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UNPLANNED URBANIZATION AND HILL CUTTING: A STUDY ON ENVIRONMENTAL CHANGE IN SYLHET

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ABSTRACT

Bangladesh is a developing country having diversified environmental issues especially in the city area. The present study was conducted in Sylhet City Corporation; one of the rapidly developing urban areas in the north-eastern region of Bangladesh to identify the main environmental problems due to rapidly increase population, unplanned urbanization and hill cutting. The major environmental problems in the city are traffic obstruction, inappropriate solid waste disposal system, inadequate water supply, water logging state, hill cutting, chance of seismicity, etc. The nature and life style of Sylhet intimately related with the hills are thus under the threat of a drastic imbalance in its ecosystem. This study also investigates the causes of hill cutting along with its probable impact on environment such as deforestation, loss of biodiversity, ecological imbalance and climatic change, chances of earthquake will increase, destroying natural beauty, soil erosion and landslide, etc. Sylhet is located in highly seismic risk zone 3 but most of the buildings and apartments are constructed without considering earthquake risk. The City Corporation authority should take a new approach to tackle urban problems by investing new ways to solve them, taking advantages of unused resources and opportunities.

Key words: Population, migration, solid waste, traffic obstruction, earthquake.

I. INTRODUCTION

During the 19th and early 20th centuries, urbanization resulted from and contributed to industrialization. New job opportunities in the cities motivated the mass movement of surplus population away from the countryside. At the same time, migrants provided cheap, plentiful labor for the emerging factories. Today, due to movements such as globalization, the circumstances are similar in developing countries [1]. The world is on the verge of a shift from predominantly rural to mainly urban. In 2008, more than half the world's people will live in urban areas. By 2030, urban dwellers will make up roughly 60 percent of the world's population. The world's regions differ greatly in their levels of urbanization. In North America, Europe, and Latin America and the Caribbean, more than 70 percent of the population is already urban; but in Africa and Asia, less than 40 percent of the population is urban [2].

Bangladesh has been experiencing a rapid growth in urbanization since 1961. The proportion of urban population increased gradually from 5.2 % in 1961 to 20% in 1991 with an average growth of about 7 % per year. Inability of rural economy and agriculture to absorb the growing population, a drastic fall in the availability of arable and cropped land, landlessness, fall of real income etc., pushed the rural poor to migrate to the cities [3-5]. Though still comparatively rural, Bangladesh has an urban population of about 35 million, or just over 25 percent of its total population. Moreover, the urban population has been growing very rapidly over 3.5 percent annually. The country will probably have an urban population approaching 50 million by 2015 [6]. This rapid growth has been caused mainly by migration of the rural poor, particularly to large metropolitan areas [7]. Urban populations interact with their environment. Urban people change their environment through their

consumption of food, energy, water, and land. And in turn, the polluted urban environment affects the health and quality of life of the urban population [8, 9].

Shaha [10] and Haque *et al.* [11] studied with two image of Sylhet City Corporation (SCC) which was classified and analyzed. From the images analysis and field survey it was found that the total water bodies of Sylhet district was 81535.2 ha at 1988 and it has become 34,535.7 ha at 1997. It has reduced to 28,435.6ha at 2006. Main causes of loss of water bodies are unplanned urbanization and capture of lowland areas by real estate limited companies. Also, found that the total settlement area of Sylhet city at 1988 was 8856 ha and it has become 13,341ha at 1997. At 2006, it was predicted to be around 16,713ha which was collected from field survey and local land department and conclude that improper land use like removal of vegetal cover brings about marked changes in the local climate of the area. According to the population census of 2001 Sylhet city has been ranked as the sixth urbanized city in Bangladesh [12]. The population in this city is going several times faster than other city of Bangladesh and the growth of slums appears to be the direct outcome of the growth of city population because of rural to urban migration pushed by the rural poverty and unemployment. Overall, the relationships between population increase, urbanization and environmental degradation are very complex, involving interactions with the natural and the built environment, as well as various economic, political, and social factors [13].

