

Impacts of Road Construction on the Natural Environment and the Indigenous Peoples of the Chattogram Hill Tracts, Bangladesh

Daud A Z M Farhan*

Doctoral Program in Environmental Studies, University of Tsukuba,
Post code: 305-0006, 2-1 Tennodai, Ichinoya 36-104, Tsukuba-shi, Ibaraki-ken, Japan
Tel: +8180-4943-9490, E-mail: farhan7123@gmail.com

Kenichi Matsui

Faculty of Life and Environmental Sciences, University of Tsukuba,
Post code: 305-8572, Room #B305, 1-1-1 Tennodai, Tsukuba-shi, Ibaraki-ken, Japan
Tel: 029-853-6701, E-mail: matsui.kenichi.gt@u.tsukuba.ac.jp

Abstract

Road construction raises a number of sustainability concerns. It becomes more complicated when it affects Indigenous people and their traditional livelihoods. This study attempts to examine the impacts of road construction on Indigenous peoples of the Chattogram Hill Tracts. There have been very limited studies to understand how Indigenous people and government road construction experts perceived about road impacts in this area. Given historical grievances among these Indigenous people since the British colonial period, it is important to examine what can be the causes of frictions. This research conducted a thorough examination of available documents, including government reports and past studies. It then conducted two separate surveys among government road construction experts and Indigenous people in the Chattogram Hill Tracts. Through our documentary review on past road construction, we identified that road construction caused deforestation, biodiversity loss, loss of Indigenous peoples' ancestral lands, land degradation and drainage congestion. The survey among government experts identified agricultural land reduction, soil destabilization, landslide, deforestation, greenhouse gas emission, the emission of dust and particulate matters and substantial noise pollution. The survey among Indigenous people revealed that 95 percent of them did not receive any compensation. They lost land and other properties. Their agricultural production was reduced. A small proportion of them, however, did gain new employment and increased their income. Many recognized better accessibility to schools and health centers due to new roads.

Keywords: Indigenous Peoples; Chattogram Hill Tracts; Road Construction; Land Encroachment; Environmental Impacts

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1. Introduction

Indigenous peoples and local communities, whose lifestyles are heavily dependent on natural resources, have experienced damages to their traditional livelihoods due to road construction (Johnson, 2015). The World Bank recommended that road works avoid encroaching Indigenous sacred territories and productive resources, and to meaningfully consult with Indigenous peoples (Tsunokawa and Hoban, 1997).

Past studies showed various negative impacts of road construction. A study on Southeast Asia found that roads facilitated high rates of forest conversion and illegal hunting. In Sumatra, Indonesia, Blankejeren-Kutacane Road pavement led to a greater access for illegal land speculation and logging on Gunung Leuser National Park (Clements, 2013). Regarding road construction between Peru and Brazil, Johnson (2015) highlighted the ongoing debate over negative and positive impacts of road through Indigenous territories. Here some proponents of the road claimed that it would provide farmers and traders with the easy transportation of goods to city market, whereas critics contended that the road would cut right through traditional territories. This study also examined some perspectives of Indigenous leaders who expressed their fear of having their unique ecosystem-livelihood connection destroyed.

In order to better understand Indigenous perspectives, past studies tend to rely on questionnaire surveys. In Peninsular Malaysia, Clements (2013) conducted a direct questionnaire survey among an indigenous group called *Orang Asli* to understand their perceptions about the impacts of road on wildlife. The negative impacts were perceived as pollution, disease, and poachers. Positive impacts included the introduction of health workers, charitable donations and jobs (Clements, 2013). Later, Clements et al. (2018) did another direct questionnaire survey on community consultation partly in connection to the requirement for prior informed consent under article 8(j) of the 1992 Biodiversity Convention. They found that Indigenous peoples were rarely consulted and this poor process led to the destruction of the forest ecosystem. Also, in a recent study Ghent (2018) illustrated how poorly planned road can lead to habitat fragmentation, vehicle-wildlife collisions, and loss of ecosystem services.

Indigenous or traditional hunters could have helped identify wildlife migration routes so that these problems could have minimized. Another study by Estrada et al. (2020) supported this by pointing out that Indigenous sociocultural identities are intricately interwoven with the plant and animal species found on Indigenous peoples' lands (Fernandez-Llamazares and Virtanen, 2020), and we can avoid the mass extinction of these species if we respect and support the efforts of Indigenous peoples to maintain their cultural ties to their lands (Estrada et al., 2020).

In Bangladesh, a similar issue was observed by Islam (2015). He found that Dhaka-Sylhet Road, which was constructed in 1998, cut about 27,000 roadside trees and displaced most roadside settlements. Other negative impacts included the loss of agricultural land, illegal logging, and changes in river routes (DHV consultants, 1998). Dust and gases emitted during road construction, noise from construction equipment and road traffic caused adverse impacts on the environment and human health (Islam, 2015).

In the Chattogram Hill Tracts (formerly known as Chittagong), where Indigenous peoples have lived for centuries, traditional lands have been placed under the jurisdiction of the central government, but Indigenous land rights have not been recognized (Rasul and Thapa, 2005). Even today, a tension between Indigenous peoples and the Bangladesh government has not subsided, requiring all researchers or outsiders to obtain government permission to visit most parts of the Hill Tracts. As a result, very few studies exist concerning impacts of road construction on indigenous peoples of the Chattogram Hill Tracts.

