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Causes, Mechanisms and Outcomes of Environmental Degradation in Bangladesh: a Study in Sylhet

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Abstract: Along with the entire world, environmental degradation is a topical issue for Bangladesh. This paper investigates the process of environmental degradation as an outcome of the destruction of forests by state and non-state actors in the Sylhet region of Bangladesh. Sylhet is home of the thirty-seven indigenous communities as well as mainstream Bengalis. Indigenous people (and Bengalis) rely on forests and the environment for their survival and livelihood to some extent. This study focuses on the *Khasi* people, as their lifestyles and livelihoods are more closely linked to environmental resources than other indigenous populations. This study takes an exploratory approach to social research and the conceptual framework of the Environmental Kuznets Curve (EKC) to investigate the role of different mechanisms behind environmental degradation. It reviews the existing literature and published and unpublished reports, alongside fieldwork data collected through observation of the circumstances and interviews with stakeholders, help to explain the process of environmental degradation, its causes, mechanisms, and outcomes. The current state of environmental degradation in Sylhet, according to this study, is neither shaped by pollution nor naturally produced environmental changes. Rather, the Sylhet region's inherent dimension of environmental degradation might be conceptualized as the result of tree removal by various entities. This study shows that the government's (and the world's) reforestation and afforestation initiatives will not help the Sylhet region's environmental predicament unless the region's environmentally harmful actions by various state and non-state entities are immediately stopped.

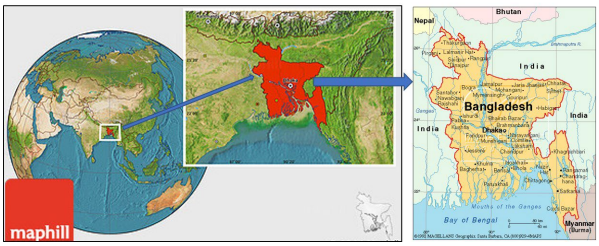
Keywords: environmental degradation; deforestation; forest degradation; the *Khasi* people; Bangladesh

1. Introduction

Bangladesh is vulnerable to climate change as a consequence of global warming[1)]. This country has also been experiencing environmental degradation for the last decades. It prioritizes on the sustainable development which is the centre of global links between the issues of environmental, economic, and social responsibility[2)]. Moreover, agriculture is the leading driving force of the economy of the country[3)]. Agriculture sector adds 18.64% to the GDP[3)]. This sector is highly linked with human resources development, employment generation, food security, rural development, poverty alleviation and environmental sustainability. Bangladesh, an emerging economic force in South Asia has got tremendous economic progress in the last decade[4)]. Along with remittance and export of readymade garments, enormous stock of natural and environmental resources has led to the constant economic growth and development of the country. The current practice of development with compromising environment put the forest and environment as well as forest dependent communities at the risk. For this, environmental degradation is a topical issue and development phenomenon in Bangladesh.

To investigate the process of environmental degradation this study adopts the Sylhet region of Bangladesh (Map 1) as a case to study. This study provides an understanding of the process of environmental degradation of Bangladesh by emphasising its two key aspects: deforestation and forest degradation. Moreover, changes in forest cover can occur in two forms: naturally induced and human-induced. Naturally-induced changes in the forest are resilient and resistant[5)]. In contrast, this study argues that human-induced changes in forests are neither resilient nor resistant, but degrade the environment. Bangladesh has been experiencing human-induced changes within its environment and forests in recent decades. The environmental degradation of the *Khasi*

people's area in Sylhet, Bangladesh is evident in deforestation and forest degradation. Moreover, this study introduces the reader to the state of forests in Bangladesh and then the situation within Sylhet, by focussing on the process of environmental degradation. This study claims that several proximate causes and underlying driving forces generate the process of environmental degradation in which different mechanisms play a role.



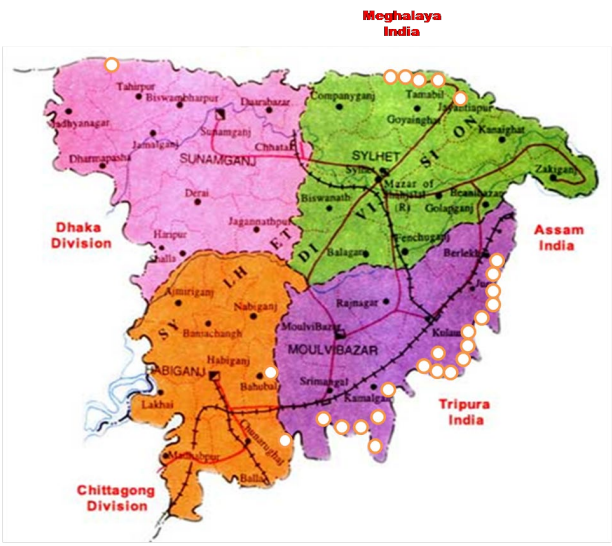
Map 1: Map of the Sylhet region and its location in Bangladesh.

The Sylhet is an environmentally important region for its tropical rainforest, lowland equatorial evergreen rainforest, reserve forests, swamp forests and tea estates. This region is also known as the capital of tea in Bangladesh for its high yielding. Sylhet is comprised of four districts named Sylhet, Moulvibazar, Habiganj and Sunamganj. There are thirty-seven indigenous groups of people living in the Sylhet region. Among these, the *Khasi* is an ethnolinguistic group of people who have been living in their current areas since time immemorial. However, they are the aboriginal inhabitants of the *Khasi* and Jaintia hills of north-eastern India[6]. The agglomeration of the *Khasi* people is called *punji.* There are 71 *punjis* in Sylhet (Table 1). Among these, most of the *punjis* are located in the adjacent lands of tea estates and the frontier region of the country bordering the Indian provinces of Meghalaya and Tripura[7]. Their locations are marked in the following map (Map 2):

Table 1: *Khasi punjis* in Sylhet[3]

Districts	Number of the *Khasi* punjis
Moulvibazar	60
Sylhet	8
Habiganj	2
Sunamganj	1*
Total	71

**Khasi village*



Map 2: Location of the *Khasi punjis* (dot marked) in Sylhet, Bangladesh.

