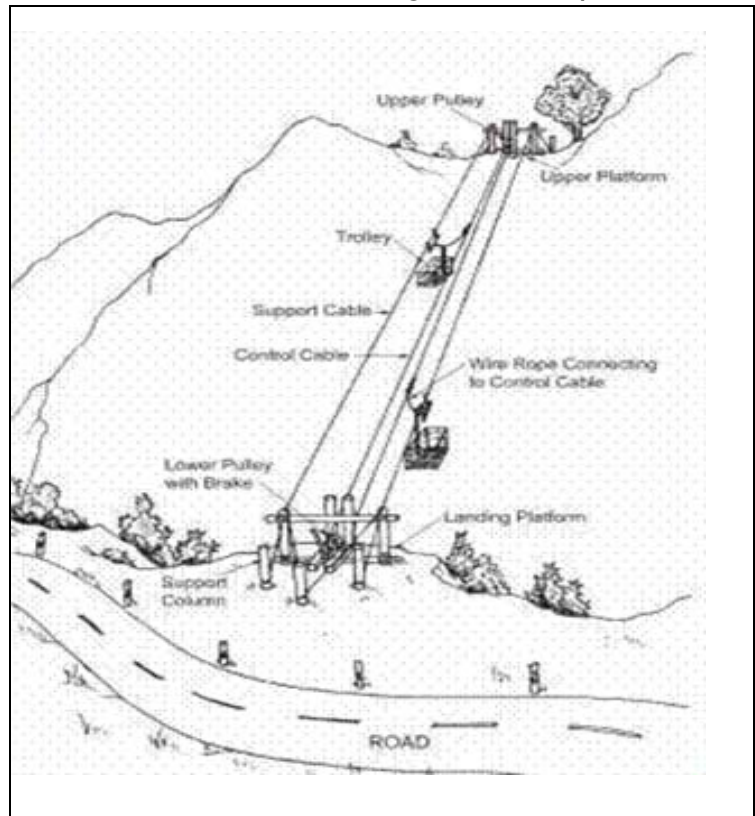


Figure 1.1: Illustration of a gravity ropeway

Here,

Initial potential energy of downward moving trolley (PE_0) = m_1gh_0 , where h_0 is the elevation difference between the upper and lower saddle.

Potential energy of downward moving trolley at the point of consideration (PE_1) = m_1gh_1 where h_1 is the height of the first trolley from lower saddle at the time of consideration.

Potential Energy of upward moving trolley at the time of consideration (PE_2) = m_2gh_2 , h_2 is the height of m_2 from lower saddle at the time of consideration.

Combined work done by the masses against the friction (W_1) = $0.25(m_1+m_2) \cos BS$ where S is the cable length covered by the trolleys at the time.

W2 Combined Rotational Energy of Sheave (W_2) = $3.14 (r^4) \omega^2$, where $\omega = v/r$, r is the radius of the sheave.

Now, as per the principle of conservation of Energy

$$0.5 (m_1+m_2+m_h) v^2 = PE_0-PE_1-PE_2 -W_1-W_2$$

From this relationship, the velocity of moving trolleys at specified time and distance can be calculated. The velocity calculated from above relation may vary from the actual velocity in field, as several unknown factor may come into play which further reduces the velocity of trolley. However, this only gives the idea of the approaching velocity, which is useful in the prediction of possible impacts.

1.2.1 Terminologies

A) Haulage ropes: Hauling ropes are the ropes, which oscillate back and forth in between to sheaves. It provides the traction force and hauls carriages on the track rope. The haulage ropes are usually smaller in diameter than track cable and having Jute core.

B) Track Ropes: Track ropes mean the ropes that are designed, manufactured or used solely for supporting carriers on a gravity ropeway. They are those ropes upon which the carriage slides on wheels "to and fro". The flexibility of the track rope is less than that of the haulage as Independent wire strand or steel wire is used as the core. The diameter of the track rope is to be designed but, it is usually larger than that of the haulage rope.

C) Carriage: A basket or carrier made up of the rolled steel for carrying the goods. Its size and shape varies according to the nature of the loads to carry.

D) Tower/ Thrust pillar: A steel or concrete structure placed at upper and bottom station to support the track cable to absorb the possible thrust.

E) Station: It is at each end of gravity ropeway line and consists of sheave, landing platform, space for storage of materials and a shed to shield them.

F) Brake: A flywheel brake is fitted at the bottom station to control the velocity of moving trolley. Wooden brake shoe is popularly used in gravity ropeway.

1.2.2 Features of Gravity ropeway

Gravity ropeway has several intrinsic features which makes it appropriate and complementary means of transportation in the mountainous territory. Some the prominent features are discussed below,

A) Cost effective: Construction /installation cost of gravity ropeway is much less than other conventional means of transport, like road way , rail way etc. The

approximate per Km cost of the gravity ropeway is Rs 800,000 where as per Km cost of 4 m wide earthen road in hill is approx Rs 20, 000, 00.

B) Time saving: - It is efficient in terms of time saving .It can cover a distance of a kilometer in less then 2 second. Therefore gravity ropeway reduces drudgery and also allows people to utilize the amount of time saved into productive and income generating activity.

C) Short route: In road or railways, winding of the alignment is unavoidable in order to attain a comfortable gradient for vehicle movement. But, in case of gravity ropeway, as the rope is suspended in the air, alignment is straight. So; the route is incomparably shorter than the railways and ropeway.

D) Energy efficient: Gravity ropeway operates solely under gravity. It does not require any external power or fuel. This is very important in term of energy saving and cutting down the operation cost.

E) Environment friendly: Gravity ropeway is environment friendly technology. It has no or negligible impact on surrounding environment. It neither cause noise nor air pollution so it does not disturb ambient environment and the existing ecology.

F) Simple technology: Gravity ropeway employs very simple technology .So, it does not require external experts to operate and maintain it. Local people can easily adopt this technology.

G) Nominal operation and Maintenance cost: As the gravity, ropeway does not require any fuel and high skilled manpower to operate & maintain, it's running and maintenance cost is nominal. Likely, it requires minimum maintenance work which does not incur much cost.

1.2.3 Limitations

Like all other technologies, gravity ropeway also has some limitations, which are illustrated below.

Span - Span of gravity ropeway is limited to 1500-meter. When the span exceeds 1500 meter, the rope tension due to its own weight become huge as the rope is suspended between two points only. Likely, energy loss due to friction is huge in longer span ropeway, which results stoppage of trolley before reaching to the landing station.

Slope: The elevation difference of top and bottom station with respect to the span is crucial for gravity ropeway. Gravity Ropeway cannot operate if the angle of elevation is less than 15 degree. The upper limit of the slope can go as high as 40 degree if proper arrangement for preventing derailing of the trolley is made. But the gravity ropeway operates best when the slope with in a range of 20 to 30 degree.

Upward moving load: It has very limited capacity to carry from down to up. So, this technology is not suitable for the place where more load is to haul up than to send down. As a rule of thumb, the downward moving load should be three times as heavy as the upward moving load

Loading ratio: As mentioned above, the speed of trolley in gravity ropeway is mainly dependent on the slope and loading ratio along with several other factors. The loading ratio should be so maintained that the trolleys approach to respective stations with minimum speed but doesn't stop in between. Actual loading ratio should be carefully evaluated after the operation of the gravity ropeway and should be maintained. If the loading ratio is not properly maintained, the trolley will either approach the station with excessive speed or stop in between. When the speed is excessive, it will produce huge impact load on hauling cable when brake is applied thus endangering the safety of the hauling rope. Likely, if the brake couldn't be applied, the trolley will bang the tower at lower station.

1.3 Objectives of the Pre-Feasibility Study

The main objective of the study is to assess the technical, financial and economical viability of the two short listed gravity ropeway sites in Meghalaya, state of India. The specific objectives of this study were to:

1. Evaluate the technical viability of installation of the gravity ropeway in two identified villages of Nongtraw and Thuruk within the scope of the existing technical design and limitations of the gravity ropeway technology.
2. Analyse the goods produced and marketed by the people in the two villages and assessing the likely impact that the ropeways would have on the production and marketing of such goods as well as the possibility of diversification of livelihood activities.
3. Delineate the service areas (project coverage/participating households).
4. Conduct traffic survey.
5. Examine the willingness and preparedness of the community to take ownership in implementing and managing the ropeways once it is installed.
6. Examine how the ropeway will alleviate drudgery particularly among women.
7. Orient the stakeholders and MRDS on the marketing aspects of gravity ropeway and on what needs to be done to market the concept.

1.4 Methodology

The methodology we followed to carry out the feasibility study is as follows:

1. Meeting/discussion/orientation using slides and video: This was done once at MRDS and based on the feedback received the discussion outline was revised. We also had series of meetings with stakeholders including

members of the Government of Meghalaya and potential partners and donors like NERCORMP.

2. Orientation on Potential Project Area and Discussion: Along with the MRDS team we went to the sites where we held meeting/discussion/orientation with the community and the user groups.
3. Map study (topographic): The two potential areas were studied and topographic maps, and preparatory works before site visit was also carried out.
4. Social and Technical feasibility survey: The study team visited the potential sites together with counterpart technicians and other staffs. The technicians used Abney, Altimeter, GPS and Theodolite (if necessary) for the technical study. Efforts were also made to capacitate the counterpart technicians as well. The market chain advisor and socio economist used Participatory market RA tools to assess daily traffic, mobility pattern, production volume and market mapping together with the potential beneficiaries and other stakeholders.

Other methodology used involved meeting and interviews with key informants and village council members. The team also interacted with project officials of MRDS and other stakeholders such as the senior officials of state government, project team of North Eastern Region Community Resource Management Project⁴ (NERCORMP), local development specialist and partner NGOs.

1.4.1 Technical Study

The study and assessment was conducted in a systematic manner employing the following methodologies:

A) Conformity of technical viability: Firstly, the technical viability of the proposed sites was checked with naked eyes upon the arrival to each site. It was pre- agreed among the study team, that, the study will further advance only after the team is confident about the technical viability .This was the precautions taken not to raise the expectation of the community and avoid the possible frustration of the community if the site is found not suitable for gravity ropeway. The technical advisor accessed each sites through visual inspection.

B) Walk over survey: The walk over survey was done to find out the best alignment for gravity ropeway/ropeway in the proposed locations. The survey team walked along and across the proposed site to find the best alignment. From the walk over survey, two alignments in each site were finalized for further site assessment. The beneficiary villagers and the representative of MDRS accompany the Technical

⁴ NERCORMP is a joint livelihood project of International Fund for Agricultural Development and North Eastern Council, Govt. of India. The project is operating in six districts of three States in northeast India. The overall objective of the project is to improve the livelihood of vulnerable people in a sustainable manner through improved management of their resource base

Advisor during the survey. The views of the beneficiaries were solicited and given due respect while fixing the alignment.

C) Site assessment and evaluation: The two alignments in each site that emerged as the best alignments during the walk over survey were further assessed with the help of instruments. The location of estimated top and bottom station of the proposed sites were recorded with the help of GPS, which was further triangulated with the help of Abney level and Altimeter. Then, each site was evaluated against the following criteria:

- Slope (angle of inclination between upper and lower station)
- Span (Aerial distance between upper and lower station)
- Profile of the ground
- Proximity of the station to the village (lower station) and market
- Crossing of public facilities (avoid the alignment if the public facilities like road the transmission line come below)

D) Key informants interview: After assessment of the site, Key informant interview (KII) was conducted to find out the availability of local materials, possible portage distance , availability of skilled and unskilled labour and the local rate. Similarly, the head man and other community member were consulted for their preferences regarding the two alignment assessed in each sites.

E) Market survey: A market survey in local market Cherrapunji and Shillong was carried out to find the availability and cost of the non-local material required for gravity ropeway. The survey was also intended to identify the potential local vendors and fabricators for the supply and fabrication of the ropeway construction materials. The team visited and inspected some of the fabricators in Cherrapunji and a technical in institute in Donbosco in this connection.

F) Desk work: Finally, the field data were carefully evaluated, necessary calculations were made and a comprehensive report was produced.

1.4.2 Socio-economic Study

A rapid participatory market mapping and discussion workshop, one of the tools of Practical Action's PMSD (Participatory Market Systems Development) approach was used to understand complex market systems, develop a vision of market growth and sustainability (jointly with market actors) and to design and implement strategic interventions (us as market facilitators only).

Together with the community level discussion and a checklist developed for the purpose of determining the feasibility of installing a gravity ropeway, we were able to analyse the production and marketing of goods and also the types of goods purchased by the people, which are transported to the two villages.

This involved a simple exercise with the community of identifying of such goods flowing from and to the villages and presenting the information in a simple tabular form. The information collected in the process includes the name of the products, quantity, seasonality, rate/price and the transaction markets.



The socio-economic study briefly looks at the current market situation and market linkages of each of these communities. Given the short time, the analysis is of broader perspectives on market development rather than focused value chain analysis or channel specific issues.

Figure 1.2: Meeting and orientation with the communities.

2. Background of Study Area

2.1 The Northeastern Region

The Northeastern region (NER) is the eastern most region of India consisting of the contiguous seven sister states and the recent entrant to this group, is the state of Sikkim. Meghalaya is one of the seven states. This landmass of 2.62 lakh sq. km covers about eight per cent of country's land mass and accounts for about 3.8 per cent of the country's population.

