PART III: PROPOSALS, CONCLUSIONS & RECOMMENDATIONS

Study for enhancing accessibility to dispersedly located villages in the three hill districts under 'My Village-My Town Technical Assistance Project'

PART III: PROPOSALS, CONCLUSIONS & RECOMMENDATIONS

14. Introduction

14.1 The status of overall accessibility and other physical infrastructure development in the CHT districts is promising that happened truly in the aftermath of the Peace Accord signed in 1997. All Upazilas are connected by paved roads except Barkal, Juraichhari and Belaichhari Upazilas. The Chittagong Hill Tracts Rural Development Projects (CHTRDP I & II) funded by ADB and those of GOB are the big contributors to this development. '*Kaptai to Belaichhari Upazila connecting road'* is ongoing, and *'Barkal to Juraichhari Upazila connecting road'* will be implemented under ADB funded 'Climate Resilient Livelihood Improvement and Watershed Management in the Chittagong Hill Tracts Project' [CHTDRP III] (awaiting ECNEC approval). *Belaichhari-Juraichhari Border Road* up to Betling of Sajek in Bagaichhari via Barkal at Tegha Mukh in Rangamati, and Lekri Border Road (via Remakri of Thanchi) are being implemented by the Bangladesh Army. These two Army roads will connect each other establishing a long border road. Many disconnected villages (such as Belting, Choto Harina) will be connected by this all-weather paved border road.

14.2 The database review, analysis and mapping put forward that there are some union Parishads (such as Gelenga union of Ruma Upazila and Farua Union of Belaichhari Upazila) not connected with their Upazila HQs through paved roads or all-weather riverine route. The most village roads are unpaved and all-weather inland waterways are also limited. Further, in the CHT, villages or paras are too dispersedly located on hill tops, valleys or foot hills and distantly located from one another and from Upazila and/or Union Parishad. Walking, traditional country boats and 2-wheelers' motor cycles are the most common transport mode used by the dwellers residing in the CHT. The need is still very huge but resources are limited **(*Table 9*).** This is a big challenge to enhancing rural accessibility in the CHT.

Table 9: Unpaved Length by Road Type in the three hill districts

Hill Districts	Upazila Road (Km)			Union Road (Km)		
	Total Length	Paved	Unpaved	Total Length	Paved	Unpaved
Rangamati	664	366.88	297.12	511.15	80.35	430.8
Khagrachhari	421.42	274.12	147.3	299.06	167.5	131.58
Bandarban	334.6	209.56	125.04	542.53	276.27	266.26
Total	**1420.02**	**850.56**	**569.46**	**1352.74**	**524.12**	**828.64**
Percentage	**100%**	**60%**	**40%**	**100%**	**38.75%**	**62.25%**

Hill Districts	Village Road A (Km)			Village Road B (Km)		
	Total Length	Paved	Unpaved	Total Length	Paved	Unpaved
Rangamati	1942.84	137.36	1805.5	1822.2	45.33	1778.52
Khagrachhari	2156.12	421.23	1734.92	286.94	48.86	238.09
Bandarban	1079.14	145.32	933.81	1165.14	36.19	1128.95
Total	**5178.1**	**703.91**	**4474.23**	**3274.28**	**130.38**	**3145.56**
Percentage	**100%**	**13.6%**	**86.4%**	**100%**	**4%**	**96%**

Source: LGED Website, June 2021

14.3 The second big challenge is high development cost per km length necessitating a large quantity of appurtenant structures such as bridges, culverts, retaining wall, L-drain with outfall for heavy rain water discharge, etc. The third challenge is related to environment, ecology and climate change, one very precondition to sustainable development. There are communities living in the reserve area need connectivity, but road development passing through forest and cutting steep hills and trees are usually not permissible, and thus road development connecting to the settlement in the reserve area or up to its vicinity hardly gets environmental clearance from the Department of Environment (DoE) and Department of Forest (DoF) an/or often faces implementation delay requiring a long approval procedure.

14.4 Chittagong Hill Tracts Regional Council (CHTRC), Hill District Councils (HDCs) and Chittagong Hill Tracts Development Board ('CHTDB') − these three entities under the Ministry of Chittagong Hill Tracts Affairs (MoCHTA) are actively engaged in development of the CHT areas and are mandated for the transferred subjects. Local Government Engineering Department (LGED) of the Ministry of LGRD & Cooperatives is mandated to develop rural infrastructure across the country. Specific to the CHT, LGED builds Upazila Road, Union Road, Village Road A and Village Road B (important village road equal or more than 2 km length) in establishing core road network, while Chittagong Hill Tracts Development Board and Hill District Councils constructs normally bridges and village access roads mostly need-based and less than 2 km length (sometimes more than 2 km length) to give a pathway to the remote villages. In doing so, these entities avoid duplication through consultation, coordination and sharing information.

14.5 Part II of the report covers the general findings and key outputs, which include mainly a database of priority sub-projects and upazila maps illustrating the disconnected villages and population. This Part III presents proposals, thematic design and conceptual framework towards building an all-weather rural transport network that will connect the dispersedly located villages with their respective Upazilas HQ. A priority list of roads and riverine routes including structures (such as bridge/culvert, ghat, collection point with passenger shed) prepared for each upazila is provided in this Part of the report. The specific proposals include rural connectivity for inclusive development, mainstreaming, agriculture and tourism development in the region. Then an estimated costing per 1000 population is also prepared, which will help in preparation of Development Project Proposal (DPP) of the ***'My Village-My Town Project'*** for the three hill districts.

15. Proposal for enhancing Rural Connectivity

15.1 The *'My Village-My Town Project'* aims to improve the living standard of village population through four interrelated plans of actions: (1) infrastructure development and planning, (2) human resources development and poverty reduction, (3) agricultural development, climate change and environmental protection, and (4) education and health services. This means boosting up of village economy through provision of required civic amenities including of all-weather transport network and fundamental economic, health,

educational and business infrastructures. Though unpaved length in the CHT districts is 8984 Km (excluding 840 km non-gazetted No ID length), the length of sub-projects totals 2756 Km (28% of the unpaved) length is identified as priority for development under the MVMT project (***Table 10***, *Graph 5*), of which 12.5% (344 Km) Village Road Type B (***Table 11***).

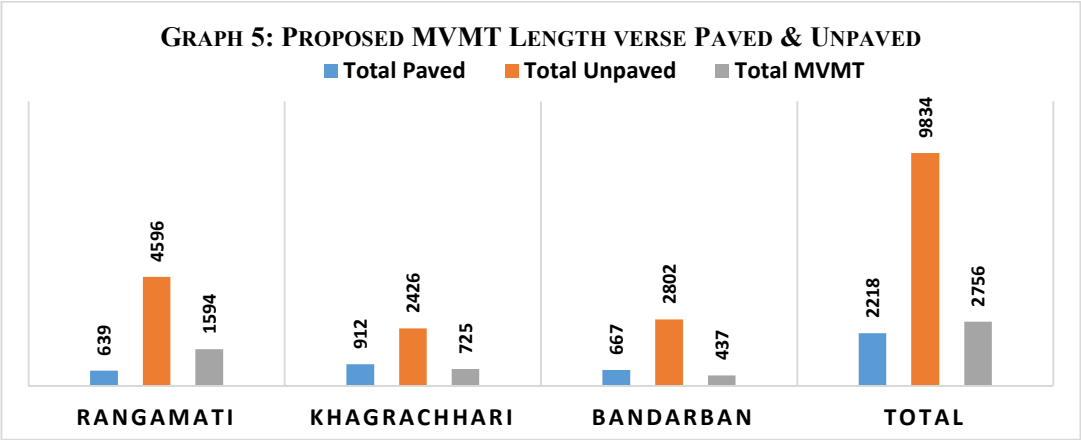


Table 10: Total Proposed Length (KM) under MVMT Project

District	Total Length	Total Paved	Total Unpaved	Total proposed under MVMT project	Percentage of unpaved Length
Rangamati	5236	639	4596	1594	34%
Khagrachhari	3338	912	2426	725	30%
Bandarban	3468	667	2802	437	16%
Total	**12042**	**2218**	**9824**	**2756**	**28%**

15.2 Khagrachhari is better connected by paved road in comparison to Rangamati and Bandarban Districts. It has 912 Km road paved, while Rangamati and Bandarban have only 639 Km and 667 Km paved road. The need is high in Rangamati (1594 Km), more than double of Bandarban needed for enhancing village connectivity. In Khagrachhari district, all Upazila HQs and Union Parishads are connected by paved road, 444 Km Village Road Type A and 173 Km non-gazetted No ID Village Roads are needed to be constructed paved to enhance connectivity of hard-to-reach villages **(*Table 11*)**.

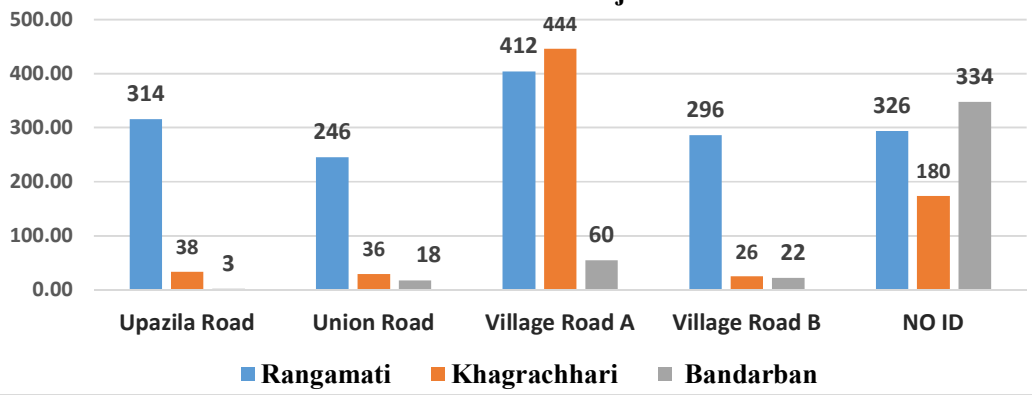
Table 11: Total Proposed Length by Road Type under My Village My Town Project

Hill Districts	Unpaved Length KM (as of June 2021)				MVMT Length KM (as of March 2022)				
	Upazila Road	Union Road	Village Road A	Village Road B	Upazila Road	Union Road	Village Road A	Village Road B	Non-gazetted No ID
Rangamati	297	422	1805	1778	314*	246	412	296	326
Khagrachhari	147	132	1735	238	38	36	444	26	180
Bandarban	125	266	934	1129	3	18	60	22	334
Total	**569**	**820**	**4474**	**3145**	**355**	**300**	**916**	**344**	**840**

15.3 In Rangamati District, the priority Upazila Road Length identified for the MVMT is more than the unpaved Upazila Road Length (*Table 9*). This has happened for two reasons. One, an extension to the Village Road A (ID 484214021) connects Barkal Upazila with Langadu Upazila is included under Upazila Road and proposed to be gazetted as 'Barkal HQ to Langadu HQ' connecting Upazila Road with New ID for 30 Km length. Second, HBB road were shown as paved in the LGED GIS database. This HBB length is proposed to be constructed paved under MVMT project (*).

15.4 It is evident from the *Table 11* and *Graph 6*, all Upazilas of Rangamati are not connected by paved road, requiring 314 Km Upazila Road still to be constructed paved. Though waterways are the main mode of communication for the Barkal, Belaichhari and Juraichhari Upazilas, for 3-4 months from March to June of the year, Karnafuli from Barkal to Chotto Harina, Shuvolong Khal to Juraichhari do not hold navigable water in the river and the channel for running Speed boat and/or launch. The Study thus identified the channel or lake or river that need degrading to develop and maintain the riverine route all-weather passable.

Graph 6: Proposed Length by Road Type under My Village My Town Project



15.5 Priority **Length Need by Upazilas and Road Type:** Table 12, Table 13 and Table 14 presents summary of 2756 km priority lengths by Upazilas of Rangamati, Khagrachhari and Bandarban districts proposed to be developed under the MVMT project. This includes of 840 km non-gazetted (No ID) roads: Rangamati 326 Km., Khagrachhari 180 Km. and Bandarban district 334 Km. The **Graph 7** below shows the percentage share of total length by each road type of the district. Majority of the disconnected villages are very remotely located in Bandarban, as compared to Khagrachhari. The details break down by individual sub-projects for each district by upazila are provided in the volume of **Appendices of Key Outputs & Observations.** Besides, for efficient and effective use by the field offices, the Study has produced separate report for each upazila that consist of upazila level database and Upazila Map showing the proposed priority roads.

Table 12: Upazila-wise Proposed Road Length for Rangamati District

Upazila	Upazila Road (Km)		Union Road (Km)		Village Road A (Km)		Village Road B (Km)		
	Unpaved	MVMT Length	Unpaved	MVMT Length	Unpaved	MVMT Length	Unpaved	MVMT Length	No ID* Length
Bagaichhari	21.92	7.00	159.61	41.00	380.30	71.50	336.21	49.00	42.50
Barkal	63.51	91.43	51.53	53.00	202.64	47.83	409.37	48.00	50.50
Belaichhari	95.87	107.00	7.50	8.50	397.39	50.50	75.50	-	26.00
Juraichhari	62.11	73.13	85.13	64.36	240.21	-	292.30	69.70	20.00
Kaptai	2.82	-	2.70	-	84.70	41.63	195.53	26.60	19.00
Kawkhali	37.50	11.00	No Data	-	36.90	11.89	89.05	11.60	50.00
Langadu	-	-	11.36	34.50	86.60	63.81	69.34	46.08	40.00
Naniarchar	7.39	26.00	28.15	21.00	156.84	74.00	48.58	3.50	16.00
Rajasthali	-	-	49.55	23.05	94.42	43.20	44.90	32.10	30.00
Rangamati S	6.00	-	26.10	-	125.50	-	217.74	-	-
Total	**297**	**314***	**422**	**246**	**1,805**	**444**	**1,778**	**296**	**326**

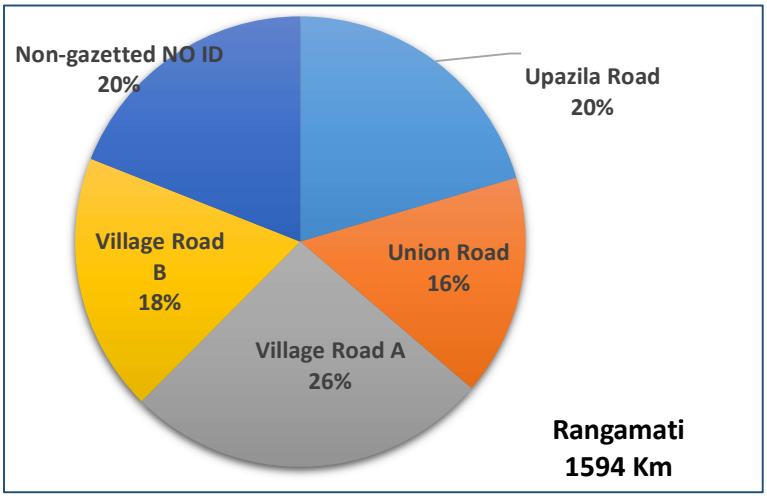
Table 13: Upazila-wise Proposed Road Length for Khagrachhari District

Upazila	Upazila Road (Km)		Union Road (Km)		Village Road A (Km)		Village Road B (Km)		
	Unpaved	MVMT Length	Unpaved	MVMT Length	Unpaved	MVMT Length	Unpaved	MVMT Length	No ID* Length
Khagrachhari	7.98	-	17.47	-	101.52	-	17.34	-	
Guimara	-	-	13.26	-	242.23	49.00	63.30	-	12.50
Lakshmichhari	43.91	26.50	37.60	7.00	260.26	27.01	35.20	5.00	11.50
Mahalchhari	27.82	-	2.37	-	69.59	39.05	2.82	2.00	23.00
Manikchhari	7.03	7.50	30.60	-	93.64	43.60	46.28	7.60	12.00
Matiranga	12.29	-	5.19	17.54	367.17	58.57	59.75	5.90	48.90
Panchhari	28.61	-	3.20	-	247.23	112.20	2.00	-	3.50
Ramgarh	-	-	-	5.00	139.73	61.77	-	-	5.50
Total	**147**	**38**	**132**	**36**	**1735**	**444**	**238**	**26**	**180**

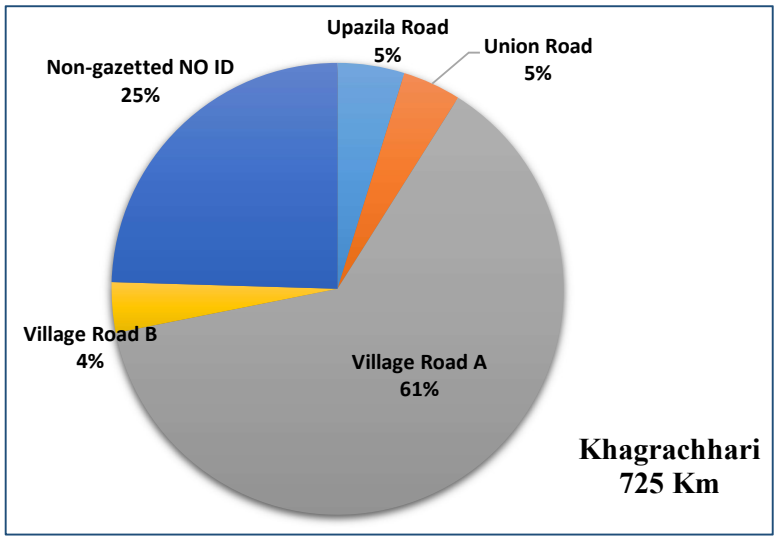
Table 14: Upazila-wise Proposed Road Length for Bandarban District

Upazila	Upazila Road (Km)		Union Road (Km)		Village Road A (Km)		Village Road B (Km)		
	Unpaved	MVMT Length	Unpaved	MVMT Length	Unpaved	MVMT Length	Unpaved	MVMT Length	No ID* Length
Bandarban Sadar	-	-	40.36	-	153.47	-	47.93	-	
Alikadam	18.53	-	27.70	-	40.22	-	28.97	-	83.50
Lama	-	2.50	33.93	5.00	95.25	11.50	452.85	19.75	37.00
Naikongchhari	16.70	-	48.10	-	269.05	8.00	28.00	-	101.50
Rowangchhari	18.76	-	40.23	-	141.82	-	177.45	1.50	47.00
Ruma	-	-	65.10	13.00	146.05	34.00	346.75	-	19.00
Thanchi	71.05	-	10.84	-	87.95	1.50	47.00	1.00	59.50
Total	**125**	**3**	**266**	**18**	**934**	**60**	**1,129**	**22**	**334**

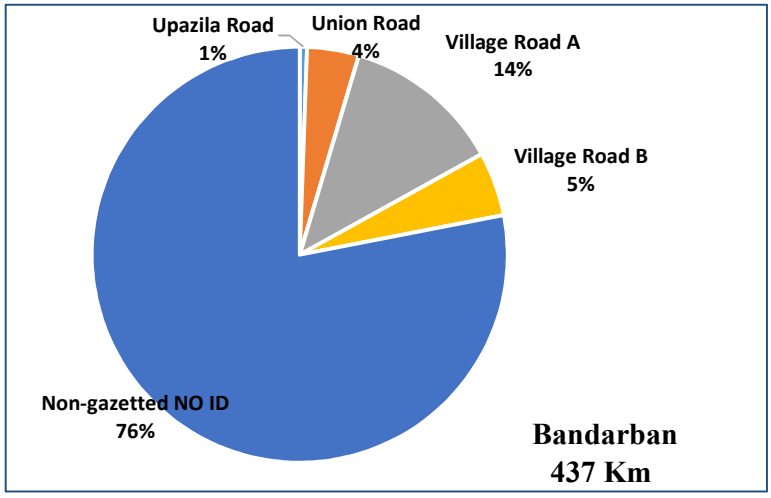
Graph 7: Percentage Share of Total Length by Road Types



Of the total proposed 1594 Km length, 20% (314 Km) is Upazila Road and 20% (326 Km) non-gazetted No ID Village Road

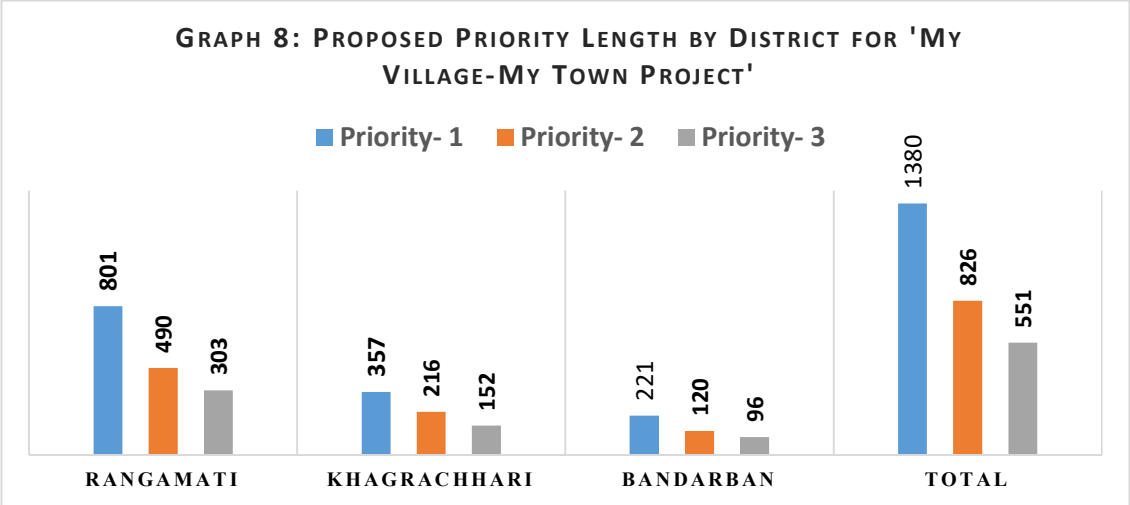


Of the proposed 725 Km length, 65% is Village Road, 180 Km non-gazetted No ID Village Road.



Of the proposed 437 Km length, 76% is No ID road, followed by 60 Km Village Road Type A.

15.6 The **Graph 8** and the table below together presents the summary of 2756 Km, the total proposed length categorized into three priority ranks; where Priority 1 means the highest and Priority 3 the lowest. The criteria used can be seen in the Approach and Methodology section of the Part I. Given the need for budget and time, it is suggested that the length in Priority 1 and 2 will be implemented first. In general, Upazila and Union Road will get the highest priority, followed by the roads and routes that connect remote villages with a bigger number of populations, and then roads connecting agricultural farms, education institutes and markets the most. In the selection process, due consideration will be given to the weightage received by each sub-project. It is evident from the table below the graph that there is a huge budget need (estimated based on field data and tentative cost escalation for calculating a tentative budget need), and thus proposed to be developed in Phases for enhancing rural connectivity in the CHT region under the MVMT project. For details, please refer to the **Individual Upazila Report** and the volume of **Appendices of Outputs & Observations**.



District	Priority- 1		Priority- 2		Priority- 3		Sub- Total	
	Length Km	Cost Lakh	Length Km	Cost Lakh	Length Km	Cost Lakh	Length Km	Cost Lakh
Rangamati	801.12	168677.1	490.75	112856.7	302.98	79680.4	1594.85	361214.2
Khagrachhari	356.89	62225.35	215.57	47849.5	152.3	28396	724.76	138470.85
Bandarban	221.5	40261.4	119.75	23227.5	96	25933	437.25	89421.9
Total	**1379.51**	**271163.85**	**826.07**	**183933.7**	**551.28**	**134009.4**	**2756.86**	**589106.95**

15.7 Given the budget need for programming the priorities, below paragraphs present the proposals at sub-project level in details with rationales. This includes the proposal of sub-projects for enhancing multi-modal transport communication, followed by the proposals of: (i) sub-projects for mainstreaming, (ii) sub-projects for inclusive development, (iii) sob-projects for tourism and (iv) sub-projects for agricultural development.

16. Multi-modal Transport Communication

16.1 The Chittagong Hill Tracts has no rails and air route, and land transport dominates the transport sector in the region. District HQs, Upazila HQs and most union parishads are connected by paved road though, road densities in the rural remotest villages are still very poor and vary by districts, upazilas, and unions. Traditionally river and/or inland waterways after walking were the main modes of transport. Most Jiris ("canals") are silted now and the main rivers such as Sangu, Matamuhuri and Karnafuli have all seasons' navigational problem, according to the Study findings, based on data analysis, consultation and observations. Below pictures depict the present-day transport modes and trades in the riverine routes of Rangamati district.

Picture 19: Carrying fruits from Choto Harina to Rangamati Sadar (take 5-6 hours).

Picture 20: Launch service from Rangamati to Choto Harina (only twice a day In the morning and in the afternoon)

Picture 21: Boats carrying passengers within Barkal Upazila.

16.2 Population has been increasing in the CHT at a high rate that one single mode of transport will not be adequate and sustainable to manage the future traffic, especially to progress the country to a middle and/or high-income country. The Perspective Plan has emphasized on building a multi-modal transport network in balancing the future traffic. The Study identified priority river routes and rural roads through consultation with the stakeholders; of which 250 km inland waterways (approximately) are proposed for dredging on priority in restoring all seasons' navigability in the important riverine routes of Sangu, Matamuhuri and Karnafuli Rivers in existence today, as given below in **Table 15 (a)**. The preferred modes such as speed boats or launch or larger boats are not passable for 3 to 4 months, usually from March to June of the year, due to siltation in these routes for years together. The channels of these rivers are badly silted. In the lean season, only small traditional boat or canoe can circumnavigate with difficulty. Transportation of goods not becomes possible except head load or bamboo raft. Such conditions have been compelled communities of the remotest villages mostly to grow non-perishable crops such as ginger and turmeric as cash crop; commercial cultivation of vegetable and fruits is unusual due to adversity in accessing hats and bazar. Owing to such poor accessibility, Jhum cultivation is dominant for growing subsistence food, though unsustainable for the ecology and productivity is low.