Indiscriminate cutting of hills in the Sylhet region has become a major environmental issue. It is estimated that every year about 5 to 12% of the total hills and hillocks are cut or destroyed in different forms at different parts of the region [14]. The probable consequences will be adverse for weather and climate, geomorphology and hydrology, and the indigenous flora and fauna. The frequency of natural calamities like earthquake, flash flooding etc. may increase considerably. Deforestation and resulting increased soil erosion, decreased ground water recharge and impaired water quality might also be consequences of such hill cutting [14]. Due to unplanned urbanization and hill cutting in SCC, settlement is rising day by day and it is creating environmental problems like landslide, pollution as well as decrease natural beauty [15]. Therefore, our study was concerned to identify the environmental problems of SCC: excessive population pressure, migration, urbanization, hill cutting, and other economic activities

OBJECTIVES

- To explore the main environmental problems due to rapid unplanned urbanization and hill cutting in the study area
- To suggest some recommendations for the improvement of the existing situation.

II. MATERIALS AND METHODS

Site Profile

The study was conducted during November 2009 to January 2010 at SCC of Sylhet Sadar upazila (sub-district) under the Sylhet district, Bangladesh, a district in north-eastern region of Bangladesh (**Figure 1**). Sylhet is located on the banks of the Surma River and is surrounded by the Jaintia, Khasi and Tripura hills. It is one of the largest cities in Bangladesh. SCC consists of 27 wards. The present study area was selected purposively because during the last few years this area is being highly affected by unplanned urbanization and hill cutting. **Table 1** describes the main features of the study area.

Figure 1: *Location map of the study area*

Table 1: Profile of the Study area

Items	Description
Location	The SCC consists of 27 wards and 210 mahallas. It occupies an area of 26.50 Sq. km.
Population	The city is approaching a population of 663,198 people while male 52% and female 48%; density of population is 250,26 per sq. km. [13].

Items	Description
Geography	Sylhet is located in the Northeastern corner of Bangladesh at 24°32′0" N, 91°52′0" E, on the northern bank of the River Surma. The physiography of Sylhet comprises mainly of hill soils, encompassing a few large depressions known locally as *'Haors'* [16].
Climate	Sylhet experiences a hot, wet and humid tropical climate. The city is within the monsoon climate zone, with annual average highest temperatures of 23°C (Aug-Oct) and average lowest temperature of 7°C (January). Nearly 80% of the annual average rainfall of 3,334 mm occurs between May and September [16].
Important attractive features	Beautiful panorama of the region with vast natural protected forest (Khadimnagar Nagar National Park), intense tea gardens and growing rubber gardens in the hills and hillocks, streams, etc. attractive for tourists from both home and abroad. Among the topographical features of the region, however, hills are the most dominating one. The city is described as a City of Saints, with the mausoleum of the great saint Hazrat Shahjalal (R.) and Hazrat Shahparan (R.) with 360 saints, who's brought Islam to Bengal during the 14th century being located here [17]. This city has an important religious values is in the country and abroad Muslims.

Sampling design

Any impact study needs huge amount of data of long period from different relevant sectors, the data availability of the relevant study is not of ample magnitude to support a detailed phenomenon as the study is at the initial stage of investigating theoretical aspects of the impacts related to unplanned urbanization. The study was based on the primary data collected directly from the field through physical inspection. The primary data were collected through a combination of various ways such as field survey, interview, focus group discussion, etc. Population data were collected from the SCC, Bangladesh Bureau of Statistics (BBS) and United Nations Development Programme (UNDP), Sylhet City office. Urbanization data was collected from whole city corporation wards. Numbers of dustbins available for waste storage, mode of waste collection, efficiency of collecting vehicles, traffic congestion, number of ponds and canals, etc. data were collected from SCC office and verified the data validity through local people interviewed and focus group discussions by direct field survey.