The states in the NER comprising of Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, and Sikkim, are mostly hilly and mountainous except for the plains areas in the Brahmaputra and Barak valleys in Assam⁵, the Imphal valley in Manipur, and the piedmont strip skirting the entire length of western Tripura. Overall, 98 per cent of its borders are with other countries namely Bhutan and China in the North, Myanmar in the East and Bangladesh in the South and West. The hill states and the region of NER is predominantly inhabited by the indigenous tribes. As per the 2001 census, the scheduled tribes form about 27 per cent of the Northeast population.

The region is renowned for its rich bio-diversity and it is one of the two areas in the Indian sub-continent classified as an ecological hot spot, denoting ecosystems, which are rich in biodiversity and possess rare and/or endangered and endemic species. It is one of the most biologically diverse areas of the world due to the dramatic changes in elevation coupled with heavy rainfall.

The economy of the region reflects its backwardness, with majority of workers engaged in agriculture. The poverty level in the region is among the highest in the country with the percentage of population below poverty line in the states ranging from 36 to 29 per cent⁶, compared to the all India average of 26 per cent.

The uplands are sparsely populated with the density of population as low as 13 and 42 persons per sq. km in Arunachal Pradesh and Mizoram respectively. Poor infrastructure is another feature of the upland areas with the development of transport, power and communication infrastructure lagging behind the rest of the country. Another feature is the low level of urbanization (except Mizoram). However, upland agriculture has remained predominantly subsistence with rural communities practicing shifting cultivation or jhum cultivation.

⁵ The plains occupy 30 per cent of the total geographically area of the Northeast but accommodates roughly 70 per cent of the population of the region.

⁶ Except for Mizoram where the proportion of population below poverty line is at 19.5 per cent as per planning commission estimates for 1999-00.

2.2 Meghalaya

2.2.1 The State

Meghalaya is a land locked territory lying between the latitudes of 25° 47'N and 26° 10'N and longitudes of 89° 45'E and 92° 47'E. It has a 496 km. long international boundary with Bangladesh in the south and west. With an area of 22,429 sq kms, it is predominantly inhabited by tribal people who account for 86 of the population (2001 census). Meghalaya attained statehood on the January 21st, 1972. Before this it was a sub state with the state of Assam. In course of time there has been many more reorganisation of the state into districts and blocks. Today the state is divided into seven administrative districts and 38 community and rural development blocks.

The Khasi, Jaintia, Bhoi and War, collectively known as the Hynniew Trep were predominantly inhabited by the people of the districts of eastern Meghalaya. These people are known to be one of the earliest ethnic groups of settlers in the Indian sub-continent belonging to Monkhmer of the Proto Australoid race. The western part of Meghalaya constituting of East Garo Hills, West Garo Hills and South Garo Hills districts is predominantly inhabited by the Garos belonging to the Mongoloid race of Bodo group. The Garos are also known as Achiks.

In addition to these main communities, there are other smaller tribal communities like the Mikirs, Lalung, Viate, Vaiphe, Hmars, Rabhas, Hajongs and Boro who are found scattered through out the state.

All the three major tribes of the state namely the Khasi⁷, Jaintia and Garo are matrilineal societies where inheritance and clan membership follow the female lineage through the youngest daughter. The Khasi and Jaintia societies consist of a number of kurs (clans). A Khasi belongs to the kur of his/her mother and the children adopt their mother's family name. In Khasi society, it is only the youngest daughter or 'Ka Khadduh' who inherits the ancestral property. She is considered as custodian of such property. While a man married to the youngest daughter normally lives in the house of his wife's mother, those married to elder sisters move out to establish separate households or they might continue to live with their husband in the house of their mother.

The majority of the population of the state lives in the rural areas. In 2001, the rural area accounted for 80 per cent of the population. Between 1981 to 2001, there has been a marginal decrease in percentage in the rural population of the state pointing to the a very slow rate of urbanization, which in turn indicates the lack of structural transformation in the economy and high dependence of the population on rural based livelihood, namely agriculture and allied activities. Further, most of the urban population is actually concentrated in the Shillong urban conglomerate in East Khasi hills accounting for 75 per cent of the urban population in 2001. All the districts have a rural population of well over 85 per cent, except in East Khasi Hills where it is 58 per cent. While the density of

⁷ Which also include the *Bhoi* and *War*

population of the state as a whole is 103 persons per sq km, there is wide variation amongst the districts with East Khasi Hills at 241 and South Garo Hills at 53.

2.2.2 Relief Features

Meghalaya is essentially a plateau region and is dissected into ridges and valleys, which lie at different altitudes. Except the narrow belts in the northern and the western parts, the whole of Meghalaya is a plateau, which is known as the Meghalaya Plateau, or the Shillong Plateau. The height of this plateau varies from 150 meters to 2000 meters from the sea level. The plateau is characterised by great diversities in relief. It is marked by highly dissected and irregular terrain on the northern and western side and steep and regular slopes in the southern side. The middle portion of Meghalaya, the plateau proper, looks like an imposing table land or plateau with steep escarpments and deep valleys bordering the Syhlet Plains. In the north, the boundary of the plateau is not well defined because of the presence of broken hill ranges in that part. On the basis of physiographic characteristics we may divide it into three distinct units:

- (a) The northern undulating hills
- (b) The central upland zones, and
- (c) The southern plateau.

The northern hills with their peaks varying in height between 170 - 820 meters gradually slope towards the Brahmaputra valley from the sub-mountain region of the Central Plateau, called Ri Bhoi by the local inhabitants. In this portion there are two peneplained surfaces - one stretches from Nongpoh to Byrnihat and the other from Jorhat to Khanapara. Above the altitude of 190 meters most of the hills are flat topped in character.

The central upland zone running from west to east is the most important physiographic unit of the plateau and occupies more than one-third of the central and eastern Meghalaya. Its outer boundary is formed by the contour of 1500 meters. This portion of the plateau consists mostly of rolling uplands intersected by rivers and dotted with rounded hills made of softer rocks. The highest point of the central upland zone is the Shillong Peak (1961 meters) which is located to the south of Shillong town, towards the west of Shillong there is a hill range called Deingiri which rises up to the height of 1823 meters.

The southern face of the plateau includes the steepest parts of the region. The local inhabitants know it as *war* country. Its northern fringe area has typical granite topography with rounded hills and shallow valleys. In the southern part there lies a vast structural platform which is built of gently dipping sandstones of cretaceous age and on the edge of which is located the magnificent Mawsmi waterfalls (near Cherrapunji). This structural platform stands as an escarpment and its surface has been deeply eroded by the agents and processes of fluvial erosion resulting from heavy rainfall. The deep valleys have divided it into three platforms, namely the Cherrapunji, the Lyngkyrdem and Mawsynram.

The terrain of Meghalaya has plays an important role in determining the character of the soil. In general, the soils are thin, immature, light in colour, less clayey and less fertile on the hilltops and are thick, mature, deep in color, more clayey and more fertile in the valleys and the alluvial low lands.

2.2.3 General Climatic Conditions

The climate of Meghalaya is controlled by the alternating pressure cells of northwest India and the Bay of Bengal and the maritime air masses coming from the south or the southwest. The cold season begins in November and continues till the end of February. The months of March and April are very warm. The rainy season start from May and recedes by August-September. The pre monsoon period in March and retreating monsoon in September to October are considered the best time of the year with very pleasant climate.

2.2.4 Economy and Livelihood

Meghalaya's economy is agriculture based with about two third of its rural population depending entirely on agriculture for their livelihood. Paddy is the main food-crop grown in the state. Besides maize, wheat, millets and pulses, potato, jute and mesta, cotton, mustard, ginger, turmeric, areca nut and betel leaf are some of the important cash crops produced in the state. Among the horticultural crops, banana, pineapple, citrus fruits mainly orange are grown in abundance in medium and lower altitude regions while fruits like plum, pears and peaches are grown in altitude temperate region. Though the state is deficit in terms of food grains production, there are surplus cash crops and horticultural crops.

The different methods of cultivation practised are Jhum or shifting cultivation (locally called *rep shyrti*) for growing annual crops, while the *Bun* cultivation (locally called *rep bun*) is used mainly for cultivation of potato and other vegetables⁸. Wet-rice cultivation is practised on lower land, called '*hali*' or '*pynthor*', which are capable of retaining plenty of water. Lowlands are usually situated in valley bottoms, which are divided into small plots, corresponding to the alleys of the plains, called '*stir*' in Khasi. These are mostly used for lowland rice cultivation.

2.2.5 Village Councils (Dorbar Shnong)

In villages inhabited by the Khasi and also the Jaintia tribes, a three tier traditional democratic structure of governance is in place represented by the Shong (village), Raid (cluster of villages) and Hima (congregation of Raid).

At the lowest unit in the village is the Dorbar Shnong or village council. The head of the dorbar called the Tymmen Shnong or Rangbah Shnong (and other

⁸ While Jhum cultivation is mostly practiced in lower elevation. In higher elevation in the Khasi and Jaintia Hills, especially in areas where the tree growth is sparse, a modified version of jhum cultivation locally called *Bun* is practiced.

functionary) is elected by adult male residents of the village and he function on the basis of collective decision making. Every adult male member of every household in the village is required to actively participate in the deliberations of the dorbar and facilitate decision making. The dorbar works for the maintenance of social solidarity and overall development of the village. Women are not represented in the dorbar and thus not part of the decision making process.

At the second tier is the Dorbar Raid which is the council of cluster of villages. At the top of this structure is the Hima (also known by other names such as Doloiship, Lyngdohship, Wahadadarship and Sordarship). The Hima is governed and ruled by 'Dorbar-Hima' (council of adult male members from every constituent village and Raid). The head of the Hima comes from a particular clan in the khasi society.

On the other hand, the Garos have a much simpler institutional set up which is clan based village community. The Garo system of governance consists of Akhing land which is equivalent to village or a group of villages. All the land within the Akhing belongs to a particular clan or lineage and the Akhing functions under the supervision of the Nokma who is the head of the clan. The Nokma regulates the political, social and economic life of the people under an Akhing with the common consent of the Akhing elders who function as his council of advisers. There is no political unit above the Akhing and no authority higher than the Nokma.

Under paragraph 3 of the Sixth Schedule, the autonomous district councils have the power on the appointment and succession of Chiefs and Headmen. The appointment of the Rangbah Shnong of the dorbars is required to be endorsed by the councils. The councils are empowered to constitute village councils or courts for trails of suits and cases of the scheduled tribe communities.

2.2.6 Land Ownership

The land ownership system in the State is governed by traditional customary laws. These laws have not been codified and till date no cadastral survey has been conducted in the state except in some villages in the plain mauzas of the Garo Hills districts⁹.

In Khasi and Jiantia Hills there are basically three main types of land based on ownership: (i) Community land-Ri Raid (ii) Private Land- Ri Kynti, and (iii) Government Land.

(i) Communal Land- Ri Raid which can be a forest or non-forest land are owned by the community over which no persons have proprietary, heritable or transferable rights except for the right to use and occupancy. These lands are allotted by the dorbar to the persons belonging to the community generally for building of house,

⁹ Since independence many laws have been enacted to safeguard tribal ownership of the land in the State the least being *The Meghalaya Transfer of Land (Regulation) Act 1972* passed by the Meghalaya Legislative Assembly which prohibited alienation of tribal land to non-tribals.

cultivation or any other purpose. Such rights revert back to the community when the person ceases to occupy or use the land for a period of three years consecutively. Heritable or transferable rights over Ri Raid land accrue when the occupant has made permanent improvements on the land. No rent or tax of any kind is charged on land for enjoying occupancy rights.

(ii) Private Land- Ri Kynti are owned by private individuals or by certain clans. The owners enjoy permanent proprietary, heritable and transferable rights upon such land. Ri-Kynti is of two types- ancestral and self-acquired. The ancestral lands (Ri Kur or clan land) are customarily under the control of the clan while the self-acquired lands are under the complete ownership of persons who have purchase the land through personal earnings.

(iii) Government Land- This is land acquired by the government over which it has full rights as owner of the land.

In the Garo Hills, the land is divided into two parts; the Plain Mauzas¹⁰ and the Hills Mauzas. The Riotwary system is prevalent in the plain mauzas, and the customary land tenure system is prevalent in the hill mauzas. In the Hills, the land belongs to particular clans and is known as akhing land. This land is under the control of the head of the clan called the Nokma. Though theoretically the nokma is a female, in actuality the akhing land is managed and controlled by her husband on her behalf. Each clan owns an akhing, which is used by clan members for meeting their livelihood needs through cultivation and for habitation

¹⁰ In India officially a village stands for an area demarcated as a Mauza meaning 'parcel of ground with defined boundaries, for revenue purposes without clear and consistent regards for its population'.

3. Technical and Socio Economic Assessment

This chapter is organized into two parts. Part A reports on the Nongtraw village and part B on Thuruk.

3.1 Nongtraw village

3.1.1 Socio-economic assessment

i) Profile: The village of Nongtraw, located in Laitkhroh- Khatarshnong block in East Khasi Hills District, is one of the many villages in the block which are not connected by a road. Laitkhroh- Khatarshnong is one of the eight communities and rural development blocks in East Khasi Hills district of Meghalaya. The people of the village belong to the *Khasi-war* community which is a part of the Khasi tribe.