Table 15 (a): Riverine Routes Proposed for Dredging under MVMT Project

1. *Karnafuli River from Barkal to Choto Harina of Rangamati need dredging.*
2. *Shuvolong Khal in Juraichhari Upazila need dredging to start at the Karnafuli River up to Juraichhari Sadar. Now the Khal remains navigable by the speed boat for only 9 months.*
3. *Mainee River in Langadu Upazila need dredging to start at the CO Tila. The passage in between CO Tila and Mainee are to be excavated or dredged.*
4. *Kattoli Beel in Langadu Upazila need dredging*

16.3 Uncontrolled deforestation, mono-culture teak cultivation, and unsustainable cultivation at the bank of the rivers and channels and jhum farming of fruits and vegetables on a commercial basis in hill slopes and valleys expose soil to erosion and drift with flood water or rains flowing down stream (*examples of such unsustainable cultivation are seen in the pictures 22 & 23 below*). To protect the major rivers, main Kaptai lake and other channel, Jiri and canal from siltation by eroded soil, protection measures such as guide wall, tree plantation, bushes or vegetation, and bringing changes in cultivation practices, and control in land uses will help reduce soil erosion and landslide, and prevent water flow of upstream Jiri or canal from carrying soil in bulk down to the river or lake basin.

Picture 22: Unsustainable Cultivation in River Bank

Picture 23: Jhum Cultivation at Kaptai National Park

16.4 The catchment of the important rivers in the CHT such as Sangu and Matamuhuri is within the country's borders that offer excellent conditions for integrated river basin management and opportunities to address problems holistically. It is thus possible and practical that inland transport communication is revived and restored by dredging rivers and channels to its highest potential and then protecting them from siltation towards maintaining all season's navigability. Improvement in the navigability of inland waterways will reduce travel time and transport costs - both for goods and passengers; while availability of and improvement in inland transport modes that ensure safety and comport will attract local passengers and traders to travel and transport using riverine routes and means.

16.5 Below are pictured the conditions of waterways transport facilities in Belaichhari and Juraichhari Upazilas. There is thus need to improve ghats with proper landing, stairs and waiting shed. The Study has proposed 15 ghats to be developed on priority, given in the ***Table 15(b)*** below.

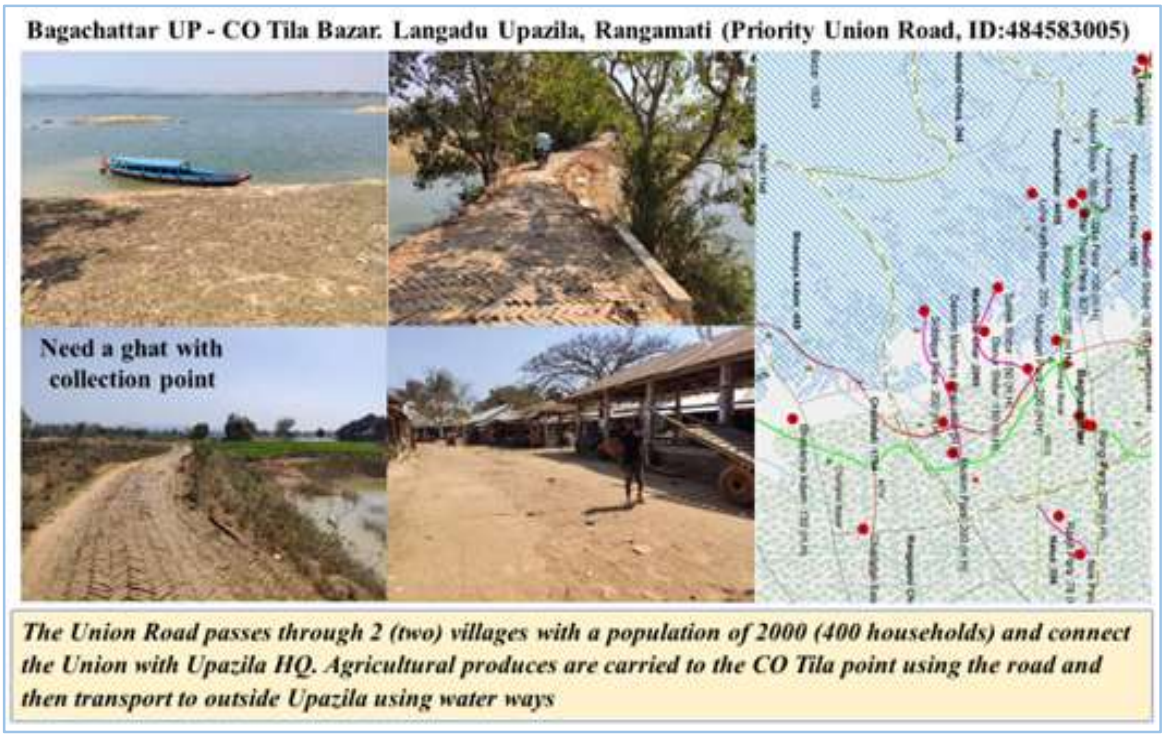
Pictures 24: Conditions of Ghats and Waterways in Juraichhari Upazila

Pictures 25: Conditions of Ghats and Waterways in Belaichhari Upazila

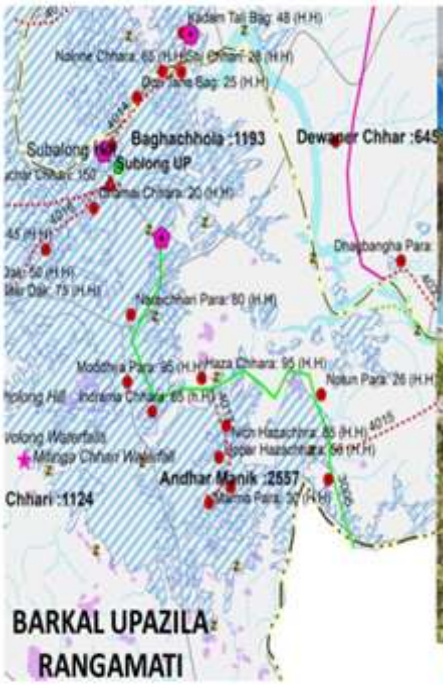
Table 15(b): List of ghats proposed for development under MVMT Project

SL	Upazila	Union	River Way	Ghat
1	Langadu	Bhasanya Adam	Kaptai Lake	Monas Para Ghat
2		Bagachattar		CO Tila Ghat
3		Langadu	Mainee River	Langadu Launch Ghat
4		Maineemukh		Maineemukh Bazar Ghat
5	Barkal	Shuvolong	Karnafuli River	Shuvolong Bazar Ghat
6				Naraichhari Saw Mill Ghat
7				Kadam Tila Ghat
8	Bagaichhari	Sajek	Kassalong River	Voachhari Ghat
9		Belaichhari	Khal	Belaichhari Launch
10	Juraichhari	Juraichhari	Shuvolonga Khal	Juraichhari Bazar Ghat
11	Naniarchar	Burighat	Kaptai Lake	Kheda Mollah Ghat
12				10 No. Tila Ghat
13				8 No. Tila Ghat
14	Thanchi	Remakri	Sangu River	Bara Modwok Ghat
15				Chhota Modwok Ghat

16.6 Among the ghats and inland waterways proposed for dredging and development, below slides show the three riverine routes with location of ghats visited by the Study team. The first used by the students, the second by the villagers, and the third by both students and villagers are strongly recommended for development under MVMT project in enhancing rural connectivity through inland waterways development.



Barkal Shuvolong Bazar- Juraichari HQ via Banjugichara GC Road
(Upazila to Upazila Connecting Priority Road, ID:484213005)



Need a Ghat with collection Point (Passenger's Shed)

Connecting 6 villages with a population of 1500 (268 households)

Hazachara High school to Kuturkhil Marmapara Road, Barkal Upazila, Rangamati.
Priority Village Road, ID:484214017

Connecting 4 villages with a population of 1200 (208 hhs). Children from other villages also use this road and water ways coming to school

Udalbagan High School - Ramratan Karbari Para Connecting Road, ID: 446434011 Priority 1 Road, Dighinala Upazila, Khagrachhari

Connecting Udalbagan Primary & High Schools & agricultural farm with markets. It is the shortest connection to two paved road, not passable when high current water flowing in the river with the banks flooded.

Mohajan Para Jame Mosque - Jakir Karbari via Donur Shibir, Priority No ID Road, Langadu Upazila, Rangamati

Link road to ID-484583005 is connecting 3 villages with a population of 2500 living 500 households

17. Ropeway Communication as Multi-modal Transport

17.1 The transportation system which is operated from electricity is usually called Ropeway[1]. Ropeways are used regularly to transport food, medicines, utility goods and other commodities to remote and isolated places in rugged hilly regions and across rivers or ravines. Also called skyway can carry travelers from one distance to another if it is built to reducing traffic on road, and/or connecting people living in the remotest highland areas for which building road is not feasible being the area is obstructed by hills and rivers; while this can offer mesmerizing aerial views of the scenic lakes, landscape, hill and town views especially to tourists if connects two or more tourist spots. The unique advantage is its ability to climb steep hills, less investment intensive in comparison to a new large bridge, and often faster to implement than building new roads. The consultant conducted feasibility study for possible ropeway communication as multi-modal transport in the three hill districts, and identified two potential locations for ropeway communication development primarily with a focus on tourism perspective: in between Sita and Ram Pahar in Kaptai of Rangamati, and another at the three surrounding hills of Manikchhari Eco-park of Khagrachhari district. These two have thick hill views and beautiful lakes and already are of tourist attraction. Besides, both have proposal under the MVMT project for consideration to create landmarks as part of the strategy for flourishing tourism in the CHT. The Sheikh Russel Aviary and Eco-Park (Bangladesh), and to the Skyway from Dharamshala to McLeodganj (India) are two set examples, from which the MVMT project can learn lessons, paying visits and further study.

Ropeway communication as multi-modal transport is possible, and are also needed in some locations of the CHT districts but not feasible, as the security system of the ropeway or skyway is susceptible to uninterrupted power supply, and need skilled operation and timely maintenance. A weather-sensitive system such that safe operation cannot be maintained in the vent of high winds. Another disadvantage is that this ropeway system cannot ease the lives of residents by being incapable of supporting heavy cargo, or large volumes of construction materials, agricultural goods and passenger bus.

17.2 Shuvolong in Barkal of Rangamati, and Kurukpata in Alikadam of Bandarban have people living in the remotest villages obstructed both by hills and rivers, and have potential with locational advantage for ropeway multi-modal connecting. However, the consultant could not identify any specific location that would be surely feasible as multi-modal transport, as the security system of the ropeway or skyway is susceptible to uninterrupted power supply, and need skilled operation and timely maintenance. A weather-sensitive system such that safe operation cannot be maintained in the vent of high winds. As a choice of multi-modal transport, another disadvantage is the fact that the cable car cannot ease the lives of residents by being incapable of supporting heavy cargo, or large volumes of construction materials, agricultural goods and passenger bus. Then, a long bridge is going to be built over the Karnafuli river at Barkal under CHTRDP III to establishing connectivity between two banks of the river and finally with the border road and with

[1] *Cableway is a system of suspended cables from which cable cars are hung while ropeway is a system of cables, slung from towers, from which carriers are suspended to transport materials.*

Barkal upazila -Langadu Upazila via Shuvolong. Prior to selecting a site finally, a further feasibility study is recommended by a team of subject matter experts.

Picture 26: Sheikh Russel Aviary and Eco-Park, Rangunia upazila, Chittagong

Sheikh Russel Aviary and Eco-Park located at Rangunia upazila of Chittagong is set up on 30 acres of land to keep the memory of the Father of the Nation Bangabandhu Sheikh Mujibur Rahman's younger son. To attract tourists, ropeway cable car is one of the unique features created in the Park, adding to its surrounding hill forests, hillocks and foot hills and artificial plantations in it. Chittagong South Forest Division has been entrusted with the supervision of the Eco-park. Since COVID pandemic, cable car service has been permanently off. It is understood that people/tourist are not so much attracted to this artificial recreational facility, rather Chittagong, Cox's Bazar and CHT are the attraction of the nature loving tourist by the scenic landscape, hills, long sea-beach, waterfalls and lakes. The lessons from the Park experience is that the operation and maintenance of the ropeway is expensive and demand for uninterrupted power supply and skillful operation that is comparatively less paid off by the number of tourists visiting the Park or riding the Cable car.

Picture 27: 1.8 km Rope from Dharamshala to Mcleodganj by Shubham Sardhalia in Himachal Prodesh

Dharamshala Skyway, the ropeway has the capacity to transport 100 people in one hour in one direction. The distance between Dharamshala and McLeodganj in Himachal Pradesh shrink drastically as the ropeway connect the two tourist hotspots in this mountain destination. The top station of the ropeway is in front of the Dalai Lama Temple in McLeodganj. The 1.8 km-long ropeway aims to be the solution for the increasing traffic on the road that connects the two places. The 207-crore project has 10 towers and two stations and covers the 1.5 km distance in just five minutes. In a major boost to regional connectivity, India has also its 'longest' river ropeway in Guwahati of Assam. Made with the investment of ₹56.08-crore, the 1.82 km bi-cable jig-back ropeway is built across the river Brahmaputra, which connects Kachari Ghat on the southern bank in the main city to North Guwahati.

18. Rural Connectivity for Mainstreaming Ethnic Tribal Communities

18.1 The Study found some tribal minority groups or communities living in the remotest villages and paras located in the reserve forest or to its vicinity or at a location where earthen road or village pathway connecting the community pass through the reserve forest or forest or hills. These communities not being connected by all-weather road and waterways, walk miles or kilometers to reach the nearest growth centres, high school and college, health clinic or hospitals located at the Upazila HQs. Some uses traditional non-motorized boat canoe or bamboo raft to commute with goods to markets, when water is available in the Jiri or canal or river. In rainy days, due to heavy current are not safe by boats, and in the winter, hardly navigable for 6-9 months.

Picture 28: Ethnic community living in Kurukpata Union, Alikadam Upazila, Bandarban

18.2 Followings are the proposed priority roads requested by the communities, LGED upazila staff, and LGI representatives (**Table 16** below) that will mainstream communities living in the reserve forest. To mainstream the communities through establishing connectivity to a minimum, construction of 127 km length will connect 57 villages (paras) residing by 3534 households with a rural population of 6809 people. However, there is chance that new settlement will establish in the reserve forest or to its vicinity around and along the paved roads. So, there should be monitoring to control such unplanned and chaotic settlement in the restricted land.

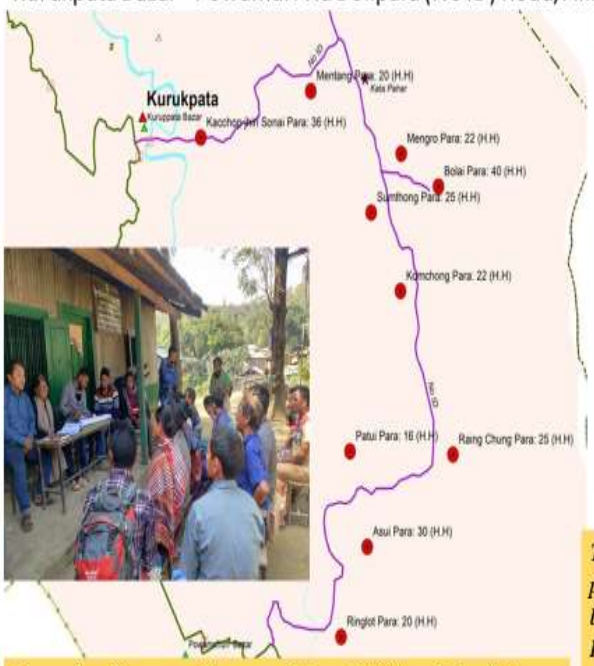
Machalong Bazar – Bhuachari, Priority 1 Road, ID: 484074044, Baghaichhari Upazila, Rangamati

Connecting 10 villages with a population of 1836 living in 328 households. This road is 15 km and earthen, passes through Kasalong Reserve Forest and hills, restricted for development

Table 16: Rural Connectivity for mainstreaming Ethnic Minority Community

District	Upazila	Union	Mouza	Road Name	Length	Road ID	Village/Paras	Pop'n
Bandarban	Alikadam	Kurukpata	Matamuhury Reserve Forest	Kurukpata Bazar - Powamuri via Bolaipara	21	No ID	Kocchop Jhiri Sonai Para, Mentang Para, Mengru Para, Bolai Para, Sumthong Para, Komchong Para, Rengchung Para, Patui Para, Asui Para, Ringlot Para	1280
				Dochhari Bazar - Bolaipara Road	22	No ID	Dochhari Bazar, Raith Moni Para, Jogoth Chandra Tripura Para, Thongpong Para, Rembuk Para, Dakshin Para, Kodong Para, Menpoi Para, Mendai Para, Dorpara	1020
	Thanchi	Remakri	Sangu Reserve Forest	8 no ward Border road (50km)- Boro Modok	4	No ID	Boro Modok Vitor para, Paimong para, Boro Modok Bazar, Sri Mohon para, Fru sha aung para, Usha Mong para	1551
Rangamati	Baghaichhar	Sajek	Kasalong Reserve Forest	Machalong Bazar - Bhuachari	15	4.84E+08	Komla Pur, Halla Pur, Mondira Chara, Chailla Toli, Lamba Chara, Tarabunia, Notun Para, Debachari, kingkor Para, Bhuachari	1836
	Belaichhari	Borotholy	Rainkhong Reserve Forest	Tiger Para - Shukramoni Para	10	No ID	Tiger Para, Kango Chara, Seijam Para, Bill Para, Shukramoni Para	900
				Dhuppani Chara Para - Sungsung Para	10	No ID	Dhuppani Chara, Sungsung Para	850
		Farua & Borotholy		Farua GC - Ruma Upazila HQ Road via Borotholy Road	45	4.84E+08	Ting Bam Chara, Notun Para, Chailla Chara, Shilchari, Borkya Chara, Ramong Chara, Chaderi Chara, Shal Chara, Borotholy Marma Para (Borotholy), Borotholy Tripura Para (Borotholy), Sam Chara (Borotholy), Saideri Chara (Borotholy), Borotholy UPC Para (Borotholy), Poli Pransa	772
Total					127			8,209

Kurukpata Bazar - Powamuri via Bolipara (No ID) Road, Alikadam Upazila, Bandarban



Connecting 22 paras with a population of 5000, mainly of Murong community. These people walk more than 20 km to reach Kurukpata Bazar. The Kurukpata Union is located within reserve forest and thus development is restricted.

There is a primary school attached with a residential hostel privately managed by the bazar committee of Kurukpata bazar, but high school or college are in Alikadam Upazila HQ, which is 45 km far from the remote community. So, students stay in rented house or with relatives for study in high school or college. Expenses is high that many parents cannot afford. Kurukpata can be developed as model village after de-reservation in part to allowing development.

Belaichhari Upazila HQ - Farua Bazar GC Road (ID: 484292001) & Farua GC - Ruma Upazila HQ Road via Borotholy (ID: 484292003), Rangamati

Both Farua and Borotholy unions are very far from Belaichhari Upazila HQ. Farua union is more than 25 km far and Borotholy is more than 50 km. Farua union is partially in reserve forest and Borotholy union is completely under reserve forest.

People from Borotholy union have to walk more than 1 day to reach Upazila, usually walk up to Paindu union (in Ruma) for almost 20 km then go to Bandarban Sadar via Ruma Upazila by Chander Gari and Bus.

It takes more than 5 hours and one night stay in Bandarban. The next day, they go to Rangamati via Rajasthali and Kaptai Upazila. Almost 2 days to go to Rangamati district HQ.

19. Rural Connectivity for Inclusive Development

19.1 The Sustainable Development Goals (SDGs) sets the targets to be achieved by 2030, 'Leaving No One Behind'. The Study found small groups of tribal communities living in the remotest paras in the distant hill valleys nearby the jhum land, poorly connected by earthen road or walking trails. They are the poorest, mostly depend on jhum cultivation and natural resources for living. Literacy rate is also very low among these communities. Walking is the main transport communication means. Development processes that are inclusive will yield better outcomes for these communities.

19.2 Inclusive development and growth will mean economic growth that creates employment opportunities for the poor and minority lagging behind and thus helps in reducing poverty. It will mean having access to essential services in health and education by the poor. It will include providing equality of opportunity, empowering people through education and skill development. **Table 17** (Rangamati) & **Table 18** (Bandarban) contain the proposed roads for inclusive development in the three (CHT) districts.

> ***Inclusive development*** *is a "development that includes marginalized people, sectors, communities and countries in social, political and economic processes for increased human well-being, social and environmental sustainability and empowerment"*

Table 17: Priority List of Sub-projects Proposed for Inclusive Development

District	Upazila	Road Name	ID	Priority	Unpaved Road Km	Walking Trail Km	Union	Connecting Village	Ethnic Minority	Pop'n	Total Travel time from Upazila HQ	Remarks
Rangamati	Baghaichhari	Konglak - Betling via Tui Chui	No ID	1	2	28	Sajek	Konglak Para, High School Para, Notun Para, Khogra kiching, Sealdailui, Kaicha Para, Arun Para, Longtean Para, Komola Para, Tarun Para, Aul Thang Nang, Niu Thong Nam, Puratan Jobpui, Notun Jobpui	Chakma, Lushai, Tripura	2980	6 hr	People walk 28 km to reach at Konglak para, and then take motorbike or jeep to go to Upazila HQ.
	Barkal	Andhar Manik - Saichal Road	484215003	2	15	-	Aima Chhara	Nicher Korolya Chhari, Moddhyom Korolyachari, Romokya Chari mukh, Bua Tek, Upor Korolyachari, Uluchari, Tripura Chara, Supari Bonna, Pera Chara, Dulubanya	Chakma	6120	4 hr	Some people walk 15 km and some use boats.
		Andhar Manik BOP - Guichari BOP	484215032	3	5	-		Master Para, Bottoli Para, Kalabuniya Chara Mukh	Chakma	4400	2 hr	People walk for 5 km and some uses motorbike.
	Belai Chari	Farua GC - Ruma Upazila HQ Road via Borotholy Road	484292003	1	30	15	Farua, Borotholy	Ting Bam Chara, Notun Para, Chailla Chara, Shilchari, Borkya Chara, Ramong Chara, Chaderi Chara, Shal Chara, Borotholy Marma Para(Borotholy), Borotholy Tripura Para(Borotholy), Sam Chara(BOrotholy), Saideri Chara(Borotholy), Borotholy UPC Para(Borotholy), Poli Pransa(Paindu)	Chakma, Pangkhua, Tanchangya	1699	10 hr	People walk 30 km to to go to Ruma Upazila, and then to Belaichhari upazila by jeep or bus.
		Belaichari Upazila H/Q - Farua Bazar GC Road	484292001	1	15	15	Farua	Uluchari, Taktanata, Laittachhari, Ekuja chari, Gowain Chari, Farua Bazar, Tarachari	Chakma, Pangkhua, Tanchangya	2398	6 hr	People walk 15 km and then use boats and motorcycle to reach Upazila HQ.
	Kaptai	Shilchari RHD Marma para - Noonchari Marma Para	484365026	1	3	-	Wagga	Shilchari marma para, Noonchari marma para, Ram Pahar Para, Sapchari Moin para, Noapara	Marma, Tanchangya	3300	40 min	People walk from home to main road. Motorcycle is the only transport mode after walking.
			Total	70	58					20,897		

Konglak - Betling via Tui Chui, No ID Priority 1 Road, Bagaichhari Upazila, Rangamati

A 30 km walking trail starting from Konglak para, last point of Sajek tourist spot passes through 5 (five) mouzas and connects 2980 population living in 14 Paras of Lusai, Chakma and Tripura communities. People have to walk around 30 Km to reach Konglak or Ruilui para, then take motorized vehicle (e.g. Chander Gari) for going to Masalong bazar or Bagaichhari upazila. This is committed by the Honorable President at his visit to Sajek last.

Aima Chara UP Road - Andhar Manik Via Jagonnath Chara (ID: 484214010, Barkal Upazila, Rangamati

Total road length is 31 Km of which 6 km is unpaved from Barkal Upazila to Jagannathchhara bazar and 25 km is walking trail from Jagannathchhara bazar to Andhar Manik bazar.

People do walk around 25 km to reach Jagannathchhara bazar, but go to Chhota Harina bazar using riverine route.

The proposed road is important for both agriculture, marketing, and people' mobility. 11 villages with a population of 11,320 will be connected with Union Parishad and Upazila HQ.

Shilchari RHD Marma Para - Noonchari Marma Para, ID: 484365026, Kaptai Upazila, Rangamati

Total length is 3 km, earthen, and walking trail. Connecting 2 (two) villages of 700 population living in 140 households. Teak plantation in the locality and along hill valley has been causing serious erosion to the soil, silting the jhiris and damaging the road. Both community and road alignment is vulnerable to erosion and rain storm water discharge. A detail survey is requested to look at the feasibility, given the road is important to connecting the community.