2. Literature review

Bangladesh has made substantial economic growth and development. It did excellent in achieving the targets of millennium development goals. The responses of the country toward the sustainable development goals (SDGs) are also praiseworthy. The agricultural sector plays a vital role in achieving the constant economic growth and development of Bangladesh. S. Pagiola (1995) argued that intensive agriculture practices in Bangladesh *"may not be sustainable and that it may be damaging to the environment"*[8]. This study did not portray the causes and mechanisms of environmental degradation. Moreover, the agricultural practices of different communities, for example, *Khasi, Garo* and *Manipuri* play a role in the conservation of the environment rather than being degraded.

A study conducted by the World Bank found that pesticide use in agriculture is harmful to the environment. According to the experiences of other Green Revolution countries, (for example, Indonesia) Bangladesh has adopted the policy of lifting the subsidy on the use of pesticides to prevent the damages of environment and natural resources[9]. However, the threats to the environment and natural resources in the Sylhet region of Bangladesh are different from the practises mentioned in the study of the World Bank[10]. Land grabbing, levelling of hills and chopping down of trees in the name of expansion of tea production are the threats to the environment and natural resources in Sylhet. Another report of the World Bank considered that 'unplanned urbanization and industrialization have substantially affected the environment of the developing countries like Bangladesh[11]. This report suggests that Bangladesh must curb environmental degradation for higher growth.

S. M. Giasuddin pointed out the causes and mechanisms of environmental degradation in Bangladesh. He found that deforestation, land degradation and loss of

biodiversity are the main problems of the environment in Bangladesh. He reported that the natural forests in Bangladesh are decreasing at an alarming rate[12]. However, he did not identify the causes and mechanisms of deforestation in Bangladesh. G. M. J. Alam explained that "deforestation, destruction of wetlands, soil erosion and natural calamities" caused environmental degradation in Bangladesh[13]. A study conducted by M. Rahman and S. Reza pointed out that over-population and development patterns of 'neo-liberalism' caused environmental degradation in Bangladesh. This study identified land degradation, land encroachment, loss of biodiversity, and habitat destruction among others as the causes and mechanisms of environmental degradation in the country. N. Nowshin proposed remedies for Bangladesh to curb environmental degradation[14]. She pointed out that unsuccessful implementation of existing laws deteriorated the environment in Bangladesh.

The above literature generalized the causes and consequences of environmental degradation in Bangladesh rather than focused on any particular region to understand the scenarios intensely. There is a lack of empirical studies on the field of environmental degradation in Bangladesh, particularly in Sylhet. Moreover, these studies bypass the application of the theoretical and conceptual framework to analyse the causes, mechanisms, and outcomes of environmental degradation in Sylhet, Bangladesh. My study aims to investigate the research question according to the theoretical and conceptual framework based on empirical data.

3. Methodology and methods

3.1 Research design

This study takes an exploratory approach to social research to investigate the role of different mechanisms behind the process of environmental degradation in Bangladesh. Social exploratory research seeks to learn *"what is going on?"* and its principal concern is to investigate *"social phenomenon without explicit expectations"*[15]. Ontologically, this study seeks to determine *"what is the form and nature of reality"*[16,17] of the study area. It aims to assess the extent of the process of environmental degradation. Epistemologically, this study combines an investigation into the role of cultural, political and economic mechanisms in environmental changes.

3.2 Unit of observation and unit of analysis

The unit of observation and unit of analysis is the same in many studies, but they can be different in some cases[18,19]. The unit of observation in this study is the 'individual' member of the *Khasi* community of different *punjis* in Sylhet, Bangladesh. Another unit of observation is the event/element/component of the processes of environmental degradation. Moreover, a unit of analysis can be an individual, a group or even a community[20]. This study takes the event/element/component relating to the process of environmental degradation as a single entity. This paper anonymise all respondents to comply with research ethics. However, the identity of the respondents is maintained on the field notes.

3.3 Sources of data

3.3.1 Primary sources of data

The primary sources of data in this study range from in-depth interviews with the *Khasi* people, political leaders, government officials, environmentalists, human rights activists and academics. Observation is also a source of primary data.

3.3.2 Secondary sources of data

This study uses secondary data which include government policy documents, notifications and reports, laws and acts, previous study reports, datasets, census reports and the reports of international organisations and donor agencies.

3.4 Sampling

This study selects the *Khasi* men and women as key respondents from the Sylhet region of Bangladesh. The technique of purposive sampling, also known as judgmental sampling[21] was used to select the respondents. This sampling technique is more productive here, as this study aims to understand the experiences of the *Khasi* people in terms of changes to their environment. Therefore, this study chooses the *Khasi* men and women who were comparatively knowledgeable about their background and had experience relating to the process of environmental degradation.