There are five other small villages in the vicinity of Nongtraw namely Wahshora, Diengsong, Dewlieh, Mawtuli and Nohshud. They are all not connected by roads. The total number of households in all five hamlets is 80. Of the five, Diengsong is the largest with 50 households.

(ii) Accessibility: Nongtraw is accessible via the Shillong - Shora road through a stop called Shora Rim or Old Sohra which lies on either side of the road and is about 12 kms from Cherrapunji¹¹. Just beyond the village of Sohra rim, about 200 meters on the North side of the road, is a flight of cemented steps, about 2500 in all, which leads to the village of Nongtraw. While Shora rim sits atop the southern plateau, the village of Nongtraw is situated near the foothills¹². The difference in the elevation between the two villages is about 360 to 370 meters.

Despite the fact that the village lies very near the road, the time taken to climb up the steps is approximately one hour (with load) and the trip down can be covered within 30 to 40 minutes. There is a further walk of 10-15 minutes from the top of the stairs to the road head. As most of the facilities such as block headquarters, bank, main markets health centre and higher secondary school are located in Sohra, the local communities traverse this route many times daily.

(iii) Demographic and Infrastructure: Nongtraw is a small hamlet with 32 households. The village is electrified and also has access to pipe water supplied through stand posts by the government (through the Public Health department). The village has a primary school and also community hall which are both concrete structures. Almost all the houses (except for four) have tin roof with 78 percent connected to electricity.

¹¹ Cherrapunji now known as Sohra is located at a distance of about 54 kms from Shillong and sits on the edge of the southern plateau overlooking Bangladesh. It lies at an elevation of 1370 m (4500 feet) and is known as the wettest place on earth.

¹² Nongtraw lie almost at the same elevation as Shora

(iv) **Main occupation:** Agriculture is the main occupation of the people of Nongtraw with 29 of the households depending on it. The households in the village practiced Jhum or shifting cultivation. Land belongs to the community and the use of it is regulated by the Dorbar. The main agriculture produces are broom grass, tapioca, banana, sweet potato and potato.



Besides agriculture, the other main occupations are government service (one household) and school teaching (two households). In addition to agriculture, rearing of livestock is an important subsidiary occupation to the households. As many as 28 of the 32 households (88 per cent) are involved in rearing of poultry (of the indigenous breeds) while 5 households (16 per cent) are involved in pig rearing. There are also three families that are involved in bee keeping.

Figure 3.1 : Collector themselves occupying small stalls in weekly market

Another important occupation of the households is basket making. The baskets are made of bamboo and sold in the markets. Almost all the households are involved in this activity and it forms an important source of household income. Many of the men of the villages are also working as labourers in the coal mines in the nearby areas.

(v) **Well-being:** The well being ranking of households based on community perceptions indicate the following: Nine households belong to the poorest category, 22 households are poor families and one household belongs to the middle wealth category.

(vi) **Flow of goods Analysis:** The information of the types of goods, quantity, seasonality, price/rate and the markets are provided in the flow of goods matrix in tables 3.1 and 3.2.

There are seven main products cultivated/produced by the households which at present the villagers have to carry up from the village to the road in Sohra rim. Besides these commodities, other goods which are produced by the households such as pineapple, squash and a variety of different vegetables are at present not being marketed by the villagers because of the problem of carrying them up the steep climb to the nearest motor able road.

Sl. No	Produce/ Commodities	Season	Quantity	Price (Rs)	Nearest Market
1	Basket	Throughout the year	One truck per week	Rs. 10 to RS. 50 per piece	Sohra (10 kms), Mawngap (40 kms), Shillong (38 kms)
2	Broom grass	Feb & May	200 Quintal	Rs. 50 per Kg	Sohra Rim (market nearby)
3	Black Berry	Aug - Oct	300 basket	Rs. 560 per basket	Shillong, Sohra,
4	Banana	Throughout the year	varies	varies	Sohra
5	Red Berry	Feb - Mar	200 Basket	Rs. 150 per basket	Shillong, Sohra
6	Wild Berries	Apr-May	100 basket	Rs. 100 per basket	Shillong, Sohra
7	Cucumber	July - Sept	200 no. per week	Rs. 60-80 per khuri	Sohra, Laityryngew (5 kms)
8	Tapioca	Oct - Apr	2 basket per week	Rs. 160 per basket	Sohra, Laityryngew
9	Yam	Dec - May	1 basket per week	Rs. 200 per basket	Sohra, Laityryngew, Shillong,
10	Sweet potato	July - Dec	10 Kg per week	varies	Sohra, Laityryngew
11	Squash	Jun - Dec	-	Rs 5 per kg	Sohra rim

Table 3.1: Flow of Goods Matrix- Up commodities come from Nongtraw

The commodities and goods that are supplied into the village are shown in the table 3.2 below.

While most of the times the produces are carried by members of the household, at times they are carried by people from the village on payment basis¹³. It was found that since many of the men in the village are employed in the nearby coal mines, the task of carrying the goods fall on the women members of the household. Essential commodities like rice, salt, cooking oil, kerosene and other fast moving consumer goods (biscuits, noodles etc) and personal items are carried in on a regular basis while construction materials and consumer durables like cement, iron rods, furniture, wood etc. are carried in occasionally. Since these items are very heavy to carry the households have to employ porter to carry these goods.

Sl. No	Produce/Commodities
1	Rice
2	House hold goods
3	Cement
4	Iron
5	Sand
6	Pebbles
7	Bricks
8	Tin roof
9	Plants/ wood
10	Feed for poultry
11	Furniture

Table 3.2: Flow of Goods Matrix- Down commodities to Nongtraw

Market observation: Local communities of Nongtraw and the surrounding clusters have developed some market linkages although it is rudimentary and limited to transactions based on selected commodities and agriculture produce. During the assessment, the locals reported that traders seeking baskets do come all the way to the village but the rest of the produce has to be taken to weekly markets or other urban areas, clearly demonstrating the higher demand of basket and its well-developed marketing channels. Furthermore, the communities currently do not practice any sort of collective marketing or input procurement which greatly increases their transaction costs. Given their proximity to a well-developed urban market (Shillong) and a small rural trading area (Sohra), the locals have yet to take advantage of their situation through increased production, value addition or targeted niche products. Finally, the team observed limited access to critical technical service like agro-vets in Nongtraw and its surrounding cluster. Although the proximity to Shora market would be one of the factors that hinder the entry of such service providers, lack of local service provider also means higher costs incurred in accessing services and longer time between service deliveries - again these two factors could possibly limit their productivity and competitiveness.

¹³ The cost of carrying a bag of cement (50 kgs) is Rs. 50

3.1.2 Technical Assessment

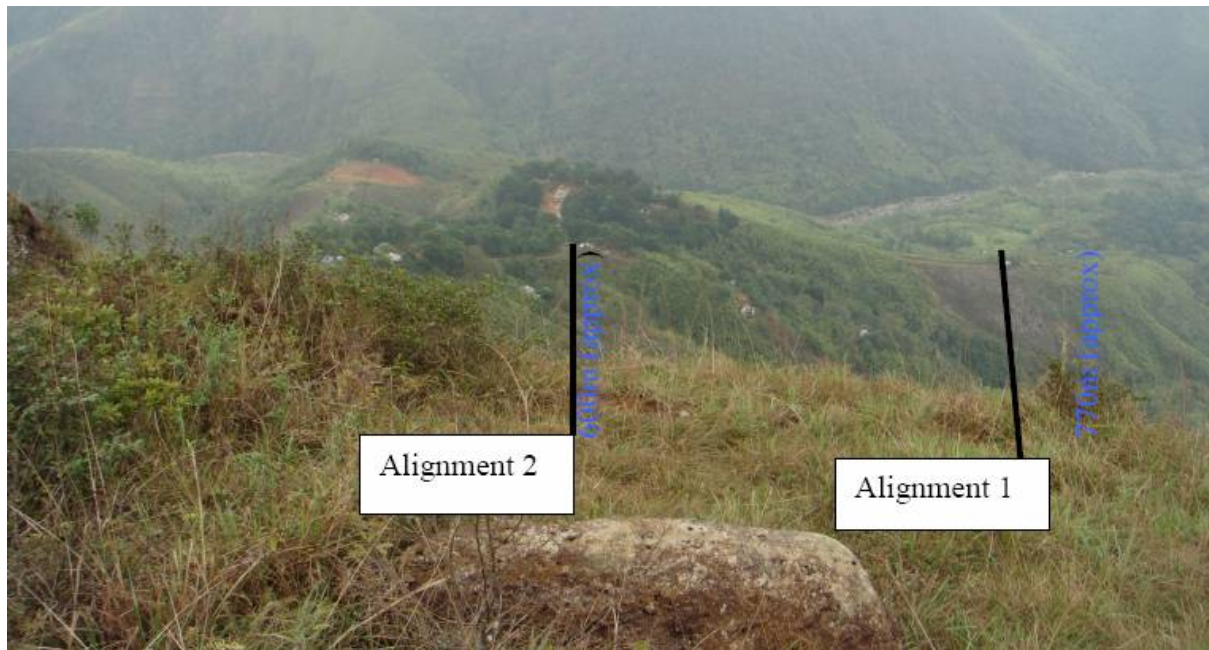


Figure 3.2: Possible Alignment in Nongtraw village

The above picture shows the two alignments viable from technical aspects in the proposed site in Nongtraw village. But, the community and the head man in particular didn't appreciate the idea of having the bottom station of the ropeway in middle of the village. He maintained that the village is fast growing and they cannot afford to set aside the land in the middle of the village for the ropeway. He rather opted for alignment 1, where the proposed bottom station would be a few meters below the village. Moreover, going for alignment 1 would also mean that the neighboring villages would get benefited as the bottom station would be closer to them than in the case of alignment 2.

Location details of alignment 1 along with topographical details

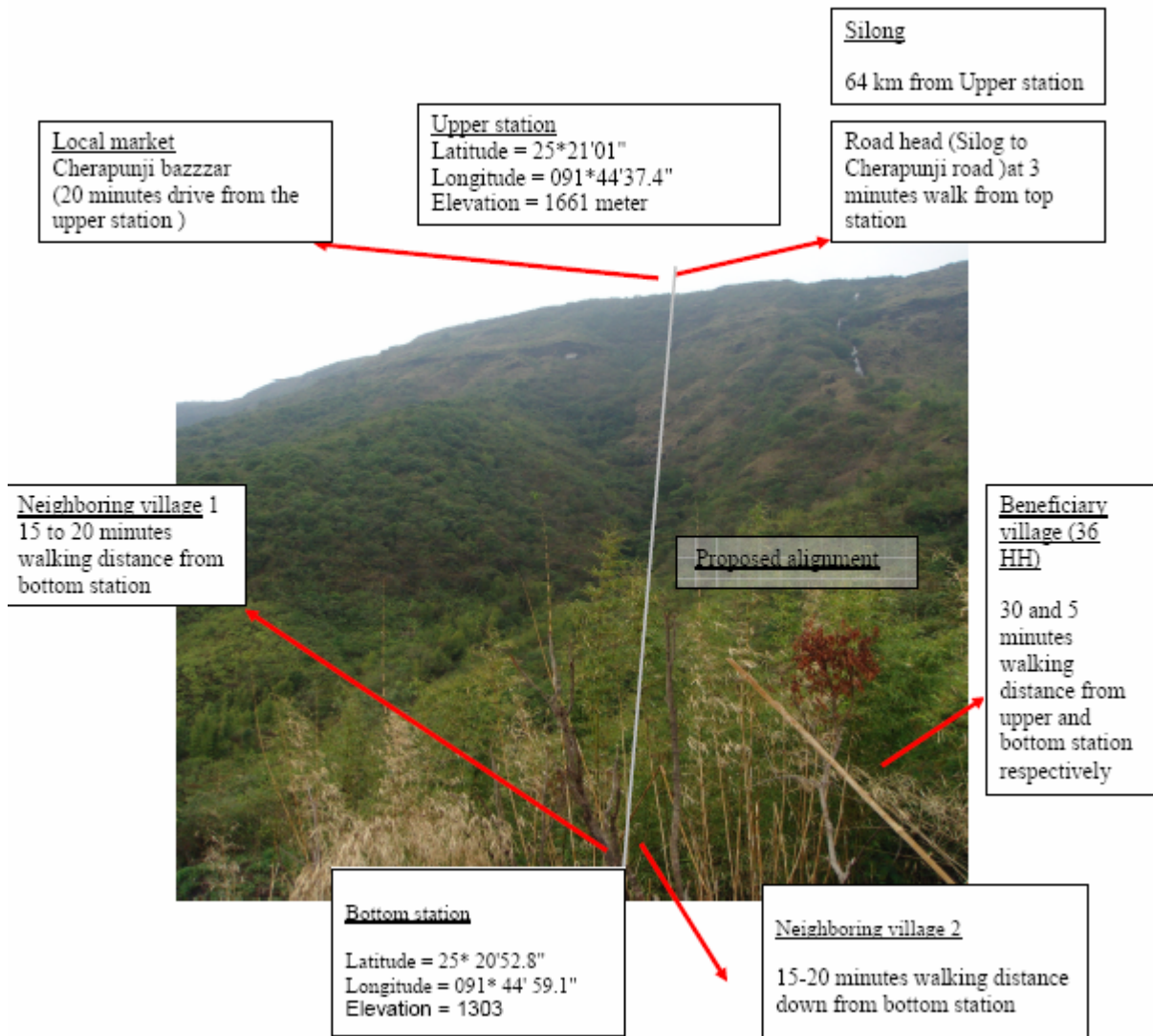


Figure 3.3: Location details of alignment 1 with topographical details

As all the technical parameters like span, angle of elevation etc lie within the permissible limit and since there are no serious climatic/environmental adversity, the site is technically feasible for installation of gravity ropeway. For robust design of the accessories and structures, further detailed survey/study of the site is needed. Though the logistic of the site is ideal for gravity ropeway installation, maintaining the load balance is challenging. The site is peculiar in a sense that the village lies at the bottom station of the ropeway which is contrary to the common practices where the village is at the upper station. To run a ropeway, it is imperative that the loading ratio of the downward and upward moving load is 3:1. But, the primary survey indicated that insignificant amount of goods goes to the village in comparison to the produces going out of the village. So, it can be the limiting factor to run the ropeway in long run if alternative measures are thought in advance. Followings are some of the suggested measures:

- The slope of the site is high and the span is relatively small. There is scope for reducing the loading ratio to 2:1.
- One of the simple and efficient measures to maintain the load balance when ever the downward moving load is less is to pass water. So, it is recommended to construct a tank in upper station .Water can be collected through rainwater harvesting or piping from the nearby spring.
- In addition to above, bulking up of goods at upper station would also help in maintaining the loading ratio. A collection centre is to be constructed at the upper station for collecting the loads and when enough load is collected for maintaining the load ratio, then only set the ropeway in operation.
- If there is enough produces in the village to export to the market and the tariff could make up the cost of the diesel, a diesel engine could also be fitted in the gravity ropeway. Whenever there be no or less load to descend, the ropeway would be operated through the engine otherwise it would function normally under gravity. This option is not preferred as long as the earlier -mentioned measures work.