Narangiri 2 no Bridge - Shitar Pahar via Daluchari, No ID Priority Road, Kaptai Upazila, Rangamati

Connecting six villages of 2150 population living in 430 households. Total length is 6 km, earthen and non-gazetted.

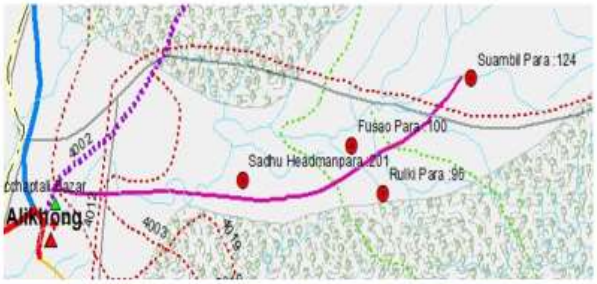
Baishari-Duchori HBB Brick Filling –Tula Tuli via Chikonchori, No ID Road, Naikhongchhari, Bandarban

Total length is 4 km, earthen and non-gazetted. Connecting 4 (four) villages of 5500 population living 1100 households. Students of adjacent villages use this road for going to primary and secondary school. Farmers carry agricultural products to the markets, and women fetch water from the nearby tertiary river channel using this road.

Table 18: Priority List of Sub-projects Proposed for Inclusive Development

District	Upazila	Road Name	ID	Priority	Unpaved Road Km	Walking Trail Km	Union	Connecting Village	Ethnic Minority	Pop'n	Total Travel time from Upazila HQ	Remarks
Bandarban	Alikadam	Kurukpata Bazar - Powamuri via Bolaipara	No ID	1	-	21	Kuruk Pata	Kocchop Jhiri Sonai Para, Mentang Para, Mengru Para, Bolai Para, Sumthong Para, Komchong Para, Rengchung Para, Patui Para, Asui Para, Ringlot	Murong, Marma, Tripura	1280	4 hr	People walk 21 Km from the villages to Kurukpata bazar for day to day need, and to Upazila HQ by means of motorcycle or jeep.
	Alikadam	Dochhari Bazar - Bolaipara Road	No ID	1	-	22		Dochhari Bazar, Raith Moni Para, Jogoth Chandra Tripura Para, Thongpong Para, Remibuk Para, Dakshin Para, Kodong Para, Menpoi Para, Mendai Para, Dorpara	Murong, Marma, Tripura	1020	4 hr	People walk 22 Km for Docchari bazar, and for Upazila HQ, use jeep or motorcycle from Docchari Bazar.
	Lama	Kuruk Patar Jhiri Para-Hargachha Para via Abdullar Jhiri Para	403515072	2	4.25		Fasyakhali	Kuruk Patar Jhiri Para, Hargachha Para, Abdullar Jhiri Para	Tripura, Tanchangya	1431	1 hour	People use jeep but some people mainly the poor walk to Upazila HQ
	Naikhongchhari	Kurokkhong Chakpara - Fungrao Para via Klitu Morong Para	NO ID	1	-	6	Dochhari	Eneljari Chak Para, Klitu Para, Fungrao Para, Tula Para, Yangli Para	Chak, Murong	482	2 hr	Very remote. Villagers walk to Upazila and also motorcycle if available
		Thoylapara -Rychong Morong Para	NO ID	2	-	6		Amjhiri Morong Para, Lengkra Para, Headman Para, Yeybot Para	Chak, Murong	510	2 hr	Very remote. Villagers walk to Upazila and motorcycle for certain distance if available.
	Rowangchhari	Tula para-Lorki - Suambil Para via Sadhu Headman Para	No ID	1	-	2	Alikhong	Sadhu Headmanpara, Fusao Para, Rulki Para, Suambil Para	Marma, Tanchangya, Bawm	529	2 hr 15 min	Very remote. Villagers walk to Upazila and also motorcycle for certain distance if available.
		Roning Para (Army Camp) - Sippi Pahar (Away 2 KM)	No ID	1	-	4		Sippi Para (Alikkhong)	Bawm	103	2 hr	Villagers walk 4 km. Very potential for tourism, for trekking.
	Ruma	Bogamukh para-Boga Lake Road via Ananda pukur	403914006 + Extended	1	7	5	Ruma	Narikel para, Vaggomoni Para, Bogamukh Para, Leitong Para, Khamui Para, Mitui Para, Ananda Para, Raikhyong Para, Kyatui Para, Punarbashan Para,	Marma, Bawm	1862	3 hrs	This route has very steep hill. Villagers walk 5 km, carrying head loads of agricultural produces to reach at Boga Lake road, where from take jeep.
	Thanchi	Thanchi Bolipara Road - Haliram Para	No ID	1		7	Balipara	Jane Rang Para, Thannak Kome Para, Halirang Para	Marma, Murong, Tripura	314	3 hr	Villagers walk for 7 km and reach at main road, from that they use jeep for transportation.
				Total	11	73				7,530		

Kacchaptali to Lokri Tripura para Road via Sadhu Headman para Road in Alikong Union under Rowangchhari Upazila, Bandarban (Priority Road 1, New Road with no ID)



Connecting 4 villages with a population of 529 in 123 households, mainly from Marma, Thangchangya and Bawm community.

Bandarban to Rowangchari RHD Road to Nothing Giri Para Road via Wagay Para Cluster Village, Priority 1 Road, ID 4009, Rowangchhari, Bandarban

Output of the Study Priority Roads to connecting the Disconnected Villages

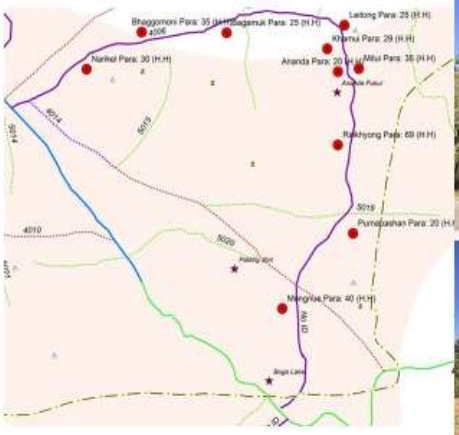
Connecting 2 (two) paras of Wagay cluster village and Nothing Giri para located next to town but remotely connected by a walkway. Need retaining wall beside the pond, few culverts and a stepping stair (photo last).

Kaplaing Para –Tinap Siter via Roning Para & Roning Para (Army Camp) – Sippi Pahar, No ID Priority Road, Rowangchhari Upazila, Bandarban

Total length is almost 15 km from Rowangchhari-Ruma RHD Road to Tinap Sitar, and the second is 4 Km from the Ronin Para Army Camp to Sippi Para (2 km away from Sippi Pahar). People have to walk this hilly road to reach the nearest growth center and Upazila HQ. This road is important for connecting both paras (around 500 population) and tourist spot.

Sippi Arsuang is the 10th highest peak in Bangladesh with a height of approximately 2939 feet. The Sippi Arsuang Hill is located in the foothills of Rowangchhari Upazila. Both Tinap Sitar and Sippi Hill view are tourist attraction but yet to attract local and international tourists in large number due to poor connectivity and others.

Bogamukh para-Boga Lake Road via Ananda Pukur, Priority 1 Road, ID: 403914006, Ruma Upazila, Bandarban



Total road length is 12 km and unpaved. Connecting 11 villages with a population of 1650 living in 360 households. This will connect mango & Lychee orchards and a potential tourist spot named Ananda Pukur. People have to walk up and down very steep slopes reaching to and from a paved road for going to Upazila Sadar and bazar.

Kurokkhong Chakpara -Fungrao Para via Klitu Murong Para (No ID), Naikongchhari Upazila, Bandarban

Connecting 5 Paras with a population of 482 in 86 households, mainly from the Chak Community living together with Marma and Murong.

20. Rural Connectivity for Tourism Development in the three hill districts

20.1 Tourism attraction includes natural places such as eco-parks, lakes, valleys, rivers, beaches, archeological sites, historic monuments, picnic spots, scenic hills and green landscape, forests and wildlife, etc. The three hill districts of the CHT have huge potential for tourism development such that this will attract national and international tourists and bring economic benefit to the country, to the region, and to the local community in particular.

20.2 Following literature review and intensive consultation with the stakeholders and community people, the Study has proposed following priority routes (both inland waterways and rural roads) to enhance connectivity with some potential tourism spots (**Table 19**), and also suggested to create some new tourism avenues that include eco-park (Manikchhari), natural ponds (Choto Harina, Barkal) and lake tourism (Barkal, Juraichhari, Belaichhari and Langadu), and landmarks (Kaptai). The section below describes the conceptual framework for new avenue creation under the MVMT project. The proposed potential avenues are those tourist spots which are connected or can be connected with the established tourist spots in offering a tourism package to both the future and today's tourists.

Table 19: Proposed Priority Roads for Promoting Tourism in the Three Hill Districts

SL No	District	Upazila	Road Name	ID	Priority	Total Length	Union	Villages	Pop'n	Tourist spots
1	Rangamati	Barkal	Barkal Bazar - Falitange Chuk	No ID	2	5	Barkal	Barkal Bazar, Marma Para, Falitange Chuk	1460	Hill view with surrounding nature.
2	Rangamati	Barkal	Charihong Mukh - Silar	No ID	2	3.5	Shubolong	Charihong Mukh, Paschim Silar dak	240	Silar Dak jharna
3	Rangamati	Belai Chari	Dhuppani Chara Para - Sungsung Para	No ID	2	10	Borotholy	Dhuppani Chara, Sungsung Para	374	Dhuppani jharna, connecting villages
4	Rangamati	Kaptai	Narangiri 2 no bridge - Shitar Pahar via Daluchari	No ID	1	6	Raikhali	1 No Marma Para, Narangiri Para, Daluchari Gol Para, Daluchari Para, Aga Para, Shitar Pahar Para	2150	Shitar pahar, jharna.
5	Khagrachhari	Manikchhari	Panna bil - Sempru Para via DC Park	4.47E+08	1	5.5	Batnatali	Dainchari Purbo Para, Golden Bagan Para, Rubber Bagan	2806	DC Park
6	Bandarban	Alikadam	Alikadam Thanchi Road 17 KM - Damtua	No ID	1	6	Chokhyong	Anup Para, Parmia Para, Nanchak Para	325	Damtua jharna, hill trekking
7	Bandarban	Lama	DC Road (Lama-Suwalac) - Prodhan Jhiri via Andhari Jamalpur	No ID	1	8	Sarai	Kalambox Para, Prodhan Jhiri	221	Hill view, Quantum Foundation
8	Bandarban	Naikhongchhari	Nanna Kata Main Road - Panjakhana Via Voghoban Tilar Point	NO ID	3	2	Sonaichhari	Nannakata, Barua Para	504	Linked with Ramu upazila; sea view and hill view; Shoilo chura view where Solomon's peak is situated.
9	Bandarban	Rowangchhari	Kaplaing Para -Tinap Siter via Roning Para	No ID	1	15	Rowangchhari	Roning Para	344	Tinap Siter Jharna and connecting villages which will promote community tourism.
10	Bandarban	Rowangchhari	Roning Para (Army Camp) - Sippi Pahar (Away 2 KM)	No ID	1	4	Alikhong	Sippi Para (Alikkhong)	103	Sippi Pahar which is also known as Sippi Arsuang is one of the highest peak in Bangladesh.
11	Bandarban	Ruma	Bogamukh para-Boga Lake Road via Ananda pukur	403914006 + Extended	1	5	Ruma	Narikel para, Vaggomoni Para, Bogamukh Para, Leitong Para, Khamui Para, Mitui Para, Ananda Para, Raikhyong Para, Kyatui Para, Punarbashan Para, Mongnue Para	1862	Ananda Pukur which is very old and situated on the hilltop and this road will connect villages.
12	Bandarban	Thanchi	Remakri 7 no ward Border Road (45Km) - Choto Modok	No ID	1	7	Remakri	Kenong Headman Para, Singa fa Mukh, KeishaPrue Para, Rangshula Para, Fuikuk khumi para, Subash Para, Shaku Para, Hana Chandra para, Pele khumi para, Chayong Para	1652	Several jharnas, trekking
13	Bandarban	Thanchi	8 no ward Border road (50km)- Boro modok	No ID	1	4	Remakri	Boro modok vitor para, Paimong para, Boro modok Bazar, Sri mohon para, Fru sha aung para, Usha Mong para	1551	Several jharnas, trekking
Total:						**81**			**13,592**	

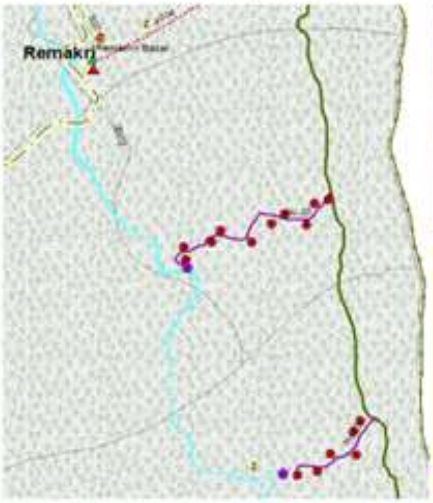
Panna Bil - Sempru Para via DC Park, ID: 446674028, Manikchhari Upazila, Khagrachhari

Total length is 5 km of which 3 km is HBB. Connecting three villages of 2800 population with Upazila HQ. It also connects several orchards of mango, lychee and pineapple. Also a eco park locally called DC Park is proposed for development under MVMT project. This road is important both for local villagers, and agriculture and tourism development.

Alikadam Thanchi Road 17 KM - Damtua, No ID Road. Alikadam Upazila, Bandarban

Total length is almost 6 km, earthen walking trail from Alikadam- Tha R&H Road. People have to walk this road to reach Damtua waterfall adjacent three villages. It takes 3 hou reach waterfall, because of steep s This road is important for both vi connecting and tourist spot.

Remakri 7 No Ward Border Road (45Km) -Choto Modwok & 8 No Ward Border Road (50 km)- Boro Modwok, No ID Priority Road, Thanchi Upazila, Bandarban



Boro Modwok and Chota Modwok are located in the deep area of Remakri union, and connected with Thanchi upazila mainly by riverine route, which 9/10 months perennial. In rainy season, this route is risky for heavy current flash flood. Lekri Border Road is being built by the Army. The proposed road will connect with the border road, an alternative way to the riverine route. Total length is 11 km of which Boro Modwok Road is 4 km and Choto Modwok 7 Km, connecting many paras with a population of over three thousands. Important for both local villagers and tourists.

20.3 Despite potential natural attraction, the international tourists are not yet large in number. With the new avenue development and improvement in connectivity, it is expected that both national and international tourist will increase in number to an expected level. Therefore, special emphasis has given on the development of landmark tourism establishment (details of which are given below) as well as on promoting eco-tourism (such as lake tourism and hill tourism) and community tourism. This will have room for participation of local community. Such participation will help local community to benefit by earning income directly through participation. Tourism must be environmentally and culturally sustainable not to jeopardize the eco-system and traditional culture, norms and values. So, awareness training to the community is strongly suggested in allowing them to learn, maintain and protect the eco-system for their own sake. Also suggested to provide the community with financial support, and training to youth interested in working as tourist guide, and to involve NGO as service provider or implementing partner for community development through mobilizing the community with facilitation for their active participation. The conceptual framework of the proposed landmark tourism is provided in the 'Thematic Design Section'.

Tourism must be environmentally and culturally sustainable and should not jeopardize local eco-system and traditional culture, norms and values. Awareness training to the community engaging NGOs is strongly suggested with essential financial support in enabling the community to learn, maintain and protect the eco-system for their own sake.

20.4 While the CHT region offers plenty of rooms for ecotourism, this may increase economic potential locally and be a source of income from surrounding nature without destroying it. However, the never-ending demand for economic growth triggers a large number of infrastructure projects that may destroy the potential for ecotourism in sensitive areas. Based on understanding that these projects would require Environmental Impact Assessments (EIA) for all its sub-projects, there is an obvious conflict between the infrastructure interests and the ecotourism interests that is not often widely recognized. Infrastructure projects are generally wide-ranging projects with a large number of possible adverse environmental impacts. One of the most important direct effects are vegetation clearing having indirect negative effects on landscape, wildlife and biodiversity, values critical for ecotourism projects. Secondary effects of such projects include new settlements, both temporary and permanent, further increasing pressure on natural resources. Therefore, it is important for an EIA process, in areas that have potential for ecotourism interest, as it is in all EIAs, to go through evaluation of alternatives, prediction of impacts as well as mitigation and compensatory measurements. There should be guidelines for how to handle ecotourism in EIAs of these types of projects.

21. Potential Tourism Development in the CHT

- *Lake tourism*
- *Hill tourism*
- *Waterfalls*
- *Eco-Park*
- *Monuments/buildings of historical and religious importance*
- *Community tourism for community of rich cultural values like the 'Munlai Para'*

21.1 Barkal, Juraichhari, Belaichhari, Kaptai, Naniarchar and Bagaichhari Upazilas of Rangamati district have potentiality of lake tourism development. Bandarban (and Rangamati as well) is being rich in green hills and scenic views offer opportunities for hill tourism like the one of 'Marayong Thong' in Bandarban.

21.2 Once tourism development in the CHT is synchronized with that of Cox's Bazar, tourists visiting Cox's Bazar with friends and family to enjoy the world's largest sea beach and Himchhari fall will have package tour to enjoy scenic hills' views, water falls, and kayaking in lakes of Bandarban and Rangamati districts.

21.3 **Cultural Tourism:** The tribal communities in the CHT have unique cultures and traditions. They have traditional festivals such as Pailong Poye (boat race and fair), wrestling fair, chariot fair, cultivation festival, harvesting festival, and new year's festival 'Boishavi (Boisuk, Shangrai and Biju)' that national plain land tourists and international tourists would be interested in enjoying and learning by visiting the community during the festive seasons.

21.4 **Community Based Tourism**: Munlai Para located in Ruma Upazila of Bandarban district is known as the cleanest community and many tourists come to see the housing environment by visits to the area. While the tourists come to visit the Boga Lake and Keokradong, they usually stay a night(s) with the community. Enhanced connectivity to this community has created opportunities to earn income at the household level. Other communities of *Ronin Para* in Rowangchhari and *Raikong Para* in Ruma have similar characteristics. If these communities are connected with road and supported with training and/or some basic facilities of housing, sanitation, water, electricity and internet, these communities will also attract tourists like Munlai Para.

21.5 Like Boga Lake of Ruma Upazila, Remakri of Thanchi and Kurukpata of Alikadam in the remotest Bandarban district have the community tourism but in a limited scale and that are informally grown on demand, not having proper accommodation facilities for the tourist in those localities. It is evident that community-based tourism has many benefits of environmental, economic and socio-cultural in nature. The **Figure 5** below depicts the benefits of community tourism as a Tool for Community Development and Livelihood Improvement:

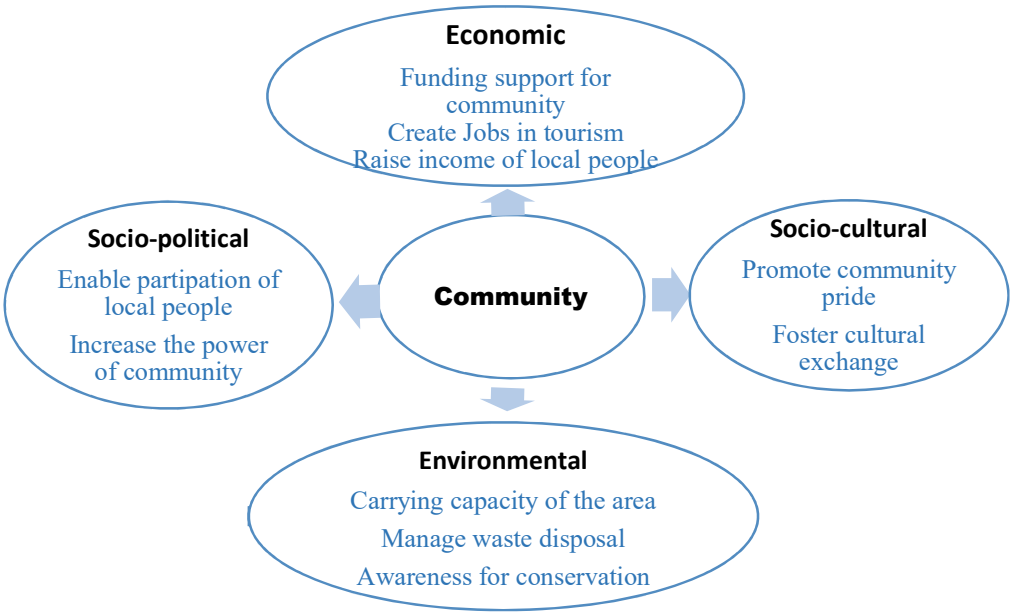


Figure 5: Community Based Tourism as a Tool for Community Development and Livelihood Improvement

21.6 In many countries of the world, community-based tourism exists. The **Box 4** describes the success of community-based tourism in the indigenous mountain and forest area of Luang Namtha province in Laos. Local communities were engaged in tourism activities as guides, porters, hotel and lodge entrepreneurs, and so forth. The community involvement helped benefiting the local population. A similar approach could be promoted in the CHT region, which has many similarities with Luang Namtha.

Box 4: Community-based tourism by ethnic populations in Luang Namtha Province, Laos

To alleviate poverty and promote socioeconomic development, the Government of Laos implemented a community-based tourism project in collaboration with UNESCO in the Luang Namtha Province of Laos. The project provided training to build skills in different tourism activities such as homestay, running a guest house, tour operations and transportation, and monitoring tourist safety. The project also designed trekking and cultural programmes, a river tour, and a jungle safari. These programmes provided opportunities for tourists to experience the area's most distinctive natural attractions and visit ethnic minority settlements, where lodging was provided by the local communities. This provided an opportunity for the local people to participate in tourism planning for their area and to share in the benefits. As a result of these activities, tourist numbers increased. A survey of international tourists found that the two strongest factors attracting tourists to the area were ethnic minorities (68% of respondents) and the natural world (66%). Cultural attractions (50%) and the novelty effect of a new destination (44%) were also strong influences. The increased employment of local people resulted in an improvement in their socioeconomic conditions and helped them move away from subsistence agriculture. Overall, the community-based tourism generated USD 137,794 in gross revenue between 2001 and 2005, of which USD 9,485 went to village funds for village development. Source: Suntikul (2007)

21.7 However, the Study received mix views on community tourism. Participation of individuals and community in tourism is preferred but not community-based tourism. There were reservation, mistrust or concern from the tribal community representatives or educated minority elites who were interviewed and/or consulted on tourism under this Study. It is feared that women and girls would be subject to humiliation and extortion. Also, a fear is rooted among the many of the tribal communities the consultant interviewed that this would invite people from outside the CHT to establish tourism business and/or encourage people from inter-and intra-districts to settle in their community location like Sajek, and they can face eviction or can lose traditionally given right to land for sustenance food cultivation and others. Following the reservation shown by the tribal community representatives and mix experiences of the Sajek, Kurukpata, Remakri and Boga Lake, a clear understanding must be reached to identifying the elements of threat and prescribing a framework for effective participation in and monitoring of community tourism. This suggests for an in-depth studying, as well of the communities which have community tourism with proven records of failures and success and mechanism of effective participation, both in Bangladesh and abroad.

21.8 **Hill View Tourism:** The beauty and view from the top hill of **Keokradong**[2] has charming attraction. Keokradong peak views smoky from the distance and/or covered with a white cloud. Due to the deep wind, sometimes it is tough to stand on the hilltop, which some tourists find thrilling. Rain, wind, and clouds have no time to come to the side of the Keokradong. **Boga Lake** and **Munlai Para** are located on the way to Keokradong. Normally, tourists visit Munlai para and Boga Lake and stay the night in Boga Lake area, then visit Keokradong in the morning next to watch the beauty of Keokradong. The **Shailochura** at Naikongchhari has a beautiful view point that can be developed further in attracting tourist from the sea beach of Cox's Bazar to the Bandarban through Ramu Upazila. A road is proposed for connecting Ramu with the spot through a shortest connection (*see in the **Table 19***).


Picture 29 & 30: Keokradong

[2] ***Keokradong*** *means the **Tallest Rock Mountain** in Marma language, is now the 5th highest mountain but was once considered the highest mountain in the country about 986 meters (3235 feet) high* located in Ramu Upazila of Bandarban district*. At present, Saka Haphong or Mowdok Taung is the highest peak of Bangladesh.*

21.9 The Study found a potential tourist spot (‘***Ananda Pukur’***) almost 5 (five) km away from the Boga Lake. The proposed road is the shortest connection between the two spots. This will also connect 10 paras with a population of 348 households (1740 people) with the markets, health centres and education institutes

Picture 31: Ananda Pukur

Picture 32: Konglak Pahar–A Beautiful Hill in Sajek

Konglak Para is located on the top of **Konglak hill**. The Sajek Valley consists mainly of Ruilui Para and Konglak Para (Rangamati & Khagrachhari). It is located about 2 kilometers from the Ruilui para. The Lusai Hills are clearly visible from the Konglak Hills. The clouds, mountains, and greenery can be seen all around.