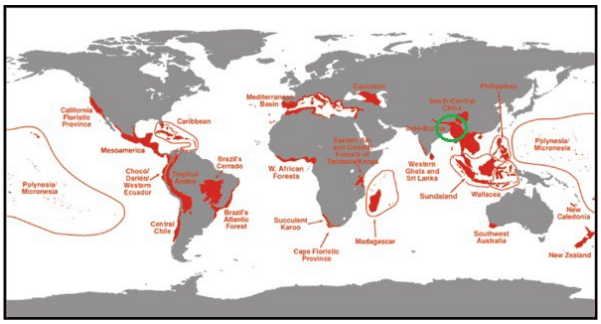
3.5 Methods of data collection

This study uses qualitative methods of data collection. The data collection methods include in-depth interviewing with the *Khasi* people in the selected *punjis*, interviewing government officials, political leaders, policy-makers, human rights activists and environmentalists. The primary data of this study was collected through fieldwork which involves *"active looking, improving memory, informal interviewing, writing detailed field notes"*[22]. An in-depth interview is a useful qualitative data collection technique[23]. This study uses in-depth interviews to understand the experiences of the *Khasi* people about chopping down trees in their habitats at a holistic level.

4. State of forests in Bangladesh and Sylhet Region

4.1 State of forests in Bangladesh

Bangladesh is located near the Indo-Burma (Myanmar) region which is of utmost importance as one of the global biodiversity hot-spots[24,25]. Map 3 highlights the location of Bangladesh concerning the world's 25 biodiversity hot-spot areas.



Map 3: Location of Bangladesh (circled) in relation to the 25 global biodiversity hotspot areas[25].

The geographical location of Bangladesh reinforces the importance of forests to the country. The forests contribute to the environment by supplying oxygen and sequestering numerous toxic gases. Forestry contributes to the environmental sustainability of the country and is the abode of many species. Forestry also contributes to the carbon stock, amounting to 42.64 million m^3 of carbon dioxide in Bangladesh[26]. Moreover, 251.8 million Mg of carbon is stored in the forest ecosystems of the country[27,28]. Of the forest territories, the hill forests include the tropical moist evergreen and semi-evergreen forests which make the highest contribution (66%) to the carbon stock in the country. The inter-tidal mangrove forests and the plain land *sal* (Scientific name of the *Sal* forest is *Shorea robusta.* It is a species of tree belonging to the *Dipterocarpaceae* family and its higher classification is *Shorea*) forests contribute 27% and 3% respectively[26]. Tropical forests play a key role in removing carbon dioxide[29]. These data reinforce the environmental benefits of the forests in Bangladesh; indeed, the sustainability of the environment of Bangladesh depends on the conservation of forests.

Although forestry plays an important role in the environmental sustainability of Bangladesh, the country has not yet mapped its forests precisely as well as failing to develop any criterion to define its forest cover. Consequently, there is a lack of consensus among the researchers, academics, development agencies, NGOs and even concerned departments on the level of forest cover in Bangladesh. For instance, the Department of Forest (DoF) claims that 17.4% of the total land of the country is forested amounting to 2.6 million hectares[30,31]. The Food and Agricultural Organisation (FAO) contend that 14% of the total lands of Bangladesh are forested with only about 10% of the forest lands having real tree cover[32]. The World Bank (2015) estimates that 11% of the total lands of Bangladesh are forested[33]. The World Bank reported that only 0.84 million ha of forest land (5.8% of total land) has good tree cover[34]. The National Biodiversity Strategy and Action Plan for Bangladesh described that only 6% of lands of Bangladesh have forest cover[35]. Indeed, the lack of proper mapping of the forests in Bangladesh has led to these controversies and contradictions among different departments.

Alongside the lack of proper mapping, there is also no uniform definition of the term 'forest' in Bangladesh. In the absence of a native definition, Bangladesh accepts the definitions which are provided by different international organisations, e.g. UNFCCC, UNEP and FAO. Bangladesh also follows the definition of forests mentioned in different acts and laws. From a legal perspective, the lands which are recorded as forest lands are considered forests in Bangladesh.

As in the high-level definition of forests, there are several opinions on the classification of types of forest lands in Bangladesh. For instance, the Forest Act of 1927 categorised the forests of Bangladesh into three types:

a) Reserve forest;
b) Village forest; and
c) Protected forest.

These categories of forests are defined by several factors such as latitude, temperature, rainfall patterns, soil composition and human activity[36]. From a managerial point of view, forests of the country are classified into three groups. These are:

a) Forest department managed forests;
b) Unclassed state forests; and
c) Village forests.

Moreover, forests managed by the forest department are divided into the following four types:

a) Hill forests;
b) Natural mangrove forests;
c) Mangrove plantations; and
d) Plainland *Sal* forests.

Table 2 reports the number of different types of forest cover in Bangladesh, as provided by the forest department. Table 3 provides the figures relating to forest department managed forests in the country.

A study reported that the forest cover of Bangladesh has been subject to a rapid decline in recent decades[37]. It should be mentioned here that forest decline indicates deforestation or forest degradation or a combination of both. Table 4 shows the negative trend in the amount of forest lands in Bangladesh according to the World Bank.

Table 2: Amount of forest lands in Bangladesh

Category of Forests	Area (million ha)	% of total land
Forest department managed forests	1.52	10.30
Unclassed state forests	0.73	4.95
Village forests	0.27	1.83
Total	2.52	17.08

Source: Bangladesh Forest Department, 2008[38].

Table 3: Amount of forest department (FD) managed forests in Bangladesh

Category of Forests	Area (million ha)	% of total land	% of FD managed forest
Hill Forests	0.67	4.54	44.08
Natural mangrove Forests	0.60	4.07	39.52
Mangrove plantation	0.13	0.88	08.54
Plain Land *Sal* Forests	0.12	0.81	07.86
Total	**1.52**	**10.30**	**100.00**

Source: Bangladesh Forest Department, 2008[38].