Past studies that deal with the situations of the Indigenous peoples in the Hill Tracts focused mainly on human rights and land rights. As early as 1991, the Chittagong Hill Tracts Commission and IWGIA in 1991 (Chittagong Hill Tracts Commission, 2000) interviewed 85 indigenous peoples in the refugee camps at Tripura in India and then travelled to three districts of the Chattogram Hill Tracts to interview government officials, political leaders, and Indigenous people regarding human rights conditions (Chittagong Hill Tracts Commission, 2000). Later, Adnan and Dastidar (2011) examined 16 land alienation cases from Indigenous peoples in the Chittagong Hill Tracts with the focus on laws and policies. More recently, Amnesty International (2013) conducted a research in the Chittagong Hill Tracts, and reported about on-going land conflicts. Indigenous peoples at the time expressed concerns about a road construction.

Considering the lack of in-depth studies on Indigenous perspectives about road construction for more than ten years, our paper intends to examine how large-scale road construction projects in the Chattogram Hill Tracts impacted the natural environment and the livelihood of Indigenous peoples. In doing so, we look at both Indigenous and officials' perspectives.

2. Materials and Methods

2.1. Study Area: The Chattogram Hill Tracts

The Chattogram Hill Tracts is a region of mountain ranges and valleys (Gain, 2013) in southeastern Bangladesh. The approximate land area is 13,295 km² (5,133 mi²). There are three administrative districts: Khagrachari, Rangamati, and Bandarban. In this area, the Roads and Highways Department (RHD) operate in the following three road divisions (separate from administrative divisions which are under the district administration): Bandarban road division, Khagrachhari road division, and Rangamati road division. Bandarban road division maintains 552 km of roads. Khagrachhari is responsible for 387 km of roads. Rangamati maintains 225 km of roads (Roads, 2022). Along with RHD, the Local Government Engineering Department (LGED) also constructs local roads in Bangladesh, and they constructed 2883.65 km of roads in Bandarban, 3030.68 km in Khagrachhari, and 4682.55 km in Rangamati up to 2022 (LGED, 2022b).

According to the 2011 Bangladesh Census and the Chittagong Hill Tracts Regional Council Act of 1998 (Act XII of 1998), there were eleven Indigenous groups in the Chattogram Hill Tracts (Roy, 2012; Statistical Bureau, 2011): Chakma, Marma, Tripura, Tanchangya, Lushai, Pankho, Bawm, Mro, Khyang, Khumi and Chak. According to 2022 Bangladesh Census, the ethnic minority population of the Chattogram Hill Tracts is 990,860 (Bangladesh Bureau of Statistics, 2022). The Chakma are the largest indigenous group with a population of 483,299 (Bangladesh Bureau of Statistics, 2022) and the Marma are the second largest with a population of 224,261. Most of them are Buddhists and the rests are Hindus and Christians (Nijhoom Tours, 2022).

Before the British rule, the hill peoples had mainly engaged in slash-and-burn cultivation that is locally known as *jum*. Here Indigenous farmers cultivated rice for their staple food. They also grew pumpkins, chili, melons, ginger, maize, sesame and cotton for trade (Schendel, 2001; Hossain, 2013). Women used forest resources for cooking, fuel, and traditional medicines (Iqbal, 2009). In a survey of 400 households in the Hill Tracts area, Dutta (2000) identified six main occupations: agriculture (64%), agricultural labor (12.5%), business (8.5%), service/professional (7.8%), fishing (4.8%), and tenant farmers (2.5%).

For these Indigenous peoples, road construction sometimes implies another form of colonialism. During the British rule, Hill Tracts tribes were politically marginalized (Schendel, 2001). The colonial authority repeatedly attempted to dismantle traditional kinship-based socio-political structure (Schendel, 1992). After the British rule, Pakistan and Bangladesh attempted to divide communal land use into individual ones. Past restrictions on non-Indigenous use of the Hill Tracts areas were gradually lifted to allow Bengali immigrants from other parts of

Bangladesh to settle. (Adnan and Dastidar, 2011). The Bangladesh government has persistently attempted to integrate the Indigenous peoples into mainstream Bengali society (al-Ahsan and Chakma, 1989). The Constitution, which was adopted in December 1972, declared Bangladesh as a monolithic cultural entity in order to assimilate the indigenous communities into Bengali mainstream society (Chakma, 2010).

These assimilation attempts have met resistance from Indigenous leadership, creating adversarial relationships with government agencies. In 1972, the indigenous peoples of the Chittagong Hill Tracts established the People's Solidarity Association to ascertain their rights to their territories. In the following year, they established an armed wing by mobilizing support from India. This led to a 24-year violent conflict (Mohsin, 2003). The conflict came to a halt after a peace treaty of 1997 (Chowdhury, 2014). Since then, however, there are still some localized conflicts. The jurisdiction over the use of the Chattogram Hill Tracts areas has been contested among Indigenous chiefs, Chittagong Hill Tracts Regional Councils, and the Ministry of Chittagong Hill Tracts Affairs (MoCHTA) (Chowdhury, 2014). The administrative power of the Deputy Commissioners appointed by the Bangladesh government over the revenue hampers the common property customs of the indigenous peoples (Chowdhury, 2014).

Other than administrative organizations, the strong Bangladeshi military presence has challenged traditional governance authorities. After the Peace Treaty, the Bangladeshi Army has often intervened the daily affairs of residents and local administration. (Chowdhury, 2014). Due to this socio-political scenario and difficult geography, development works, especially road development had always been a challenging task in this region.

