Environmental Impact of Rapid Urban Growth in Dhaka Megacity: A Case Study of Bhatara Union

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Introduction

Dhaka is one of the oldest and fastest growing cities in the world. During the last three decades, the average annual growth has been over seven percent which led to rapid expansion of Dhaka city both horizontally and vertically (ADB, 1998:8). This expansion especially held at the city periphery areas (Shovon, 2008: 1) which led to a transformation of surrounding land and urban dwellers with ever-increasing demand for basic services and facilities and other resources. It enhanced unabated yet sprawl based physical growth, slum and squatter formation and so on (Rahman et al., 2008: 7). It leads to loss of natural resources, threatening basic ecosystem services and biodiversity, environmental pollution and degradation of standard of livings, health and well being of the people of Dhaka (Haque, 2004: 8). Due to the lack of proper planning and policy framework, budget, institutional co-operation and so on the urban environment is being degraded regularly (Alam, 2004: 2). Clearly, there is a huge administrative challenge for local authorities and community leadership to devise ways to develop and implement appropriate policies and strategies to control unabated urban growth and pursue sustainable urban environmental management in the peripheral areas of Dhaka city. Thus this study attempts to examine the causes of urban growth and its impact on the selected peripheral Unions in order to throw light on how they are governed and can be better governed. The study also suggests appropriate policy measures to improve the local environment as a way to address the environmental problems of the local inhabitants in the study area.

Objectives of the Study

The research aims to highlight the causes of urban growth in Dhaka megacity in general and Bhatara Union in particular; to investigate the environmental impact[1] of the unabated urban growth in the study area; and to suggest appropriate and doable policy measures for the improvement of local environment in the study area.

Methodology

In this study, mix qualitative and quantitative methods were used. The first phase involves a quantitative analysis of spatial variation of urban growth and its environmental impact. The spatial data is analysed by using Remote Sensing software 'ERDAS Imagine 8.4'. The purposive sampling adopted to cover a host of location, land use and surrounding environmental situation and so on. Fifty questionnaires were surveyed by purposive sampling for household survey in the selected unions. The respondents were household heads and mostly employed as landowners and businessmen, covering 10 respondents of each villages in

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[1] Environmental impact refers to the alteration of the natural environment by human activity. There are two basic types of environmental impact: (a) resource depletion (e.g. loss of agricultural land, loss of wetland and biodiversity) and pollution, like air pollution, water pollution, solid waste disposal etc. (McKinney & Schoch, 2003: 12).

the study Union. These aspatial data was analysed by using statistical software 'SPSS 16' etc. The second phase of the research involves qualitative methods by studying field-based case studies to get a more comprehensive understanding of the real situation by examining the experience of people with urban growth and environmental management. Cases included a local government leader (i.e. Union *Parishad* Chairman); a businessman and a traditional rich landowner. However, environmental quality related data has been collected from relevant literatures from the Department of Environment (DoE) and *Rajdhani Unnayan Katripakkha* (RAJUK) in Dhaka. Population and other statistical data are collected from Bangladesh Bureau of Statistics. Various published and unpublished reports, documents and maps were collected from Union councils and relevant Government Organizations (GOs) and Non-Government Organizations (NGOs). Finally, both types of data have been integrated and presented by dint of various maps, tables, and figures.