The technical specification of the gravity ropeway is discussed in the next section.

3.2 Thuruk village

3.2.1 Socio-economic assessment

(i) Profile: Thuruk is located in Saipung block in Jaintia Hill district. The block is a coal rich belt of the state. Besides the Jaintias who are the dominant tribe in the district, Saipung block has a sizeable Baite population. The Baites, a sub-tribe of the mizo¹⁴, are a minor tribe in Meghalaya. In Saipung, the Baites are concentrated in Thuruk and the neighbouring villages which lie close to the North Cachar district of Assam.

(ii) Accessibility: Thuruk is located near Lungmaicham village. Both Thuruk and Lungmaicham are located on hilltops. Lungmaicham is the last village which is connected by a fair weather road that is motor able only during the winter dry season isolating these clusters of villages in monsoon season. To reach Lungmaicham from Thuruk, one has to walk about one hour through a slippery forest track.

Lungmaicham is the nearest market for the people of Thuruk and neighbouring villages where the people sell their products and also buy their required provisions. Besides this market, the next important market is in Saipung which is about 62 kms. Saipung is also where the bank and block headquarters is located.

Besides Thuruk, there are seven other villages lying beyond Thuruk that uses the forest track to Lungmaicham and Saipung.

¹⁴ Predominant tribe of Mizoram.

Sl. No	Villages	Households	Population
1	Thuruk	83	700
2	Saibal	70	600
3	Muolsei	110	1000
4	Jongrianew	12	60
5	Arten	15	100
6	Trizol	17	100
7	Moulhoi	32	250
8	Saphat	25	150
	Total	364	2960

Table 3.4: Demography of Thuruk and nearby Villages

(iii) Demographic and Infrastructure: Thuruk has 80 households. There is no electricity in the village although the village is connected with electric transmission lines¹⁵. The village has a public lower primary school, an upper primary school and an EGS centre. The village also has a community hall. Seventy four per cent of the houses have tin roof. A unique feature of the village is that all the households have proper toilets.

(iv) Main occupation: Agriculture is the main occupation of the people of Thuruk and Jhum cultivation is a common agricultural practice. Land belongs to the community and the use of it is regulated by the village council. The main agriculture produces are paddy, Maize, yam, vegetables like brinjal, cucumber, chilly and pumpkin. The people also grow fruits like oranges and banana. Rice is cultivated in Jhum field and also in terraces while orange is grown in orchard.

Besides agriculture, people are also involved in rearing of poultry (64 houses), cattle (43 households) and piggery (10 households). Weaving is another important activity of the women of the households. Burning of wood for production of charcoal is another activity which the villagers are engaged in particularly during the winters.

(v) Flow of Goods Analysis: There are as many as nineteen types of produce/commodities that come from Thuruk and nearby villages to Lungmaicham. These are shown in table 3.4 below. At present all these commodities are carried by the people to Lungmaicham. Similarly there are as many as seven important commodities that are carried from Lungmaicham to the eight villages. These are shown in table 3.5.

While most of the times the produces are carried by member of the households, at times they are carried by people from the village on payment basis.

¹⁵ The village had received electricity in the past, albeit for a short duration of a week. After that the power stopped for unknown reasons.

Sl. No	Produce/ Commodities	Season	Quantity (carrying capacity per tripper person)	Frequency	Price (Rs)	Nearest Market
1	** Cane	January to March June & July	60 kg	Twice a week	Rs. 5 to Rs. 10 per piece	Lungmaicham
2	Broom grass	February to March	50 to 60 kg	Twice a week	Rs. 25/kg (dry)	Lungmaicham
3	* Ginger	December to February	50 - 60 kg	Twice a week	Rs. 10/kg	Lungmaicham
4	**Lichen (stone flower)	Throughout the year	30-40 kgs	Weekly	Rs. 50/ kg	Lungmaicham
5	Yam	December to March	10 kgs	Weekly	Rs. 10/kg	Lungmaicham
6	Pumkin	November to January	5 to 6 nos	Weekly	Rs. 5 to Rs. 10 per piece	Lungmaicham
7	*Beans	December to January	30 kgs	Weekly	Rs. 20 /kg	Lungmaicham
8	*French beans/cow pea	August to September	30 kgs	Weekly	Rs. 20/kg	Lungmaicham
9	Wild onion	Throughout the year	40-50 bundles	Weekly	Rs. 20 per bundles	Lungmaicham
10	Tapioca	October to January	10 kgs	Weekly	Rs. 5 per piece	Lungmaicham
11	Tree bean	December to January	30 kgs	Twice a week	Rs. 2 per piece	Lungmaicham
12	**Chilli	July to September	30 kgs	Weekly	Rs. 60/kg (green) & Rs. 200/kg (dry)	Lungmaicham
13	** Brinjal	July to September	20 kgs	Weekly	Rs. 10/kg	Lungmaicham

14	* Solanum sp	July to September	15 kgs	Weekly	Rs. 10/kg	Lungmaicham
15	** Banana	Throughout the year	One whole bunch	Weekly	Rs. 15/- for 12 pieces	Lungmaicham
16	Pine apple	June to September	15 piece	Weekly	Rs. 5to Rs. 10 per piece	Lungmaicham
17	*Orange	November to January	150 pieces	Weekly	Rs. 10 for 3 pieces	Lungmaicham
18	** Piggery	Throughout the year	50 to 60 kgs	Monthly	Rs. 9000 to 10000/- per pig	Lungmaicham
19	*Poultry	Throughout the year	15 birds	Daily /weekly	Rs. 250 to Rs. 300 per bird	Lungmaicham

** Highly focus products
* Focus products

Table 3.4: Flow of Goods Matrix- Commodities that come from Thuruk and neighbouring Villages

Sl. No	Produce/Commodities	Quantity (carrying capacity per tripper person)	Frequency	Remarks
1	Household	5 to 10 kgs	Monthly/Weekly	-
2	Potatoes & off season vegetables	5 to 10 kgs	Monthly/Weekly	-
3	Rice	40 kgs	Every three month/monthly	after -
4	Rod/Ring for house construction	50 kgs	Twice or once in a year	Head load charge Rs. 100 for 50 kg.
5	Cement	50 kgs		Head load charge Rs 100 for 50 kg
6	Limestone/Paint	40 kgs	Twice or once in a year	-
7	Tin roof for house construction	-	Once in a year or after 3 year	-

Table 3.5: Lists of Up Commodities for eight villages

Market observation: Thuruk village has the unique advantage of being the market hub for the 7 other surrounding villages/ communities as the motor able road from Lungmaicham to this cluster ends in Thuruk. However, due to lack of skills, knowledge and abilities to respond to market opportunities, Thuruk has not been able to capitalize on their comparative advantage nor are they able to offer anything other than collection point for goods. This cluster of 8 villages has a well-diversified economy derived from natural resources that are abundantly available where the locals are able to gather NTFPs¹⁶ (like Lichen and Cane), raise livestock and cultivate vegetables and fruits. However, given their distances from the local markets, isolation during monsoon period and limited marketing abilities, they are often marginalized and cannot access fairer markets to increase their profits. Furthermore, these village clusters suffer from acute lack of critical services as very limited number of service providers were observed in Thuruk (the main hub). Access to inputs, finance, technical advice and market information are often limited to farmer to farmer interaction and/or project/ NGO staff. Both of these sources are not well-placed to provide the most relevant, accurate or appropriate information on a sustainable manner.

¹⁶ Non Timber Forest Products

3.2.2 Technical Assessment

Topographic details of the site



Figure 3.5: Proposed alignment for ropeway

Span one - Station 2 to 3

Elevation of upper station = 1125 M

Elevation of middle station = 961 M

Angle of inclination = 12°

Span = 790m

Min sag required = 40m

Approaching angle = 0°

Span two - Station 1 to 2

The tentative angle of inclination = 6 to 7 degree

Span length = 600 meter (approximate)

The above topographical data does not support the gravity ropeway technology. Though the span is within the permissible limit, the angle of inclination of both the span is far low then the minimum slope required for operating a ropeway. Therefore, gravity ropeway is not possible and recommended in this site. Instead, power fed or hybrid type ropeway may suit the geography. Furthermore, the beneficiary village and the market /road head are approximately at the same

elevation at two different ridges separated by a gorge. Therefore, connecting the village with the market with single span ropeway is not possible. It requires either two independent units of ropeways or multi span ropeway. The possible options are discussed in the next section.

The topography and the logistic of the site are not suitable for the installation of gravity ropeway. Therefore, this technology is not recommended for this site. But, if the site is socio economically feasible and community can generate the running cost, there are two options, which are discussed in the site descriptions above. The prospect and constraints of each option are illustrated so, it is up to the support organization and community to choose between them considering its social and economical aspects.

4. Findings and Recommendations

4.1 Technical Proposal

4.1.1 Technical Specifications

4.1.1.1 Gravity ropeway at Nongtraw

The topography of the site is ideal for the gravity ropeway technology (please refer above information). The following are the salient features of the proposed gravity ropeway.

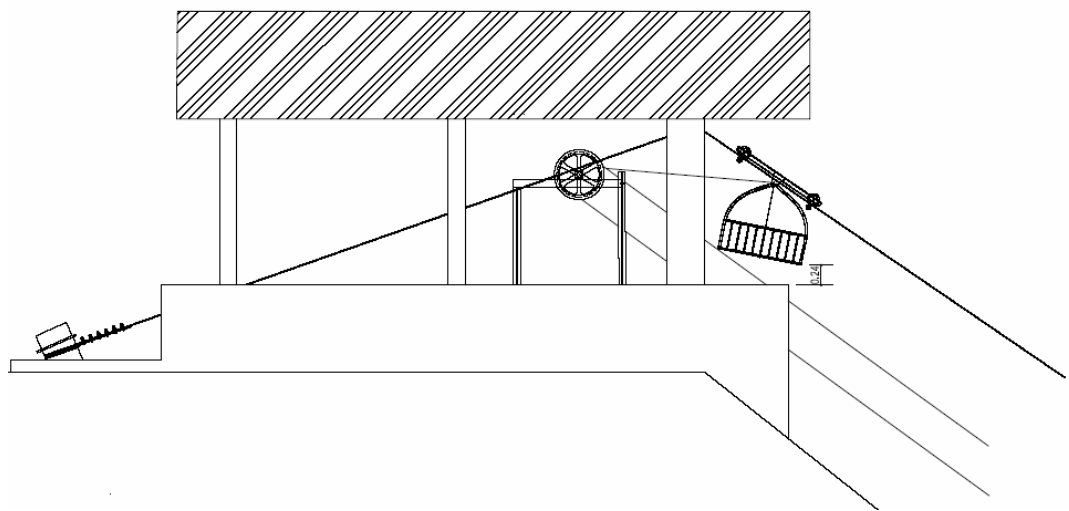


Figure 4.1: Typical drawing upper station

Ropeway type	Bi- cable gravity ropeway
No of span	One
No of Tower	Two
Elevation difference between the stations	358 meters
Horizontal distance between the stations	673
Angle of elevation	28 Degree
Inclined distance	763 meters
Carriage rope size	12mm dia 6X19 seale -
IWRC	core
Haulage rope size	9 mm dia 6X19 seale - fibre core
Max .load carrying capacity (downward)	120kg
Max. Load carrying capacity (upward)	50 kg
Weight of trolley	35 kg
Min Sag to be provided	45 meter
Travel time	1.5 minute (max)
Angle of inclination at bottom station (B1) corresponding to 45 m sag	= 15 degree

4.1.1.2 Gravity ropeway at Thuruk

a) Option 1: Multiunit hybrid ropeway

Two independent units of ropeway are installed for two stretches (station 1 to 2 and station 2 to Station 3). Both the units will share the same bottom station i.e. station 2 but have separate upper stations one proximate to the village and another to the market. As the slope of both the stretches is far less than the required slope to run gravity ropeway, both the stretches are not feasible for it. So, it would require power fed ropeways. As there is no electricity, diesel operated ropeway is the only resort. The diesel consumption can be minimized in stretch one as the descending load can travel to the midway under the influence of gravity before pulling it with the motor. This option is bit tedious as it would require loading and unloading of the goods at the intermediate station also. This option will require additional operator at the intermediate station also, which increases the operation cost in the long run.

b) Option 2: Multi - span Power fed gravity ropeway

The more convenient option is to go for multi span power fed ropeway. There will be an intermediate tower in place of station 2 in this case. The ropeway will be a single entity and loading and unloading of goods is not required in between the final destinations. It doesn't require the additional operator at the intermediate station. But the initiation investment is slightly higher than the previous option. It also involves more technicalities than the previous one. The sheave position has to be horizontal instead of vertical and special arrangement is needed for the saddle at the intermediate station for the trolley to pass smoothly through it. The installation cost will be roughly 20 to 30 percent higher than the option 1.