Table 4: Percentage of forest lands in Bangladesh from 2001 to 2013

Year	Percentage of forest land
2001	11.3
2002	11.2
2003	11.2
2004	11.2
2005	11.2
2006	11.2
2007	11.1
2008	11.1
2009	11.1
2010	11.1
2011	11.1
2012	11.0
2013	11.0

Source: World Bank, 2015[33].

As with the debates surrounding the definition and the amount of forests, there are no concrete data on the rate of deforestation in the country. For instance, FAO (1999) stated that the annual deforestation rate of Bangladesh is less than 1%, while the Forestry Master Plan of Bangladesh (1993) placed the figure at 3.3%. Indeed, the published data on the rate of deforestation in Bangladesh is inconsistent[23]. The lack of proper surveying and mapping of the forests has resulted in this inconsistency. Despite the discrepancy in the reported amount of forests and the rate of deforestation, there is no contradiction regarding the occurrence of degradation of the environment in Bangladesh[39,40]. Indeed, there is a consensus among different organisations and academics concerning the changes to the forest lands in Bangladesh.

There are several contributing factors to deforestation and forest degradation in Bangladesh. These factors are cited from different study reports. These can be listed as:

a) Logging[41,42,43];
b) Encroachment[37,41,44,45,46];
c) Unplanned development activities[47];
d) Implementation of government development projects[47,48];
e) Increase of population and persistent poverty[49];
f) Over-extraction of forest resources[50];
g) Expansion of agriculture[51,52]; and
h) Human migration in forest areas[43].

The factors outlined above have shaped the process of environmental degradation. These factors are generated by different mechanisms. This study aims to identify the mechanisms behind the process of environmental degradation in Sylhet, Bangladesh. The next section discusses the process of environmental degradation of the Sylhet region based on empirical data and by focusing on the two major threats of deforestation and forest degradation as outcomes of cutting down trees e.g. destruction of forests.

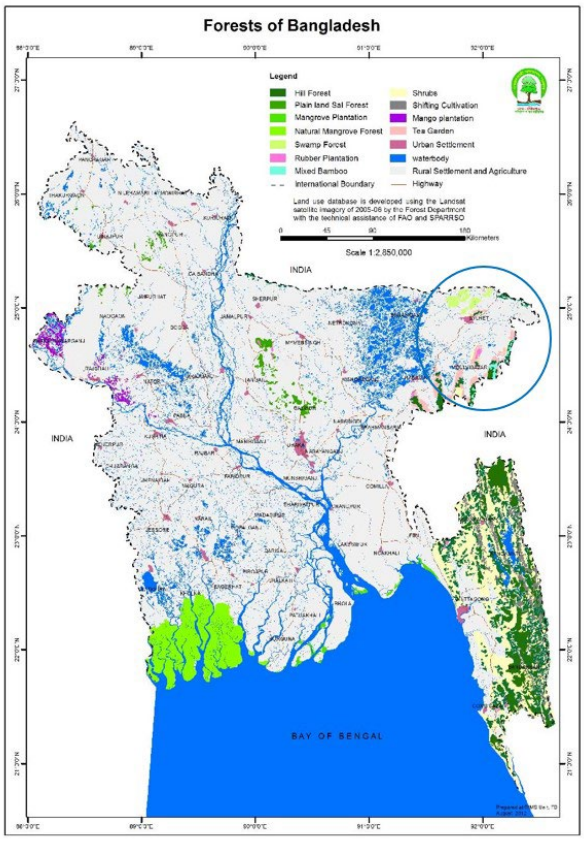
4.2 The process of environmental degradation in Sylhet, Bangladesh

Before discussing the process of environmental degradation in Sylhet of Bangladesh this section provides a brief description of the forests of this region.

4.2.1 The state of forests in Sylhet, Bangladesh

Sylhet, the north-eastern region of Bangladesh, is located at 24°30′N 91°40′E. The Sylhet region is bordered by the Indian provinces of Meghalaya to the north, Assam to the east, Tripura to the south, the Chittagong division of Bangladesh to the southwest and the Dhaka division to the west. The Sylhet region is one of the most distinctive regions in the country due to its ecosystem, which is shaped by sub-tropical hills, rain forests, river valleys, tea estates and water bodies locally called *haor* (a wetland which is physically a bowl or saucer-shaped shallow depression) and *beels* (a lake-like wetland with static water). There are 166 tea gardens in Bangladesh. Among these, the highest altitude tea gardens, totalling 133 in number, are in Sylhet. It is one of the three largest tea plantations in the world both in terms of area and production. Its geophysical location makes this region a rich abode for floral and faunal diversity.

Sylhet is an important region of Bangladesh because of its environmental settings, including tropical rain and hill forests, swamp forests and tea and rubber plantations. The total amount of forest lands within Sylhet is 65,617.38 hectares. Of this figure, 68% of the forest lands (amounting to 44,292.40 hectares) are declared as reserved forests. These reserved forests are mainly categorised as hill forests. The Sylhet region is distinguished from other parts of the country by its tropical moist evergreen and semi-evergreen forests, which are also identified as hill forests (Map 4).



Map 4: Forests of Bangladesh. The circled area indicates the Sylhet region.

The majority of forest lands in Sylhet are designated as reserved forests. Declaration of the forests as a reserved area is an initiative designed for the conservation of forests. Nevertheless, the situation of the forests of Sylhet seems to be that despite the majority of forests being declared as reserved forests, they are not satisfactorily conserved. The following section explores the process of environmental degradation within Sylhet, Bangladesh.