2.2. Methodology

This paper is based on both primary and secondary data. The secondary data were collected mainly from government organizations that are responsible for road construction and maintenance. These include the Roads and Highways Department, the Local Government Engineering Department, the Department of Forest, the Department of Environment, and the Chittagong Hill District Council. We focused on information that had some insights on traditional land encroachment and environmental impacts due to road construction. We also collected and reviewed newspaper and online reports on Bangladesh' Indigenous peoples and development works along with academic books and journal papers. We also collected and reviewed several monitoring and evaluation reports produced by project consultants and the Ministry of Chattogram Hill Tracts Affairs on two government road construction projects (funded by loans from the Asian Development Bank) which took place between 2000 and 2009. The reports contained particularly relevant information regarding works carried out by the Local Government Engineering Department (LGED).

Based on the analysis from secondary sources, we designed two questionnaire surveys. This paper uses the data we collected from a questionnaire survey among government experts of the Roads and Highways Department in March 2017. Eighteen engineers from the Roads and Highways Department had a bachelor's degree or above in civil engineering and transportation engineering. Two of them were superintendent engineers, six were executive engineers and ten were sub-divisional engineers. We call them "experts" based on the facts that they had six to seventeen years of work experience in the road construction sector, which include highway planning, design, construction, maintenance, and operations. Moreover, all experts had work experience in the Chattogram Hill Tracts between six months to three years. Hence, they were relatively well-informed about geography, indigenous peoples, and socio-political issues in the Chattogram Hill Tracts.

This survey intended to understand the perceptions of these officials about the impacts of road construction on land and local livelihoods. In order to understand the consequences of road construction, we used five-point Likert-scale and the respondents were asked to choose the level of their agreement to given statements. Some questions regarding future solutions were open-ended. The questionnaire was conducted online. The respondents were initially briefed about the questionnaire through emails and video conferencing. The lead author has worked for the Roads and Highways Department for 11 years and obtained permission from his organization to conduct this survey.

In addition, a public response survey was conducted using purposive sampling method among 40 members of Indigenous communities in the Chittagong Hill Tracts (e.g., Chakma, Marma, Tanchangya), where there were road construction projects in the past. They belonged to the Chakma, Marma, and Tanchangya communities. About 30 of them lived along the 27.6 km stretch of Rangamati-Kaptai road. The lead author visited the area a while working in the Chattogram Hill Tracts, and later in the land office, RHD office, and LGED office. It had been revealed during the visit that no formal land acquisition procedure had been followed during the construction of this road, hence, it is likely that the people living along this road had been affected. The people who mainly depended on their lands were the main target. The survey asked their opinions about land acquisition for road, compensation, tree cutting, consultation meetings, income increase, and other secondary social issues after road completion. The questionnaire was sent directly to those who could understand the survey in Bengali. The other respondents, who were not sufficiently educated to answer in Bengali, were interviewed by Mr. Ajay Tanchangya, a member of Tanchangya community who was an acquaintance of the lead author during his service period in

CHT from 2013 to 2015. The surrogate interviewer was briefed through email and video conferencing about the survey after permission.

During the data analysis period in 2017, we contacted an executive engineer and a Upazila engineer of Local Government Engineering Division (LGED) of Rangamati district. We also talked to divisional forest officers at Bandarban, Khagrachari, and Rangamati Forest offices via telephone to confirm facts, and they all kindly responded. In December 2021, the executive engineer and the sub-divisional engineer of Khagrachari road division were contacted through email to inquire about the land acquisition record of Khagrachari-Sajek road. They both responded and informed us about the land acquisition status of the road. Additionally, we checked the updated websites of the Roads and Highways Department, Ministry of Road Transport and Bridges (MRTB), and the Local Government Engineering Department (LGED) to confirm and update any information about our interviews.

3. Results

3.1. Document Analysis on Native Land and Forest Encroachment by Roads

Before elaborating on the results of our questionnaire survey, we discuss our findings from our examination of secondary sources and government project reports as well as informal interviews by phone or online. A significant negative impact of roads on Indigenous lives can be traced back to the Pakistani period, when roads were built across the Karnaphuli River. When Kaptai Dam was to be built, a link road was constructed between the dam site and Rangamati Upazila headquarters. The reservoir eventually submerged 54,000 acres of arable land, which comprised 40% of the total arable land in Chattogram district (Burger and Whittaker, 1984 and Ishaq, 1971). Dislocated families were initially promised to have both financial compensation and substitute land, but about 60,000 people did not receive compensation of any kind (Chowdhury, 2014). In 2008 the Local Government Engineering Department (LGED) expanded this village road for a 21.56 km-long and 5.5-meter-wide road (LGED 2022b).

We contacted the executive engineer and the Upazila Engineer of LGED in Rangamati about this new road development. It turned out that they could not find any land acquisition or compensation record for the road expansion. Hence, it was possible that the land acquisition was not clearly authorized. We could not find any record to show compensation to indigenous peoples. Unfortunately, we could not contact any indigenous people for more information.

Also, indigenous peoples challenged foreign aid funded road construction in the Chattogram Hill Tracts. In 1977, for example, the Australian Development Assistance Bureau (ADAB) undertook the 41-mile long Khagrachari-Rangamai road project and the Rangamati-Chittagong Road improvement project (Burger and Whittaker, 1984). The Bangladesh government and the ADAB claimed at the time that these projects would improve the connectivity for Indigenous peoples to market. Indigenous leaders opposed this, nevertheless. They said that the road would benefit Bengali businessmen instead by giving them an easier access to tribal territories. Eventually, due to massive protests from Indigenous communities, the ADAB pulled out of their road construction projects and left the roads unfinished (the Bangladesh government later completed the road) (Burger and Whittaker, 1984). The Australian organization, Community Aid Abroad, noted in 1981 that: “the Chittagong Hill Tracts stands out as almost certainly the most destructive use of Australian aid anywhere in the world” (Burger and Whittaker, 1984).