4.1.2 Costing

4.1.2.1 Cost breakdown for Nongtraw

The approximate project cost is Seven lakhs eighty six thousand and seven hundred fifty rupees only (Rs, 786,750). The approximate estimation and costing is based on the previous experience of Practical Action, Nepal and prevailing market price of the materials at the time of the pre-feasibility study. This is for the idea of the budget required for the scheme but more accurate and realistic costing of the scheme is to be carried out after the final design of the ropeway.

Particulars	Cost	Local Cost	Non Local Cost
A. LABOUR COST			
Skilled	48,000	48,000	

Unskilled	138,000	138,000	
Sub- Total (A)	186,000		
B.MATERIAL COST			
Wire Ropes	258,750		258,750
Steel Parts (Sheave ,trolley etc)	105,000		105,000
Transportation	35,000	20,000	15,000
Cement	47,000		47,000
Reinforcement rod	12,000		12,000
CGI Sheet for roofing	30, 000		30,000
Sand , aggregate and stone	95,000	95,000	
Hand Tools and Equipment	18,000		18,000
Sub-Total (B)	600,750		
Total (A +B)	786,750	301,000	485,750

Table 4.1: Cost breakdown for Nongtraw

N.B: The cost is exclusive of the detailed survey and design cost

4.1.2.2 Cost Breakdown for Thuruk

Particulars	Cost	Local Cost	Non Local Cost
A. LABOUR COST			
Skilled	66,000	66,000	
Unskilled	208,000	208,000	
Sub- Total (A)	274,000		
B. MATERIAL COST			
Wire Ropes	348,750		348,750
Steel Parts (Sheave ,trolley etc)	195,000		195,000
Diesel motors 2 units (7.5 KW)	90,000		90,000

Transportation	55,000	35,000	20,000
Cement	65,000		65,000
Reinforcement rod	27,000		27,000
CGI Sheet for roofing	45, 000		45,000
Sand , aggregate and stone	155,000	95,000	60,000
Hand Tool and Equipments	18,000		18,000
Sub-Total (B)	998,000		
Total (A +B)	1,272,750	404,000	868,750

Table 4.2: Cost breakdown for Thuruk

4.1.3 Project Planning and Scheduling

4.1.3.1 Time Planning

Time management simply means to get more in less time. It means utilizing minimum time to accomplish the goals. Time is scarce resource in project management. Time wastage means cost escalation. It includes the preparation of project activities schedule using bar chart. Preparation of project implementation schedule in the initial stage is always helpful since it will indicate what activities are in critical path and allow for planning ahead .This chart will be very useful in optimizing the resources (labor, equipment and materials) by distributing them in balanced way.

Furthermore, this will also be key tool to monitor progress by tracking the planned versus actual milestones reached both for particular activity and for the overall project implementation. Undoubtedly, such a chart will undergo frequent revision during the construction phase. However, it is still helpful to formulate a chart and, make few changes as necessary, since it can be to monitor the progress of work and plan for future activities such as procurement of construction materials and labour arrangements.

4.1.3.2 Labor Resources planning and scheduling

Local human resources are mobilized in the construction of gravity ropeway. In most of the cases the local community is involved in voluntary contribution. So, the no of working hours per day and the individual output per day assumed in the norms setting may not fit the local context. Therefore, the number of people and days required for each day should be worked out depending upon the individual output and working hours. Then the no of people required for each operation and

the time taken for each tasks are then reconciled to give the exact no of people and days required for each operation. This is very important as work supervisor or the construction committee should ensure the required manpower at the required time. A typical manpower scheduling is shown in the following figure accompanied by the graph showing weekly variation of manpower

4.1.3.3 Availability of Materials and Labor

Local materials: Among the local construction materials, stones are locally available in abundance. Community has to import the sand from outside and the purchased sand is transported up to the road head on trailer and then pottered to the village. Likely, as the quality of the aggregate prepared from the stone available in the village is not good, community opted to purchase the aggregate from outside. This will increase the construction cost.

Non- local materials: The non-local construction materials such as cement and reinforcement rods are available in local markets (Cherrapunji Bazaar in case of Nongtraw village, the nearest market centre for the village, which is just twenty minutes distance on vehicle from upper station of the ropeway). There are 5/6 small fabricators which are primarily engaged in small-scale fabrication of doors and window grills in Cherrapunji Bazaar. The workshops are equipped with the drilling and welding machines. If trained and capacitated the fabrication of trolley, brakes and other steel parts is possible through them. They have potential to be developed as the local service centre and provide support in the repair and maintenance.



Figure 4.2: Fabricator at Cherrapunji



Figure 4.3: Workshop in Shillong

Labour: Most of the male members of the village work in coal mines. So, there could be some difficulty during the hoisting of cable for gravity ropeway as manpower is required in hundreds at a time. But, the community's enthusiasm

towards the installation of gravity ropeway is high .The female members are especially interested in the scheme and are ready and capable to take the responsibility of construction upon them.

The skilled manpower required for the construction of gravity ropeway is available in the village.

4.1.3.4 Climatic Condition

Though in depth study of climatic condition of project areas does not fall in the scope of this study, some observations were made during the study regarding this which are as follows:

Heavy rainfall - The intensity of rainfall is very high in the project area. This may have adverse effect on the ropeway if necessary precautions are not taken. The operation of ropeway should be halted during heavy downpour and the mechanical components should be properly shielded by the sheds at each station.

Wind - The maximum wind speed during the study was recorded at 22 km/hr which is not much alarming. But as per the villagers, the wind speed in the area is much more than this and in that case necessary precautions should be taken against it during the design and operation of gravity ropeway.

4.1.4 Operation and maintenance

As the gravity ropeway employs very simple technology, operational safety is very crucial. Its life is largely dependent on the operational safety and its regular maintenance. Its maintenance cost is very nominal as well. Regular greasing of rope and bearing, time-to-time replacement of brake shoes and periodical replacement of shelve bearing are the primary maintenance works. These all together constitute the annual maintenance cost of less than Rs. 10,000. Major retrofitting in the case of gravity ropeway might be the replacement of wire rope but experience has shown that, if due care is given to its regular maintenance and operation, its life is greater than 10 years. It is necessary that the rope is thoroughly inspected by a competent person every two years of operation.

Max per annum operation and maintenance cost

Particulars	Cost (Rs,)	Remarks
1. Lubrication and Greasing (after every 200 hours of operation) -	4000	
	500	
2. Paint (Primer) - Trolley	2000	
3. Bearing	1200	
4. Brake/brake shoes replacement		
5. Trolley Pulleys replacement	1000	
6. Mechanics Charge	1000	
7. Operators Salary	72,000	Rs, 3000 per month per person
8. Miscellaneous	2000	
Total	Rs, 83,700	

Table 4.3: Operation and maintenance cost

As the gravity ropeway solely operates under the influence of gravity, it does not require any fuel or external power. Therefore, its running cost is zero except the operator's salary. It is imperative to have a trained operator at the time of operation at each station. So the operator's salary is the major operating cost. The operators should be selected from the beneficiaries' communities and properly trained before deployment.

The operation cost will include the cost of the diesel in case of the hybrid type and the diesel powered gravity rope. The cost will depend upon the frequency and duration of the operation, which should be worked out separately.

4.2 Market Development Proposal

4.2.1 Market situation

Markets are important to the rural poor in Meghalaya. In fast growing economies like that of India, markets play a key role in uplifting large numbers of rural poor through better employment opportunities, fairer wages and better prices for agriculture produces. However, markets do not always work for the poor. Due to limited risk taking abilities, low skills, limited assets, high transaction costs, limited understanding of the market trends and their remote and often isolated locations - markets fail to include or in most cases they exploit the abilities of the marginalized.

Limited local economic opportunities and aspiration for better livelihoods has resulted in the large scale migration of men from rural communities in Meghalaya to more thriving areas within the North Eastern States or even within Meghalaya to places like Shillong and East Jaintia hills coal mines. This is especially the case for Thuruk and its surrounding cluster of villages. Although, it has resulted in stabilising the economy through remittances it is also contributing to the feminisation of the agriculture economy. Most would argue that this is a welcome change and does provide increased opportunities for women to participate in the economy, there are certain issues to be addressed as well. Loss of traditional knowledge, decreased farm productivity and increased burden on women are some of the immediate impacts seen from this trend. Although, the empowerment of women means more control over their lives and livelihoods, in the rural communities the change in their roles have resulted in women having to go beyond their traditional roles of caretakers of family and livestock to more complex transactions such as deciding on and purchasing inputs, negotiating loans and sales, accessing information and markets - all of which require different skills set which most women do not possess. Tackling these issues require empowering these communities which can result in women being able to use their skills and experiences to enable them to respond to changing market opportunities.

Focused analysis is therefore necessary to understand the specific constraints in channels that are important in the livelihoods of the poor and have realistic prospects for sustainable economic growth. Donors, governments and other public and private agencies seeking to foster equitable growth in this sector need to acquire and promote “market-literacy”: knowledge and understanding of the institutions, competencies and relationships that make market systems work for poor rural producers. Further more, they need to understand and make the link between market dynamics and empowerment processes of rural communities underpinned by learning abilities and processes that are fueled by market and non-market incentives.

4.2.2 Approaches and Tools

Practical Action’s Participatory Market Systems Development (PMSD) approach and its tools are one of the methods of understanding and analysing the market systems in rural communities in Meghalaya. This approach uses a combination of qualitative and quantitative procedures which combine market systems perspective of the value chain analysis and the cross-cutting approach of the Business Development Services (BDS) analysis (Albu and Griffith 2005). The participatory nature of this approach assists in garnering participation and collaboration of a wide variety of market actors, civil society organisations, academics and researchers to understand the market systems, identify blockages, problems and opportunities and to undertake actions to make them work better for all. While the systemic view of this approach ensures that the analysis seeks to understand the complex and interrelated nature of market systems and the required transformation of both actors and relationships. The approach is also inclusive and has a sub-sectoral focus which is appropriate for the purpose of analyzing one or two high impact commodities which can offer quick return for the rural poor. This approach has a multidimensional model whereby economics are just one piece of the puzzle and fosters a deeper understanding of social, political and cultural factors as equal and in some cases more important than economic or commercial factors.

4.2.3 Sequencing

4.2.3.1 Preliminary market mapping

The three stage process of the PMSD approach begins with the preliminary analysis of the market system by the NGO/ market facilitator in conjunction with a group of key informants or “interest group” of stakeholders. This entails a quick study of the market systems in Nongtraw and Thuruk clusters which would gather information on some of the key commodities, the core market actors, the situation of BDS (Business Development Service) providers and the business environment or the enabling environment around these market systems. This analysis can build on previous studies such as market analysis, sub sector analysis or value chain analysis and will be able to provide the facilitators a snap-shot of the market system. By understanding these market systems, the facilitators also build confidence and knowledge in these sectors which are some of the key requirements for the next steps.

In preliminary mapping, the most important aspect are managing immediate expectation of the stakeholder and establishing mechanisms for working with market chain actors.

4.2.3.2 Participatory Market Chain Analysis (PMCA)

In this step specific market-chain actors itself are brought together to elaborate the Market Map, explore key issues in detail and build relationships. The PMCA is a

key approach to operationalising the Market Map framework - converting an otherwise abstract framework into a practical tool which can facilitate efficiency, improve coordination, stimulate innovation and bolster trust within the market-chain. Finding a “hook” to engage commercial actors is critical. The preliminary Market Map can help facilitators identify very specific issues common to all market actors, and turn them into an “offer” that will draw actors into the process. One solution is for facilitators to orient weaker participants in advance, so they understand their role in these events, and have realistic expectations of PMCA processes outcomes (USAID 2008).

4.2.3.3 Moving from analysis to action

A carefully facilitated PMCA should result in a Market Map that can help provide a basis for common understanding and action; and the PMCA processes can encourage more powerful actors in the market chain to engage with issues that negatively impact on weaker players. The PMCA can, by itself, be the end of the interventions justified simply in terms of establishing linkages, improving coordination and bolstering trust among the market-chain actors. However, more significant improvements in market-chain performances stem from a more enabling business environment or from better access and use of business and extension services by these actors. Achieving these wider changes requires longer-term interventions for which PMCA is a starting point.