Moreover, hill cutting data was collected from the highly hill cutting affected areas such as 3 city wards namely:

Ward no. 8, 20 and 21. So, these 3 wards was selected purposively and field survey was conducted in the such areas Pathantula, Panitula, Nayabazar, Goa bari, Tilaghar, Tillargaon, kalibari, Balochar, Valley City, Under Construction of Heart Foundation Sylhet and Scholarshome School and College area, etc. and photographs were captured to visualize the present situation. Total six focus group discussions were conducted in this manner to collect actual data as well as the findings would reflect the whole city area. To know about the hill cutting related Laws and actions, data were collected from the Department of Environment (DoE), and Bangladesh Environmental Lawyers Association (BELA). The required all information from the field so collected and was sorted out complied and then analyzed statistically and manipulated into convenient forms as usual in the result and discussion section sub sequentially

III. RESULTS AND DISCUSSION

Population and Settlement in SCC

Table 2 shows the population scenarios of SCC from 1991 to 2010. In 1991 and 2001 SCC was municipality and has an area of 16.92 and 26.05 sq.km; total population was 234,355 and 263,197 respectively. Population density in per sq. km was 13,851 and 10,103 correspondingly. But, at present, SCC has an area of about 26.50 sq. km and an estimated population of around 663,198 and population density in per sq. km was 250,26. It appears from the information that over the years SCC experienced a phenomenal growth both in terms of area and population. This growth of urban population did not commensurate with the development of necessary infrastructure and effective rendering of civic services and the

deteriorating living and working conditions for those living and working in urban areas.

Table- 2: Growth of Sylhet City due to Urbanization (1991 to 2010) [18]

Items	Year		
	In 1991	In 2001	In 2010
Area (sq.km)	16.92	26.05	26.50
Households	14,068	49,628	95,554
Population (million)	234,355	263,197	663,198
Male (million)	129,675	146,247	347,859
Female (million)	104,680	116,950	315,339
Ward	5	13	27
Mahalla	94	201	210
Density (per sq. km)	13,851	10,103	250,26

The growth of slums appears to be the direct outcome of the growth of SCC population because of rural to urban migration pushed by the rural poverty and unemployment. There are about more or less 20 percent people are live in slums in SCC. The situation is more or less same for the other cities. The slums houses are made of poor construction materials such as old CI sheets, wood, bamboo, straw, sack and polythene. The slums dwellers don not have adequate income to good food, cloths, heath and education for their children. They are not provided necessary civic amenities such as water, gas, electricity, and sanitation facilities and health service. They live in very poor environment and equally, they degrade the city environment

Major Urbanization Problems in SCC

SCC is one of the rapidly growing metropolitan areas in the north-eastern region of Bangladesh. It belongs to medium urban centers that have grown rapidly in the recent years and has steadily improved their ranks in the urban hierarchy. SCC has got urbanized without an appropriate urban design. Due to population increase, unplanned urbanization and hill cutting, the city is now facing some crucial environmental problems. The SCC undertook a detailed feasibility study funded by the Urban Development Directorate, Ministry of Works, UN centre for human settlements and UNDP Programmes for Poverty Reduction in the Urban City to assess the social and economic situation of Sylhet and recommendations for implementing the "Sylhet Structure Plan". But it is a very common incident that people and also the authority do not follow those plans always.

Water System

Tube well is the major water source of drinking in the city poor slum people. Others depend on surface water such as surface wells, ponds, and river. The river Surma is flowing through the city. According to expert opinion, the quality of this river water is still satisfactory, but is going down day by day because Chattak Paper Mills, food processing plants, rice and saw mills are discharging their wastes into this river. The flow of the river is gradually reducing and in particular during the dry season it takes the shape of a narrow canal. The existing water pumps of SCC cannot supply adequate water for all [19, 20]. They are operating with a daily capacity of about 100 m^3/h per pump but supply is inadequate. In the old city area about 20 percent water supply coverage is found from the data of City Corporation. Among the 27 wards, five wards are not still provided with public water supply [18]. In the slum areas, water supply is not available and new city areas. The scarcity of public water supply is mainly occurs due to shortage of production, presence of leakage and other faults in the pipeline and also due to unauthorized connection. Now most of the city dwellers are bound to buy water from pure water producing centers. They have to spend 40 to 50 taka for each gallon of water. Underground water in SCC is almost free from arsenic but there is a possibility of such contamination from nearby areas due to excessive use of ground. It is also possible to use other source of water such as rainwater after such as rainwater after harvesting it to make it suitable for drinking.