The fear expressed by Indigenous leaders about intrusion by settlers materialized when the construction of Alikadam-Lama-Chokoria Road was undertaken by the Roads and Highways Department (Roads, 2022b) in the 1980s. Extensive logging activities ensued after a new road was constructed (Gain, 2013). The Mro, Marma, and Tanchangya communities who used the forests were affected (Wikimapia, 2022). A village headman of the Mro community living near the reserved forest claimed that 90% of Matamuhuri forest had disappeared although a divisional forest officer in Lama Upazila reported that 70% of the forest was still intact. The Indigenous peoples also said that the road allowed timber traders and smugglers to have access to the forest. Logging threatened the survival of many endemic species, including Asiatic wild dog or Dhole, Asian elephant, hog deer, Binturong, Asian black bear, Indian bison and Sambar deer (Gain, 2013).

After 2000, the Asian Development Bank (ADB) funded two major rural development projects in the Chattogram Hill Tracts with the heavy emphasis on road and other infrastructure improvement. These are known as the Chittagong Hill Tracts Rural Development Projects (CHTRD) I and II (Asian Development Bank, 2011a and Asian Development Bank, 2011b). CHTRD I improved about 260 kilometers of feeder and rural roads between October 2000 to December 2009 (Asian Development Bank, 2011a). The Implementation Monitoring and Evaluation Division at the Bangladesh Ministry of Planning conducted an evaluation study on this project by interviewing 1,490 individuals in 60 villages within three Hill districts. According to the evaluation report, the project had positive impacts such as improved accessibility to schools and health centers and also easier transportation to market which facilitated selling of agricultural goods and handicrafts (Ministry of Planning, 2011). However, the interim technical assistance report of CHTRD II investigated the land issues of Indigenous peoples and found the widespread “loss of common land” because of expanded road networks (Asian Development Bank,

2010). It is estimated that at least 200 households lost more than 10% of their productive lands or other properties like shops or residences. Both Indigenous and non-indigenous peoples informed that their leaders promised compensation but the promise never materialized (Asian Development Bank, 2010).

Taking lessons from CHTRDP I, the government prepared the Specific Indigenous Peoples Plan (IPP), the Land Acquisition and Resettlement Framework (LARF), and Environment Planning Framework (EPF) during the Project Preparation Technical Assistance (PPTA) of the second Chittagong Hill Tracts Rural Development Project (CHTRDP II) (MoCHTA, 2016a). The CHTRDP II policy principles stated that the Project will respect “Indigenous peoples’ identity, dignity, human rights, livelihood system and cultural uniqueness.” From this project, the Indigenous peoples would “receive culturally appropriate social and economic benefits.” The project would make sure that the Indigenous peoples would participate in the project so as to avoid adverse impacts (MoCHTA, 2016b).

The Project policy laid out four principles that safeguard Indigenous rights. First, the government would duly compensate the Indigenous peoples for their loss of common lands (MoCHTA, 2016b). It developed the Land Acquisition and Redevelopment Plans (LARP) through extensive community consultations. Second, the Project would conduct participatory village mapping to delineate boundaries and major land use patterns (Ministry of Planning, 2011).

A four-tier Grievance Redress Mechanism (GRM) was established by incorporating an alternative dispute resolution method. First, under the Hill District Council, the Grievance Redress Committee (GRC) was established. Second, under the Chittagong Hill Tracts Regional Council, the Regional Advisory Council (RAC) was established (MoCHTA, 2016a). Third, the Project attempted to relieve poverty among relatively smaller Indigenous peoples in the project areas. The Chakma, Marma, Tripura, and Mro were identified as larger Indigenous groups, and the other seven ethnic groups were identified as target groups. Fourth, the Project would raise awareness among Bangladesh government officials in the Chittagong Hill Tracts about Indigenous peoples’ social issues, history and customs. These officials received training about land acquisition and resettlement.

CHTRDP II recognized Indigenous peoples’ customary land rights to some extent. The Land Acquisition and Resettlement Framework (LARF) was designed to provide a grant for acquiring land for Indigenous peoples. It certified Indigenous headmen, circle chiefs and Hill Tracts Council members. The LARF also verifies land registration for Indigenous peoples in accordance with the Chittagong Hill Tracts Regulation I of 1900 (Asian Development Bank, 2010).

However, CHTRDP II had shortcomings in terms of environmental damage monitoring from road construction. The interim environmental monitoring report of July 2016 mentioned that the implementing agency did not allocate any fund to monitor environmental pollution related to surface water, air quality, noise (shrillness of sound), and soils (fertility of soil)” (Islam, 2016). The report expressed concern about landslides and soil erosion. It observed land slide at some sections of rural roads and village access roads. At rural road alignments, 5,895 trees were cut. The affected persons were given some compensation, but the project did not include a plantation program (Islam, 2016).