The PMSD approach is not a prescription that can provide a “cookbook” for these actions but rather a guideline to assist market facilitators in accomplishing their goals through a systemic and holistic understanding of the market. This will be based on the specific constraints on the different market systems, the mandate and the program design of the facilitators and above all the deeper understanding of market system which leads to interventions designed to carefully balance the empowerment process for the rural poor, the facilitation of interactions between the market actors themselves for transformation of the market system and finally the strengthening of the communication process within the market system for uptake of ideas, models and innovations. This report recommends the following three activities:

- Conduct a detailed Participatory Market Chain Analysis of Nongtraw and Thuruk clusters to identify some of the key constraints in the market systems of high impact commodities currently existing and some potential commodities (mostly focused on livestock and NTFPs). This should give the market facilitators a better understanding of the current and potential market situation and issues regarding market access. This will also be able to draw out market-chain actor’s perception on the GGR and to see if this technology is appropriate for this market system. And, if so - how best to implement the technology (who pays, who builds, who operates, fee structures, benefit sharing etc.

Practical Action can assist the MRDS team through a short theoretical orientation on PMSD approach and some of the key tools like participatory market mapping. This can be further applied immediately in the field through the facilitation of Market Development Advisor from Practical Action in close coordination with the project team in Nongtraw and Thuruk while the training and the mapping sessions can be attended by other MRDS staff for wider scale replication in their own districts or project sites.

- Building on this, the report recommends quick impact and confidence building measures to be initiated by starting small market systems interventions in both clusters. These interventions should synergize with MRDS's current project activities and should be able to build market linkages with key market-actors up-stream and strengthen the supply of services. E.g. this may include the possibility of organizing a match-making meeting between vegetable wholesalers in Lungmaicham and Thuruk clusters/ Shora and Nongtraw cluster; developing a local "bare-foot" paravet to provide fee-based services to livestock and agriculture farmers in Thuruk; or training few active local youths and leader farmers as local resource person for technical and market based advises and linkages to the communities. Furthermore, the project can identify few opportunities for small and micro enterprises (SMEs) within these communities such as cane basket retailer (Nongtraw), livestock trader and butcher shop (Thuruk), agro-processing service providers (both cluster) and initiate income generating activities linked with providing better access to markets for the large communities. Practical Action can provide condensed and modular course design for enterprise development training adapted from ILO's SIYB (Start and Improve Your Business) package to promote such interventions.
- Regardless of the eventual decision on the GGR technology, there is an urgent need to empower the communities going beyond the traditional sense of group formation. Both of the clusters show remarkable similarities in terms of not being "market literate" and proactive. Despite its proximity to the market, Nongtraw clusters have failed to utilize economies of scales to reduce transaction costs or increase their negotiating abilities with traders. Similarly, Thuruk cluster have failed to recognize the value of introducing value addition in their production to create demand and attract buyers going beyond transactions to relationship development with the market. The project can help develop the skills, knowledge and abilities of these communities to better recognize market opportunities and assist in creating local enterprises to do so. Practical Action recommends MRDS to include market literacy training packages with their ongoing skills development training. Such low cost packages focused on low literacy and neo-literate target groups have been developed by Practical Action and can be adapted for MDRS's uses.

4.3 Institutional Development Proposal

4.3.1 Institutional framework

Well established institutional arrangements and clear division of responsibilities among the stakeholders is crucial to ensure smooth implementation and sustainability of gravity ropeway. Some of the diesel operated ropeways visited during the pre-feasibility study were found defunct due to severe failure or lacking in institution. Community were found not at all or less consulted during the site selection and not involved in the installation. So, the community lacks the sense of ownership towards the structure and eventually the structure was found abandoned when small problem occurred. So, drawing the lesson from the failure of the diesel operated ropeway, all the care and emphasis should be given to establish a strong institutional arrangement. The community should take the lead role in all the stage of the scheme from site selection to the operation and maintenance where all the stakeholders should act as a facilitator or helping hand to them. The village councils, the dorbars, should also taking leading role in motivating and mobilizing the community towards installing gravity ropeway.

To have a service providers in a easy reach of community is also important for the smooth operation of gravity ropeway. It is not always possible and feasible for the community to go to the Gohati or Silong when any repairment or replacement in the gravity ropeway component is required. But, if the Fabricator at the Cherapunji bazaar could give this service, the maintenance work of the gravity ropeway would be prompt, easy and cost effective. So, capacity building of the local fabricator should also given due priority.

Therefore, the institutionalisation of the gravity ropeway is very important for the sustainability of the gravity ropeway. The key stakeholders from the government, to the donors, NGOs, the dorbars and the community should be involved in the consultation, installation and the operation of the gravity ropeway.

As it is a very viable technology in terms of economics and the service it provides, government should take major initiative in providing development funds for gravity ropeway. However because of its benefits to the rural deprived community donors will also be interested to provide grants for such projects. As it is very lucrative if well operated, development banks and private sectors should also be encouraged to invest in such projects.

Gravity ropeway is an intermediate, efficient and a low cost technology. Practical Action is also the pioneer in gravity ropeway. In this context Practical Action can be mobilized to provide its technical skill and expertise to first install and operated then provide consultation and build the capacities of local NGOs like MRDS to implement such projects in the future.

Local manufacturers and suppliers are available that if trained and capacitated will be able to provide for the fabrication of trolley, brakes and other steel parts. They

also have potential to be developed as the local service centre and provide support in the repair and maintenance. Also for the construction of the gravity ropeways, the construction should be provided by reputed firm, where as the labour required should be mobilised from the community itself which should minimise costs to some extent as well as give the community some sense of ownership. The operation and maintenance is by far the most important aspect, which determines the sustainability of the ropeway. It is recommended that a committee be formed for O & M, and some funds be allocated through the running of the ropeway itself for operation and maintenance. Local service providers should be capacitated for maintenance, as well as provide them with a manual and link them with the committee that looks after the operation of the gravity ropeway. Below is the schemetic diagram of proposed Institutional arrangement for the proposed gravity ropeway .

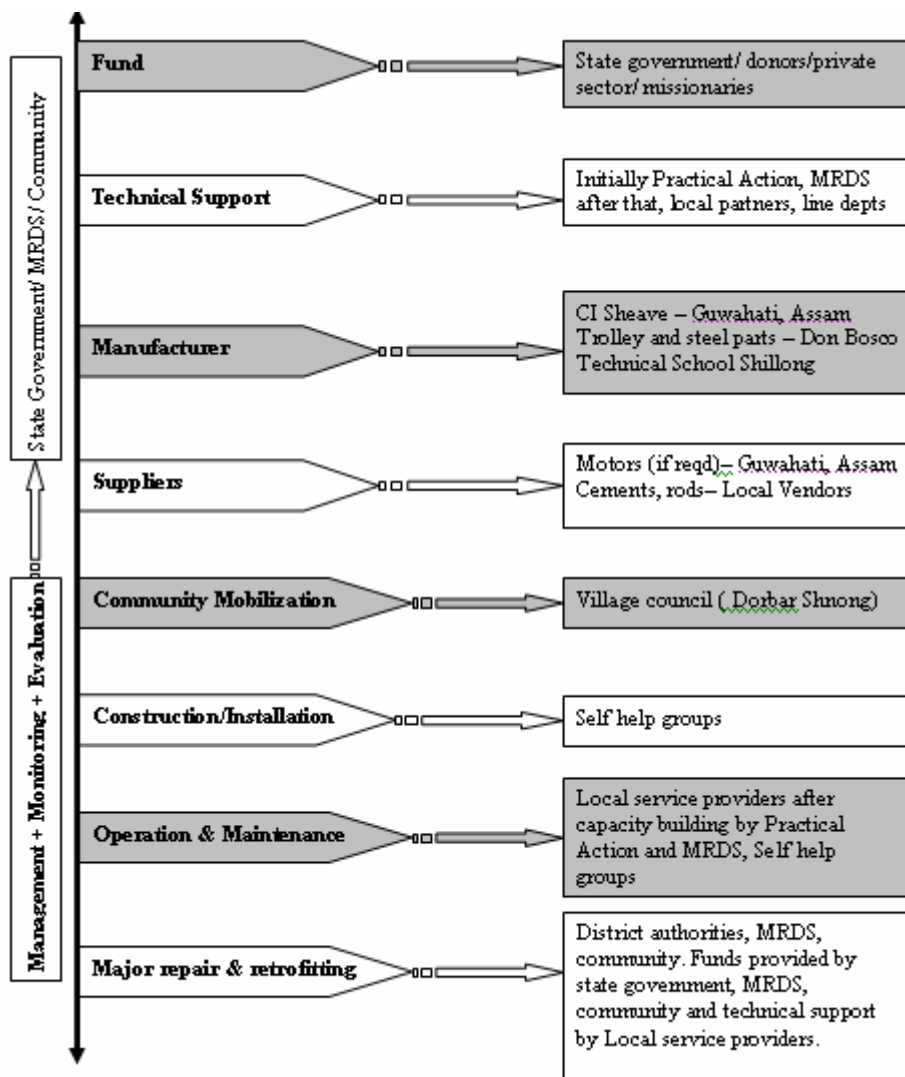
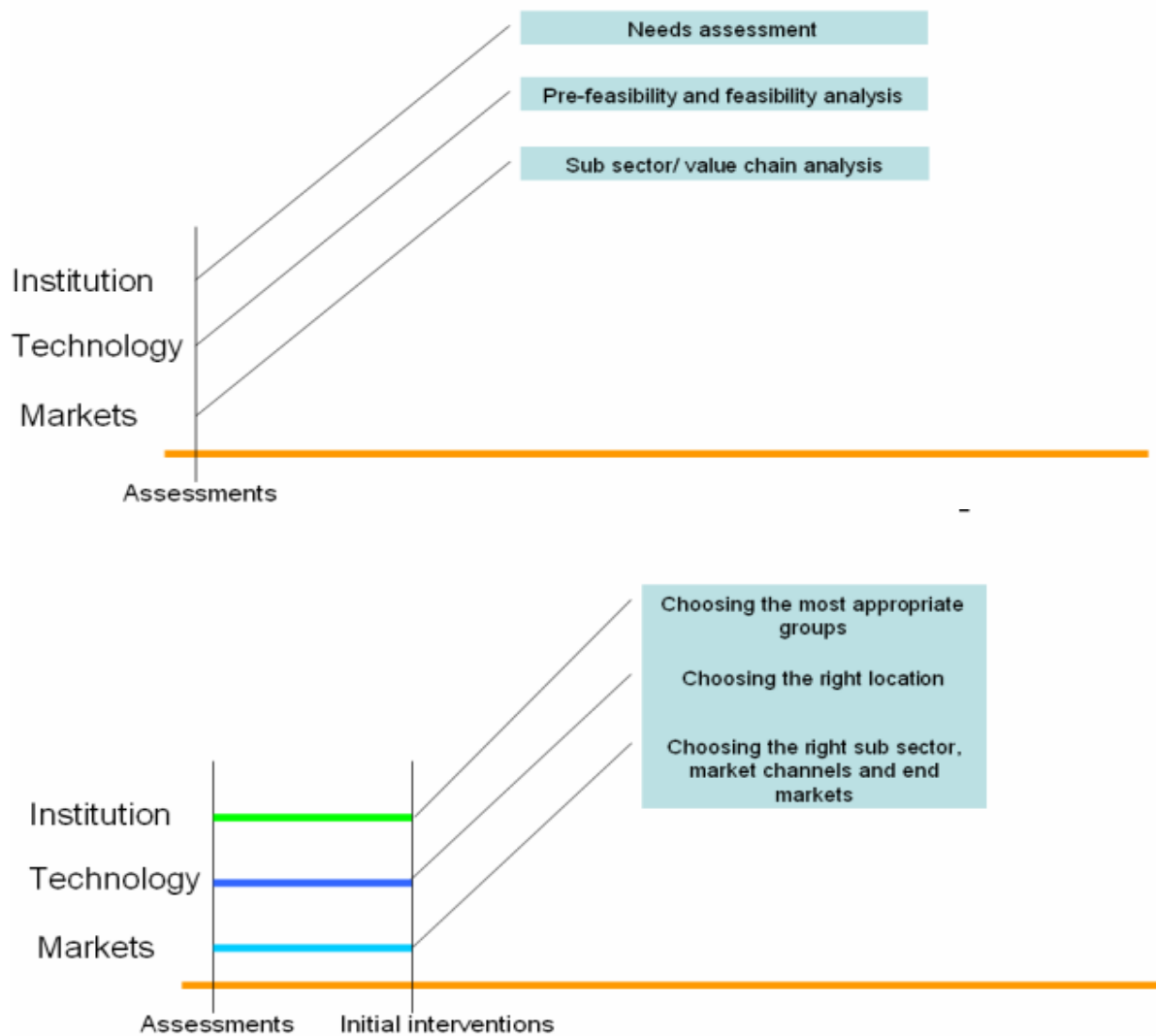
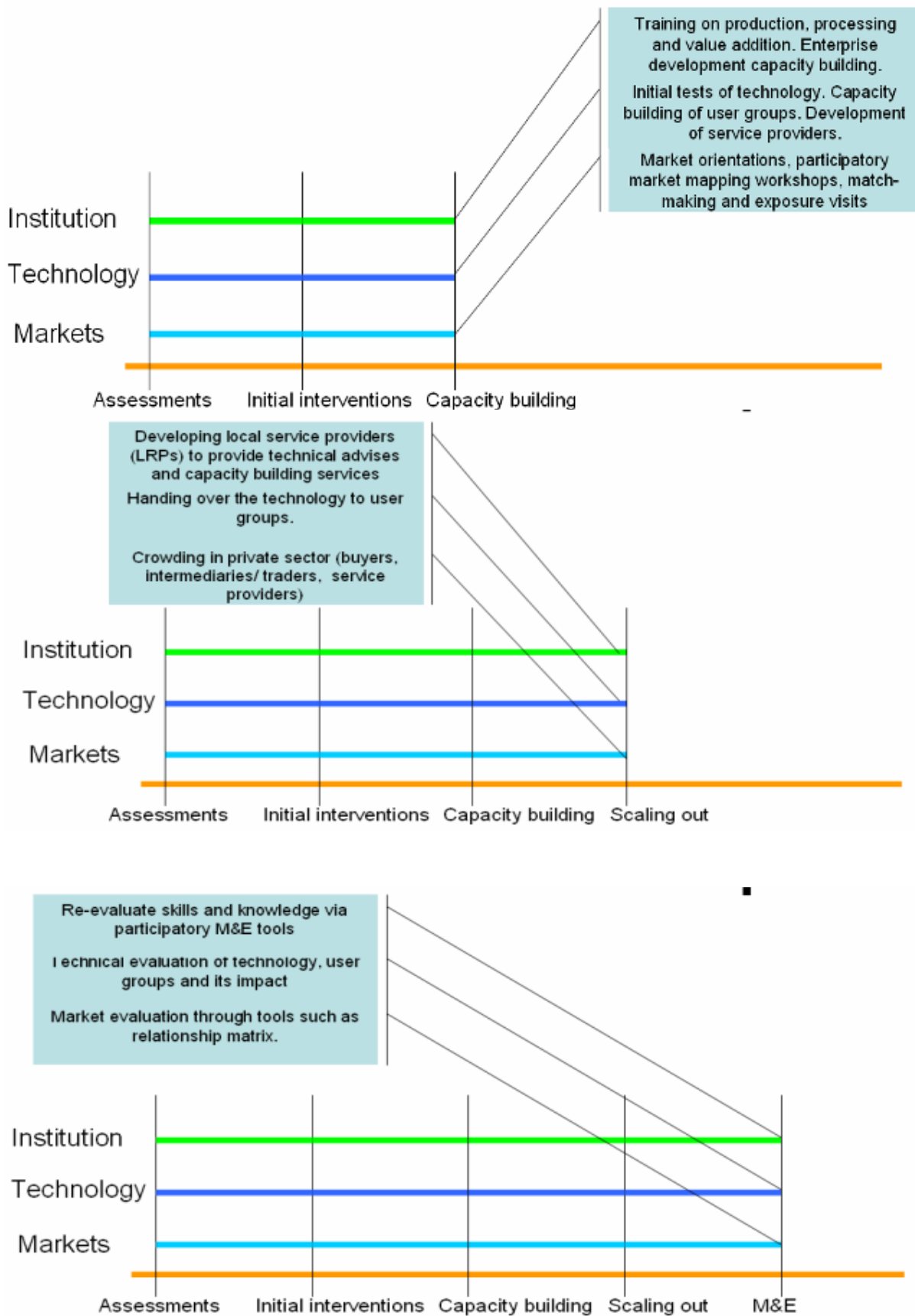