Traffic Obstruction

The road hierarchy of Sylhet city is incomplete and in some major developed areas there is no road hierarchy. Old city area and some other places of the city have major access problems and it will likely deteriorate as development intensifies. The intolerable traffic congestion of SCC has become an everyday certainty and a frightening for the city dwellers. There are several of reasons behind this problem. Effective reasons include: significant increase in population and also all types of vehicles, poor transportation and infrastructure planning, simultaneous presence of motorized and non-motorized vehicles on the same street, traffic mismanagement, violation of traffic rules and

regulations and other issues such as political reasons, lack of manpower, etc. Rickshaw is the most frequent mode of transport followed by CNG 4-stroke, own vehicle (motor cycle and private car), hired car and public bus. The total number of registered rickshaws in SCC is about more than 175, 00. But at present SCC has about 450, 00-500, 00 rickshaws, most of which are unauthorized [21].

Ponds, Canals Filling and Water Logging State

SCC poses a serious threat due to ponds and canals filling and drainage congestion as a result make water logging situation in the monsoon. Most of the entire canals in the city are illegally encroached, filling by earth, choked by deposition of city garbage and used for various construction purposes are: Rangmahal Cinema hall, Naiorpul point, Zindabazar, near Blue Bird High School, Mirabazar, Bondor Bazar and other busy areas. One decade ago there were about 17 ponds in SCC which was used to carry a huge amount of rainwater. But now many of these have been filled for various purposes such as Dhopadighi (for the construction of "Osmani Children Park"), Laldighi (for the construction of Hawkers market), Masudighi (for the construction of private buildings), and Ramer dighi (for the construction of private buildings) (*Dighi* means a large sized pond). Some of the existing ponds are situated in the Naiorpul, Kasthagar, Topkhana, Haldapara, Upashahar (A Block), Shenpara, Kharadipara, Amberkhana Boro Bazar, Kazitula, etc. Formerly, this canals and ponds used to carry a huge amount of surface run-off and daily wastewater and these were ultimately drained into Surma River. But now a day their effectiveness has been greatly reduced. Water logging problems faces the following areas: Khuliapara, Naiorpul, Sobhanighat, Shenpara, Denpara, Laldighir par, Majumdarpara, Keowapara, Darshan Deuri, Gashitula, Sadarpara, Shibgonj, Mendibag, Chara Digirpar, Upashahar, Mirapara, Baghbari, Sheikhghat, Kazir Bazar, Lamapara, Masimpur, Kajalshah, Khuliapara, Kanishail, etc. [13].

Solid Waste Disposal and Garbage Problem

The solid wastes accumulated in the areas of SCC are derived from various sources. Such as household or domestic wastes, commercial and office wastes, institutional wastes from schools, colleges, mosques, temples, churches, clubs, community centers, auditoriums, and community organizations, street sweepings, sanitation residues, hospital wastes, and dry excreta of cows, chicken, etc. The SCC authority has set up only 160 concrete made bins for waste disposal in some places of the city area. About 240 tones of solid waste are produced everyday from domestic, commercial and clinical sources. Everyday City Corporation dumps about 135 tons of waste manually from main and other roads and the remaining (44%) are consumed by the city [22]. Although the open or closed lorries used for solid waste disposal are not be allowed to collect garbage from the waste disposal places after dawn, they are always used during the day time, creating air pollution, odor nuisance, aesthetic problems and even sometimes traffic jams at some places. Dumping of domestic wastes in the home and roadside arenas was found to become a potential source of pollution in the localities.

Hill Cutting Scenarios in SCC

At present, hill cutting is the main and burning issues for SCC. In the whole Sylhet division people are indiscriminately destroying the natural hills. Population is growing and so there is demand for croplands and houses. So, residents are invading the hills and cutting the trees for housing. The people of Sylhet region are rich and economically stable than other city in Bangladesh and they lead a high standard of living. Such a high standard of living, there is an acute crisis of low wage working people like house maid, rickshaw puller or day labor etc. that are mostly migrated from other cities. Homeless poor people from Noakhali, Netrokona, Rangpur, Bogra and also from another district of Bangladesh, migrate in Sylhet only with a hope to survive and for better living. These poor people try to live in the hills for low cost of housing. In most cases rich people are doing even more serious harms to the hills at a large scale. It has been observed that business man are destroying hills at Pathantula, Goabari, Kalibari, Akhalia, Baluchar, Khadhimnagar, Tilagar, Nayabazar, Tillargaon, Kumargaon, Osmani Airport for real estate business, brick manufacturing, making house, hospital, school, etc. These men are cutting hills for filling up lakes and water bodies to recover land for their questionable enterprise [13].