Study Area

Bhatra, a newly formed Union in 2003, is located in Badda *thana* in the mid-Eastern part of Dhaka megacity. Bhatara Union is about 1554.87 acres or 6.292 sq. km consisting of five villages (Khilbarir Tek, Nurer Chala, Bhatara, Naya Nagar and Solmaid) and surrounded by Ward 18 of DCC on the West, Dumni Union on the East, Ward 17 of DCC on the North and *Sutibhola* canal on the South (Figure 1). This Union is not under the jurisdiction of DCC but lies within the Strategic Planning Zone (SPZ)-12 of RAJUK. Bhatara is close to the affluent Gulshan residential area and Baridhara diplomatic zone in the city. It is also within seven to eight kilometers from the Central Business District (CBD). However, six small scale export oriented garment industries, one washing factory, one handicraft and weaving industry, one ice cream factory, a few bakery and stationery goods factory are located in Bhatara Union. In terms of health services, there is only one private clinic and health center in the Union.
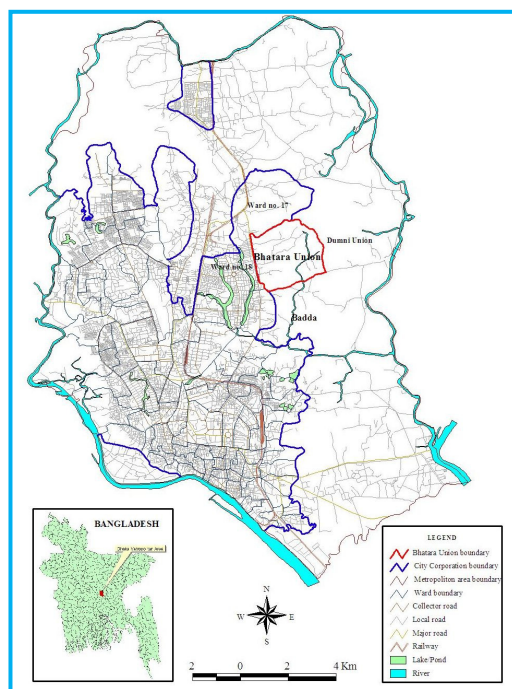

Fig. 1: Location map of Bhatara Union in Dhaka Metropolitan Area.

Urban Growth and Environment Policies in Bangladesh: An Overview

There is a lack of integrated and comprehensive urban development policy in Bangladesh. What exist are some 'stand-alone' policies, owned by different national and local authorities. There are three types of policy areas that have direct and indirect implications for urban growth and environment. These are:

National-level Policies on Population and Housing

The Ministry of Health and Family Welfare formulated Bangladesh population policy in 2004 which focuses to reduce rural-urban migration by promoting *rural employment opportunities in agriculture and agro-based industries.* The National Housing Policy, 1993 tried to ensure housing for all strata of the society, especially for the lower, disadvantaged and shelter-less people (Rahman, 2008: 157).

National-level Policies on Environment

The Environmental Pollution Control Ordinance, 1977 reconstituted the Environmental Pollution Control Board empowering it to control, prevent and abate the environmental pollution (Quader, 2000: 668). The Fourth Five Year Plan (1990-1995) has depicted environmental objectives where c*ontrol and prevent pollution and degradation related to soil, water and air; Strengthen public and private sectors to manage environmental concern as a basic requisite for sustainable development are the objectives.* In 1992, the National Environmental Policy (NEP) was drawn up the following objectives of the policy: *Maintaining the ecological balance and overall development through protection and improvement of the environment; Identifying and regulating polluting and environmentally degrading activities; Ensuring environmentally sound development; Ensuring sustainable and environmentally sound use of all natural resources; and Actively remain associated with all international environmental initiatives* (Huq, 2003: 322). The National Environmental Action Plan (NEMAP) undertaken in 1995. The main activities of NEMAP are "*to better management of scarce resources, reducing the rate of environmental degradation, improving the natural and manmade environment, conserving habitats and biodiversity, promoting sustainable development and improving quality indicators of human life*" (Ministry of Environment and Forest, 1996). However, Bangladesh Environmental Conservation Act, 1995 has committed to the "*conservation, improvement of quality standards, and control through mitigation of pollution of the environment*". To protect natural water bodies, canals, rivers depressed low-lying areas and open space in all the municipalities the Government of Bangladesh has framed the Natural Water Bodies, Open Space, Playground, Park Protection Law, 2000.