The lessons from these two projects, and the policy principles formulated based on these projects, were not later followed by all the agencies. One of the recent projects undertaken by the Chattogram Hill Tracts Development Board (CHTDB) was to construct a 20-km road between Rowangchhari and Ruma Upazila in Bandarban district (UNPO, 2020) at a cost of Tk 48 crore (Approximately US\$ 4.7 million). The foundation stone of the work was laid on February 1, 2019 by the Minister for Chittagong Hill Tracts Affairs (Barua, 2020). *The Daily Star*, a national daily newspaper, reported in March 2020 about devastating social and environmental impacts of the road (Barua, 2020). The road cut through at least twenty hills and destroyed at least ten grave sites of Khyang and Marma communities. A large number of planted trees by fifty families were destroyed. Zuan lian Amlai, chairperson for the Bandarban chapter of Parbatya Chattogram Forest and Land Rights Protection, pointed out that CHTDB projects benefited mainly stone thieves and illegal loggers (Barua, 2020). Those affected Khyang and Marma families claimed that they were not offered any compensation. Instead the contractors threatened the villagers to file criminal cases against them. filing of criminal cases against the villagers. When contacted by the newspaper, the project director explained that no provision instructed him to compensate people (Barua, 2020). Local villagers also expressed their safety concern from the road. The cutting of hills would induce landslides and degrade soil quality (Barua, 2020; UNEP, 2001).

Some roads built in the Chattogram Hill Tracts were recently used to promote tourism. One of the examples is the construction of 65.25 km-long Khagrachhari-Dighinala-Bagaihat-Sajek Road. The road was not very significant when it was first built from Khagrachhari to Dighinala by the Roads and Highways Department. No record of land acquisition exists in the Land Management System of the Ministry of Road Transport and Highways Division (RTHD, 2022). When we inquired about this in December 2021 with the sub-divisional engineer and the executive engineer, they both informed that the road was probably first built as a local road during the Pakistan era. In 2003 it was expanded from Dighinala to Sajek by the Bangladesh Army (Gain, 2013). The indigenous peoples here included the Chakma, Marma, Tripura, Pankua, and Lushai (Roy and Sharmin, 2021). The

Bangladesh Tourism Board and Bangladesh Army wanted to bring tourists to Sajek (Bangladesh Tourism Board, 2022), labeling the Sajek valley as the “Switzerland of Bangladesh” (Ahmed, 2017). About a dozen resort hotels were built along the road to Sajek (TripAdvisor, 2022), of which two luxury resorts in Ruilui para were built by Bangladesh Army in 2014 (Ahmed, 2017). The Army maintained the road until 2017 and handed it over to the Roads and Highways Department (Roads, 2022b).

The road helped promote tourism in the Sajek valley. For safety purposes the Bangladesh government enhanced surveillance and militarization in this area. Tourism development resulted into encroaching more Indigenous peoples’ land. Tourism subjected them to be exotic products for tourists (Ahmed, 2017). In April 2008 a total of about 70 Indigenous homes were burned down in several villages of Sajek (Ahmed, 2017). The indigenous leaders complained that the military took over the road construction work in Sajek and harassed them. In February 2010 400 homes in Sajek, most of which belong to the indigenous peoples, were burned down after a conflict between Indigenous peoples and new Bengali settlers (IWGIA, 2010). Several eyewitnesses said that members of the security forces were present when the attacks took place. Two indigenous villagers were shot and killed by military officers (Ahmed, 2017).

As more tourists and Bengali settlers were ushered into the Indigenous territory, more reports came about environmental problems. An online article mentions about increasing vehicles, worsening air and water contamination, dust from resort construction, and plastic garbage (Majumder, 2020). In June 2017 an acute food shortage affected about 2500 people in Sajek. The *Daily Star* claimed that dwindling forest resources had shrunk the local source of diet for the Indigenous peoples (Shachi, 2017). The resorts in this area hired very few indigenous workforces. The indigenous peoples did not have access to water as they depended on a water tank in the Sajek area (Ahmed, 2017).

Figure 1 shows the road networks through reserve forests and lands of Indigenous Peoples in Chittagong Hill Tracts at the time of this study (Chowdhury, 2014; Roads, 2022a; LGED, 2022a).

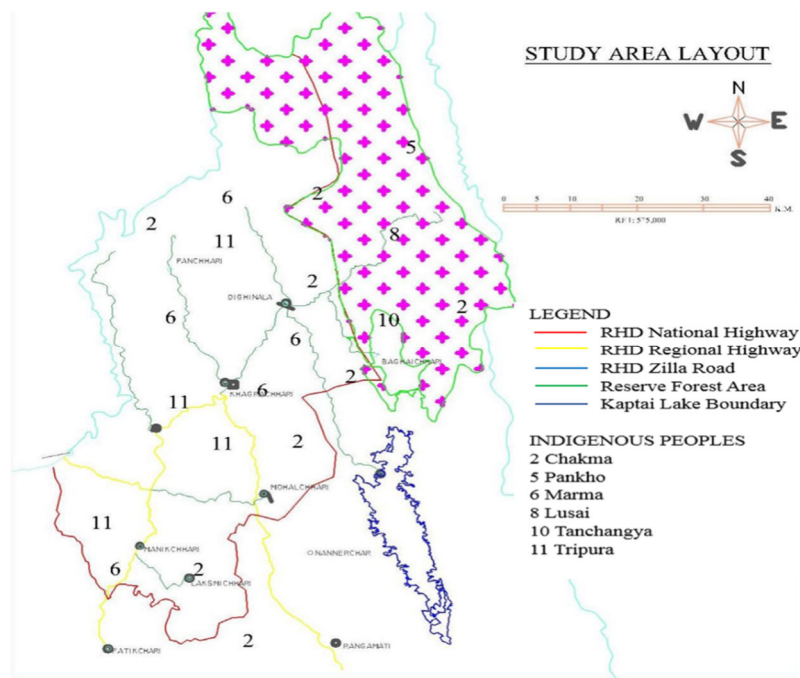


Fig 1. Chittagong Hill Tracts Road Networks and Indigenous Peoples’ Territories (Chowdhury, 2014; Roads, 2022a; LGED, 2022a).