Urbanization is the main cause of hill cutting in this area because sometimes rich people are doing even more serious harms to the hills and at a larger scale. From field survey, it has been observed that the rich people were destroying hills for their vested interest like, real estate business, brick manufacturing, large-scale agriculture or filling

land for road construction etc. The real estate developers are cutting hills as in filling up lakes and water bodies to recover land for their questionable enterprise (Figure 2). Despite the laws, they do not face much obstacle and sometimes even receive permission for cutting hills. The small hillocks in the Sylhet region near localities are the best choice for rich people to build a luxurious house. Some of the economic and agricultural products like tea, rubber, pineapple, jackfruit, lemon etc. are especially suitable to produce in the highland of the Sylhet region. Many big firms are grown up for the purpose of producing the above crops destroying hills. In this form of destruction, they are mostly destroying the forest over the hills, and planting it with different crops.

Figure 2: *(clockwise) Hill cutting scenarios in Sylhet City Corporation, Bangladesh*

Another cause of hill cutting in this area is the construction purposes. Cutting hills simply for collecting soil for land fill or construction purposes are one of the most serious form of destruction observed all along the region. From the field survey it is observed that the construction of educational institution, play ground, road construction, housing, drainage, dustbin, bridge and culvert construction, market and shop, etc. are the main cause for hill cutting.

Such indiscriminate destruction of hill in this region will result in drastic consequence on its society, nature and ecosystem. The direct and probable impacts due to destroying hills require detail Environmental Impact Assessment study. Depending on the topography, land use and hydro-climatic features of Sylhet, major effects of cutting hills can be grouped as follows: deforestation, desertification and biodiversity; ecological imbalance and climatic change; chances of earthquake will increase; destroying natural beauty; soil erosion and landslide; siltation in rivers and canals; change in catchment drainage and flush flood.

Hill cutting related Law's in Bangladesh

Department of Environment (DoE), at a state, while the destruction of the hills were looming large in an unrestricted way, government had taken initiative to impose legislative sanctions for those miscreants under the law started from 1995 and this is called Bangladesh Environmental Conservation Act, 1995 and later amended in 2000 [23].

The government has imposed restriction on hill cutting without permission and directed the concerned authorities to strictly execute the Building Construction Act, 1952. Despite the fact that hill cutting without proper legalization is banned, the activity goes on without fear of reprisal and, in some cases, with the law enforcers working as accomplices. The Building Construction Act was enacted in 1952, which was given effect from 21.03.1953, with a view to preventing haphazard erection of buildings, excavation of tanks and cutting of hills and hillocks in Bangladesh. Initially the act did not contain any specific provision for the cutting of hills. But later on after realizing the significant of this issue, the government amended the 1952 Act twice in 1987 and in 1990. Being empowered under section 18 of the Act, the government formulated the Building Construction Rules 1996 with specific provision regarding the permission procedure for cutting of hills [24]. The above laws for preventing hill cutting are quite attractive and adorable. Nevertheless, it is unfortunate that still it could not prevent destruction of hill as a whole.

Increase Chance of Seismicity

Earthquake is the most terrifying natural disaster. Geologically, Bangladesh lies in the southern vicinity of the Shillong plateau which is the center of a strong seismic activity in the whole region. This seismic center greatly affects almost the whole of Bangladesh and causes huge damage in Sylhet, North-Bengal districts (Rangpur, Dinajpur) and Mymensingh-Dhaka belt of the country. The tectonic framework of Bangladesh indicates that Sylhet city, due to the presence of Dauki fault

system of eastern Sylhet, the deep-seated Sylhet fault and proximity to the highly disturbed southeastern Assam with the Jaflong thrust, the Naga thrust and the Disang thrust, is a zone of high seismic risk. Sylhet city is located in the seismic zone three and so it is highly vulnerable to earthquake. In the last 150 years three earthquakes of magnitude greater than 7.5 occurred in Sylhet [25]. The Sylhet city is a part of Surma basin, which consists of four types of landforms such as: Sylhet depression, Lowland flood plains, alluvial fence and up-lands.