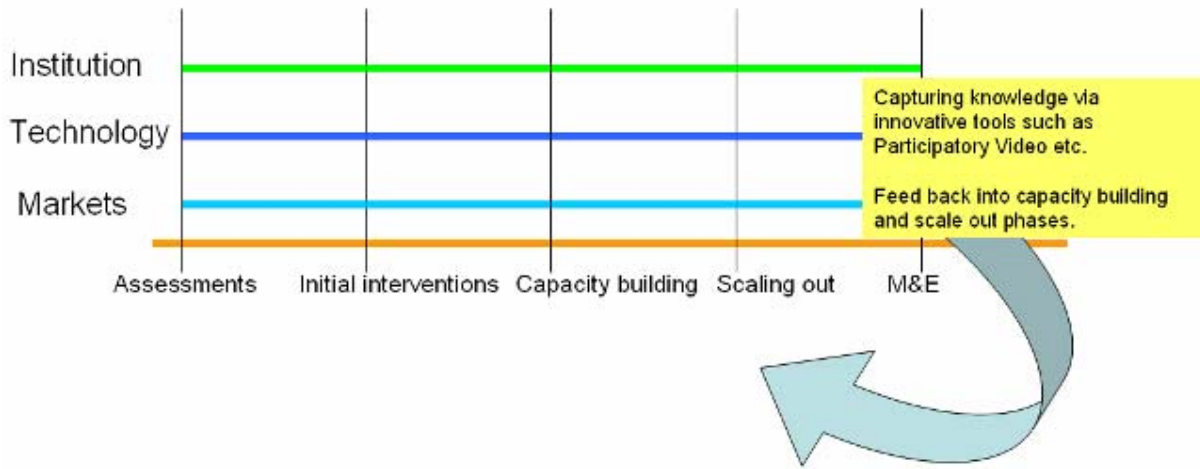
Figure 4.4: Proposed institutional setup

ANNEX

Annex 1: Pictorial of the overall process of Gravity Goods Ropeway Installation







Annex 2: Time Planning

Time Planing

Items	Details	Time /weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A) Agreement	MOU signing			■																		
	Project Management training			■																		
B) Local Materials collection and preparation	Sand			■	■	■	■	■														
	Gravel			■	■	■	■	■	■													
	stones			■	■	■	■	■														
	wood						■	■	■													
C) Excavation	Site clearance and layout			■																		
	Excavation				■	■	■	■														
D) Procurement	Cement and reinforcement rod					■	■															
	Fabrication and supply of steel parts			■	■	■	■	■	■	■												
	Wire ropes			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
E) Transportation	Cement and reinforcement rod						■	■														
	Structural steel									■	■											
	Wire ropes																	■	■			
F) Execution	Masonray work							■	■	■	■	■	■									
	Plumb concrete									■	■	■										
	RCC work										■	■	■									
	Roofing												■	■								
	Sheave anchorage fixing												■	■								
	Curing and finishing works													■	■	■	■	■				
	Alignment clearance for cable laying																	■	■			
	Cable laying and hoisting																			■	■	
	Shave fixing and trolley installation																				■	■
G) Testing and commissioning	Test operation																				■	■
	Operation and maintenance training and commissioning																					■

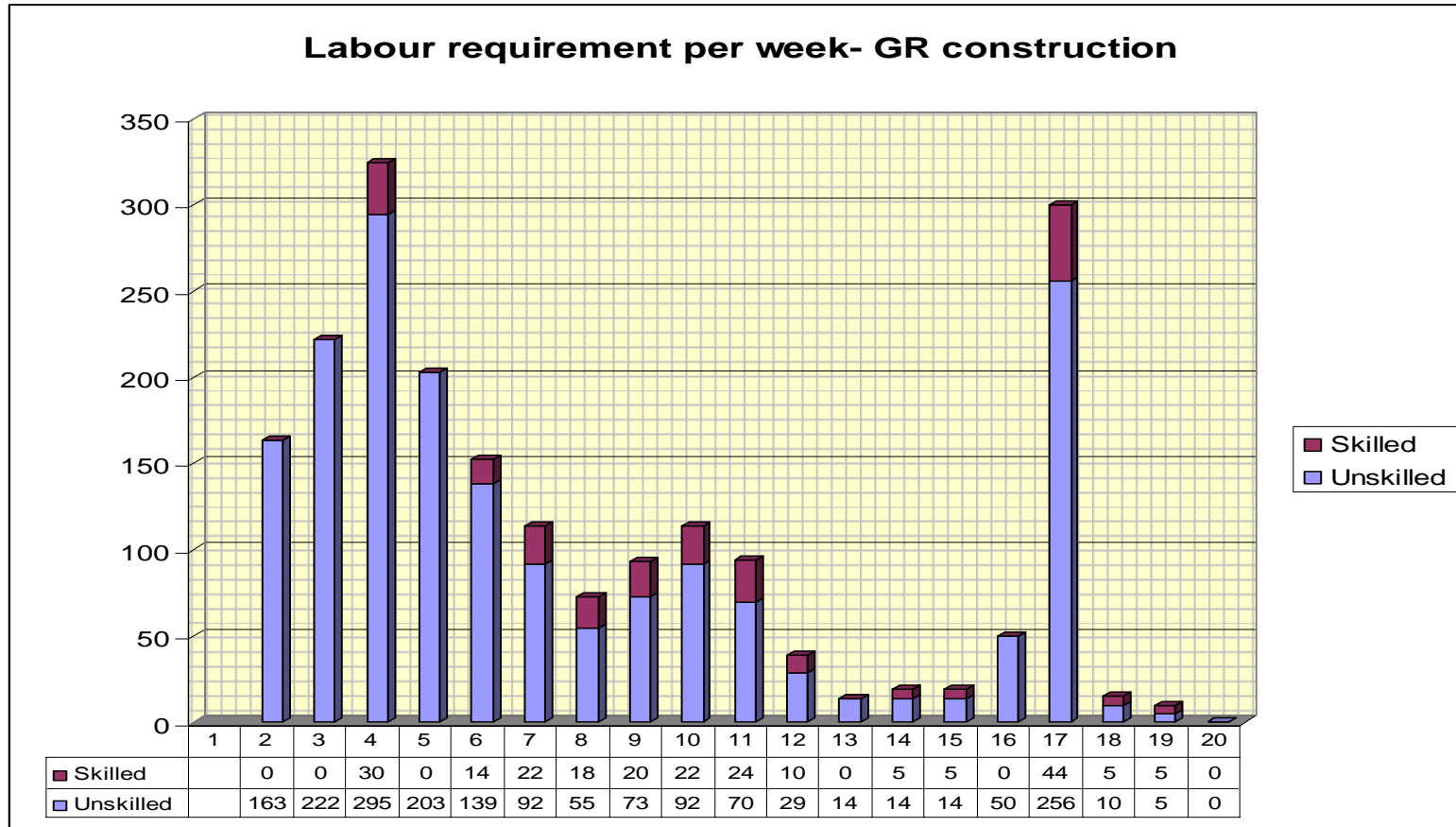
Annex 3 : Labour planning

LABOUR PLANING

Details	Time /weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																			
A)Material colletion and Pottering			U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S	U S																			
Sand			45	45	125	100																																		
Gravel			20	61	51	41	31																																	
stones			78	50	50																																			
wood					3	30																																		
Pottering						62	62																																	
B)Site clearance and excavation			20	57	57																																			
C)Masonray work							46	14	92	22	55	18	45	18	35	11	33	11																						
D) Plumb concrete													28	4	28	4																								
E) RCC work														28	7	29	7																							
F)Roofing															15	10																								
G)Reinforcement															8	6																								
H)Curing and finishing works															14	14	14	5	14	5																				
I)Alignment clearance for cable laying																	50																							
J)Cable laying																		258	44																					
K)Cable hoisting																			10	5																				
L)Shave fixing and trolley installation																				5	5																			
Total			163	0	222	0	295	30	203	0	139	14	92	22	55	18	73	20	92	22	70	24	29	10	14	0	14	5	14	5	50	0	258	44	10	5	5	5	0	0

U- unskilled labour
S- Skilled labour

Labour requirement per week- GR construction



Annex 4: Tables

Table A: Unconnected Habitations in Meghalaya

Districts/ Habitations Category	1000+	500- 999	250-499	<250	Total
	Total Number of Habitations				
East Garo Hills	5	88	254	559	906
East Khasi Hills	49	148	212	435	844
Jaintia Hills	56	93	100	103	352
Ri Bhoi	18	98	163	261	540
South Garo Hills	1	11	87	528	627
West Garo Hills	55	169	421	795	1440
West Khasi Hills	28	106	214	298	646
Meghalaya	212	713	1451	2979	5355
	Unconnected Habitations as on 01-12-2008				
East Garo Hills	0	22	124	391	537
East Khasi Hills	5	31	62	238	336
Jaintia Hills	0	16	37	66	119
Ri Bhoi	0	17	68	189	274
South Garo Hills	0	0	33	372	405
West Garo Hills	3	46	205	536	790
West Khasi Hills	1	18	70	199	288
Meghalaya	9	150	599	1991	2749
	Unconnected Habitations as on 01-12-2008				
East Garo Hills	0	21	123	390	486
East Khasi Hills	5	31	62	238	275

Jaintia Hills	0	16	36	66	85
Ri Bhoi	0	17	68	189	249
South Garo Hills	0	0	33	372	377
West Garo Hills	1	31	201	532	716
West Khasi Hills	0	14	57	198	231
Meghalaya	6	130	580	1985	2415

Table B: Percentage of Unconnected Habitations in Meghalaya

Districts/ Habitations Category	1000+	500- 999	250-499	<250	Total
	Total Number of Habitations				
East Garo Hills	2.36	12.34	17.51	18.76	16.92
East Khasi Hills	23.11	20.76	14.61	14.60	15.76
Jaintia Hills	26.42	13.04	6.89	3.46	6.57
Ri Bhoi	8.49	13.74	11.23	8.76	10.08
South Garo Hills	0.47	1.54	6.00	17.42	11.71
West Garo Hills	25.94	23.70	29.01	26.89	26.89
West Khasi	13.21	14.87	14.75	10.00	12.06