3.2. Perceptions of the Government officers and the Indigenous Peoples

3.2.1. Experts’ Opinion (Expert Survey)

In the previous section, we have discussed about negative impacts of road development, including loss of lands and livelihood, deforestation. Roads were built without consultation and compensation. These points are important to understand the results of our questionnaire survey. First, we summarize the results of the survey among government experts in Table 1, and discuss the result.

Table 1. Results of the Expert Opinion Survey

Question	Agree	Somewhat Agree	Undecided	Somewhat Disagree	Disagree
Road construction had reduced indigenous peoples' agricultural land.	39%	17%	0%	33%	11%
Road construction had destabilized the soil.	50%	33%	6%	11%	0%
Hill cutting for road construction is a major cause of landslides.	50%	28%	0%	17%	6%
Road construction had caused deforestation.	56%	39%	0%	0%	5%
Soil pollution occurs due to road construction.	22%	33%	11%	17%	17%
Road construction activities pollute water.	22%	28%	17%	11%	22%
Road construction activities degrade aquatic life forms.	17%	39%	6%	17%	21%
Silt accumulation is an issue caused by road construction.	22%	39%	5%	17%	17%
Road construction causes scarcity of water supply.	6%	28%	5%	17%	44%
Road construction increases greenhouse gas emissions.	39%	39%	0%	11%	11%
Road construction increases dust and particulate material emissions.	44%	39%	0%	6%	11%
Road construction causes noise problems.	67%	28%	0%	0%	5%
Road construction may cause in long-term economic loss.	6%	22%	17%	11%	44%
Road construction has made local people change their jobs.	33%	50%	0%	6%	11%
Have you encountered Indigenous resistance while working among Indigenous people due to road construction?	44%	44%	0%	0%	12%

As we found negative impacts of road construction include pollutions of air, land, and water, deforestation, endangering wildlife, and threat to public health, our questions focused on their perceptions about these environmental impacts. The first part of the questionnaire included land issues. The first question asked if they recognized that road construction had reduced agricultural land Indigenous people had used. In response, about 56 percent of the respondents agreed. The next question asked whether road construction had destabilized the soil. In response about 83 percent agreed. These respondents knew that from 2012 to 2017, six major landslides occurred in Rangamati and Bandarban. These landslides killed a total of 180 people (Islam, 2017). On this point, a collaborative research was by the Bangladesh University of Engineering and Technology, Japan Institute of Disaster Prevention and Urban Safety. It identified several reasons for the landslides, including deforestation, change of slope stability due to hill cutting, and unregulated development works (Islam, 2017). On this point, another related question asked the experts if hill cutting for road construction was the main cause of landslides. The result similarly showed that about 50 percent agreed and 28 percent somewhat agreed.

The next question asked was if road construction had caused deforestation. On this point, about 95 percent agreed. In the previous section, we have found that road construction directly caused tree cutting (DHV consultants, 1998), allowed illegal logging through better accessibility, and thus threatened endangered animals in this region (Gain, 2013). The experts were divided when they were asked about soil pollution due to road construction activities. About 55 percent agreed whereas 34 percent disagreed, and 11 percent was undecided on this point. We have not found any confirmed evidence of soil pollution from secondary sources.

In *The Chittagong Hill Tracts Man-Nature Nexus Torn*, Gain (2013) showed that the stone traders started stone mining in the Gheraojhiri stream for road materials. This mining activity affected the water quality, the important source of water for a Marma village. The mining reduced the water level, polluted water, and decreased in fish catch (Gain, 2013). Considering this study's findings, we asked the respondents whether road construction had polluted water. In response, about 50 percent agreed. About 33 percent disagreed. Another related question asked if there was any negative impact on aquatic life. In response, 56 percent agreed whereas 39 percent disagreed. When the respondents were asked if road construction caused water scarcity, only 6 percent agreed. Another water

related question asked about silt accumulation by road construction. About 61 percent found it occurred due to the construction whereas 34 percent disagreed.

Bricks are important component for road construction. However, a study by the Department of Environment in 2012 showed that brick kilns in Bangladesh emitted three million tons of CO₂ annually, the highest GHG source in Bangladesh (Department of Environment, 2012). This situation continued for another ten years. In 2022 Deputy Commissioners to the High Court identified 130 illegal brick kilns in the Chattogram Hill Tracts. These kilns had supplied bricks to road construction (Financial Express, 2022).

Hence, the next set of Likert-scale questions asked the experts about air pollution due to road construction equipment, materials, and activities. The first statement was presented to the respondents to ask about their level of agreement. This statement asked if road construction had increased greenhouse gases emission. In response 78 percent agreed. Another question asked if road construction had increased dust and particulate materials emissions. About 83 percent agreed. We also attempted to know the extent to which the respondents were concerned about noise pollution from road construction. The result shows that about 95 percent were concerned about it.

From the review of CHTRDP I project, we found that Indigenous people lost their land without meaningful consultation and compensation (Asian Development Bank, 2010). Hence, the last set of questions asked about social and economic issues. We asked whether road construction had long-term economic loss. In response, 55 percent disagreed whereas 28 percent agreed. When asked if road construction activities changed people's occupations, 83 percent agreed. These results show a stark contrast to the government evaluation report of the project. It found "no change in the type of main occupations before and after the project" (Ministry of Planning, 2011). Another asked if they had encountered Indigenous resistance while working among indigenous people. About 88 percent agreed. When asked if the respondents had engaged in consultations with Indigenous people regarding road construction, 89 percent was negative.