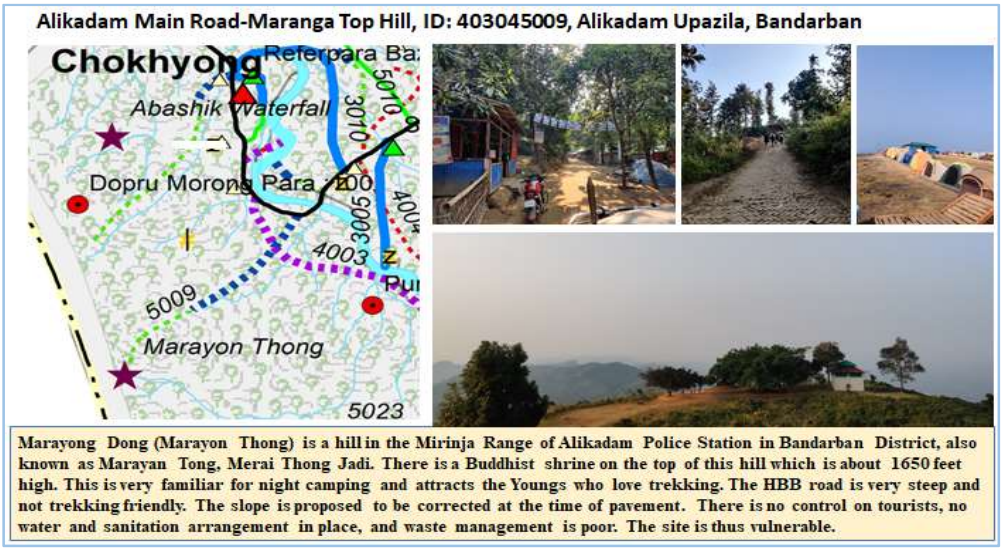
21.10 According to local information, this area is called Kamlak Para because of its large orange groves. The **Konglak spring** is located at the bottom of the hill and the hill is named after this spring. Konglak Pahar has now become a focal point of attraction for tourists visiting Sajek (*Picture 32*). The small village is inhabited by Tripura and Lusai ethnic groups. Jhum farming is the main source of food and income in this neighborhood. Turmeric, ginger, and orange are mostly cultivated. There is a water crisis in Konglak Para. Rainwater harvesting is the main source of water in this area. Residents collect rainwater from the shed of the house, store it in the reservoir and carry out daily activities. The road connecting Konglak is being built by the Rangamati Hill District Council. An RCC tower structure to creating a viewing point from the hill top including water and sanitation facilities is proposed for development in establishing a landmark tourism. It will be really amazing to explore the Sajek Valley as well as Konglak Pahar together.

22. Main barriers to tourism development in the hill districts of the CHT Region

22.1 The most barrier to tourism is the lack of good facilities, remoteness, limited tourist spots that are accessible in the region. The number of international tourists is less, compared to national tourists mainly due to lack of facilities (such as accommodation, food, water and sanitation) up to international standard and then restriction due to security. According to the FGDs and KIIs findings in the Study, once good facilities including safety and security are well created in the region, the tourism will flourish further.

23. Strategic Tourism Impact Management in the Chittagong Hill Tracts (CHT) Region

23.1 Having the natural beauty in the CHT area and rich heritage amongst the tribal communities, the Chittagong Hill Tracts (CHT) is visited by 25-30 lac tourists every year[3]. Every fountain falls and streams in the CHT forest region is home to a highly biodiverse ecosystem: protected forests or wildlife sanctuaries. Moreover, these streams are the primary source of potable drinking water, domestic use, and irrigation for local communities. There are many governmental run resorts. Private entrepreneurs have also developed different hotels, motels, and resorts to support the local tourism industry devoid of proper environmental impact assessment (EIA), waste and wastewater management. Unaware of tourism activities in primeval areas have created substantial loads of solid wastes (seen in the Marayong Tong of Alikadam). The impact of the tourist industry has been deteriorating ecosystems, natural resources such as water, biodiversity, and polluting the local environment of the tribal community (Jahan, Asef, et. al. 2020). Considering the scenarios, as mentioned, it is high time to manage the tourism activities in CHT strategically focusing on ecotourism and have strategic environmental assessment (SEA) to mitigate environmental impacts.

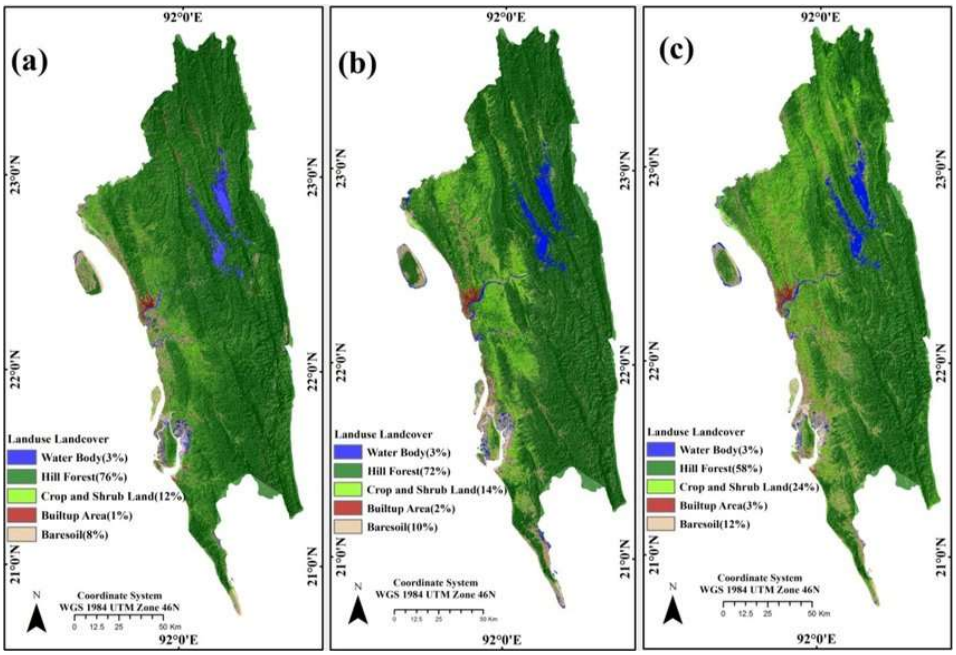


[3] *According to a paper presented by Mashura, Shammi and Jahan, Asef in the 5th International Conference on Mountains in the Changing World October 8-9, 2020 Online, ZOOM Platform, Kathmandu, Nepal, At: Kathmandu, Nepal*

24. Rural Connectivity for Agricultural Development in the three hill districts

24.1 The Chittagong Hill Tracts (CHTs) comprise 10% of country's landmass, and covers 13,184 km2, comprising 70% of the hilly areas of Bangladesh, of which 90% are sloping lands. The area is mild to very steep ranging from 15% to over 70% slope, often breaking or ending in cliffs (SRDI, 2018). High hills ranged from 200-1000 m and lower hills from 15-200 m above the mean sea level (Hossain et al., 2017). Officially reserved forests cover 3,483 km2 (26%) of the Chittagong Hill Tracts, and the rest is unclassed state forest areas used mostly for jhum cultivation. Large areas are fallow, made up of abandoned jhum fields that have undergrowth of shrubs, vines, sun grasses, thickets and weeds and the rest have horticulture, forest plantations, canes, bamboos, rubber, and tea plantations. The **Map** 3 below is the Land Cover Map of CHT in 1995(a), 2005(b) and 2015(c). Deforestation and/or reduction in vegetation is clearly evident from these maps.

Map 3: Land Cover Map of Chittagong Hill Tracts



24.2 Chittagong Hill Tracts have wealth of natural resources, but there is only limited land suitable for agriculture in the region, as 79% of its area is steeply sloping (**Map 4**) with severe to very severe limitations on agriculture (**Table 20**). Many of these areas have shallow soils and suffer from soil erosion as a result of deforestation and jhum cultivation.

24.3 Yet, agriculture is the main source of livelihood of the majority of CHTs dwellers. Agricultural activities include ploughing lands, shifting cultivation, fruit gardening, paid wage labor, timber production, livestock and poultry rearing, and free fishing. Crop agriculture including fruits and trees provide both subsistence foods, and cash incomes of both Bengali and ethnic communities living in the hilly areas. Agriculture in the hilly area is greatly rain-fed. Hills are highly susceptible to erosion and difficult to irrigate. The monsoon rainfall is very high, more than 2200 mm annually. Valleys and floodplains

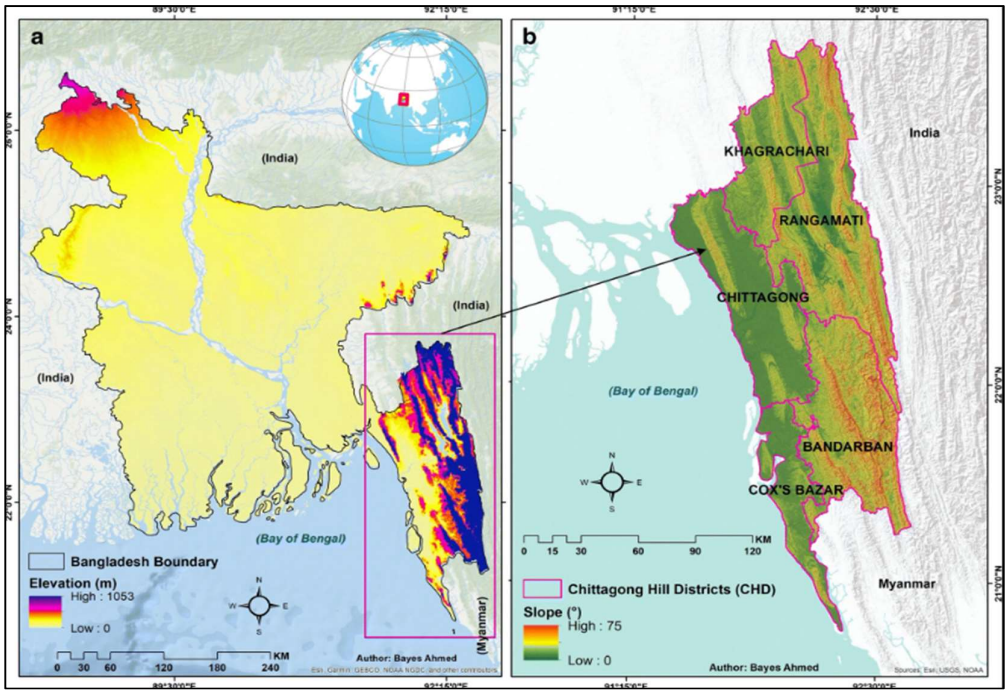
of the CHT are suitable for plough agriculture mainly of rice, maize, tobacco, potato, cotton, papaya, sugarcane, pineapple, turmeric, ginger, aroid and others vegetables cultivation (Ahammad and Stacey, 2016). The hill slopes are suitable for growing a number of high value fruits such as banana, pineapple, papaya, mango, litchi, jackfruit, orange, guava, dragon fruit and lemons.

Table 20: Distribution and extent of slope classes in Chittagong Hill Tracts

Slope class	*Slope %*	*Area (ha)*	*Covered Crop*	*Crop suitability*	*Crop limitations*
Nearly level	*< 5*	*104*	*6.2*	*Very good*	*Minor limitations*
Gently sloping	*5-15*	*26,518*	*2.0*	*Good*	*Few limitations*
Moderately sloping	*15-30*	*102,136*	*7.7*	*Fair*	*Moderate limitations*
Steep	*30-50*	*297,536*	*22.4*	*Less suitable*	*Severe limitations*
Very steep	*50-70*	*399,482*	*30.0*	*Restricted for agricultural use but good for watershed protection purposes*	*Very severe limitations*
Excessively steep	*> 70*	*349,786*	*26.3*	*Unsuitable for agriculture, only suitable for watershed protection purposes*	*Very severe limitations*
Settlements & water	*30-70*	*71,939*	*5.4*	*Mostly urban areas, cluster villages, Kaptai lake, and rivers*	
Total		**1,330,501**	**100**		

Source: SRDI 1994-2002. Bangladesh's Soil Resource Development Institute (SRDI) has mapped the soils and land resources of the Chittagong Hill Tracts (SRDI 1986). Most agricultural development programmes in the tracts have been based on this work's recommendations. SRDI carried out a soil survey of the CHT's 25 administrative areas (Thana/Upazila) from 1994 to 2002 to assess the existing natural resources. The results were published in Bengali (SRDI 1994-2002). The slope class data in Table 6.1 is based on these reports.

Map 4: Elevation Map of Chittagong Hill Districts



24.4 Today, the CHTs region is one of the richest fruit production regions in Bangladesh. At least 25-50% of households of CHTs produce banana in their annual farming plots and home yards (Khan et al., 2012). Distinctive climatic conditions of CHTs provide a great diversity and variety for fruit production, and orchard fruit production system comprises the largest fruit sector of Bangladesh (Dewan et al., 2015). Tree based crop production systems either with fruit or timber plantations has increased in CHTs which are more economically attractive and environmentally (except Teak) sound (Bala et al., 2013). There is tremendous potential for growing high value crops such as fruit, vegetables, medicinal plants and aromatic plants under agroforestry system in hilly areas.

24.5 The crop agriculture in the hilly area is mainly divided into two systems i.e. plain land plough agriculture and non-plough slope agriculture. In valley and foothill, irrigated seasonal and annual crops are cultivated extensively. In hilly slope, shifting cultivation, horticultural plantation, agroforestry and mixed fruit gardening are practiced in the CHTs by the tribal and non-tribal both communities; while shifting cultivation (jhum) is a traditional system being practiced in the CHTs by the tribal communities. An increasing trend of fruit cultivation and production is observed in the CHTs. Agroforestry and perennial fruit gardening have showed higher economic benefits with environmental stability in this region. Extensive jhum practice creating a dilemma in conserving nature and food production. Soil erosion is extensive in CHTs due to shifting cultivation and mono-cropping systems. Tobacco and, slash and burn method of cultivation are very destructive to land and forest ecosystems. Sustainable alternate land use of jhum farming including multi-story agroforestry and multi-strata fruit orchard has been evolved in some areas of CHTs. Although alternate land use practices started, extensive expansion should be considered after careful review and environmental assessment for the sake of environmental conservation.

Unsustainable Jhum Cultivation

24.6 **Alternative to Jhum Cultivation**: As described in Part I of the Report, many of the tribal communities living in the CHT practice shifting cultivation, traditionally known as jhum cultivation, has proved to be destructive and unsustainable. Cropped land is no longer given enough time to recover its fertility between cropping cycles. Increasing pressure on the land to meet the needs of the growing populations has led to the shortening of fallow periods to only three to five years. Today, traditional jhum cultivation can no longer meet local people's subsistence requirements and the removal of large areas of forest has had an adverse effect on the environment causing much soil erosion. The system has caused enormous deforestation, soil degradation, fertility reduction, and siltation in lakes and waterways.

24.7 An integrated socioeconomic and erosion study on the sustainability of traditional shifting cultivation (Jhum) carried out in 1998 and 1999 in the Chittagong Hill Tracts of Bangladesh showed the system to be non-sustainable under the current conditions with fallow periods of only 3-5 years and lack of rights to land. To ensure long-term productivity of the soils, Jhum should therefore be adjusted to a tolerable level and farmers should be given title to the land to motivate them to switch to improved and settled farming systems. Also, it has come out of the regional workshop in Rangamati that creation of alternative livelihood can pave the way available for reducing dependency on Jhum cultivation. Priority should be given on improving of rural connectivity to their area of living so that non-farm employment is created for people dependent on jhum with a special focus given to educating children of Jhumers families.

24.8 Jhum cultivation need be adapted to make it environmentally friendly. Initiatives are also to be taken to promote the gradual abandonment of jhum cultivation and the rehabilitation of affected jhum cultivators. Many countries have used rubber cultivation to replace shifting cultivation. Rubber plantations give better economic returns, a more equitable distribution of income, and better forest cover to reduce soil erosion (Jayasena and Wickramanayake 1996). The 1965 Canadian forest survey (SRDI 1986) estimated that about 0.24 million hectares of the CHT's medium sloping unproductive uplands were suitable for rubber, coffee and other agroforestry crops. Over the last two decades rubber has emerged as an important economic activity in the CHT. However, there needs initiatives to encourage cultivators to move away from monocultures of rubber to mixed plantations of rubber with timber, fruit orchards, and other crops.

24.9 A feasibility study carried out by the Bangladesh Tea Board (BTB 2000) suggested that an additional area of 46,856 ha of land in three CHT districts could be converted into small holding tea plantations. This would create jobs for about 100,000 families, reduce soil erosion, and improve the local environment. Smallholder tea plantations are beginning to be established in many parts of CHT.

24.10 **Climate change effect on agriculture**: Agriculture remains the most vulnerable to the effect of climate change. The key channels through which climate change damages the productivity of the agriculture sector: (i) rising temperature and solar radiation increases the incidence of insects, diseases and micro-organisms hurting soil fertility; (ii) rise in salinity due to sea level rises undermine soil fertility, hurting farm productivity. Government recognizes that the country can expect to experience sea level rises of 14 cm, 32 cm, and 88 cm by the years 2030, 2050, and 2100, respectively (cf. Delta Plan 2100). Rangamati is susceptible to sea level rise effects. This will result in both loss of private and public lands and assets, fall in production and put people at risks—leading to climate induced migration; (iii) increased flooding, land erosion and cyclones resulting from climate change will hinder agricultural output.

24.11 **Land use planning and development control for agriculture**: Like tourism, it is understood that Chittagong Hill Tracts has tremendous potential for development in agriculture. The number of fruit gardens is increasing day by day. Commercial

cultivation of vegetables and fruits is a trend, and Jhum land is being converted to fruit garden. Some Upazilas and unions are producing more than others. Fruits and vegetables are largely observed, where transportation facilities are established. Communication is playing a big role to this change in development. Given the high demands from people for rural road connectivity, the Study proposes following priority roads under the MVMT project (Table 16 below) for facilitating agricultural production and diversification. Noting that the conversion of land is unplanned and uncontrolled, this Study suggests that there should be land use planning and then control to check any unwanted and unplanned growth and conversion of land in protecting and preserving the sensitive eco-system of the hill districts from intensive and unstainable agriculture. It is also strongly advised that environmental sustainability is taken into consideration in selection of alignment for enhancing rural connectivity in the three hill districts.

Table 21: Proposed Priority Roads for Facilitating Agricultural Production, Rangamati

Upazila	Road Name	ID	Priority	Total Length	Union	Village	Pop'n	HHs	Major Agriculture Crops
Barkal	Jagonnath Chara - Saichal via Dighol Chhari	No ID	2	11	Aima Chhara	Dighol Chari, Modon Para, Aima Chhara, Saichal	1700	425	Turmeric+Vegetable+ Papaya
	Andhar Manik BOP - Guichari BOP	484215032	2	5	Aima Chhara	Master Para, Bottoli Para, Kalabuniya Chara Mukh	4400	1100	Vegetable+Papaya+ Paddy
Jurai Chhari	Jurachari H/Q - Shilchari GC Road	484472002	1	13.43	Jurai Chhari	Balukhali Mukh, Samira Bazar, Ghilatoli(Moidong), Shilchari Bazar(Moidong), Tin Tila(moidong)	2736	880	Turmeric
	Jurachari UPC - Dumdumya UPC via Lulang Chari & Chalka Para	484473003	1	39.36	Jurai Chhari	Deba Chara, Lulang Chari, Barudgola, Beltola, Amtola, Naksatoli (Dumdumya), Gonda Chara(Dumdumya)	3328	1070	Turmeric+ Vegetable + Settlement
Kaptai	Shilchari RHD Marma para - Noonchari Marma Para	484365026	1	3	Wagga	Shilchari marma para, Noonchari marma para, Ram Pahar Para, Sapchari Moin para, Noapara	3300	660	Ginger+Coriander+ Turmeric+Banana+ Sojena
Kawkhali	Betbunia Kala kaji Para Bridge - Sugarmill road	484255011	1	6	Betbunia	Kala Gaji, Kalampati Amchhari, Dabbunya Chhara, Tarabunia	1150	230	Bamboo+ Teak
Langadu	Mainimukh - Choto Mahilla Road (Sonargaon)	484584007	1	11.50	Gulshakhali	Gatha Chhara, Gulshakhali, Ahsanpur, Choumohoni Bazar, Mohammadpur, Rajnagar, Sonargaon	22360	4300	Paddy+Human Settlement
	Bagachattar UPC - CO Tila Bazar	484583005	1	6.50	Bagachattar	Boiragi Bazar, Jalia Para	2080	400	Paddy+Papaya +Collection Point
	Hossain pur Choumohoni - Mayanimukh Bazar via Kalapakujya Union	484583002	1	8.00	Kalapakujya	Salampur, Islampur, Mamunpur, Rajapur, Dakkhin Rahmatpur, Gatha Chhara, Jatramura	6708	1290	Mango+Banana
Naniarchar	Panchari Para - Nanniarchar & Longudu bowndary	484754010	1	8.5	Naniarchar	Horina Chhara, Chailla Chara, Jadukhan Chhara (Part), Talukder Para, Rangi Para, Tholchap Para	3870	545	Pineapple
	Nanakrum - Shiallachari via Boroitoli	No ID	2	4	Burighat	Nanakrum Para,Boroitli, Shialla Para	4402	620	Pineapple
	Burighat Bazar - 8 no Tila	No ID	3	1.5	Burighat	8 No Tila	2130	300	Pineapple
Rajasthali	Gainda UPC Office - Moronga Para	484784006	1	5	Gainda	College para, Mabbi Punarbason Para, Keang bro Para, Powaithu Para	1071	210	Mango+Teak
			Total:	**123**			**59,235**	**12,030**	

Bagachattar UP - CO Tila Bazar. Langadu Upazila, Rangamati (Priority Union Road, ID:484583005)

The Union Road passes through 2 (two) villages with a population of 2000 (400 households) and connect the Union with Upazila HQ. Agricultural produces are carried to the CO Tila point using the road and then transport to outside Upazila using water ways

Rangi Para - Mayani Ghat Road, ID: 484584006, Bagachattar Union, Langadu Upazila, Rangamati

Proposed 8 km road connecting Rangi Para, Gaus Pur bazar, Forest tila (Loha kat), Mayani Mukh para with 1650 people residing there and huge agricultural land. Need 2 bridges and 2 culverts.

Bagachattar Choumohoni - Ranjit Para Road, ID: 454585012, Bagachattar Union, Langadu Upazila, Rangamati.

4.5 Km road connecting 2 (two) Paras with a population of 660 living in 132 HHs and mango orchard and agricultural land. A 50 meter bridge is a need.

Juraichhari UPC Dumdumya UPC via Lulang Chari & Chalka Para. Juraichhari Upazila, Rangamati, Priority 1 Road, ID: 484473003

7 (seven) villages with a population of 3328 (1070 households) are connected with Upazila HQ. Agricultural products are carried to the Lulang Bazar and Juraichhari Sadar using this road.

Table 22: Proposed Priority Roads for facilitating Agricultural Production, Khagrachhari

Upazila	Road Name	ID	Priority	Total Length	Union	Village	Pop'n	HHs	Major Agriculture Crops
Dighinala	Udalbagan - Ramratan Karbari Para	446434011	1	5	Dighinala	Udalbagan, Katarang Chhara, Ramratan Karbari Para, Khinarai Karbari Para	3000	750	Papaya+Banana +Mango
Guimara	Gowaichhari GPS - Uttar Hafchhari via Baroy Chhari GPS	No ID	1	9	Sindukchari	Gowaichhari, Baroy Chari Chakma Para, Baroy Chari, School Para, Bagan Para, Uttar Hafchhari	1380	230	Mango
Lakshmich	Koilash Mohajan Para - Barodona Para via Botgach Para	No ID	1	2.5	Dulyatali	Koilash Mohajan Para, Botgach Para, Purbo Barodona Para, Dewan Para	1100	250	Paddy+Bamboo
Mahalchha	Lahit Baran Karbari Para (R&H)-1 No Sabakang Union H/Q Road via Kalachan Karbari Para	446654019	1	5.5	Mahalchhari	Khamar Para, Gada Chhara, Rajranjan Para, Bimal Para, Hemoranjan Para, Bosonto Para, Kalachan Para, Hemonto Para	2464	352	Pineapple
	Milonpur Banabihar - Khamar Para via Radhamon Bazar	No ID	1	5	Mubachhari	Radhamon Para, Khamar Para	2100	300	Pineapple
	Rangapani Chhara GPS - Pera Para via Juddhomoni Para	No ID	1	5.5	Kayangghat	Rangapani Para, Hazachhara, Juddhomoni Para, Pera Para, Kalabunia Para	1729	247	Pineapple, Mango
Manikchha	Bara Dulu DP Para (RHD) - Changuchara Para Road	446674009	1	6.35	Juggachhala	Bou Bazar, Karbari Para, Noghuram Para, Pakka Tila	6832	1120	Turmeric+ Settlement
	Panna bil - Sempru Para via DC Park	446674028	1	5.5	Batnatali	Dainchari Purbo Para, Golden Bagan Para, Rubber Bagan	2806	460	Mango+Litchi +Pineapple
	Manikchhari RHD - Eyatalang Para via colonel Bagan	446675007	3	2	Manikchhari	Nath Para, Asrayan Prokolopo	1586	260	Mango+Litchi
Matiranga	Matiranga Chowdhury Ghat-Obbhya Para Road.	446704033	1	10.15	Matiranga	Jari Chandra Para, Jatin Para, Majra Para, Abhya Para, Ropai Sing Para, Thong Thung Para, Rabi Chandra Para,Cichok Para, Thang Thung Para, No-4 Rubber Bagan, No-3 Rubber Bagan, Bazar Chowdhury Para, No-2 Rubber Bagan, No-1	2127	462	Jackruit+Mango +Rubber
Matiranga	Redoy Member Para (RHD road) - Kap Para via Risang Jhorna	446704114 + Extended	1	3.5	Matiranga	Kap para	718	156	Mango+Banana
	Harun Headman Para Abur Dokan - Apurno Para GPS via Jali Para Poti Karbari Para	No ID	1	12	Amtali	Harun Headman Para, Jali Para, Poti Karbari Para, Asroy Para, Gumti Para, Sorbo Siddhi Para, Apurno Karbari Para	1666	362	Mango+Litchi
	Ramshira Bazar - Anondo Karbari Para via Mohendro Master Para	446704062 + 446704060	1	7.5	Amtali	Mohendro Master Para, Monlal Headman Para, Mohonto Karbari Para, Anondo Karbari Para, Kamini Para	1520	331	Mango+Litchi
	Gumti UP Office-Bhibonchara GC via Tailafang & Gakulmani BDR Camp Road.	446703010	1	8.5	Gumti	Gokulmani Para, Kachko Chhara, Vanga Mura Para, Mohajan Para	1932	420	Jackfruit+Mang o
	Abdul Barek Bagan - Kulpu Boiddo Para via MP bagan	No ID	1	3	Baranal	Hari Charan Para, Kulpu Boiddo Para	1058	230	Mango+Litchi
Panchhari	Bhaibonchara Kheyaghat - Jiranikhola Para via Kathalmuni Para	446774027 + Extended	1	10	Latiban	Bagan Para (Yomong Marma Bari), Mogli Mohon Karbari Para, Khealadhula Para, Chaiyong Karbari Para, Anakka Chara, Kathal Muni Para, Jiranikhola Para	1833	390	Pineapple and other fruits and collection point
	Mirzatila - Boromuing Para via Ramshing Para	446774050 + Extended	1	9	Latiban	Boromura Para, Ramshing Dewan Para, Durchhari Para, Uklaima Chhara, Kanarai Para, Boromuing Para	1152	245	Mango+Tamari nd +Turmeric
Ramgarh	Nakapa Bazar - Batnatoli UP Office via Taichakma and Kumari	446803001	1	6.5	Patachhara	Tholi Para, Taichakma Para, Kumari Para, Sadhu Para, Belchhari Para, Guja Para, Mora Koila Para	11139	2370	Mango+Litchi +Pineapple
			Total:	**116.5**			**46142**	**8935**	

Udalbagan-Ramratan Karbari Para. Priority Road 1, ID: 446434011, Dighinala Upazila, Khagrachhari.