Hills					
Meghalaya	3.96	13.31	27.10	55.63	100.00
	Unconnected Habitations as on 01-04-2000				
East Garo Hills	0.00	25.00	48.82	69.95	59.27
East Khasi Hills	10.20	20.95	29.25	54.71	39.81
Jaintia Hills	0.00	17.20	37.00	64.08	33.81
Ri Bhoi	0.00	17.35	41.72	72.41	50.74
South Garo Hills	0.00	0.00	37.93	70.45	64.59
West Garo Hills	5.45	27.22	48.69	67.42	54.86
West Khasi Hills	3.57	16.98	32.71	66.78	44.58
Meghalaya	4.25	21.04	41.28	66.83	51.34
	Unconnected Habitations as on 01-12-2008				
East Garo Hills	0.00	23.86	48.43	69.77	53.64
East Khasi Hills	10.20	20.95	29.25	54.71	32.58
Jaintia Hills	0.00	17.30	36.00	64.08	24.15
Ri Bhoi	0.00	17.35	41.72	72.40	46.11
South Garo Hills	0.00	0.00	37.93	70.45	60.13
West Garo Hills	1.82	18.34	47.74	66.92	49.72
West Khasi Hills	0.00	13.21	26.64	66.44	35.76
Meghalaya	2.83	18.23	39.97	66.63	45.10

Table C: Socio-Economic Characteristics of States in NER

States	ST population (as percentage of state population)	Population density per Sq. Km	Urban population	Rural workers engaged in agriculture	Shifting cultivation (SC)		Forest land under community*		Economic Infrastructure					
					Total forest Area*	Area under SC	Total forest area	Under community control	Transportation		Power		Communication	
					Sq. km		in percentage	2001	2001	2000	2001	2004	2004	
Arunachal	64.2	13	20.8	72.9	51500	2600	82	16.54	21.93	NA	68.6	44.53	2.44	50
Assam	12.4	340	12.9	59.1	27000	3100	30	52.53	111.14	40.21	95.5	16.54	3.73	86
Manipur	34.2	103	26.6	61.3	17400	3600	78	30.26	51.21	47.80	69.5	52.53	7.13	50
Meghalaya	85.9	103	19.6	76.0	9500	2600	70	44.14	42.34	51.99	160.3	30.26	2.95	61
Mizoram	94.5	42	49.9	84.7	15900	3800	87	56.88	23.58	NA	120.7	44.14	6.22	61
Nagaland	89.1	120	17.2	77.4	8600	3900	85	31.75	126.8	9.63	84.7	56.88	2.41	50
Tripura	31.1	305	17.1	59.4	7000	1000	55	41	133.81	38.91	95.5	31.75	2.98	61
India	8.1	313	27.8	53.4	-	-	-	-	74.31	39.32	354.8	43.52	4.34	84

Notes: * Total forest area is as per administrative classification of forest

Sources: Umdor (2008).

Table D: Demographic Profile of Districts in Meghalaya

Districts	Area in Sq. Kms	Population	Percentage of rural population	Literacy rate	Density of population
East Khasi	2748	660923	56	76	241
West Khasi	5247	296049	88	65	56
Jaintia Hills	3819	299108	92	52	78
Ri Bhoi	2448	192790	93	66	79
West Garo	3677	518390	89	51	141
East Garo	2603	250582	86	61	96
South Garo	1887	100980	91	55	53
Meghalaya	22429	2318822	80	63	103

Source: Census (2001) and Govt. of Meghalaya.

Table E: Socio-Economic Characteristics of Meghalaya

General:	
Area (in sq.km.)	22429
Number of Districts	7
Number of Blocks	39
Number of Villages	6026
Demographic:	
Total Population	2318822
Male	1176087 (50.7)
Female	1142735 (49.3)
Population density per Sq. Km	103
% of rural Population	80.4
Sex ratio	972
Percentage of literacy (2001)	62.6
Female literacy rate (2001)	59.6
S.T. population	85.9
Total workers	970146
Total Main and Marginal workers	757011/213135
% of workers in agriculture	65.8
Dependency ratio	884.1
Health indicators:	
Crude Birth Rate (SRS 2007)	24.4
Crude Death Rate (SRS 2007)	7.5
Infant Mortality Rate	56
Total Fertility Rate (NFHS-III)	3.8
Medical centres (1999)#	511
Population served per centres#	4513
Infrastructure:	
Road Density per 100 Sq. Km	42.34
% of unconnected habitation	51.99
% of rural households having electricity	30.26
Average population (in 000) per bank	13
State Domestic Product:	
NSDP at constant (1999-2000) prices for	422483
Per Capita Income at Constant (1999-2000)	17408
School related Indicators (primary only)	
Number of schools	9268
% of primary schools	75.29
% of schools having single classrooms	25.41
% of single teacher primary school	14.95
% of schools having drinking water facility	78.18
% of kitchen having kitchen shed	2.42
% of primary schools having attached pre	85.39
Gender Parity Index	1.01
Pupil teacher ratio	17

Annex 4: Checklist

Checklist 1: Preliminary Check List for Gravity Goods Ropeway pre-feasibility study

A. General Information

District
Village/ township
Total Population
Proximity to nearest town/ market centre

B. Socio-economic assessment

Criterion	Yes	No
Are the target groups a significant portion of the overall population?		
Is agriculture/ horticulture production a major part of the communities' livelihoods option?		
Do majority of the target group have food security for 12 months?		
Are the target groups currently selling surplus produce?		
Is this area well-known for any particular local produce/ skills/ service?		
Are there any value addition (post-harvest) activities taking place?		

C. Technical assessment

Criterion	Yes	No	
Are the proposed top and bottom stations clearly visible from each other?			
Are there any cross ridges in-between the top and bottom station?			
Is flat and stable land available for stations?			
What is the approximate slope of the hill where gravity ropeway is proposed?		<table border="1" style="width: 100%; height: 20px;"> <tr><td> </td></tr> </table>	
What is the approximate inclined length between proposed top and bottom station?		<table border="1" style="width: 100%; height: 20px;"> <tr><td> </td></tr> </table>	
Are there any major adverse climatic conditions (high winds, floods, and landslides) reported in this area?			

D. Market assessment

Criterion	Yes	No
Are there major market places close by (Haat Bazaar, wholesale market, collection centres)?		
Do the target groups have access to critical services (inputs, loans, advices etc)?		
Do they know where to go to sell their products beyond the local market?		
Are they currently selling their products individually?		
Are they currently buying their inputs individually?		
Are there any settlements, roads, main trails or transmission lines just below the alignment and transportation services available in this area?		

E. Evaluator's overall observation

Please provide observation in the back of this sheet or in a separate piece of paper.

Checklist 2 : Check List for Gravity Goods Ropeway pre-feasibility study in East Khasi Hills

A. General Information

District	East Khasi Hills
Village/ township	Nongtraw/Dewlieh/Wahsohra/Tyniar
Total Population	375
Proximity to nearest town/ market centre	Sohra

B. Socio-economic assessment

Criterion	Yes	No
Are the target groups a significant portion of the overall population?	✓	
Is agriculture/ horticulture production a major part of the communities' livelihoods option?	✓	
Do majority of the target group have food security for 12 months?	✓	
Are the target groups currently selling surplus produce?	✓	
Is this area well-known for any particular local produce/ skills/ service?	✓	
Are there any value addition (post-harvest) activities taking place?	✓	

C. Technical assessment

Criterion	Yes	No
Are the proposed top and bottom stations clearly visible from each other?	✓	
Are there any cross ridges in-between the top and bottom station?		✓
Is flat and stable land available for stations?	✓	
What is the approximate slope of the hill where gravity ropeway is proposed?	< 65°	
What is the approximate inclined length between proposed top and bottom station?	3 km	
Are there any major adverse climatic conditions (high winds, floods, and landslides) reported in this area?	✓	

D. Market assessment

Criterion	Yes	No
Are there major market places close by (Haat Bazaar, wholesale market, collection centres)?		✓
Do the target groups have access to critical services (inputs, loans, advices etc)?	✓	
Do they know where to go to sell their products beyond the local market?	✓	
Are they currently selling their products individually?	✓	
Are they currently buying their inputs individually?	✓	
Are there any settlements, roads, main trails or transmission lines just below the alignment and transportation services available in this area?		✓

E. Evaluator's overall observation

Please provide observation in the back of this sheet or in a separate piece of paper.

Checklist 3 : Check List for Gravity Goods Ropeway pre-feasibility study in Jaintia Hills

A. General Information

District	Jaintia Hills
Village/ township	Thuruk
Total Population	361 household
Proximity to nearest town/ market centre	Sutnga

B. Socio-economic assessment

Criterion	Yes	No
Are the target groups a significant portion of the overall population?	✓	
Is agriculture/ horticulture production a major part of the communities' livelihoods option?		✓
Do majority of the target group have food security for 12 months?		✓
Are the target groups currently selling surplus produce?		✓
Is this area well-known for any particular local produce/ skills/ service?	✓	
Are there any value addition (post-harvest) activities taking place?		✓

C. Technical assessment

Criterion	Yes	No
Are the proposed top and bottom stations clearly visible from each other?	✓	
Are there any cross ridges in-between the top and bottom station?		✓
Is flat and stable land available for stations?	✓	
What is the approximate slope of the hill where gravity ropeway is proposed?	45°	
What is the approximate inclined length between proposed top and bottom station?	2 Km	
Are there any major adverse climatic conditions (high winds, floods, and landslides) reported in this area?		✓

D. Market assessment

Criterion	Yes	No
Are there major market places close by (Haat Bazaar, wholesale market, collection centres)?	✓	
Do the target groups have access to critical services (inputs, loans, advices etc)?		✓
Do they know where to go to sell their products beyond the local market?	✓	
Are they currently selling their products individually?	✓	
Are they currently buying their inputs individually?	✓	
Are there any settlements, roads, main trails or transmission lines just below the alignment and transportation services available in this area?		✓

E. Evaluator's overall observation

Please provide observation in the back of this sheet or in a separate piece of paper.

Checklist 4: Detailed Checklist for Feasibility study assessment of Gravity Goods Ropeway at the community level

A. General Information

1. District	
2. Village/ township	
3. Total Population	
3.1 Population of focused target groups (women, disadvantaged groups, ethnic minorities etc)	
3.2 Other targeted population	
4. Proximity to nearest town/ market centre	
5.	

B. Socio-economic assessment

Criterion	Yes	No
Scale of impact		
1. Are the target groups a significant portion of the overall population?		
2. Is agriculture/ horticulture production a major part of the communities' livelihoods option?		
Capacity		
1. Do majority of the target group have food security for 12 months?		
2. Are the target groups currently selling surplus produce?		
2. Are the producers currently involved in cash-crop/ high value crops production?		
3. Are there alternate off-farm income generating activities in significant scale?		
Local skills and indigenous knowledge		
1. Is this area well-known for any particular local produce/ skills/ service?		
2. Are the producers using any innovative methods for production?		
3. Are there any value addition (post-harvest) activities taking place?		
Access to services		
Production infrastructure		
1. Do the target groups have access to irrigation facilities?		
2. Are irrigation facilities available throughout the year?		
Collaboration and coordination		
1. Are there any SHGs (Self Help Groups), Farmer groups in the community?		
2. Are a significant number of target groups part of these groups?		

C. Technical assessment

Criterion	Yes	No
Topography		
Are the proposed top and bottom stations are clearly visible from each other?		
Are there any cross ridges in-between the top and bottom station?		
Is flat and stable land available for stations?		

Approximate span (inclined length) with in 1200m?		
Angle of inclination above 15 degree?		
Are there any settlements, roads, main trails or transmission lines just below the alignment?		
Material and Labour Availability		
1. Are there abundant availability of unskilled labourers?		
2. Are there any season/ time of the year when there is a shortage of unskilled labours (plantation, harvesting, and migration)?		
Weather and climate		
1. Are there any major adverse climatic conditions (high winds, floods, and landslides) reported in this area?		
Transportation and road		
1. Is this area (bottom station) easily accessible by major roads?		
2. Are there transportation services available in this area?		

D. Market assessment

Criterion	Yes	No
Proximity to market centres		
1. Is this location close to any major urban market/ cities/ township?		
2. Are there any major market places close by (Haat Bazaar, wholesale market, collection centres)?		
Access to services		
1. Do the target groups have access to critical services (inputs, loans, advices etc.)		
Please check those that easily accessible to target groups		
1. Public extension service/ government agency		
2. Private agro-vets and para-vets		
3. Finance (loans, savings, insurance) – MFIs, Banks, Coops		
4. Collection centres and information centres		
Market knowledge		
1. Do the target groups have access to market information? Prices, quality, variety, demand etc.		
2. Do they know where to go to sell their products beyond the local market?		
Collaboration and coordination		
1. Are they currently selling their products individually?		
2. Are they currently buying their inputs individually?		
3. Is there a bulking point? Collection centre?		
4. Are there any specific individuals/ group providing market related services?		
Please check those that easily accessible to target groups		
1. Bulking service for products (Collection centres)		
2. Storage services (chilling centres, cellar storages)		
3. Transportation services (porters, trucks and vehicles)		
4. Mediation and match-making (finding buyers and traders)		

E. Evaluator’s overall observation