5. State of environmental degradation in Sylhet

An important feature of the forests of Sylhet is that they are not entirely covered with trees. On contrary, the tree cover in Sylhet is decreasing every year. Global Forest Watch (GFW) reported that the Sylhet region lost 5,523 hectares of tree cover from 2001 to 2012. The reserve forests and protected lands are not exempt from this trend. For instance, Lawachara reserved forests lost 1,188 trees in 2005-2006[53]. Moreover, the occurrence of illegal tree felling occupies the highest position among the forest crimes committed in Sylhet[54].

To reiterate, there are two major threats to the environment of Sylhet: deforestation and forest degradation. These threats are geographically widespread and of global environmental concern, being environmentally negative, economically wasteful and socially undesirable[55]. Both processes of deforestation and forest degradation have devastating impacts on the economic and ecological values of forest cover[56,57,58]. Indeed, the ultimate impact of these processes is environmental degradation. This study focuses on a special occurrence that has threatened the environment of the Sylhet in the last decades. This special occurrence is nothing but tree felling. The following discussion helps to understand the argument of this paper:

The role of trees in promoting environmental sustainability for any state in the world is well accepted. Beyond promoting environmental sustainability, trees also provide social and economic benefits. The environmental benefits of trees are identified as producing oxygen, sequestering carbon dioxide, recharging groundwater, replacing soil nitrates, preventing soil erosion and maintaining the stability of temperature and rainfall. The survival of the earth depends on the survival of forests. However, the Sylhet region of Bangladesh has been experiencing incidences of the destruction of forests for a couple of decades[59].

The removal of trees without adequate reforestation causes a decline in habitat and biodiversity. Bangladesh retains a small patch of its 'original' forest[60]; nevertheless, tree felling has become a major environmental issue for the Sylhet region. The present study observed that the forest department plays a controversial role in tree felling through the implementation of its forest regeneration programme. For instance, every year the forest department auctions aged trees, intending to clear the forests for reforestation. I observed during the fieldwork that most of the cleared lands remained fallow, with no sign of trees is being planted. Subsequently, these areas are targeted for land grab. In some cases, these lands have already been grabbed by political and economic elites. Consequently, forest cover in Sylhet is decreasing every year. The findings of this study are reflected in the data produced by Global Forest Watch which stated that from 2001 to 2015, the Sylhet region lost 5,880 hectares of its forest lands.

This study also found that several state and non-state actors are involved with tree felling in Sylhet to pursue manifold purposes. These include the pursuit of economic benefits through the timber business, converting the forest lands for non-forest use and evicting forests dwellers from their lands. It is a global phenomenon that livelihoods of local communities depend on natural resources[61]. In this context, this section will focus closely on three different regions in Sylhet, where the *Khasi* people have been experiencing major tree felling in the last decade.

5.1 Tree felling at Nahar punji: converting the forest lands for non-forest use

The Nahar area of Sreemangal Upazila of the Moulvibazar district has been experiencing major tree felling since 2000. The local *Khasi* and Bengali people and news published in various newspapers stated that the Nahar Tea Estate (NTE) authority has cleared trees in this area at different intervals over the last decade. The NTE authority demanded that they cut trees from the leased and 'adjacent lands' of the tea estate to extend the tea plantation.

The local *Khasi* people revealed that the NTE authority cut down thousands of trees in the tea estate area in 2000. However, nobody protested as these trees were in the territory of the tea estate. In 2008, the NTE authority attempted to cut an additional 1200 trees from the lands adjacent to the tea estate. On this occasion, the *Khasi* people protested on the basis that these trees were used for their agroforestry based natural resource management. They had planted and nurtured these trees for their own interest of survival, but the interests of the *Khasi* people were not considered by the NTE authority. Despite the protest, the NTE authority received a no objection order from the High Court (HC) and permission was granted on 22 February 2008 to clear 1200 trees from the adjacent lands of the tea estate and the *Khasi* punji. The court order naturally demotivated the *Khasi* people from protesting further[62]. Subsequently, the trees were cleared in the hills and hillocks by the NTE. Although the trees were felled in 2008 to enable the extension of the tea plantation[62], to date not a single tea tree has been planted on the cleared lands (Figure 1). This incident implies that the real intention of the NTE was to evict the *Khasi* people from the lands and make a profit from timber trading rather than create an extension to the tea plantation.

Figure 1: The Nahar Tea Estate authority cleared the forests on the hills. The tea estate authority urged that they clear the forest to extend the tea plantation. However, not a single tea tree is planted there yet.

In the same year of 2008, the NTE authority attempted to cut down an additional 4000 trees from the same area, once again based on extending the tea plantation. They claimed that they obtained permission from the Ministry of Environment and Forests to clear the trees by paying the royalty to the government, amounting to BDT 4,750,000. However, the Divisional Forest Officer of Sylhet contends that the NTE only received permission to clear 2,350 trees (along with 450 dead trees) to prepare the lands for tea plantations. Nevertheless, the NTE authority auctioned 4000 trees to a local timber trading company for the sum of Tk. 15,000,000. The *Khasi* people, along with other indigenous communities, environmentalists and human rights activists, organised a series of protests against the NTE authority for the tree felling. The programme of protests included rallies, public meetings, human chains and press conferences. The NTE authority continued to clear entire trees amid the protestations and they deployed elephants for tree removal from the area. This caused further deterioration of the forests because it destroyed several immature trees, plants and stems (Figure 2).