Most of the buildings in the city are built without consultation with skilled engineers and most of the owners have no idea about national Building Code and earthquake resistance buildings. Unsafe brick buildings are being constructed by low income people in the city area and considering the risk from earthquake hazards. But currently, rich peoples are change their perception and they are constructing and designing their building by expert architects and engineers. People of this area have to be very conscious about earthquake and Engineers and Architects can play a vital role in this case.

Table-3: Strong earthquakes in the last 50 years in Sylhet region

Date	Name	Magnitude	Striking area
10/01/1869	Cachar Earthquake	7.5	Sylhet, Cachar (Assam)
08/06/1918	Shrimongal Earthquake	7.6	Shrimongal an dnearby area
15/08/1950	Assam Earthquake	8.5	Assam, Bengal

IV. CONCLUDING REMARKS

The present study explores the unplanned urbanization problems in SCC. Increased population is the main cause of environmental degradation of the study area. Some of the most serious impacts that are of special concern for the region are changes in climatic condition, drainage pattern, deforestation, increase in flood frequency and impact on biodiversity, possibility of earthquake occurrence, loss of natural beauty, etc. In recent years, the areas' environment has undergone serious deterioration. But, this condition is not expectable. It is necessary to save and preserve the natural beauty at any cost. Concerned people should come forward and take necessary steps about this condition. If these scenarios are running the beautiful city Sylhet will face more serious natural hazards like earthquake, landslides and ecological imbalance. The governments and NGOs in this area are trying to change this situation but it is not only the duties of authorities but also all people's participation is needed to change the present situation. Government should need to implement strong policy to stop unplanned urbanization and hill cutting in this area. However, detailed study, if possible, should be carried out to establish a more generic picture of this city, its problems and potentials and also the way to improve the situation. Above all discussion, it is conclude that a comprehensive urbanization policy and improvement of urban management within a local government system are essential for a sustainable future of the SCC as well as the whole country. The following suggestions are provided to improve the existing environmental situation in the entire SCC:

1) Ensure preservation of hills, forests, natural canals, ponds, river and wildlife of the area should be protected from illegal occupants and should be kept under regular observation. Government must take action to save the natural beauty of this area and environment.

2) Public participation is to be maintained especially for the prevention of hill cutting through training, workshop, seminar, campaign, leaflet, poster, movie, cartoons, television spots, dramas, documentary, etc. that they play vital role in control the degradation of environment.

3) Slow down the rate of migration from rural areas to Sylhet City by ensuring rural employment opportunities through agriculture and agro-based industries. Simultaneously, satellite towns and growth centers should be established with adequate facilities to provide alternative facilities to rural migrants and roads and communication systems should be linked with the city.

4) Proper applications of environmental laws as well as participation of government and NGOs in implementation of environmental laws should be ensured. Government should provide support to the registered NGOs related to population, urbanization and environmental sectors to work in rural areas.

5) Headquarters of important Government and NGOs, educational institutions and industrial units may also be shifted to the rural areas that people's dependency on city will minimize.

6) Regulate the growth of slums in the city area and encourage environment friendly activities. Undertake appropriate steps through the City Corporation, local Government, NGOs and law enforcing agencies in this regard.

7) The residents of SCC are not all aware of adequate solid waste disposal. The City Corporation and other community organizations should take awareness program so that people will know the importance of cleaning the garbage and sewerage system and hence will not throw here and there. Undertake a cleanliness drive regularly by the City Corporation and Municipalities and other civic authorities to keep cities, towns, hats and bazaars clean.

REFERENCES

[1] Population Bulletin: *International Migration: A Global Challenge*. Population Reference Bureau, Inc., Vol. 51(1). (1996).