The road is 3 km and earthen connect Udalbagan school and markets. It's a link to two paved road that connects with the upazila HQ. important for both education and agriculture.

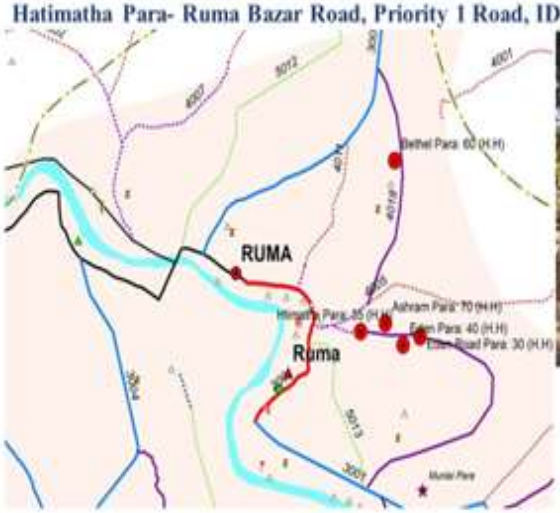
Bagaichhari Mukh (Anando Bazar) - Gobinda Karbari Para via Nilkamal Karbari Para. Dighinala Upazila, Khagrachhari, Priority Village Road, ID: 446434012

Connecting 5 villages of 3500 population living in 640 households with school and college and markets.

Table 23: Proposed Priority Roads for Facilitating Agricultural Production, Bandarban

Upazila	Road Name	ID	Priority	Total Length	Union	Village	Pop'n	HHs	Major Agriculture Crops
Lama	Chiuni Mukh - Thakurjhiri	No ID	1	4	Lama	Chiuni Mukh	120	25	Mixed vegetables and Collection Point
Naikhongchhari	Kurokkhong Chakpara - Fungrao Para via Klitu Morong Para	NO ID	1	6	Dochhari	Eneljari Chak Para, Klitu Para, Fungrao Para, Tula Para, Yangli Para	482	86	Settlement+Lemon +Plum
Rowangchhari	Tula para-Lorki - Suambil Para via Sadhu Headman Para	No ID	1	7	Alikhong	Sadhu Headmanpara, Fusao Para, Rulki Para, Suambil Para	529	123	Papaya+Teak +Banana
Ruma	Galangya Union Parishad - Chimbuk Thanchi Road	4.04E+08	1	10	Galangya	Thongring Para, Bagan Para, Punarbashan Para, Empu Para, Shita Pahar Para, Pora Bangla Para	1300	250	Mango+Banana
	Bogamukh para-Boga Lake Road via Ananda pukur	40391400 6 + Extended	1	12	Ruma	Narikel para, Vaggomoni Para, Bogamukh Para, Leitong Para, Khamui Para, Mitui Para, Ananda Para, Raikhyong Para, Kyatui Para, Punarbashan Para, Mongnue Para	1862	358	Mango+Banana +Pineapple +Cashew Nuts+Papaya +Tourism
	Bethel Para- Bagan Road	4.04E+08	1	3	Ruma	Bethel Para	312	60	Mango+Banana +Pineapple+ Cashew
	Hatimatha Para- Ruma Bazar	4.04E+08	1	2	Ruma	Hatimatha Para, Ashrom Para, Barua Para, Eden Para, Eden Road	1482	285	Mango+Banana +Pineapple +Cashew Nuts +Papaya +Rubber+Jackfruit
	Artha Para- Jurbarang Para	4.04E+08	1	7	Paindu	Artha Para, Notun Para, Debachora, Ronin Para, Jurbarang	1144	220	Mango+Orange
Thanchi	Remakri 7 no ward Border Road (45Km) - Choto Modok	No ID	1	7	Remakri	Kenong Headman Para, Singa fa Mukh, KeishaPrue Para, Rangshula Para, Fuikuk khumi para, Subash Para, Shaku Para, Hana Chandra para, Pele khumi para, Chayong Para	1652	295	Papaya+Banana +Vegetables +Collection Point
	8 no ward Border road (50km)- Boro modok	No ID	1	4	Remakri	Boro modok vitor para, Paimong para, Boro modok Bazar, Sri mohon para, Fru sha aung para, Usha Mong para	1551	277	Papaya+Banana +Vegetables +Collection Point
	Thanchi - Narikel para Mission -Niyabutpara	4.04E+08	1	1.5	Thanchi	Narikal Para	280	50	Mango+Papaya
	Kowtling para- Ring kring para	No ID	1	12	Tindu	Kowtling Para, Busing Para, Paw para, Ring Kring Para, Padowik Para, Shaping Para	437	78	Cashew nuts+ Papaya+Banana
	Thanchi Bolipara Road - Haliram Para	No ID	1	7	Balipara	Jane Rang Para, Thannak Kome Para, Halirang Para	314	56	Mango+Papaya +Cashew Nuts
	Bandarban Thanchi RHD Road - Khonjoy Para via Dingtey para	No ID	2	2.5	Balipara	Dingtey Para, Khonjoy Para	336	60	Mango+Papaya +Cashew Nuts
			Total:	85			11,801	2,223	

Hatimatha Para- Ruma Bazar Road, Priority 1 Road, ID: 403914019, Ruma Upazila, Bandarban



Connecting 4 (four) villages with a population of 1000 living in 175 households and fruit orchards of mango and Lychee. Total length is 2 km and unpaved.

Bogamukh para-Boga Lake Road via Ananda Pukur, Priority 1 Road, ID: 403914006, Ruma Upazila, Bandarban.

Total road length is 12 km and condition of the alignment is unpaved. Connecting 11 villages with a population of 1650 (360 households). A potential tourist spot named Ananda Pukur will be connected by this road. People have to walk in several steep slopes to reach a paved road and then go to upazila Sadar and bazar.

25. Thematic Design, Engineering Design & Cost Estimation

25.1 LGED has road design standards and schedule of rates for the CHT hill region. Road Design Standards of LGED Booklet (7 July 2021) prescribes 'Standard Sections' for Upazila Road, Union Road, Village Road Type A and Village Road Type B published in a gazette notification. Towards building a climate resilient and sustainable infrastructure, site specific design will be a need depending on the field conditions, especially for bridges and culverts, and is strongly suggested, based on the study findings and observations, and discussions with the LGED engineers and technical staff working at the Upazilas and Districts. This is also suggested that a detailed field survey and a proper feasibility study to a minimum for each sub-project will be conducted in determining gap and additional structural need (such as retaining wall, L-drain, box culvert, etc.) by a team of qualified and competent technical staff prior to starting the design:

- Number of bridges and culverts, and span to a maximum;
- L-drain with outfall aligned with natural water flow; Length to a minimum with no comprise with the need. Basin must be considered where feasible;
- Adequate box culvert in allowing smooth drainage of heavy rain and storm water;
- Guard wall in variable height prerequisite in protecting the soil at the hill side.
- Road widening to the hill side in ensuring hard shoulder to the other side;
- RCC retaining, brick retaining, etc.
- Protective works and safety elements such as signboard cautioning and warning, mirror, turn in hill neck, etc.)

This footbridge was built by PIO, today not passable by CNG Rickshaw, need reconstruction. LGED standard design will normally be used, where feasible the most. Depending on the ground reality (topographic survey, soil test and others), site specific design with adequate provision for drainage is to be ensured. Bridge span and width to be decided based on survey results and future traffic volume and nature. The Traffic may be projected up to 2030 (SDG) and 2041 (Vision 2041).

Excavation with hill cutting is sometimes required for road widening and new road development in the three hill districts. The hill cutting is ideally to be done in slope (1:2), where the hill is not too steep and high. To protect the soil from erosion and landslide, it is important to have slope treatment well in settling the open soil before the rainy season starts. Such treatment can be done with vegetation naturally grown if time allows or using bio-engineering technique.

L- drain slopes are not sometimes maintained properly and outfall is blocked by grass or leaves which is not cleaned timely and regularly. During rainy season, it causes blockage of water and damage the road even to collapse. Construction of L-drain with right slope up to outfall is crucial to building a climate resilient infrastructure.

Guide wall and retaining wall should be placed correctly. Trees which hold soil strongly can be planted in the gap between the road and walls. This will give the road extra natural protection. 'Broom grass' which is locally known as 'Jharuful' can be planted along slopes. And to protect Jhiri or riverside, water spinach or other water plants can be planted as it grows largely and roots hold the soil strongly.

Adequate traffic signs and boards are to be installed properly to avoid unwanted accidents. Installation of solar light in hard turning point of roads and in approach of bridges will reduce accident. Use of solar light is environment-friendly green energy.

25.2 The three hill districts are attraction mostly to local tourists now, but there has potential for further tourism development in attracting national tourist at large and international tourists in particular. As strategy for enabling, any design and development should fit to the hill context, be safe and pedestrian friendly, and be attractive and interest to the tourist and people living there. In the current design and execution, elements of tourism are missing or lacking; attractive bridge with approach, railing, guard post, and plantation for beautification with ornamental trees, and planting trees in a row along the road are suggested. Unique design and materials used in construction of hanging bridge, pedestrian bridge and Foot Bridge will add value to the beauty of the hills.

Picture 33: Hanging Bridge in Rangamati

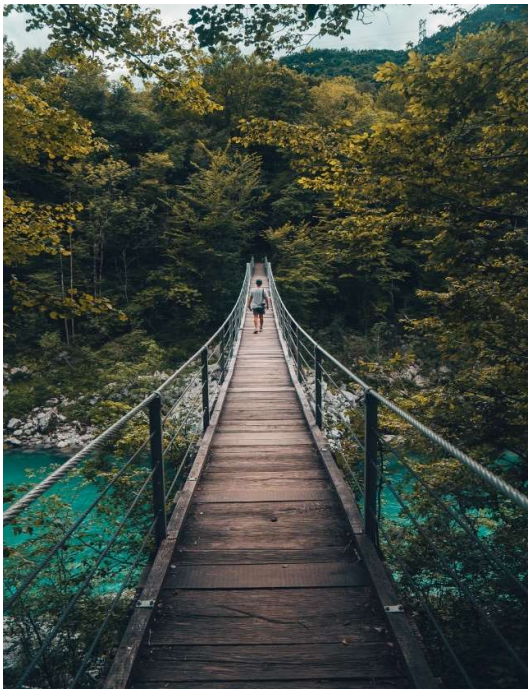
25.3 The '**China Bridge**' in pictures below is made of glass and steel, and has RCC foundation. Though the terrain, soil type, shape and structure of the mountain are not similar to Bangladesh, this bridge is just an example of development in tourism sector. This is quite expensive structure may not be feasible financially but will be technically possible on Kaptai Lake in between Sita Pahar and Ram Pahar (Hill) located at Kaptai Upazila of Rangamati district in Bangladesh. A detailed feasibility will be a need to confirm the recommendation.

Picture 33: Best example of China's new bending bridge, Ruyi Bridge (Zheijiang Province)

***Picture** 35*

10.3.2 Comparatively durable these types of wooden bridges are mostly seen in rural hilly areas of Northeast India and in park and forest. It has maintenance challenge. Participation of LGI or community will be desired, when used in rural roads.

10.3.1 Though risky and has less load bearing capacity, low cost wooden bridge can be an alternative to huge and expensive RCC structure, especially where population is less, in forest and for tourist only areas.



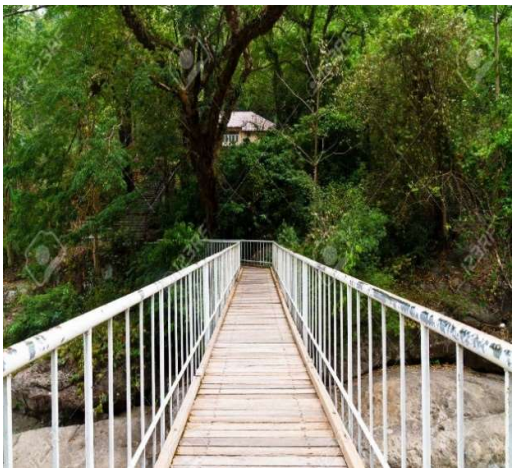
Picture 36

10.3.3 Wooden bridge and path may be designed for short distance in village road network on temporary basis. Though less bearing capacity, this type of bridges will have the ability to bear motorcycle, and auto-rickshaw and path to link inaccessible villages or tourist spots.

Picture 37(a): Examples of eco-system friendly wooden bridge in

Picture 37(b): Examples of eco-system friendly wooden path to inaccessible village or tourist

Picture37(c): Eco-system friendly small wooden footbridge in forest in Canada. *Recommended*



Picture 38(d): Wooden Bridge with metal hand rail across river or stream in forest. *Recommended*

25.4 A structure like *'Marsh Tower'* may be designed to establish a tourist landmark in Kaptai Sita Hill top or at Langadu Kattoli Beel or at Sajek Betling connected by boarder road. The unique structure will be of interest to professional tourist as well as to nature loving tourist. A hanging bridge like China Bridge on the Karnafuli River, Landmark similar to the Marsh Tower in Sita Pahar, and boat for kayaking will establish this tourist spot to a different height and attraction. Once Sita Mandir and ghat are connected by hanging Bridge of China Bridge kind with walking trail along the river bank, this will attract more religious tourists too. However, there should be tourist control strategy not to allow huge gathering at a time.

Picture 38 (a)

Picture 38 (b): best example of landmark establishment

Marsk Tower, the 25-metre-tower is located in the UNESCO world heritage site of Wadden Sea National Park in southwestern Denmark and was constructed from Corten steel.

"The double helix provides two stairs and an elevator with a single stack of rotating steel steps, allowing visitors to ascend and descend in a single spiraling loop from the sand to the sky – connecting the marshland to the Wadden Sea."

The tower is topped by viewing platform and provides 360-degree views across the marshland from which it is named – "marsk" is Danish for marsh. Because of the earth curvature, visitors gradually expand their view of the horizon while walking to the top of the tower.

"On the foot of the tower, one is able to see four kilometres into the distance, but from the top of the tower the view is expanded to an 18-kilometre view into the horizon."

The building was designed to function as a tourist landmark. Reaching a height of 36 metres above sea level in the flat landscape, Marsk Tower will be visible from a far.

An elevator at the core of the 146-step tower provides access for wheelchair users. The structure was created for Marsk Camp, a tourist destination that aims to showcase the unique landscape of southern Jutland.

The Wadden Sea area where the building is located was given UNESCO world heritage status as the largest unbroken system of intertidal sand and mudflats in the world.

25.5 In Bangladesh, there are numerous mountains in the Chittagong Hill Tracts areas that make the natural landscape outstanding. To developing a view point on the hill top, providing stair step and constructing a viewpoint using RCC structure with pathway such as the Nilachol will be safer and durable and will make the landscape view more beautiful. However, material color and texture fit to the environment should be used. Here are few viewpoints suggested by the study team for a technical survey and feasibility in details:

Picture 39: RCC structure to a view

(i) Marayong Thong, Alikadam upazila, Bandarban district
(ii) Shoilo Chura (Solomon Peak), Naikongchhari upazila, Bandarban district
(iii) Sita Pahar, Kaptai upazila, Rangamati District
(iv) Kattoli Beel, Langadu upazila, Rangamati District
(v) Saka Haphong (Mowdok Taung, 3,451 feet), the highest peak in Bangladesh at Mowdok range on the border with Myanmar.
(vi) Dumlong (3314 feet), the second highest mountain in Bangladesh
(vii) Keokradong, the third height mountain (3,172 feet) in Bangladesh.

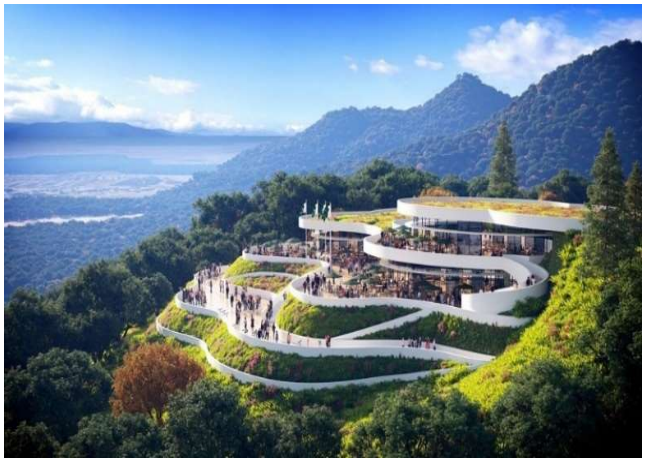
Picture 40: Marayong Thong, cloud home at Alikadam upazila, Bandarban district

25.6 The 3 km existing HBB road to the Marayong Thong is built very steep, not trekking friendly; 4-wheelers can drive to the peak, 1000 tourists, mostly energetic and enthusiastic youths who love adventurous crowd to the peak mostly at winter, despite no water supply and electricity. Waste management is zero and no control of tourist number has made the area vulnerable. Talking to the youths, it is understood, they want to enjoy trekking and do not want the road is built up to the peak. The road is proposed under MVMT project for pavement construction with walkways both side (3 steps and then 3 steps equivalent flat for trekkers to walk and breathe), recommending that the road will end one km away from the peak where there will be parking place, emergency medical

facilities, accommodation and food court. Tourist will be controlled with tickets from this point. The view is best seen from the second peak but the point where the tourists stand is unsafe. An RCC structure to a view point (photo above) is thus recommended. Steps to the 2nd peak where the Buddha Mandir is established will be built as examples and type below:

Picture 41: Examples of best stair/step in grass hill (up) & best slope

25.7 **Public Private Partnership (PPP):** There are many excellent hill viewpoints such as Sajek Hill view, Sita Pahar View, and Marayong Tong Hill View in the CHT region. These are safe and attracted by thousands of tourists, but in very bad shape now. Rejuvenation is possible to create one or more landmark tourist destination for both national and international tourists. Bangladesh Parjaton Corporation shall consider Public Private Partnership (PPP) to developing a world class tourist establishment like the one Kashmiri architect, Tony Ashai presented for Daman-e-Koh, a viewing point and hilltop garden in Margalla Hills, Islamabad for the development of tourism industry in Bangladesh, and create opportunities to earn foreign and local revenue from this sector.



A conceptual design by Tony Ashai (US-based Kashmiri architect) for Daman-e-Koh, a viewing point and hilltop garden in Margalla Hills, Islamabad. Daman-e-Koh is currently in a bad shape. This is prepared on the request of Prime Minister Imran Khan for transformation of the area into a world-class tourist destination and an iconic park for Pakistan.

Picture 42: Examples of Landmark Establishment with a hill view

25.8 **Engineering Design & Cost Estimation:** Engineering designing of infrastructures will be the responsibility of the Design Unit of LGED Head Quarters in Dhaka. While LGED design standard will be followed, there will be need to prepare site specific designs with proper technical survey and detailed feasibility study where necessary. It is suggested that there will be a dedicated design team consists of road engineer(s), bridge engineer(s), architect(s), estimators and AutoCAD Operators. Designs will require more time in view of the conditions in the CHT: designs for bioengineering and biotechnical works, and also for site-specific designs for bridges and retaining walls. Number of culvert span and size need to account for increased flows of water; some cases were observed not adequate by the study team. Depending on the package size and site-specific design requirement under Phase I of the MVMT project, design team capacity will be made available. It is suggested that any landmark work will be led by a separate team of expert architect and

structural design engineer. Survey and design must consider possible soil erosion and landslide and bio-engineering treatment to make the infrastructure (such as road, retaining wall and bridges) safe, climate resilient and sustainable.

25.9 Cost estimate will be prepared by the estimators of the LGED Design Unit and are subject to approval by the Project Director. The senior infrastructure engineer to be hired under the MVMT Project (Rural Connectivity Component) will review the cost estimates of rural infrastructure to be constructed under the Project. S/he will update the unit costs (if needed) taking into consideration: (a) cost escalation in line with the latest Schedule of Rates; (b) latest tender rates; and (c) additional road and pavement strengthening (i.e., climate proofing) and improved slope protection measures (e.g. bioengineering solutions) that are considered appropriate in view of increasing climate variability.

A. Bio-engineering in slope protection

25.10 Climate resilient slope protection using bio-engineering techniques is a cost-effective and eco-friendly alternative to the conventional methods of soil slope stabilization and erosion control. One of the major developments and maintenance challenges of rural roads, bridge approaches and embankments in Bangladesh is protection of respective slopes. Excessive rain and inundation loosen the earthen soils resulting in erosion of the slopes. The traditional engineering solutions for this problem have been application of concrete blocks, palisade, sand bags, stone revetments, geo-textile, etc. that not only increases cost of construction and maintenance but is often found ineffective and unsustainable. It has been widely recognized that plant root systems can improve the soil shear strength significantly, and has been used in China as long ago as 28 BC, for constructing and repairing dikes. Bio-engineering measures for road side-slope stabilization include:

- Vetiver grass on road embankment slopes or on slopes built with blocks
- Turfing
- Stones with live cutting
- Root wads

25.11 **Side-slope protection with vetiver grass**

Picture43: Vetiver Grass Field

Vetiver grass (Vetiveria zizanioides, locally known as binna grass) is resilient and can survive deep inundation of up to 6 m. This hardy bunch grows naturally across many of the humid parts of the world, and is being used as an efficient bio-technology for slope protection in many countries, especially for its attributes: longer life, strong and long finely structured root system, and high tolerance of extreme climate conditions.

25.12 The data acquired from the field trials conducted in different parts of the coastal region under the 'Coastal Climate Resilient Infrastructure Project (CCRIP)' and the model study conducted at BUET premise, have revealed that the vetiver-based slope protection

measure is an effective method in protecting the slope of road embankment from rain-cut erosion. These grasses will need planting at least six weeks before the monsoon period start to have better growth performance and survival rates and therefore protecting slopes from erosion more effectively. Proper nursing and watering need be ensured until the plants grow quite well, which could be a challenge that have water scarcity in the CHT region.

25.13 **Piloting in the Hill districts:** Bio-engineering technique in contrast to current practices of embankment slope protection around the world is more sustainable. From the BUET study, it is though clear that vetiver plantation holds a good prospect for protecting slopes in different geographic setting with various soils and climatic conditions, a pilot in the CHT districts is suggested. For reasons, first, the growth rate of vetiver roots and shoots widely vary with soil conditions i.e., soil type, nutrient content, salinity and climatic conditions. Second, it is understood from field observations and local knowledge while talking to the community, to local forest officer and LGED technical staff, local grass species such as 'jaru (broom) ful' and 'kash ful' grass grown naturally along the hill slope well to hold the soil from erosion since ancient times. So, Binna grass as well as 'jaru (broom) ful' and 'kash ful' grasses are recommended to use in testing the bio-engineering grass treatment for slope protection and erosion control in the region.

Picture 44: Locally grown broom flower grass known as 'Jaru Ful' grass, naturally grow in the hill slope and give good protection from soil erosion. Kash ful is another naturally grown vegetation grass found in CHT.