In February 2011, the NTE authority auctioned 3,000 more trees from the lands adjacent to the tea estate. The same company secured the work order to clear the trees from the lands. The auctioned trees had been used by the *Khasi* people of Nahar punji for their betel vine cultivation. As with the earlier events, the *Khasi* people and environmentalists mounted a protest. However, despite their efforts, their forests became ineffective. The *Chuto Mantri* (Deputy Headman) of Nahar-1 punji said that: *"after the cutting down of trees, the NTE authority set fire to the hills to burn the remaining plants and stems, intending to convert the fertile lands as fallow lands so that nobody from the Khasi community could plant anything over there."* It seems that the underlying driving force to clear the

trees by the tea estate was to evict the *Khasi* people from these lands, rather than extending the tea plantation. To achieve this apparent goal, they cleared entire forests, irrespective of the size and types of the trees (Figure 3).

Figure 2: Immature trees and stems were destroyed due to the use of elephants for the removal of felled trees.

Figure 3: Clearing trees irrespective of their size and type. The NTE authority sought permission to cut down the mature trees only, but the pictures show that the NTE authority felled immature trees.

The NTE authority has therefore been felling trees adjacent to the tea plantation on different occasions since 2000. I observed during the fieldwork that the flora and fauna of this area were destroyed due to the clearing process. The local *Khasi* people claim that they suffer considerably due to the felling of these trees as they had depended upon them to cultivate betel leaves. A 70-year old *Khasi* man said that: *"we do not find any medicinal plants and vines in this area after the clearing of the trees. As a result, many people of our community are not cured of the different diseases and they died."* The *Khasi* people further explained that many birds and animals have disappeared due to the destruction of their shelter. After the clearing of the forests, landslides, siltation of the streams and soil degradation have become common occurrences in this area (Figure 3). Given these circumstances, the area is experiencing a process of environmental degradation.

This study found that the underlying driving force behind the clearing of the trees is the conversion of the forest lands into fallow lands to use for non-forest purposes. For instance, the NTE authority has built amusement structures and a watchtower for the visitors and tourists in the cleared lands, instead of planting tea. Effectively, they have converted the lands of the tea estate into a recreation centre instead of an extension to the plantation. This represents a violation of the lease agreement with the government. However, the law enforcement agency has not taken any action against the tea estate authority.

5.2 Tree felling at Jhemai: an instrument of land grabbing

Jhemai punji at Kulaura Upazila of the Muolvibazar district has been experiencing a series of events of tree felling by the local tea company, Jhemai Tea Estate (JTE), since 2000. The local *Khasi* people have been protesting against tree felling by the JTE, but their campaigns have been ineffective in stopping the clearing of the forest by the tea estate authority in their area. However, in 2012, the *Khasi* people did succeed in protecting about 2,000 trees from felling by the JTE. A 42-years old *Khasi* man at Jhemai punji explained that: *"Jhemai Tea Estate Authority is involved with cutting down trees and selling them to timber traders. It is a business for the tea estate authority. But their target was very high in 2012 when they attempted to cut an enormous volume of trees. We protested their attempt to clear trees from our area because we have been taking care of these trees for six decades."* The JTE authority justified their activities of clearing the forests, claiming they were extending the tea plantation. The Manager of the JTE mentioned that: *"We have taken a lease of 661 acres of land from the government for tea plantation. But we are yet to take control of 371 acres of land. According to the lease agreement with the government, we must extend the tea garden area by 2.5 per cent each year. In this circumstance, we have no option except cutting the trees to extend the tea plantation"* (The Daily Star, 9 August 2015). The Manager of the JTE further claimed that they obtained permission from the relevant department of the government for clearing 2,096 trees. In contrast, the *Khasi* people claimed that the JTE attempted to cut the trees which have been used for cultivating betel leaves. The betel vines enfolded the trees, which are marked for logging, providing evidence that the underlying objective is not to extend the tea plantation but to grab the lands of the *Khasi* people (Figure 4). Moreover, if they intended to extend the tea plantation they could not clear the forests entirely, because the tea plantation requires the shade of trees to protect the tea leaves from direct sunlight. It seems that the tea lord comprehends that, without trees, no *Khasi* people could survive in their lands. In this scenario, tree felling is a tool of the tea estate company to grab the nearby forest lands of the *Khasi* people.

Figure 4: A tree enfolded with betel vines at Jhemai punji is marked for felling by the tea estate authority

These trees were grown and nurtured by the *Khasi* people for their own interest of cultivating betel leaf. This picture was taken from: http://www.ucanews.com/news/as-tea-estates-expand-in-bangladesh-tribes-fear-for-their-future/73091 [accessed August 12, 2016].

5.3 Tree felling at Boiragi: an outcome of organised crimes

About two decades ago the Boiragi area of Chunarughat Upazila in the Habiganj district of Bangladesh was famous for its thick forest and biodiversity. Currently, few trees are remaining in this area. Several organised forces are involved with tree logging at Boiragi punji. In 2000, a few *Bahinis* (gang) were formed with local muscle men and miscreants intending to smuggle trees from the forest lands. Each *bahini* has 40-50 members. Organised forest crimes of tree cutting and timber trafficking resulted in desertification and environmental calamities at the Boiragi area of Chunarughat Upazila. The stumps of felled trees are evidence of the extent of tree felling by these *Bahinis* in the past decade (Figure 5).

Figure 5: The stumps of felled trees as evidence of the extent of deforestation at the Boiragi area.

I observed that the main occupation of the members of these *bahinis* is timber trafficking from the forest lands. The *bahinis* divide the forests lands and mark territory to avoid inter-*bahinis* clashes. The members of the *bahinis* patrol their territories by turn so that they are alerted if anybody from the forest department or law enforcement agency arrives there.