3.2.2. Indigenous Peoples' Opinion (Public Survey)

The second set of the survey was conducted in March and April 2017 among Indigenous people to better understand their perceptions about road construction projects. Here we focused on impacts of road construction on livelihood and social integrity. We summarized the results of the survey in Table 2, and then discuss the results.

Table 2. Results of Indigenous Peoples' Opinion Survey

Question	Yes	No
Have indigenous peoples' lands been acquired?	47%	53%
Did the persons whose land had been acquired receive compensation?	5%	95%
Did indigenous peoples lose trees during road construction?	42%	58%
Among those who lost trees, were their livelihoods affected?	35%	65%
Was there any consultation meeting with the Indigenous community of the region before or during past road construction projects?	7%	93%
Did the respondents experience any types of problems because of road construction?	45%	55%
Did road construction result in increasing their incomes for indigenous peoples?	45%	55%
Did new roads improve accessibility for indigenous peoples?	100%	0%

The first set of questions asked if their lands had been taken; and, if so, how large. About 47 percent of the respondents said that they had lost about 0.02 acre to 0.5 acre of land. The next question asked if they had been compensated. Almost all (95%) did receive some kind of compensation. One respondent told us, however, that he received compensation, but the amount was so small that he was not satisfied.

Next, we asked the respondents if they lost trees during road construction and if that affected their livelihood. In response, 42 percent of the respondents had their trees cut. Among them, 35 percent had their livelihoods affected.

The second set of questions in the survey asked about the social impacts of road construction. First, we asked if there was any consultation meeting with the Indigenous community of the region before or during past road construction projects. About 93 percent of the respondents were negative. Only 7 percent joined consultation meetings, but they thought that their opinion was not considered. This result was contrary to the official claim that the CHTRDP II developed the Land Acquisition and Redevelopment Plans (LARP) that conducted extensive community consultations (Ministry of Planning, 2011).

The next question asked if the respondents experienced other types of problems because of road construction. About 45 percent indicated several types of problems, including the loss of properties such as shops and houses (10 percent) and reduced agricultural production (15 percent). The respondents also emphasized their concerns over the potential trespassing of outsiders and the higher exposure to non-Indigenous cultures. Sixteen persons said that more exposure to outsiders and their culture would destroy their social integrity.

The evaluation report of CHTRDP I claimed that road construction projects improved accessibility of local communities to market, education, medical facilities, and more employment opportunities. Considering this, the next question asked the respondents whether road construction resulted into increasing their incomes. In response, 45 percent of the respondents were positive, of which 25 percent seized new business opportunities, 5 percent

obtained new jobs, and 2.5 percent invested the compensation money into some business. In response to the question whether new roads improved accessibility for them, all respondents answered affirmatively. They agreed that they now had better access to school, colleges, hospitals, and health centers.

4. Discussion

Both the documentary reviews and our two surveys showed that overall Indigenous people were not properly consulted nor did they receive fair compensation from road construction projects with some exception. In particular, before 2000, little or no community consultation processes existed. Although Bangladesh Government reports claimed that their road projects created employment opportunities and improved business opportunities, non-government and academic reports claimed that these employment and business opportunities mostly benefited Bengali settlers. Our survey among Indigenous people did find a few who economically benefited from new roads, but a larger proportion of them lost land, properties like shops and houses, and livelihoods that depend on forest ecosystem and slash-and-burn agriculture. In addition, most respondents showed their concerns over negative social impacts.

While previous studies concerning road construction and indigenous peoples focused on a certain project and time, our study covered a timeline ranging several regimes including the Pakistani regimes and Bangladeshi regimes. We presented the results chronologically to show the continuing impacts of road construction on the indigenous peoples and the environment of a region and whether there is any mitigation and policy actions have been introduced. We showed that while the regimes changed, the negative issues regarding road construction remained despite some positive initiatives. We found continuation of negative impacts along with some new issues such as intrusion of exotic culture and products along with land encroachment due to tourism which has been facilitated by new roads.

Road projects after 2010, such as CHTRDP II, formulated policies for community consultation for land acquisition and a grievance redress mechanism. This project trained or attempted to train government officials about Indigenous issues. CHTRDP II provided compensation to some of those Indigenous residents who lost their lands due to road construction. Our survey shed new light on this government claim. Our surveys with government experts and Indigenous people found that some people were compensated but this compensation process was far from fair and thorough, especially if one considers about long-term grievances since the British colonial period, which we discussed in our literature review.

Another salient finding we showed above is that both government experts and Indigenous respondents agreed with negative environmental impacts from road construction whereas their opinions about economic impacts were rather divided. Both Indigenous people and government experts raised concerns over land and forest degradation (e.g., arable land reduction, soil destabilization, landslides, deforestation), air pollution, and noise pollution. However, the experts mostly disagreed with Indigenous people's concern over water pollution. The experts did not believe that overall Indigenous people lost economically. The Indigenous respondents largely felt otherwise.

5. Conclusion

This paper has demonstrated complex and sensitive aspects of road construction in the Chattogram Hill Tracts where the historical marginalization of Indigenous communities has led to somewhat adversarial relationships between government officials, Bengali settlers and Indigenous people. This is still one of the most politically controversial areas in Bangladesh so that it pays special security attention. Our examination of road construction in this region showed another aspect of historical marginalization and local inequity that similarly exist in rural and ethnically contested areas of the world.