Box-5: Following principles and techniques will need consideration to ensure climate-resilient slopes in transport infrastructure:

- Basic Principle: Address slope protection and surface runoff and groundwater issues during road location, design and construction– not as an afterthought.
- Key Elements: Use a combination of drainage, slope protection and stabilization measures, including both inert (engineered) and vegetative components.
- Techniques: Retaining structures and earthworks; mechanical stabilization; erosion control; soil bioengineering; biotechnical stabilization

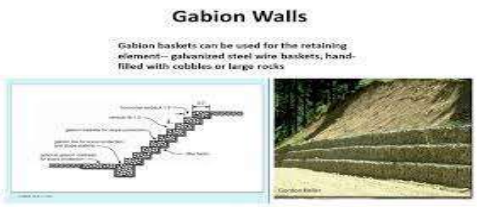
25.14 To effectively implement the bio-engineering interventions, the principle, elements and techniques (mentioned above) should be considered at the survey and design stage. This would include a preliminary assessment of existing erosion problems in the proposed intervention sites; inventory preparation of the suitable bio-engineering plant species; identifying appropriate bio-engineering technique and plant nursery requirements for bio-engineering. Furthermore, a training of contractors at an early stage is required covering construction of structures like gabion walls, slope drainages and bioengineering structures. These should be conducted before construction starts (in pilot testing phase) or even before tendering, and then be repeated during the construction.

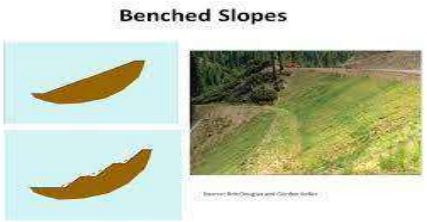
25.15 To effectively implement the bio-engineering interventions, the principle, elements and techniques (mentioned above) should be considered at the survey and design stage. This would include a preliminary assessment of existing erosion problems in the proposed intervention sites; inventory preparation of the suitable bio-engineering plant species; identifying appropriate bio-engineering technique and plant nursery requirements for bio-engineering. Furthermore, a training of contractors at an early stage is required covering construction of structures like gabion walls, slope drainages and bioengineering structures. These should be conducted before construction starts (in pilot testing phase) or even before tendering, and be repeated during the construction period.

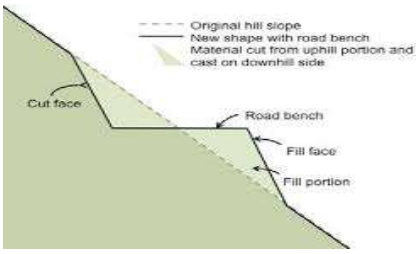
Slope Protection work in Navi Mumbai, Airoli

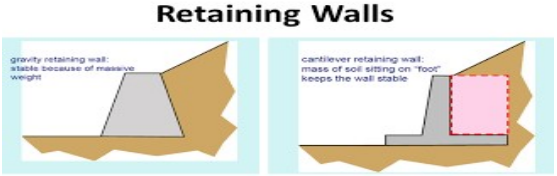
The restraint work consists mainly retaining structures, anchoring, piling and other slope protection works. The control measure is mainly composed of the earthwork, water management and bio-engineering work. Earthworks and Drainages are essential factors in improvement of slope stability.

Picture45: Shape of slope is often a defining factor in slope stability. Natural slope are generally concave, most stable and least susceptible to erosion. Manmade slopes are linear, and in most cases, erode until they take a concave shape.









Elements of Climate resilient slope stabilization

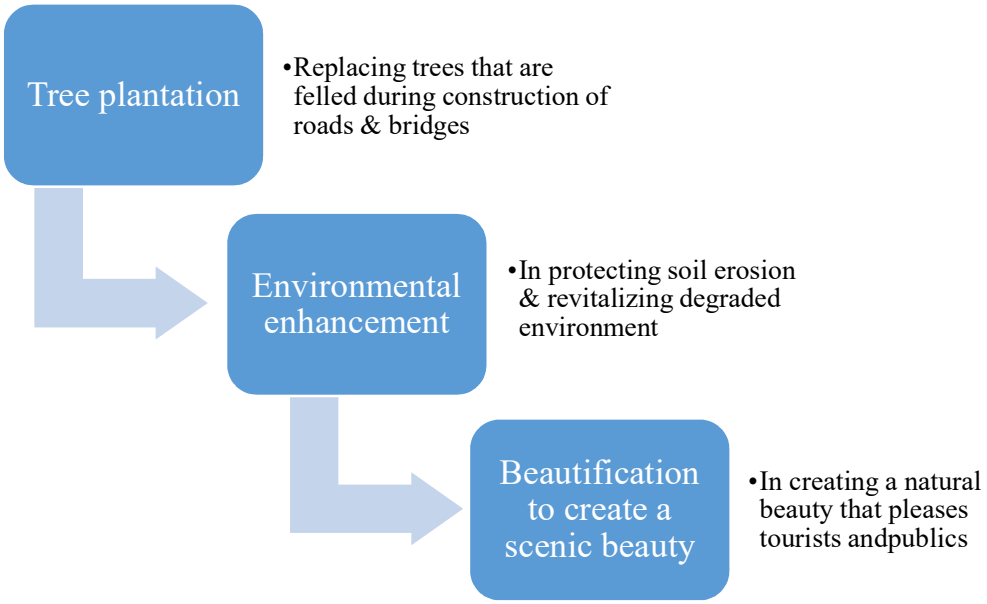
25.16 **Potential benefits in using vetiver-based bio-engineering:** There are many advantages to bioengineering techniques over conventional "hard" structures if designed properly. Aesthetically pleasing, usually self-maintaining and less expensive vetiver can be more effective for controlling erosion and can be useful to create streamside habitat for wildlife and fish. While human-made structures such as concrete walls break down over time, bioengineering structures grow stronger as plants mature.

- *Cost-effective protection, minimizing costly engineering structures;*
- *Create opportunities for local people's participation in nursing development and supply of vetiver;*
- *Sustainable land and environment management*

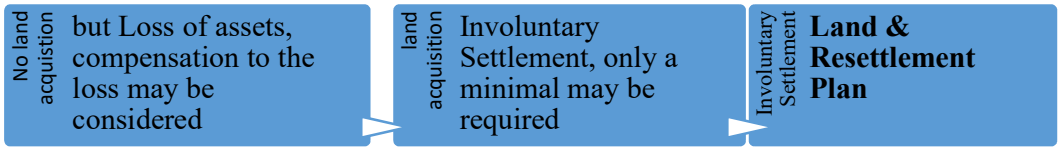
25.17 Studies show that vetiver application is about eight times cheaper than masonry wall protection and about five times cheaper than the revetment stone-slope protection system. Potential benefits from using Vetiver grass (Vetiveria zizanioides, locally known as Binna grass) plantation in slope protection include not only the cost-effective protection of soil erosion minimizing costly engineering infrastructure, but also opportunities for participation of local interested and affected stakeholders (including indigenous people living on the mountainous slopes) in nursery development. Bioengineering interventions furthermore lend itself extremely well for the forest improvement, disaster risk reduction and sustainable land and environment management to reduce climate change effects in the mountainous and upland slopes of the CHT.

B. Environmental Protection & Social Safeguards

25.18 Trees will be planted along roads, and at bridges' approach with right kind of plants that can check soil erosion and withstand floods and/or assure beautification to creating a scene view. The trees that are cut will be replaced. Beautification and environment enhancement should not be with foreign trees but with environment-friendly tested local species that will create synergy with the surroundings.



25.19 The MVMT project will have environment expert, and resettlement expert respectively for preparation of IEE, and safeguard and resettlement plan (as required). Given the promise by the LGI representatives and community at the stakeholder meetings, KIIs and FGD sessions, the study team understood that there will be no need of land acquisition and involuntary resettlement for road construction. Assuming that most landmark work will be established using Khas land, thus it would require only minimal land acquisition for sub-projects on landmark and other associated infrastructures facilities to be development. A rapid survey of all prioritized subprojects will therefore be carried out at an early stage clearly to establish whether the concerned works would involve any land acquisition and resettlement or not.



25.20 After completion of the surveys, proposed road alignments including centerline and boundary lines will be reviewed by engineering team, and approved by the MVMT Project Director prior to the commencement of detailed design. The environmental specialist will prepare IEEs and EMPs for the subprojects, and the Resettlement Specialist will prepare 'Land and Resettlement Plan' for the subprojects that require (some) land acquisition and resettlement. If any affected people are identified, the plan will provide all needed information to undertake the resettlement and compensation process prior to mobilization of the contractor.

26. Limitations of the Study

26.1 This Study was limited by the feasibility study on rural connectivity in 23 Upazilas that excludes Sadar Upazilas of the three hill districts of the Chittagong Hill Tracts region. Secondly, 23 unions were case studied for authenticity check: one union from one upazila of the 23 Study Upazilas. Given the time constraints, scope of work, remoteness and security, validation of the need and priority was not thus possible for all sub-projects listed in the Database. So, the long list and short list of priority sub-projects cannot be treated as 'free error and/or a complete list'. This presents the priority need of the sub-projects that are identified and reviewed together with the representatives from LGIs and field staff of LGED Upazilas and vetted by the study team and endorsed by the Executive Engineers of the three hill districts.

26.2 Due to budget constraint, use of high-resolution satellite image, GPS survey and/or 'Drone Survey' was not possible. GIS is used at a limited capacity in preparing the maps, suggesting that LGED GIS attributes and spatial data are to be improved using Drone Survey and high-resolution satellite images.

26.3 LGED has standard designs for roads and bridges for the three hill districts. Thus, this Study has not given any thematic design, except conceptual framework and some examples to learn from and design infrastructure climate resilient and tourist-friendly, and suitable to local context. The study recommends to implement site specific designs with modifications needed on the standard designs based on technical survey, soil test and feasibility.

27. Conclusions & Recommendations

27.1 Given the fact that transport plays a vital role in the economic and social development of a region and a country, the Chittagong Hill Tract Region is progressing to build a climate resilient rural transport network connecting its remotely located hard-to-reach villages under My Village-My Town Project. An optimal rural road network is recommendable in the hill region that is healthy for its sustainability and needed for its anticipated growth and development; where possible, inland waterways are to be revived, restored and integrated for sharing traffic now and future through developing a multi-modal balanced transport network in the region. In achieving this, the proposed inland waterways will be rejuvenated by dredging on priority, including development of ghats, collection shed, and waiting facilities. Approaches of Public Private Partnership (PPP) and subsidy to the owners are also desirable in introducing speed boat, engine boat, ferry where feasible, and vessel as necessary.

27.2 It is understood that dredged river and khal have chance of siltation back by soil eroded from hills and forest and by open soil surface run-off; hill cutting, jhum cultivation, deforestation and uncontrolled teak cultivation make the surface soil vulnerable to erosion. To protect the dredged river and khal from siltation, plantation along river bank, jhiris and canals is indispensable. Rejuvenation of forest with plantation and/or allowing years to grow them naturally, checks on hill cutting, and reducing dependency on wood collection and/or jhum cultivation with creation of alternative livelihood are imperative. Where feasible to create river front park facilities for recreation, landscaping, plantation and/or walkways with guard wall are suggested at vulnerable length of the bank to a least.

Picture 46: Examples of River Front Park

27.3 Development of all identified roads (given in volume of **Appendices of Key Outputs & Observations**) will take time and need huge budget, so development will be in phases. Sub-projects listed in first and second priority will be developed in first two phases. To protect built road and bridges from damage and/or collapse from soil erosion induced landslide, a combination of structural and non-structural protective measures is found effective. For non-structural protective work with vegetation, it is understood that Binna grass is going to be promoted in the region. Therefore, a Pilot testing with Binna grass, and locally grown grass ('Broom grass- Thysanolaena maxima, locally known as 'Fuler Jaru' grass) and bamboo thin variety are recommended prior to start of Binna and replication of Binna across the three hill districts. These locally grown grass and bamboo have been giving protection to soil in the CHT region since time immemorial. However, Binna can be used in slope without trial, where blocks are used in protecting soil in slope shown in the picture as example.

Picture 47: Examples of Binna Vegetation from Haor,

27.4 The 1,300 sq. km Chittagong Hill Tracts (CHT) area is covered with a deep evergreen and deciduous forest which is a habitat of many wildlife species such as the Asian Elephant (Elephas maximus), White Duck (Cairina scutulata), Banrui (Maris crassicaudata), Banchhagal (Capricornis sumatraensis), Shajaru (Hystrix indica) and other endangered species. Wild habitat (e.g. elephant, monkeys, wild goat and cock) are less seen now-a-days due to traffic on the road (and animal killing mainly for eating has reduced the number), according to the understandings of the study from FGDs and KIIs. Therefore, new paved road construction should carefully avoid alignment that is used by wild habitats and should not pass through the home of wild and endangered species.

27.5 Reserve forests and vast hills share the Chittagong Hill Tracts region. The three unions of Kurukpata in Alikadam, Farua and Borotali in Belaichhari are located in the reserve area. In these unions, there are a number of remote villages/paras with 1000s tribal community people residing. A minimum of proposed four roads need construction on priority to connect these remote villages and community people. Though they have right to live there by declaration of the unions, legally and normally, development of road and other infrastructure facilities are not permitted in the reserve area. This is contradictory to inclusive development in mainstreaming minority. As long as unions are declared with

1000 people residing, a portion of land may rightly be de-reserved or declared in part demarcating the Unions' boundary to allow development essential for local people well-being and construction of the proposed roads on priority. Then restriction for the rest ecosystem should strictly be maintained to secure it from further encroachment. The way deforestation and degradation has been happened in the public forest (mainly in the leased forest), it is high time strictly to maintain the reserve forest and declare some more forests as reserve forest to rejuvenate a rich and sustainable forest ecosystem.

27.6 It is advising that LGED indicates clearly in the Development Project Proposal (DPP) of the MVMT project, the name and location of the sub-projects that need clearance of the Department of Forest and Department of Environment, and secure clearance at the approval stage of the DPP in the Inter-ministerial meeting and in the ECNEC to avoid any delay at the implementation stage.

27.7 More than security, lack of standard facilities and tourism landmarks, and small number of accessible tourist spots are the main barriers to flourishing tourism in the region that can contribute to regional economic growth, creation of local employment for youths and raise income of community people in improving their livelihood. Therefore, development of potential tourist spots, Landmark Bridge and Tower, and infrastructure facilities such as electricity, road, internet, water, and health service are recommended to create new attraction and enabling environment for the tourist now and future, home and abroad. Construction of the proposed roads categorized under tourism will establish connectivity with the tourist spots, and will facilitate hill tourism, eco-tourism and cultural tourism.

27.8 The potential for eco-tourism as well as for community tourism can be availability of tourism resources, strong community history and cultural uniqueness. So, the first job will be finding the potential destination for community tourism, second, community willingness that they show their enthusiasm to such tourism development, the third will be finding investment by local entrepreneur preferably from/within the community; and the fourth is tourism that will increase potential for local economic growth without disturbing eco-system. Then it will be justified for the accessibility in terms of transportation, communication and restriction free. However, no outside entrepreneur will be encouraged that can pose threat to traditional culture and values that the communities fear (the Study team apprehended a fear among the community while talking to the community or interviewing KII respondents). Eco-tourism should also not be of scale and size that can pose serious threat to the eco-system. It is suggested that both positive and negative impacts are monitored starting from the selection, design and implementation to end results.

27.9 Development of transport communication especially rural road can heighten fruit gardening converting jhum land and others. Uncontrolled trend in diversified agriculture, monoculture teak and fruit gardens in the hill slopes and valleys is evident from the field observations and calls for development control in land use. It is highly recommended that the Chittagong Hill Tracts have 'zoning' exercise, review public forest for new reserve forest declaration and portion of existing reserve forest 'de-reservation', land use plan declaring land for agriculture and settlement, and then have development control in place to balance development with sustainable management of nature, environment, and ecosystem.

27.10 Rural development and infrastructure development in particular are essential to generating employment and improving livelihoods for the rural poor. The main constraints in the CHT are the lack of road connectivity, multiple institutions involved in rural development, the high investment cost given topographic and access conditions, and the lack of financing for development and operation and maintenance (O&M) costs. Greater local participation in the provision of upazila, union, and village infrastructure is necessary to ensure that (i) what is constructed improves rural market access; (ii) rural infrastructure development creates opportunities for the poor, particularly women, to access the core economic and local governance infrastructure; and (iii) what is built can be used effectively and sustained. The capacity of LGIs, hill organizations and LGED field offices need enhancement to enable them participate in planning and undertake design and implementation. Finally, institutional capacity to support such development is strongly recommended.

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Annex-1: Stakeholder Consultation Checklist

(1) **Upazila & Union Characteristics**: what are your Upazila within the district & Case study union within your Upazila?

- Your Upazila verse Upazilas in the district
- Case Study Union verses Unions in your Upazila
- Disconnected Village(s) verse Villages in your case study union verse upazila (size, population, tribal verse non-tribal, overall/specific need

SWOT (Strength, Weakness, Opportunity, Threat): remoteness, environmental challenge, social structure, morphology

(2) **Transport System**: Which roads and river or channels to be developed on priority and why? Suggest or identify in database and/or mark in maps the important routes or priority routes connecting:

- Upazila HQs, Union Parishads
- Service facilities (e.g. health centre, school, college)
- Economic or business hub (markets or growth centres)
- Disaster & emergency response: Cyclone or Flood shelter
- Tourism: Tourist spot (s)
- Employment
- Security, Law & Order: quick mobilization or movement, evacuation
- Tribal & non-tribal community

Prioritize road and/or river or channels need development on priority for disconnected village community (or union or unions or Upazila or District overall development)? Agricultural (agro-based farm and/or agro-processing plant or collection points: farmers' produces or agricultural inputs transportation and marketing, and price) development? Tourism development? **Climate-resilient, sustainable, fit to context**

SWOT (Strength, Weakness, Opportunity, Threat): security, remoteness, environmental challenges, social structure, and morphology

(3) **Land ownership, Involuntary Settlement or Land acquisition**:

(a) Will there be any need for involuntary resettlement or land acquisition? Do you think community people will be willing to give land voluntarily?

(b) Does a person with traditional land ownership get compensation? Traditional & legal structure of land ownership

(c) What practices or learning are there to offer compensation to a person with traditional land ownership?

- LGED
- Chittagong Hill Tracts Development Board (CHTDB)
- Hill District Council (HDC)

(4) **Culture, Social structure, Climate, Environment, Geography & Morphology**:

(a) What can make a road and structure (bridge, culvert, protection work, and ghats) not sustainable in your hill area?

(b) Challenges to build a road or route climate-resilient, sustainable and fit to context?

- Sustainable & climate resilient road/route: flood, land slide, earth quake, rainfall
- Environment & geography: reserve forest, hill, channel, common asset
- Social structure: Community role, engagement, participation
- Culture & tradition: thematic design
- Safe road or route

(c) What are the practices in or learning from?

- LGED
- Chittagong Hill Tracts Development Board (CHTDB)
- Hill District Council (HDC)

(5) **Tourism:** (a) is potential for tourism development: eco-tourism verse community tourism verse cultural tourism?

(b) What kind of tourism activity or tourism venture will benefit the community most & how? Youth employment, entrepreneurship, community engagement, traditional food and clothes, handicrafts, and traditional hut (family or individual tourist accommodation with water, sanitation, electricity, and internet facilities).

(c) What facilities will be needed to develop and where? What should not be developed or allowed to develop in protecting the culture, tradition, eco-system, and environment? Do you foresee any threat to social security?

- Transport network (Road & Inland waterways), Bridge/Culvert, multi-modal transport system;
- Water and Sanitation
- Accommodation
- Security (Tourist), Social Security (Local)

SWOT (Strength, Weakness, Opportunity, Threat): remoteness, environmental challenge, social structure, morphology

(c) Which road and/or river route or channels need development on priority for tourist and tourist village community and/or tourism development? **Climate-resilient, sustainable, fit to context**

(d) Is there options and opportunities to develop ropeway communication, where and how feasible will it be? Benefit or added value in tourism, cost effectiveness

(6) **Agriculture:**

(c) (a) What does 'Jhum cultivation' mean to you and to your community? Are there any effects on the environment? If so, what are they? How do you see the effects on the overall eco-system degradation and management?

(d) Is there any way to reduce dependency on Jhum? If so, what are the options that would be acceptable and preferred by the community? What are the major crops grow in the your CHT area? What are the commercially grown crops? What do you think about the change in land use and commercial crop cultivation?

(e) In your opinion, how does rural connectivity historically impact on agricultural diversification and value-added crop cultivation in the CHT area?

(f) How improvement in rural connectivity impact on the change and development? Do you see any negative impact now or in future? If so, what are they? How to mitigate them?

Annex 2: List of Key Persons Met/Interviewed in KIIs

Local Government Engineering Department (LGED)

1. Md. Ali Akhter Hossain
   Additional Chief Engineer
   Local Government Engineering Department (LGED)
   Phone: 01708123104, e-mail: ace.maintenance@lged.gov.bd
2. Engr. Bipul Chandra Banik
   Superintending Engineer
   Road Maintenance and Road Safety Unit (RMRSU), LGED
   Phone: +880 1711 007 765; e-mail: se.maintenance@lged.gov.bd
3. Anil Chandra Barman
   SE (HR, Env & Gender)
   Local Government Engineering Department (LGED)
   Phone: 01708123114, e-mail: se.training@lged.gov.bd
4. Engr. Shah Nurul Quadir
   Project Director, Chittagong Hill Tracts Rural Development Project, LGED
   Phone: +880 1552 332 533, +880 2914 6064 e-mail: quodirsn@yahoo.com
5. Engr. Nur Nabi
   Project Director
   Climate Resilient Livelihood Improvement and Watershed Management in the Chittagong Hill Tracts Project' [CHTDRP III], LGED
   Phone: +880 1713 039 921 e-mail:
6. Dr. Engr. Md. Lutfor Rahman
   Institutional Development Consultant
   Climate Resilient Infrastructure Mainstreaming (CRIM) Project
   Local Government Engineering Department (LGED)
   Phone: +880 1715 039 646, e-mail: talhafatema64@ambero.de
7. Tasnuva Afroz
   Senior Assistant Engineer,
   RIDP: Chittagong Hill Tract, 2nd Phase, LGED
   Phone: 01714549832, e-mail: tasnuva_afroz@yahoo.com

Chittagong Hill Tracts (CHT)

8. Md. Ashraful Islam
   Chief Executive Officer
   Rangamati Hill District Council
   Phone: +880 1873 772 826, +880 351 63262, e-mail: cht.rhdc@yahoo.com
9. Mrs. Subarna Chakma
   Executive Officer
   Chittagong Hill Tracts District Council
   Phone: +880 1716 409 657; +880 2333 371 691
   E-mail: subarnactg@yahoo.com; chtrc@yahoo.com

10. Mr. Sukheswar Chakma
    District Officer, Rangamati Hill District Council
    Women & Girls Empowerment Through Education & Skills Project
    Phone: 01824778632, e-mail: sukheswar.bd@gmail.com
11. Mr. Tushit Chakma
    Executive Engineer (Current Charge)
    Chittagong Hill Tracts Development Board
    Phone: 01840958327, e-mail: xen-rmt@chtdb.gov.bd

Department of Forest

12. Md. Subedar Islam
    Forest Protector (CF)
    Department of Forest
    Phone: 01999009999, e-mail: cf.bfd.rangamati@gmail.com

Upazila Nirbahi Officer (UNO)

13. Muntasir Jahan
    Upazila Nirbahi Officer, Kaptai
    Phone: 01844878939, e-mail: unokaptai@mopa.gov.bd
14. Jowel Rana
    Upazila Nirbahi Officer, Barkal
    Phone: 01886988866, e-mail: jowelrn@yahoo.com
15. Jitendro Kumar Nath
    Upazila Nirbahi Officer, Juraichari
    Phone: 01557676214, e-mail: unojuraichari@mopa.gov.bd

Local Government Institute (LGI)

16. Suresh Kumar Chakma
    Chairman
    Juraichari Upazila Parishad,
    Rangamati Hill District
    Phone: +880 1552 307660, e-mail: chakmasureshkumar@gmail.com
17. Bishah Pradeep Kumar Karbari
    Chairman
    Ramgarh Upazila Parishad
    Khagrachhari Hill District
    Phone: +880 1948 917 884, e-mail: chairmanramgarhuzp@gmail;com

Annex-3: Photographs from Stakeholder Consultation Workshop in Rangamati District & Meetings held at the upazila Level

Stakeholder Consultation Workshop in Rangamati

Stakeholder Consultation Meetings held at the Upazilas of Rangamati District

Bagaichhari Upazila

Barkal Upazila

Belaichhari Upazila

Juraichhari Upazila

Kawkhali Upazila

Kaptai Upazila

Naniarchar Upazila

Langadu Upazila

Rajasthali Upazila

Stakeholder Consultation Meetings held at the Upazilas of Khagrachhari District

Dighinala Upazila

Lakshmichhari Upazila

Mahalchhari Upazila

Manikchhari Upazila

Panchhari Upazila

Ramgarh Upazila

Matiranga Upazila

Guimara Upazila

Stakeholder Consultation Meetings held at the Upazilas of Bandarban District


Alikadam Upazila


Naikongchhari Upazila


Rowangchhari Upazila


Ruma Upazila


Thanchi Upazila


Lama Upazila

Annex-4: List of Participants in the Stakeholder Consultation Meetings held at the Upazila Level