6. Analysis of causes and underlying forces of environmental degradation in Sylhet, Bangladesh

This section uses the conceptual framework of 'proximate causes' and 'underlying driving forces'[63] to explain the causes and mechanism of environmental degradation in Sylhet. This conceptual framework is developed through the investigation of 'proximate causes' and 'underlying driving forces' of the 152 nations (55 in Asia, 19 in Africa, and 78 in Latin America). Here, 'proximate causes' refer to 'human activities' or 'immediate actions' at the local level. In contrast, 'underlying driving forces' are the 'fundamental social processes' which underpin 'proximate causes.' These fundamental social processes can occur either at the local level or at a national or global level.

'Proximate causes' of deforestation are relatively easy to identify[64,65,66,67] but it is tough to determine the 'underlying driving forces'[68,69,70,71,72]. Geist and Lambin identified the 'proximate causes' of deforestation as agricultural expansion, wood extraction and infrastructure extension[63]. On the other hand, the 'underlying driving forces' of deforestation are categorised into five broad clusters[63]. These are demographic, economic, technological, policy and institutional and cultural factors.

If we concentrate on the environment of the Sylhet region, then we can observe the changes in climatic data in the last few years (2000-2018). The climatic data show that the average annual rainfall in Sylhet has decreased while the average annual temperature has increased. In 1999, 2001, 2002, 2003, 2005, 2006, 2008, 2009 and 2011 the mean annual rainfall was less than the normal range i.e. 4195.9 mm[73]. The rainfall year exhibiting the highest deficit in the Sylhet region was 2011[73]. It is 'largely' different from the other parts of Bangladesh[73].

The findings of this study suggest that the Sylhet region of Bangladesh has been experiencing a range of 'localised' environmental problems, which in the majority of cases can be attributed to bad governance in the environmental sector, policy constraints and environmentally unfriendly development processes. It appears that the current infrastructural expansion and development process of Bangladesh does not consider the country's environmental interests.

Bangladesh has experienced constant economic growth in recent years. To keep the economic growth increased, Bangladesh needs to develop its infrastructure as the highest priority[74]. However, this study has determined that the current infrastructural development process in Sylhet of Bangladesh conflicts with environmental sustainability.

Economic growth in developing countries leads to urbanisation[75], and this is true in the case of Bangladesh. The country also prioritises industrialisation in its desire to move from a low-income country to a middle-income country. These processes of urbanisation and industrialisation have changed the infrastructure of the country. Consequently, the environment has changed as an outcome of economic development, industrialisation and urbanisation[76,77]. Figure 6 shows the components of the underlying driving forces and proximate causes of deforestation and forest degradation, which are the two major threats to the environment of the *Khasi* people area in Sylhet.

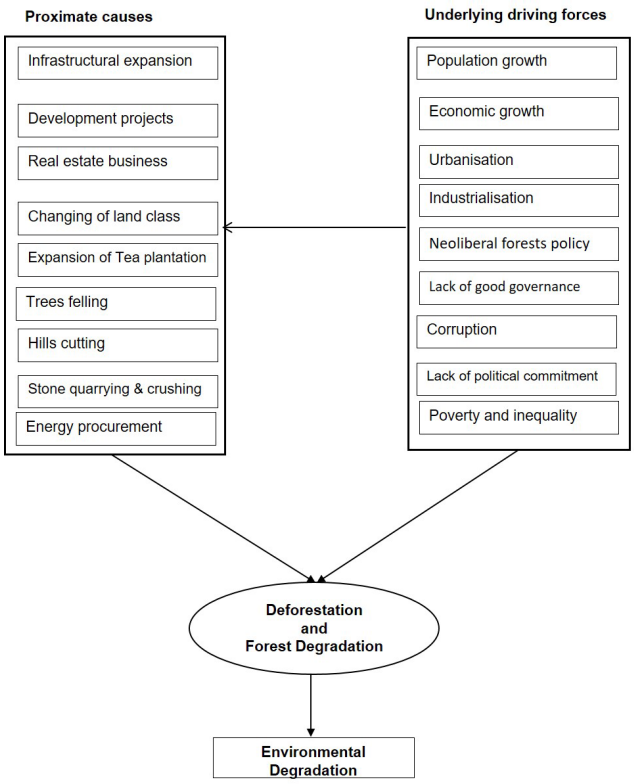


Figure 6: Proximate causes and underlying driving forces of environmental degradation

This study uses the conceptual framework of the Environmental Kuznets Curve (EKC) to explain how the process of environmental degradation of Sylhet, Bangladesh is shaped by current economic growth, urbanisation and industrialisation. The application of EKC to explain the relations between economic growth and environmental degradation came into the limelight in 1991[78]. The idea was originated in 1955 by Kuznets. It states the relationship between economic growth and income inequality. There is an endeavour to empirically investigate the current development process and the situation of the environment of Bangladesh in line with the Environmental Kuznets Curve (EKC) hypothesis[79]. The EKC is an inverted U-shaped curve that asserts that there is a systematic relationship between economic growth and environmental degradation[78,80,81]. Moreover, the empirical reality is that environmental degradation tends to deteriorate until a country reaches a certain level of economic growth[82].

Deforestation, a major phenomenon of environmental degradation is a product of national economic growth[83]. Studies found that national economic growth affects tropical deforestation[84,85]. According to the hypothesis of the EKC, the economy would develop by taking resources from the environment; after achieving the targeted economic development, a state then invests in the environment for sustainability. Although the argument of the EKC is highly contested it has become *"standard fare in a technical conversation about environment policy"*[78]. According to the assumptions of the EKC, a country needs infrastructural development which essentially deteriorates its environment. After achieving a certain level of economic development, the environment becomes sustainable. However, I disagree with this straight assumption on the sustainability of the environment.