[2] H. Carl: *World Population Data Sheet*. Population Reference Bureau: Washington, DC (2007)

[3] S. A. Mortuza: *Rural-Urban migration in Bangladesh: Causes and Effects*. Berlin: Dietrich Reimer Verlag. (1992)

[4] A. Q. M. Mahbub: *Mobility Behaviour of Working People in Bangladesh, Dhaka: USP*. Department of Geography and Environment, University of Dhaka, Bangladesh. (1997)

[5] S. Huq, A. A. Rahman and D. Mallick: Population and Environment in Bangladesh. *Paper presented at the workshop on Population and Environment in Bangladesh*. Organized by The IUCN Bangladesh. Bangladesh Centre for Advanced Studies (BCAS), Dhaka. Pp. 1-17. (1998)

[6] WorldBank: *Bangladesh Economic and Social Development Process*. Vol. III, (Report 5409), Washington, D.C.: The World Bank. (1985)

[7] N. Islam, A. Q. M. Mahbub, and N. I. Nazem: *Urban slums of Bangladesh*. The Daily Star, internet edition. (2009, June 20)

[8] K. P. Jyoti: Indira Gandhi Institute of Development Research, "Consumption Patterns: The Driving Force of Environmental Stress. Paper presented at the United Nations Conference on Environment and Development. (1991)

[9] World Bank: *Environmental Assessment Sourcebook*. Report no.19, Washington, D.C.: The World Bank. (1997)

[10] N. K. Shaha: *Study on Environmental change of Sylhet District Using Remote Sensing and Geographical Information System*. BSc Engineering Thesis, Shahjalal University of Science and Technology, Sylhet, Bangladesh. (2007)

[11] A. Haque, J. B. Alam, N. K. Shaha, and F. Raihan: "Study on Land use Pattern Change and Its Causes" *International Journal of Environmental Research*, **2(2):** 199-204. (2008)

[12] Bangladesh Bureau of Statistics (BBS): *Area, Population and Literacy Rate by Paurashava-2001*. Planning Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. (2001) Available online at http://www.bbs.gov.bd.

[13] M. H. Rahman: *Urbanization and Hill Cutting: Study on Environmental Change in Sylhet.* BSc. Thesis. Department of Forestry and Environmental Science, Shahjalal University of Science and Technology, Sylhet, Bangladesh. (2010)

[14] M. S. Islam, G. M. J. Hasan and M. A. I. Chowdhury: "Destroying hills in the northeastern part of Bangladesh: A qualitative assessment of extent of the problem and its probable impact" *International Journal of Environmental Science and Technology*, **2(4):** 301-308. (2006)

[15] J. Gerrard: *Mountain Environment*. MIT Press, Cambridge, UK. (1990)

[16] BMD: Official information (unpublished), *Bangladesh Meteorological Department*, Dhaka, Bangladesh. (2009)

[17] V. C. Pandey: *Environment, Security and Tourism Development in South Asia*. Gyan Publishing House. pp. 113-114. (2006)

[18] SCC: Official information (unpublished), *Sylhet City Corporation*, Sylhet, Bangladesh. (2010)

[19] A. Hossain: *Evaluation of Surface water Quality: A case study on Surma River*. BSc Engineering Thesis, Civil and Environmental Engineering Department, Shahjalal University of Science and Technology, Sylhet, Bangladesh. (2001)

[20] M. J. A. Shiddiky: *A study on the water quality parameters of the Surma River*. MSc Thesis, Chemistry Department, Shahjalal University of Science and Technology, Sylhet, Bangladesh. (2002)

[21] H. Rahman: *Traffic concentration to noise and air pollution in Sylhet*. BSc. Engineering Thesis, Shahjalal University of Science and Technology, Sylhet, Bangladesh. (2005)

[22] S. Khan: *Environmental degradation due to urbanization in Sylhet City*. BSc. Engineering Thesis, Department of Civil and Environmental Engineering, Shahjalla University of Science and Technology, Sylhet, Bangladesh. (2005)

[23] DoE: *A compilation of environmental laws*. In: Department of Environment (DoE) and Bangladesh Environment Management Project, Dhaka, Bangladesh. (2002)

[24] BNBC: *Bangladesh National Building Code.* Housing and Building Research Institute, Dhaka, Bangladesh. (1993)

[25] M. A. Ansary: *Seismic risk of Sylhet*. Paper presented in a seminar on earthquake vulnerability in Sylhet City, organized by Grameen Kollan. (2005)