District: Rangamati

SL	Upazila	Sadar/ Union	Name	Designation	Mobile
1	Langadu	Upazila Sadar	Abdul Barek Sardar	Chairman	01556611895
2		Upazila Sadar	Anowara	Vice-Chairman	01875999108
3		Langadu	Md. Faruk Ahmed	Member	01557316784
4		Gulshakhali	Md. Shofikul Islam	Chairman	01627690497
5		Maineemukh	Md. Kamal Hossain	Chairman	01552380851
6		Atarak Chhara	Ajay Chakma	Chairman	01870815233
7		Kalapakujya	Abdul Barek	Chairman	01883155977
8		Bhasanya Adam	Md. Hayat Ali	Chairman	01878746331
9		Bagachattar	Abul Bashar	Chairman	01860434694
10	Baghaichhari	Upazila Sadar	Md. Abdul Kaiyum	Vice-Chairman	01554060973
11		Rupakari	Jasmin Chakma	Chairman	01553287435
12		Rupakari	Ronol Bikash Chakma	Member	01552716155
13		Rupakari	Gulmoni Chakma	Secretary	01553141772
14		Sarboatali	Bhupati Ranjan Chakma	Chairman	01828810396
15		Sarboatali	Amulya Ratan Chakma	Member	01820362718
16		Amtali	Md. Mojibur	Chairman	01855940742
17		Amtali	Md. Hossain	Member	01874213626

18		Baghaichhari	Olive Chakma	Chairman	01556392224
19		Baghaichhari	Kangkan Chakma	Member	01836952152
20		Kedarmara	Dhanobindu Chakma	Member	01840481185
21		Kedarmara	Shuvodeb Chakma	Member	01646507237
22		Sajek	Atulal Chakma	Chairman	01811654511
23		Sajek	Parichoi Chakma	Member	01624199673
24	Naniarchar	Upazila Sadar	Pragati Chakma	Chairman	01829662491
25		Upazila Sadar	Md. Nur Alam	Member	01866980696
26		Ghilachhari	Basanti Chakma	Chairman	01642869584
27		Ghilachhari	Modhumita Chakma	Member	01875559034
28		Ghilachhari	Dipayan Khisa	Member	01828903074
29		Sabekyong	Nitu Chakma	Member	01830563948
30		Burighat	Nasma Begum	Member	01874489581
31	Kawkhali	Upazila Sadar	Md. Shamsul Hasan	Chairman	01553790050
32		Upazila Sadar	Aung Prue Marma	Vice-Chairman	01553760414
33		Fatikchhari	Ushaton Chakma	Chairman	01839805849
34		Fatikchhari	Randip Chakma	Member	01788362901
35		Ghagra	Md. Nazim Uddin	Chairman	01816000112
36		Ghagra	Minu Rani Chakma	Member	01984404105
37		Ghagra	Amui Prue Marma	Member	01875381985
38		Kalamapati	Kyajai Marma	Chairman	01556777730
39		Kalamapati	Md. Anowar	Member	01835688980
40		Betbunia	Shahnaz Akter	Member	01813253722
41		Betbunia	Kabir Mohammad	Secretary	01815610660
42	Rajasthali	Upazila Sadar	Ubach Marma	Chairman	01553633852
43		Ghilachhari	Robert Tripura	Chairman	01553682811
44		Ghilachhari	Uday Kumar Tanchangya	Member	01553104502
45		Gainda	Puching Mong Marma	Chairman	01553262284
46		Gainda	Goutami Khiyang	Member	01557043283
47		Bangalhalia	Adomong	Chairman	01831653174
48		Bangalhalia	Kamal Hossain	Member	01557414220
49	Kaptai	Upazila Sadar	Abdul Latif	Chairman	01811610288
50		Raikhali	Mongnue Marma	Chairman	01818449879
51		Wagga	Chiranjit Chakma	Chairman	01536002329
52		Wagga	Amal Kanti Dey	Member	01823964393
53		Chitmaram	Uggyajai	Member	01833786125
54		Chandroghona	Md. Mainul Islam	Member	01822686566
55		Chandroghona	Md. Mamun	Member	01819950406
56	Belaichhari	Upazila Sadar	Sunil Kanti Dewan	Chairman	01828804436
57		Upazila Sadar	Jyotimoi Chakma	Member	01552507354
58		Farua	Bidyalal Tanchangya	Chairman	01828806333
59		Farua	Ujjal Tanchangya	Member	01557056387
60		Borotholy	Atomong Marma	Chairman	01833085716

61		Kangrachhari	Rasel Marma	Chairman	01556703160
62	Juraichhari	Upazila Sadar	Suresh Kumar Chakma	Chairman	01820265195
63		Juraichhari	Emon Chakma	Chairman	01626234311
64		Juraichhari	Arun Chakma	Member	01516193587
65		Juraichhari	Potyarani Chakma	Member	01559708820
66		Banjugi Chhara	Santosh Bikash Chakma	Chairman	01532363148
67		Banjugi Chhara	Chichimoni Chakma	Member	01559450315
68		Dumdumya	Sadhin Kumar Chakma	Chairman	01554605269
69		Dumdumya	Khukumoni Chakma	Member	01813979109
70		Maidang	Sadhana Nanda Chakma	Chairman	01553128716
71		Maidang	Dhanagyaan Chakma	Member	01849891426
72	Barkal	Upazila Sadar	Bidhan Chakma	Chairman	01556859835
73		Upazila Sadar	Shyam Ratan Chakma	Vice-Chairman	01557577698
74		Shubolong	Tarun Jyoti Chakma	Chairman	01828932302
75		Barkal	Provat Kumar Chakma	Chairman	01556619141
76		Bhushan Chara	Abdul Sabur	Panel Chairman	01879520891
77		Bhushan Chara	Md. Rhul Amin	Member	01881732001
78		Aima Chhara	Subimal Chakma	Chairman	01610226356
79		Aima Chhara	Sushil Jiban Dewan	Member	01885806384
80		Bara Harina	Bimal Chakma	Member	01572555053
81		Bara Harina	Sukanto Chakma	Member	01817826412

District: Khagrachhari

SL	Upazila	Sadar/ Union	Name	Designation	Mobile
1	Dighinala	Upazila Sadar	Md. Kashem	Chairman	01553210451
2		Upazila Sadar	Mostofa Kamal	Vice-Chairman	01553002394
3		Merung	Ghono Shyam Tripura	Member	01820733640
4		Merung	Chandra Sekhar Chakma	Secretary	01553212337
5		Babuchara	Santosh Hiran Chakma	Chairman	01854563014
6		Kobakhali	Gyaan Ujjal Chakma	Member	01554793059
7		Kobakhali	Dishokon Chakma	Secretary	01690020058
8		Dighinala	Praggan Jyoti Chakma	Chairman	01867311387
9		Boalkhali	Kiran Chakma	Secretary	01553645303
10	Matiranga	Matiranga	Hemchandra Tripura	Chairman	01553118385
11		Belchhari	Md. Rahmat Ullah	Chairman	01553616084
12		Belchhari	Md. Amir Hossain	Member	01553103873
13		Amtali	Md. Abdul Goni	Chairman	01553010608
14		Amtali	Yunus Mia	Member	01553261990
15		Taindang	Md. Peyar Udddin	Chairman	01554315400
16		Taindang	Md. Awar Hossain	Member	01551732619
17		Gumti	Tofazzal Hossain	Chairman	01536039859
18		Barnal	Md. Ilias	Chairman	01557907660

19	Panchhari	Panchhari	Joy Dutta Chakma	Chairman	01866730952
20		Panchhari	Rejwn Joy Tripura	Member	07867105375
21		Ultachhari	Shipu Joy Tripura	Chairman	01553663695
22		Ultachhari	Shyamol Kantri Khisa	Member	1556620154
23		Latiban	Amra Marma	Chairman	07843047123
24		Latiban	Monita Tripura	Vice-Chairman	01552609751
25		Chengi	Bhulona Chakma	Member	01826665377
26		Chengi	Manek Puti Chakma	Member	01864923038
27	Guimara	Guimara	Nirmal Narayan Tripura	Chairman	01553325517
28		Guimara	Haripadda Tripura	Member	01822910655
29		Sindukchhari	Redak Marma	Chairman	01845777700
30		Sindukchhari	Md. Jahangir alam	Secretary	01552393515
31		Hafchhari	Mong Shae Choudhury	Chairman	01550552880
32		Hafchhari	Roit Choudhury	Member	01585275264
33	Manikchhari	Upazila Sadar	Md. Joynal abedin	Chairman	01812254603
34		Upazila Sadar	Tajul Islam Babul	Vice-Chairman	01825132135
35		Manikchhari	Md. Shafikur Rahman	Chairman	01553600566
36		Batnatali	Md. Abdur Rahim	Chairman	01811192339
37		Batnatali	Md. Abdul Momin	Member	01823827932
38		Juggachhala	Shahina Akter	Member	01831620793
39		Tin Tahari	Abul Kalam Ajad	Chairman	01815659374
40	Lakshmichhari	Upazila Sadar	Babul Choudhury	Chairman	01865704099
41		Dulyatoli	Trilon Chakma	Chairman	01790004394
42		Dulyatoli	Sagar Dewan	Member	01866022196
43		Laxmichhari	Prabil Kumar Chakma	Chairman	01811203306
44		Laxmichhari	Ratna Bindu Chakma	Member	01553790860
45		Barmachhari	Sui Sala Choudhury	Chairman	01728353117
46	Ramgarh	Upazila Sadar	Hasina Akter	Vice-Chairman	01837615421
47		Ramgarh	Shah Alam	Chairman	01871929967
48		Ramgarh	Samsul Haque	Member	01824477558
49		Patachhara	Kazi Nurul Alam	Chairman	01553002292
50		Patachhara	Md. Amanullah	Member	01826596399
51		Patachhara	Md. Imam Hossain	Member	01553809054
52	Mahalchhari	Mubachhari	Bappi Khisa	Chairman	01814801997
53		Mubachhari	Chiku Chakma	Member	01820709203
54		Mahalchhari	Manik Ranjan Khisa	Member	01556770330
55		Kayanghat	Hemanta Bikash Chakma	Member	01879301157

District: Bandarban

SL	Upazila	Union	Name	Designation	Mobile
1	Naikhongchhari	Sonaichhari	Anning Marma	Chairman	01822394551
2		Sonaichhari	Neda Thowai Prue	Member	01883829461
3		Dochhari	Md. Imran	Chairman	01811707861
4		Dochhari	Thowai Ching Aung Chak	Member	01852495637
5		Dochhari	Mongnue Marma	Headman	01823969509
6		Baishari	Md. Alam	Chairman	01827291221
7		Baishari	Belal Uddin	Member	01833947975
8		Naikhongchhari	Md Yusuf	Chairman	01849729756
9		Naikhongchhari	Md. Arefullah	Member	01820402800
10		Noa Patang	Chonumong Marma	Chairman	01556705518
11	Rowangchhari	Rowangchhari	Meh Hala Aung Marma	Chairman	01557328390
12		Rowangchhari	Lal Rousang Bawm	Member	01553653645
13		Alikhong	Biswanath Tanchangya	Chairman	01556572010
14		Taracha	Unumong Marma	Chairman	01568927600
15		Taracha	Hlaching Priyo Marma	Member	01843625077
16	Ruma	Ruma	Ung Hla Ching Marma	Chairman	01553605488
17		Ruma	Numrau Marma	Vice Chairman	01585285681
18		Galangya	Menrotto	Chairman	01706628155
19		Paindu	Uhlamong	Chairman	01553104567
20		Paindu	Vannun Ang Bawm	Member	01838709570
21		Remakri Pransa	Maksing Mrong	Member	01554279841
22	Thanchi	Remakri	Shui Shoi Thui	Chairman	01557584463
23		Thanchi	Aung prue Mro	Chairman	01553210982
24		Thanchi	Vaggo Mro	Member	01575527893
25		Tindu	Hlayi Marma	Member	01868584590
26		Tindu	Komong Khumi	Member	01858358569
27		Balipara	Jiya Aung Marma	Chairman	01557432673
28		Balipara	Sajal Karmokar	Member	01856730008

Annex-5

Figure 6: Actual Work Plan

Study for Enhancing Accessibility to Remotely Located Villages in the Three Hill districts

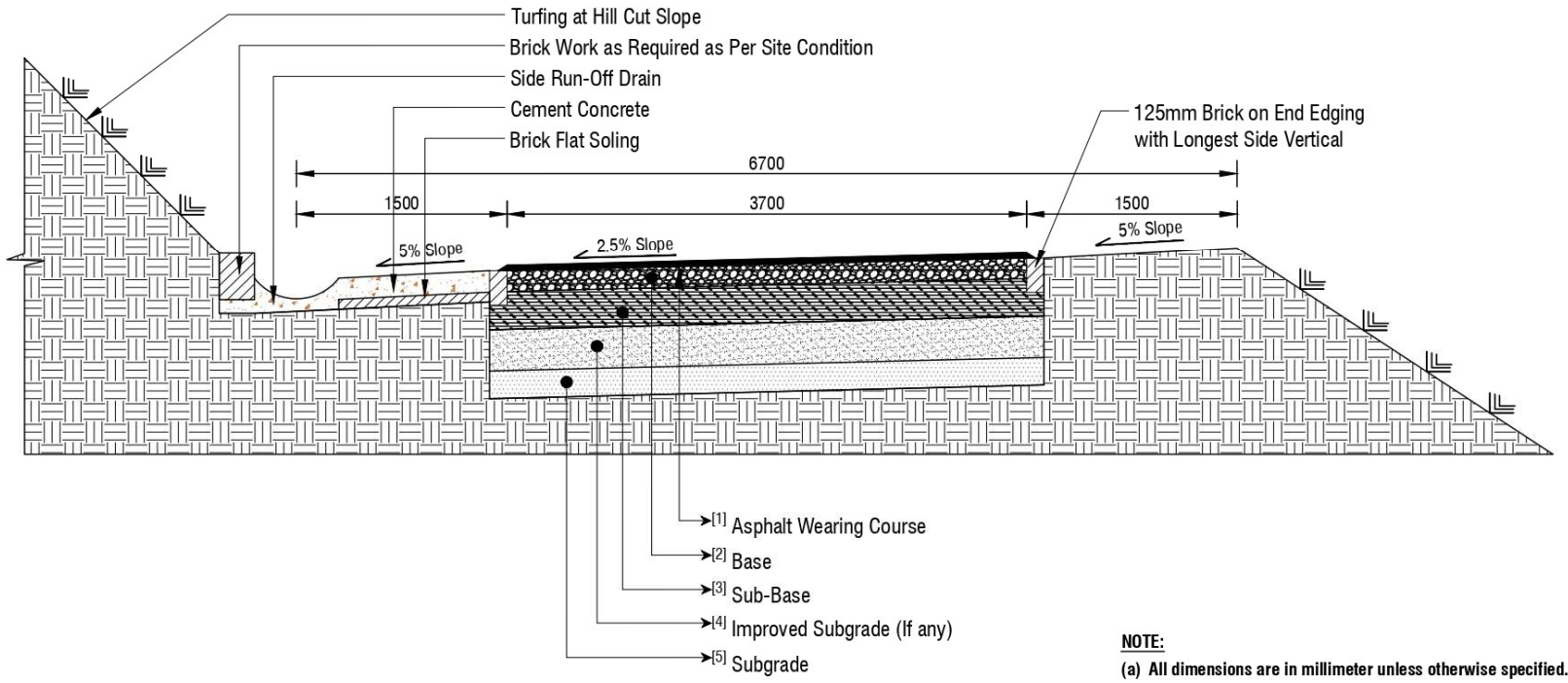
Of Carrying out Feasibility/Reviewing Study on Rural Connectivity

Contract Effective Date: 18 October 2021, Inception Submission Date: 25 November 2021

Sl. No	Major Activity	Month 1 (18 Oct-17 Nov)				Month 2 (18 Nov-17 Dec)				Month 3 (18 Dec-17 Jan)				Month 4 (18 Jan-17 Feb)				Month 5 (18 Feb-17 Mar)				Month 6 (18 Mar-17 Apr)				Month 7 (18 Apr-17 May)				Month 8 (18 May-17 Jun)			
		W-1	W-2	W-3	W-4	W-1	W-2	W-3	W-1	W-2	W-3	W-4	W-4	W-1	W-2	W-3	W-4	W-1	W-2	W-3	W-4	W-1	W-2	W-3	W-4	W-1	W-2	W-3	W-4	W-1	W-2	W-3	W-4
1	**Inception Report Preparation & Submission** 1) Office Setup & Team Mobilization 2) Desk Review, Meeting with Key Stakeholders 3) Initial Authenticity Check of Disconnected Village Database & Maps (37 days)																																
2	**Preparation for the Field Study** 1) Sample Upazila Maps for 23 Study Upazilas showing Disconnected Villages 2) Sample Tourism Maps for the three hill districts showing existing Tourists Spots. (21 days)																																
3	**Stakeholder Consultation Meeting & Fieldwork** 1) Disconnected Village Database Review 2) Spatial Data Review 3) Disconnected Village Mapping 4) 23 Unions Case Study																																
4	**Draft Report Preparation & Submission** Data Analysis and Tabulation, Disconnected Village Database Update, GIS Map Preparation (Upazila Map A1 Size, Case Study Union Map A3 Size, Tourism Map A1 Size), etc.																																
5	**Regional Stakeholder Workshop at Rangamati** Consultation and Validation of Study Findings																																
6	**Final Report Preparation** incorporating feedbacks and suggestions from the regional workshop																																
7	**National Stakeholder Workshop** at LGED, Dhaka Dissemination of the Study Findings																																

ANNEX-6: LGED STANDARD DESIGN FOR THE HILL DISTRICTS, P 209-217

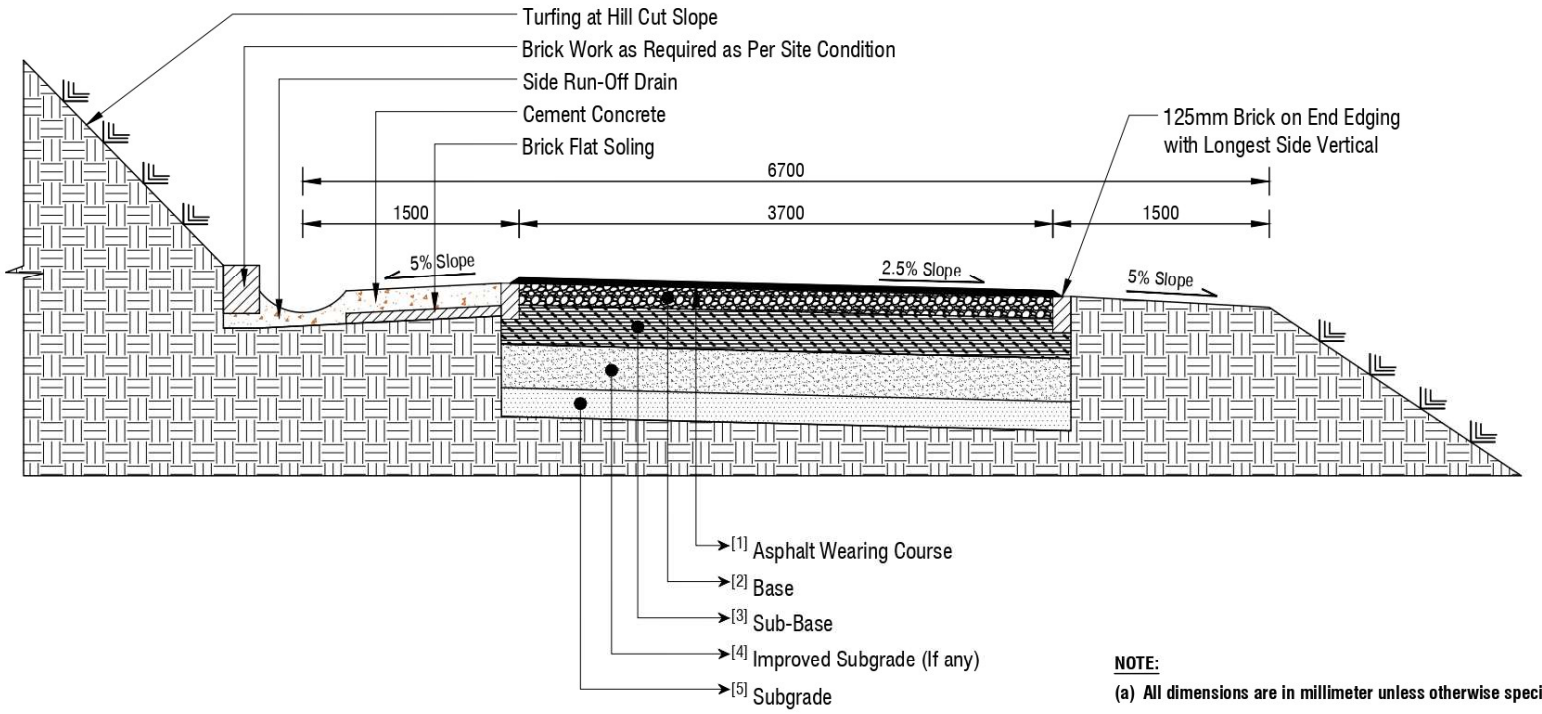
PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD 0-300)
HAVING HILL-CUT ON ONE SIDE AT INWARD CURVATURE TO HILL



NOTE:
(a) All dimensions are in millimeter unless otherwise specified.

CVD	Pavement Thickness (mm)											
	For Subgrade Soaked CBR 2% - 3%				For Subgrade Soaked CBR 4% - 6%				For Subgrade Soaked CBR ≥7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
0-100	40	150	250	300	40	150	200	250	40	150	150	-
101-200	40	150	275	300	40	150	225	250	40	150	175	-
201-300	40	175	300	300	40	150	250	250	40	150	200	-

PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD 0-300)
HAVING HILL-CUT ON ONE SIDE AT OUTWARD CURVATURE TO HILL

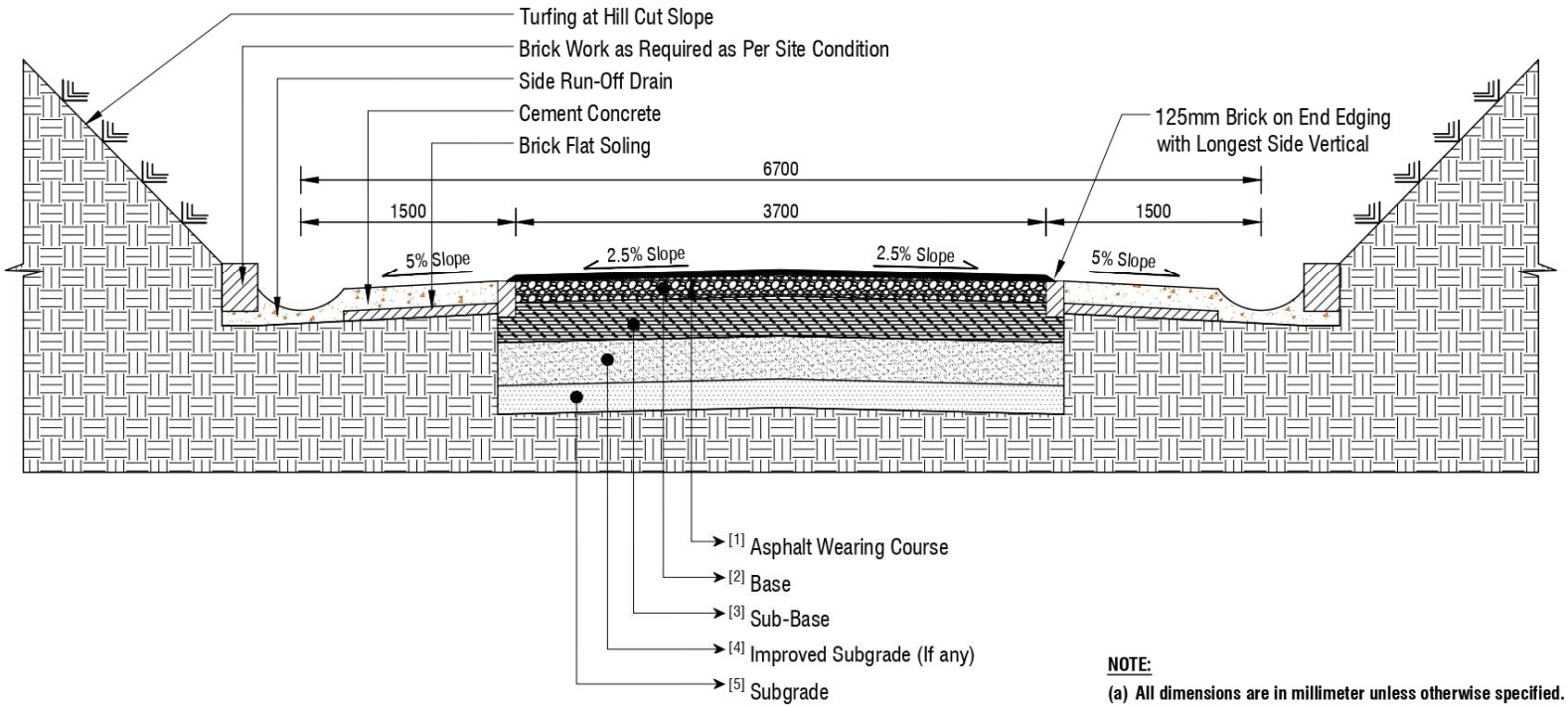


NOTE:

(a) All dimensions are in millimeter unless otherwise specified.