I argue that the hypothesis of the EKC is unrealistic in explaining the current process of environmental degradation in the Sylhet region in Bangladesh. There are several reasons which suggest that the environment of the Sylhet region would not be improved after achieving the goal of development. The critical point is that the region is being destroyed rather than polluted: alongside deforestation and forest degradation, environmental artefacts are being completely devastated in Sylhet. For instance, the Sylhet region has lost hills, rivers, streams, canals and forest cover due to environmental destruction. A country or region can achieve its expected economic growth, but it cannot regain the hills, rivers, streams and natural forest cover which have disappeared. Nevertheless, reforestation and afforestation programmes can extend the stock of trees or the area of forest cover, but these cannot restore the holistic components of a natural forest.

I explain why the assumptions of the EKC are not relevant to the situation of environmental degradation in the Sylhet region of Bangladesh. The concept of *"economic distributional profile of developing country on the forest loss"* claims that an economy with greater inequality causes more deforestation than that of an egalitarian economy[84]. However,

deforestation and forest degradation vary from region to region[65]. Moreover, Bangladesh is one of the countries which have an unequal economy. For instance, in Bangladesh, the Gini coefficient of income has increased from 0.451 in 2000 to 0.458 in 2011. The Gini co-efficient, also known as Gini index, measures the inequality and income distribution of the population of a country. It was developed by sociologist Corrado Gini (1912). The index can vary between '0' and '1' where '1' is the most unequal and '0' is the most equal economic situation. In addition, the rural income inequality in Bangladesh has increased from 0.393 to 0.431 during the same period[86]. Therefore, the current economic growth with inequality is a barrier to conceptualising the state of the environment of Sylhet according to the hypothesis of the EKC.

The state effort of afforestation and reforestation in Bangladesh seems to be an effort of plantation rather than restoration. The afforestation and reforestation programme of Bangladesh merely prioritises plantation. While an initiative of plantation helps to reduce the process of exploitation of natural forest and contributes to carbon stock, it would not help to regain the wildlife, biodiversity, or habitat of a typical natural forest or natural ecosystem.

The current government efforts to respond to the process of environmental degradation, particularly deforestation and forest degradation, appear to indicate that Bangladesh is guided by the forest transition theory of the environment. A. S. Mather is one of the pioneers who coined the term 'forest transition' in the field of environment[87]. The forest transition theory claims that in the period of tracking the stage of development, a large decline in forest cover may take place. After a period, the trend turns around with a slow increase of forest cover[67,88,89,90,91,92]. Indeed, the two following circumstances (which may overlap) promote the situation of forest transition in developing countries like Bangladesh[93]:

a. Economic development regenerates forests by providing non-farm jobs to the farmers to ease the pressure on forest resources;
b. A scarcity of forest products encourages governments and landowners to plant trees for a better benefit.

Indeed, forest transition reinforces a positive relationship between economic development and environmental quality[94]. Bangladesh adopted the Clean Development Mechanism (CDM) and Reducing Emissions from Deforestation and Forest Degradation (REDD+) as requisites of forest transition[82]. CDM is an important component of the Kyoto Protocol (Article 12) which aims to reduce greenhouse gases emissions through several projects aiming at sustainable development, formation of carbon markets and promotion of bioenergy options. Under the CDM framework, developed countries have agreed to invest in developing countries' projects on carbon sequestration, biomass combustion efficiency and carbon substitution projects. On the other hand, REDD+ is an initiative under negotiation by the United Nations Framework Convention on Climate Change (UNFCCC) to provide financial incentives to the developing countries to abstain from the rates of deforestation and forest degradation. It aims to enhance carbon stock to mitigate global climate change. This initiative further focuses on the conservation of forest biodiversity and improvement of rural livelihoods through the sustainable management of forests. The global initiatives of CDM and REDD+ assist Bangladesh in extending plantation, generating employment for rural people and promoting carbon trading. Nonetheless, these initiatives have become ineffective in terms of reinstating the extinct and endangered plants and wildlife that happen in Sylhet, Bangladesh. However, green management[95] would be a solution to promote the environment protection in the study area. Indeed, green management reduces the negative and destructive effects on the environment[96]. It can reduce environmental degradation[97]. Comprehensive and profound work can be cope with the challenge of envrionmntal protect[98]. Along with this, the indigenous peoples who are the caretaker of the forests should be included in the forest and environment management. Indeed, promotion of social inclusion upholds environmental conservation[99].

7. Conclusion

The environment of the Sylhet region is a subject of degradation due to a few proximate causes and underlying driving forces. The proximate causes of environmental degradation include conversion of forest lands for non-forest use, land encroachment by the tea estate proprietors and tree felling by state and non-state actors. This study revealed that these proximate causes of environmental degradation are shaped by several underlying driving forces like economic growth, high density of population, urbanisation, industrialisation, lack of good governance, corruption and poverty and inequality. The findings of this study suggest that the assumptions of the Environmental Kuznets Curve are not relevant to explain the state of environmental degradation in the Sylhet region of Bangladesh. Moreover, the Sylhet region of Bangladesh is not in a suitable position for forest transition either. Therefore, the government (and global) initiative of reforestation and afforestation will not improve the situation of the environment of the Sylhet region unless the environmentally destructive activities of different

state and non-state actors are discontinued immediately. The current situation of environmental degradation in Sylhet is not shaped by environmental pollution or naturally induced changes in the environment. Rather the inherent dimension of environmental degradation in the Sylhet region can be conceptualised as the outcome of tree felling.

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