We also showed that the Bangladesh government did attempt to improve consultation processes with Indigenous people in the Hill Tracts partly by adopting an alternative dispute resolution approach. However, the meaningful consultation with free and prior informed consent has not yet been fully informed and practiced among both government officials and Indigenous communities. Government land acquisition processes for road construction has not yet achieved transparency and accountability. It is important to include Indigenous people in planning and redress processes. Furthermore, in order to make future road construction projects in this area economically, socially, and environmentally sustainable, more detailed research is needed to better understand impacts of road construction in the Hill Tracts.

Finally, the data collected for this study dated back to 2017. Further research on the region may help better understand the impacts of road construction during and after the COVID-19 pandemic. Within the government, there has been discussion about adopting more sustainable materials for roads, including alternatives to using conventional brick kilns. Also, more field works in this area may give us more information about how recently district administration and the Forest Department implemented actions to curb the number of illegal logging and brick production activities.

Future studies may also address some other dimensions of the impacts of road construction activities on the Indigenous peoples of this region. One of such areas is the political marginalization of Indigenous peoples through

the intrusion of outsiders facilitated by the newly constructed roads. Future studies should also investigate about the impact of road construction projects on everyday lives of the Indigenous communities, and how their cultures have been affected and altered by newly constructed roads and improved communication which may supplement the discussion on this multi-dimensional issue.

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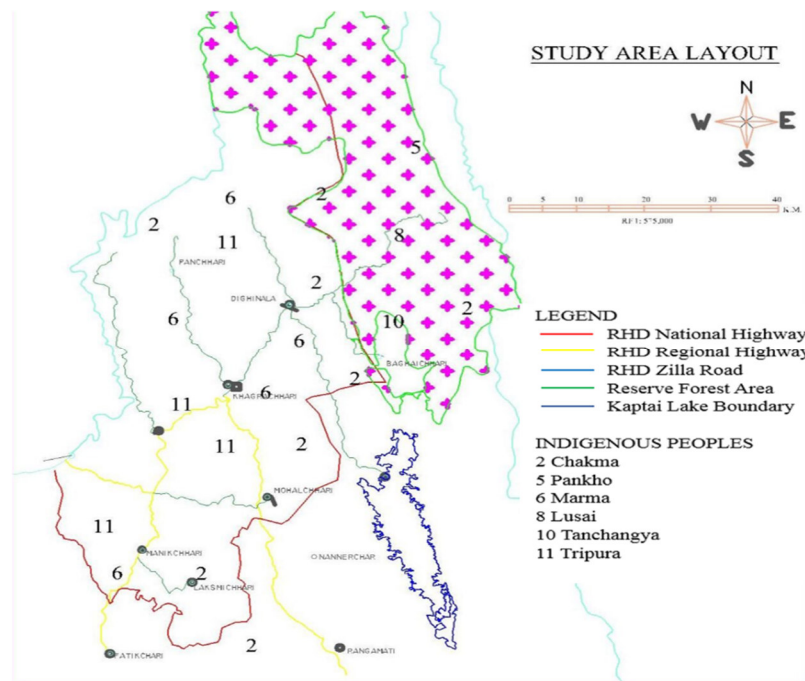


Figure 1. Chittagong Hill Tracts Road Networks and Indigenous Peoples’ Territories (Chowdhury, 2014; Roads, 2022a; LGED, 2022a).

Table 1. Results of the Expert Opinion Survey

Question	Agree	Somewhat Agree	Undecided	Somewhat Disagree	Disagree
Road construction had reduced indigenous peoples’ agricultural land.	39%	17%	0%	33%	11%
Road construction had destabilized the soil.	50%	33%	6%	11%	0%
Hill cutting for road construction is a major cause of landslides.	50%	28%	0%	17%	6%
Road construction had caused deforestation.	56%	39%	0%	0%	5%
Soil pollution occurs due to road construction.	22%	33%	11%	17%	17%
Road construction activities pollute water.	22%	28%	17%	11%	22%
Road construction activities degrade aquatic life forms.	17%	39%	6%	17%	21%
Silt accumulation is an issue caused by road construction.	22%	39%	5%	17%	17%
Road construction causes scarcity of water supply.	6%	28%	5%	17%	44%
Road construction increases greenhouse gas emissions.	39%	39%	0%	11%	11%
Road construction increases dust and particulate material emissions.	44%	39%	0%	6%	11%
Road construction causes noise problems.	67%	28%	0%	0%	5%
Road construction may cause in long-term economic loss.	6%	22%	17%	11%	44%
Road construction has made local people change their jobs.	33%	50%	0%	6%	11%
Have you encountered Indigenous resistance while working among Indigenous people due to road construction?	44%	44%	0%	0%	12%

Table 2. Results of Indigenous Peoples' Opinion Survey

Question	Yes	No
Have indigenous peoples' lands been acquired?	47%	53%
Did the persons whose land had been acquired receive compensation?	5%	95%
Did indigenous peoples lose trees during road construction?	42%	58%
Among those who lost trees, were their livelihoods affected?	35%	65%
Was there any consultation meeting with the Indigenous community of the region before or during past road construction projects?	7%	93%
Did the respondents experience any types of problems because of road construction?	45%	55%
Did road construction result in increasing their incomes for indigenous peoples?	45%	55%
Did new roads improve accessibility for indigenous peoples?	100%	0%