CVD	Pavement Thickness (mm)											
	For Subgrade Soaked CBR 2% - 3%				For Subgrade Soaked CBR 4% - 6%				For Subgrade Soaked CBR ≥7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
0-100	40	150	250	300	40	150	200	250	40	150	150	-
101-200	40	150	275	300	40	150	225	250	40	150	175	-
201-300	40	175	300	300	40	150	250	250	40	150	200	-

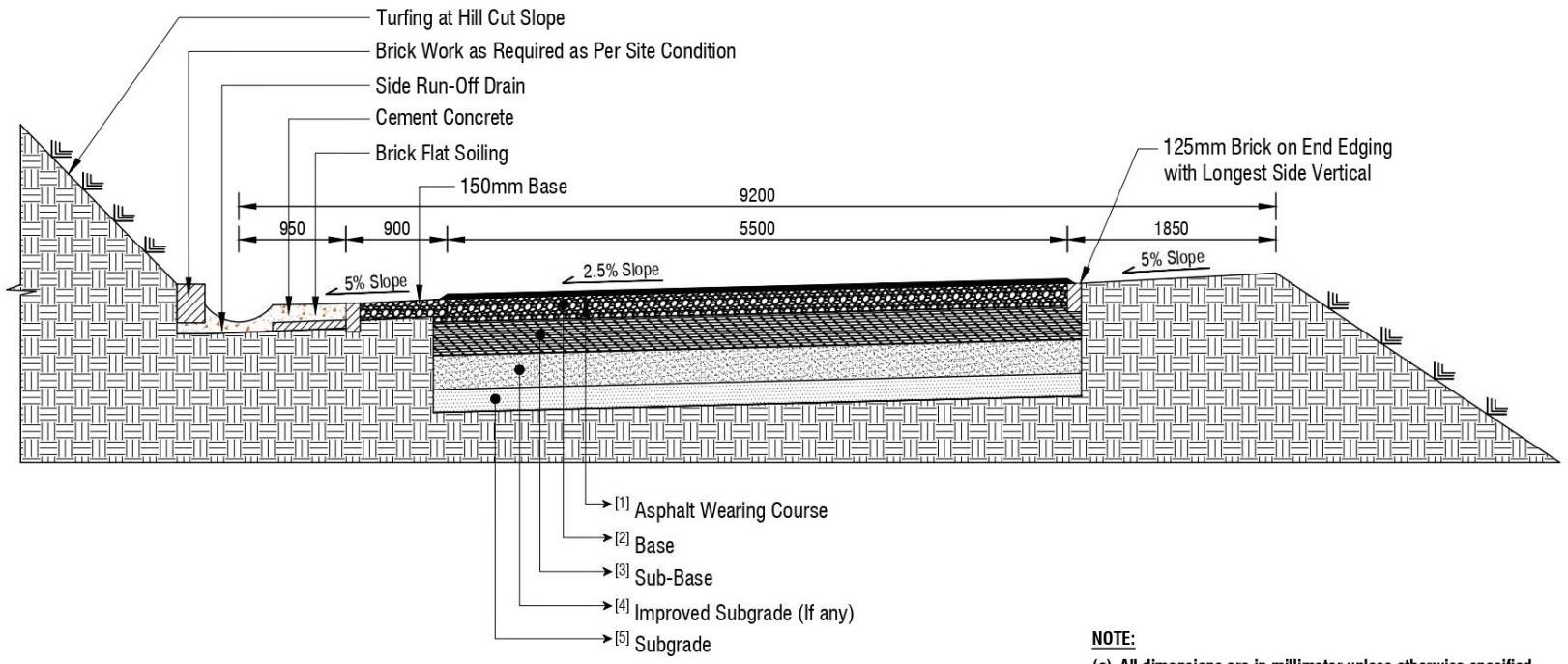
PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD 0-300)
HAVING HILL-CUT ON BOTH SIDES



NOTE:
(a) All dimensions are in millimeter unless otherwise specified.

CVD	Pavement Thickness (mm)											
	For Subgrade Soaked CBR 2% - 3%				For Subgrade Soaked CBR 4% - 6%				For Subgrade Soaked CBR ≥ 7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
0-100	40	150	250	300	40	150	200	250	40	150	150	-
101-200	40	150	275	300	40	150	225	250	40	150	175	-
201-300	40	175	300	300	40	150	250	250	40	150	200	-

PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD > 300)
HAVING HILL-CUT ON ONE SIDE AT INWARD CURVATURE TO HILL



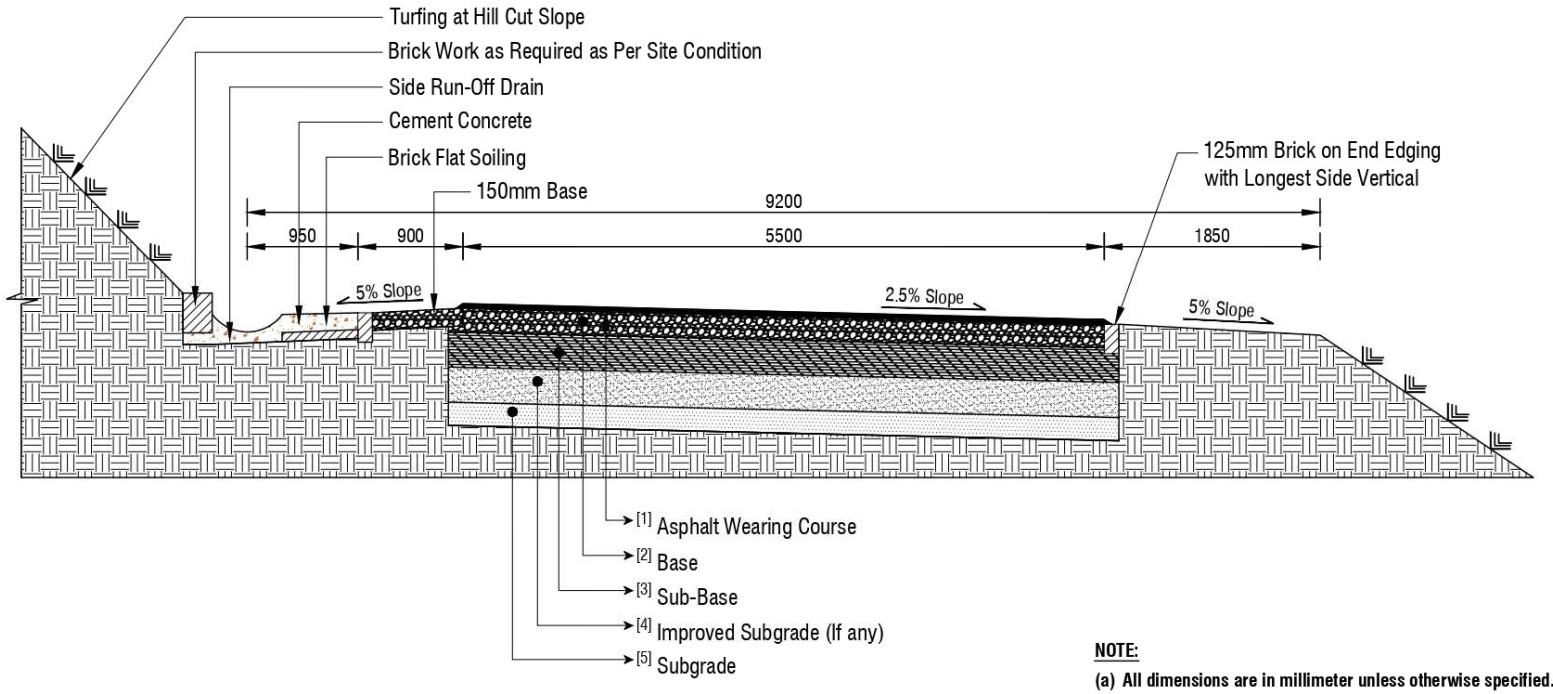
NOTE:

(a) All dimensions are in millimeter unless otherwise specified.

CVD	Pavement Thickness (mm)											
	Layer Thickness for Subgrade CBR 2% - 3%				Layer Thickness for Subgrade CBR 4% - 6%				Layer Thickness for Subgrade CBR ≥7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
301-400	40	200	300	300	40	175	250	250	40	175	200	-
401-500	40	225	300	300	40	200	250	250	40	200	200	-

Note: Hilly roads with CVD>500 will be designed case by case based on traffic and subgrade condition

PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD > 300)
HAVING HILL-CUT ON ONE SIDE AT OUTWARD CURVATURE TO HILL

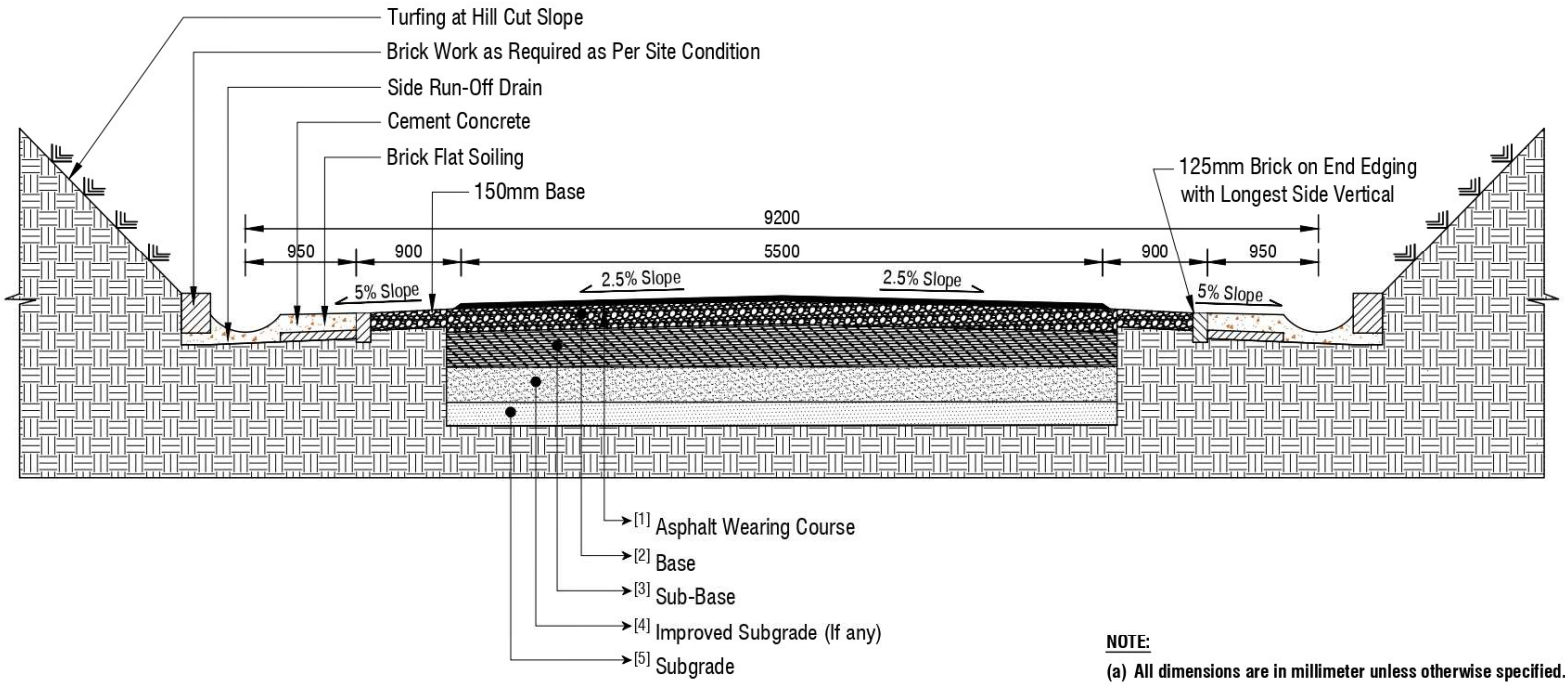


NOTE:
(a) All dimensions are in millimeter unless otherwise specified.

CVD	Pavement Thickness (mm)											
	Layer Thickness for Subgrade CBR 2% - 3%				Layer Thickness for Subgrade CBR 4% - 6%				Layer Thickness for Subgrade CBR ≥7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
301-400	40	200	300	300	40	175	250	250	40	175	200	-
401-500	40	225	300	300	40	200	250	250	40	200	200	-

Note: Hilly roads with CVD>500 will be designed case by case based on traffic and subgrade condition

PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD > 300)
HAVING HILL-CUT ON BOTH SIDES



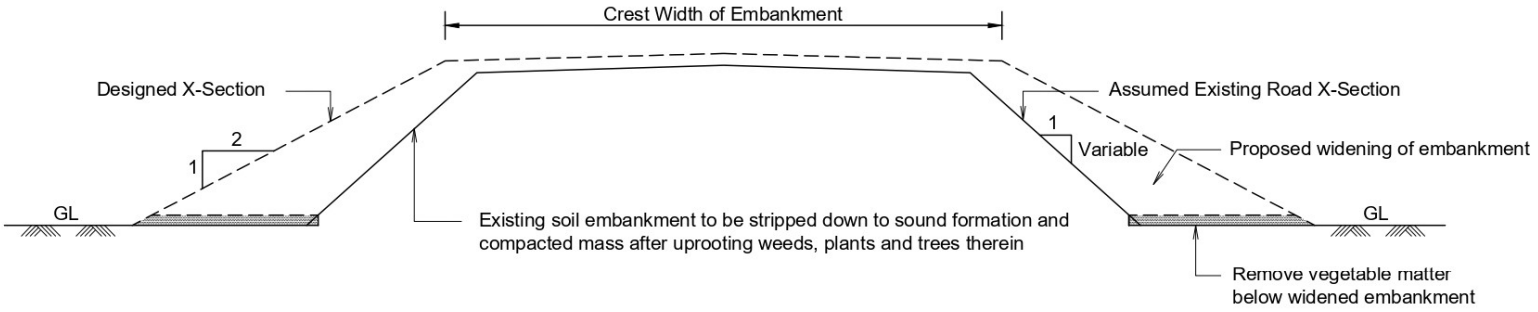
NOTE:

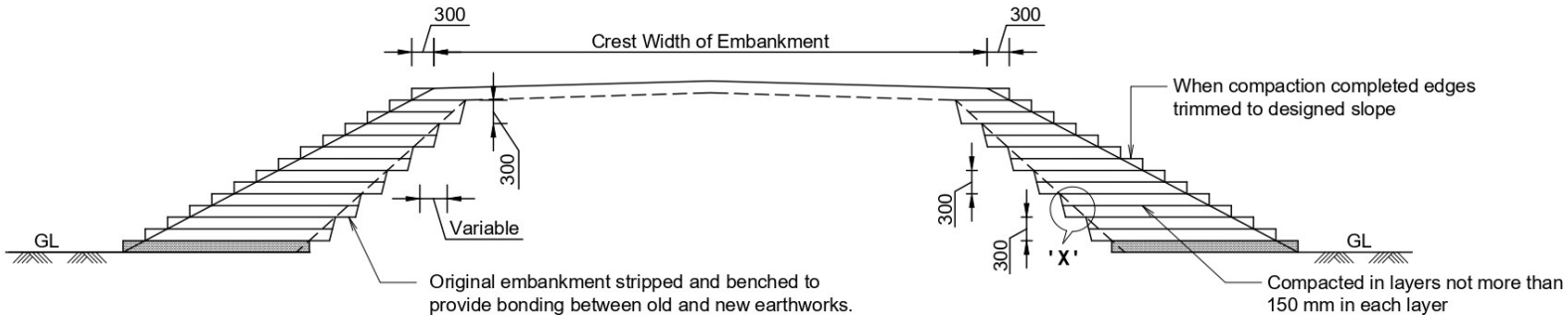
(a) All dimensions are in millimeter unless otherwise specified.

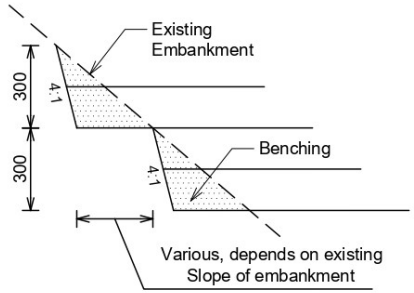
CVD	Pavement Thickness (mm)											
	Layer Thickness for Subgrade CBR 2% - 3%				Layer Thickness for Subgrade CBR 4% - 6%				Layer Thickness for Subgrade CBR ≥7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
301-400	40	200	300	300	40	175	250	250	40	175	200	-
401-500	40	225	300	300	40	200	250	250	40	200	200	-

Note: Hilly roads with CVD>500 will be designed case by case based on traffic and subgrade condition

ROAD EMBANKMENT WIDENING

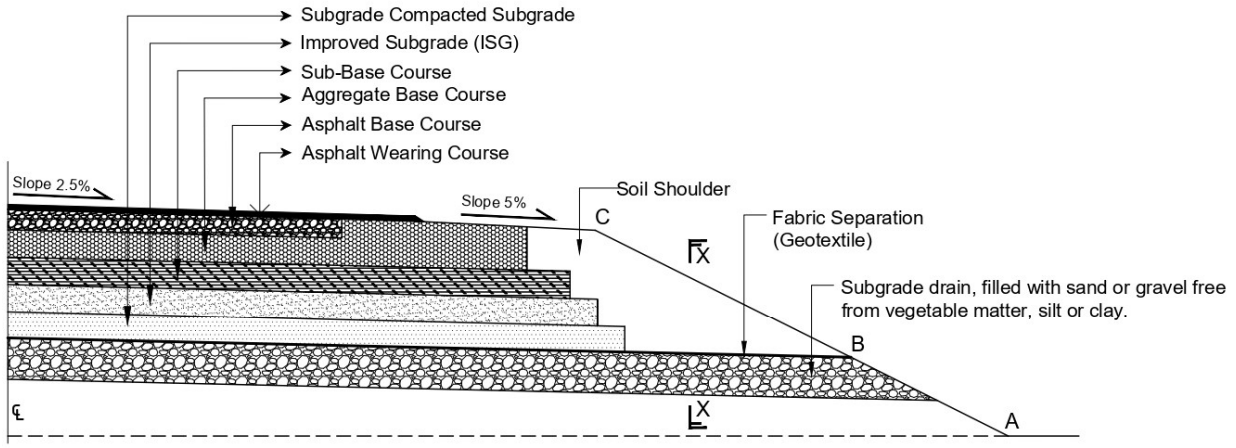




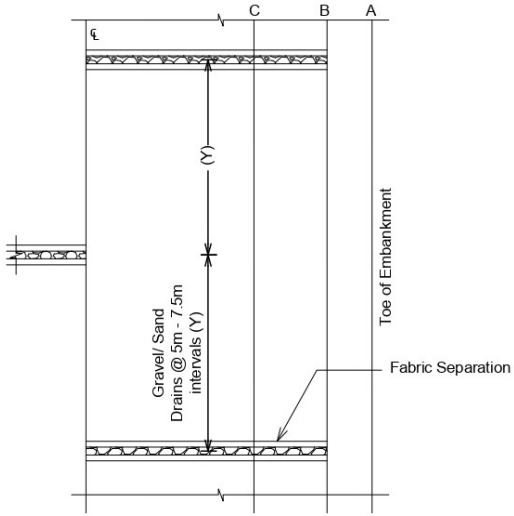


Details at ' X '

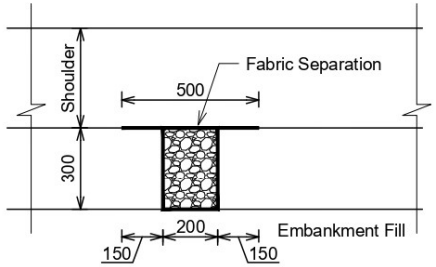
SUB-GRADE DRAINAGE



CROSS SECTION



TYPICAL PLAN

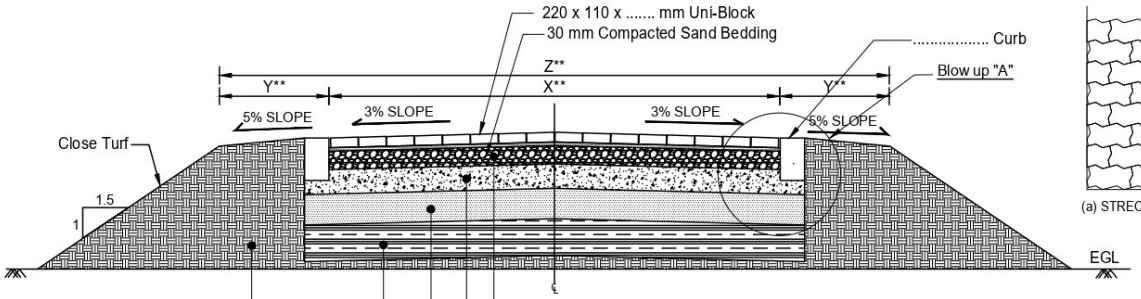


SECTION X-X

NOTES:

1. All dimensions are in millimeter unless otherwise stated
2. Gravel/ Sand Drains spaces at 5m - 7.5m intervals staggered to opposite sides.
3. This Gravel/ Sand Drains are not applicable for Town Areas.
4. Any joints in the fabric should overlap by at least 150 mm.

TYPICAL X-SECTION (UNI-BLOCK ROAD)



Base Course: (.....mm)* WMM / WBM, Los Angeles Abrasion Value (LAA) max. 40% (for Brick Chips), 35% (for stone chips); Compacted in Two/Three layers, each layer Soaked CBR min. 80%, Compacted to 100% of MDD (Modified Proctor)

Sub-Base: (.....mm)* Sub-Base, Los Angeles Abrasion Value (LAA) max. 40% (for brick chips), 35% (for stone chips); Compacted in Two/Three layers, each layer Soaked CBR min. 30%, Compacted to 98% of MDD (Modified Proctor)

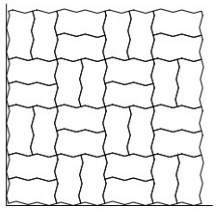
ISG: (..... mm)* Compacted Sand Improved Subgrade, Sand FM min. 0.8, PI value<6%, Compacted in Two/Three Layers, each layer soaked CBR min. 8%, Compacted to 98% of MDD (Modified Proctor)

Subgrade: 300mm Subgrade Compaction min. 95% of MDD (Modified Proctor) in Two/Three Layers, Soaked CBR min. 5%, PI value 8%-20%

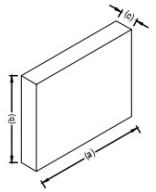
Original soil cut into designed shape, or fill with normal soil, PI Value 8%~20%, compaction min. 95% of MDD (Modified Proctor), Soaked CBR min. 3% to achieve designed cross-section of side embankment

Typical X-Section

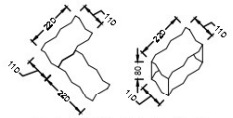
(a) STRECHER BOND OR RUNNING BOND (b) HERRINGBONE BOND (90° / 45°)



(c) BASKET WEAVE OR PARQUET BOND



Typical Curb/Kerb stone



Typical Uni-Block Section Details

Sieve Size	Bedding Sand Gradation	Joint Filling Sand Gradation
	Percent Passing (%)	Percent Passing (%)
9.52 mm	100	-
4.75 mm	95-100	-
2.36 mm	80-100	100
1.18 mm	50-95	90-100
600 micron	25-60	60-90
300 micron	10-30	30-60
150 micron	0-15	15-30
75 micron	0-10	0-10

*** Table-1: Different Road Type & Layers Specification**

Sl No.	Road Type & Traffic	Layer Thickness (mm)				Thickness (mm)/Strength (MPa)		Probable Curb / Kerb stone sizes (a x b x c)	Remarks
		ISG	Sub-Base	Base(/CC)	Sand Bedding	Concrete Block (CB)	Curb / Kerb stone		
01	Cycle Tracks, Pedestrian Footpaths, Non-motorized Vehicles	250	-	150(/100)	30	60 / 30	150 / 30	500 x 250 x 150	
02	Low Traffic Road (Traffic Volume < 0.50 MESA)	250	-	200	30	80 / 35	150 / 35	500 x 250 x 150	
03	Low Traffic Road (0.50MESA<Traffic Volume < 1.00 MESA)	250	150	150	30	80 / 35	150 / 35	500 x 250 x 150	
04	Medium Traffic Road (1.00 MESA <Traffic Volume < 2.5 MESA)	250	200	200	30	80 / 40	200 / 35	500 x 250 x 200	Only for Intersections
05	Heavy Traffic Road (2.50 MESA<Traffic Volume < 10.0 MESA)	250	250	250	30	100 / 40	200 / 35	500 x 300 x 200	

** X, Y & Z shall as per Approved geometry. Y must not less than 1000mm.

Sieve Size	Base Material Gradation	Sub-base material Gradation
	Percent Passing (%)	Percent Passing (%)
50 mm	100	100
37.5 mm	95-100	90-100
19.0 mm	70-92	-
9.5 mm	50-70	-
4.75 mm	35-55	30-60
600 micron	12-25	-
75 micron	0-8	0-12

Notes:

1. All dimensions are in millimeter.
2. All layer's thickness, compaction & other specification must comply as shown.
3. Bedding sand (FM-2.5) shall well graded (as shown) & Compacted at OMC±3% condition.
4. Joint filling sand (FM-1.5) shall also well graded (as shown) & filled properly.
5. After setting uni-blocks (at desired location), compaction shall ensured by Plate Compactor/Vibratory roller with joint filling sand.
6. Joint filling sand (dry) shall broom after uni-block setting & 7 days later again.