Dhaka Specific Policies and Strategic Plans

From 1959 to 2009, there have been a number of plans and projects to improve urbanization in Dhaka from time to time. At present The Dhaka Master Plan, 1959 has completely become ineffective (Haque, 2004:44). A long term strategic plan was prepared to guide and regulate the future growth of the Dhaka Metropolitan Area under the Dhaka Metropolitan Area Integrated Urban Development Project in 1981. The recommendations were made that the northern expansion and peripheral development should be directed towards the flood free areas. RAJUK has developed its 20-year long term (1995-2015) the Dhaka Metropolitan Development Plan (DMDP) in 1995. The plan consists of three sectoral developments-structural plan, urban area plan and detailed area plan.
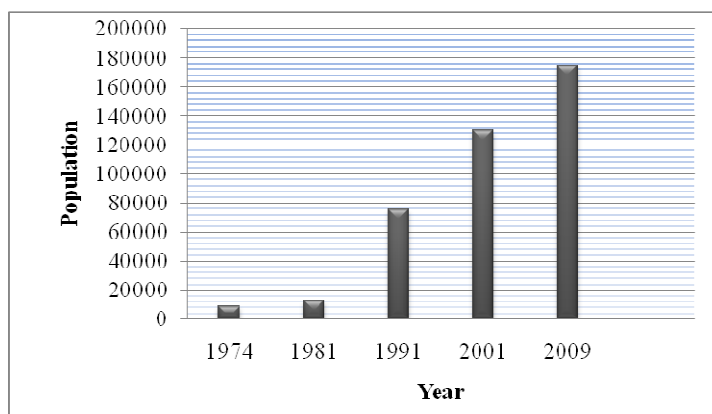
According to the Structure Plan policies, the study area 'Bhatara' Union is comprised of urban fringe development acceleration and area of high agricultural value. It is considered as fringe area of Dhaka in 1980. According to DMDP Urban Fringe Development Policy, *"The*

Authorities will initiate and coordinate a range of measures aimed at stimulating reorganization and re-subdivision of the urban fringe areas. To optimize the utilization of land converted to urban use in the 1980s and the development of appropriate and affordable levels of infrastructure and road provision" (Haque, 2004: 69). The Detailed Area Plan identifies development pattern of this location as spontaneous residential area development and linear commercial development in Eastern side of *Progoti Sarani* (which is a major highway dividing the DCC and the megacity) (*Rajdhani Unnayan Katripakkha*, 2009). However Flood Action Plan (FAP), 1989 were recommended to *protect the drainage system all natural canals and water courses have to be preserved.* Strategic Transport Plan for Dhaka, 2005 also highlighted policies for reducing pollution from noise, vehicle exhausts etc.

Urban Growth in the Study Area

Population Growth

The population growth of Bhatara Union is somewhat exponential. During 1974, the population was only 8,750 (Bhatara Union *Parishad*, 2009). The growth trend was rather slow between 1974 and 1981. In 1981, the population reached 12,795. But major growth had taken place after 1981 with a six fold increase until 1991. In 1991, the population was 75, 380 or 11,980 persons per sq. km which crossed the average population density (7918.43) of Dhaka megacity in 2001 (Bangladesh Bureau of Statistics, 2003). The population reached 129,653 in 2001 and the present population is 174,608 (Bhatara Union *Parishad*, 2009). If we consider the floating population[2] then the present total population probably would reach 250,000. Figure 2 shows the population growth trend in Bhatara Union from 1974 to 2009.

Source: Rajdhani Unnayan Katripakkha, 2009; Bhatara Union Parishad, 2009

Fig. 2: Population growth trend in Bhatara Union *Parishad*, 1974-2009.

Demographic and Socio-Economic Profile

In Bharara Union, 54.02 percent are male and 45.98 percent are female population (Bhatara Union *Parishad*, 2009). The average family size is 4.6. However, majority of the families (60 percent) have between 4-6 members. Sixteen percent families do have more than 6 members as well (Field survey, 2009). There are two public and 16 private primary schools; two public

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[2] In Bangladesh, some people have a tendency to float from one place to another in search of economic and other social reasons.

and 16 private higher secondary schools; seven *madrasas* (religious institutions) and one public library in Bhatara Union. However, there are a few colleges and universities in the periphery of Bhatara Union. The survey reveals that 66 percent household heads are landowners and businessmen. Their average monthly income (Tk 10000-50000) is higher than that of other occupations. After 2001, those who were previously landowners and traditional farmers gradually shifted to land-business (i.e. buying and selling of land) and trade. It was gathered that the educated family members are working elsewhere in the city.

Causes of Urban Growth in Bhatara Union

In Bhatara Union, about 70 percent households are migrated from other parts of the country and the low-lying peripheries of Dhaka megacity and only 30 percent are permanent residents of the Union (Field survey, 2009). Fifty percent residents migrated to Bhatara in the past ten years (Field survey, 2009). Unemployment and lack of business opportunities in the countryside are the prominent 'push' factors for such migration. However, locational advantage is also an influencing factor for population growth in Bhatara due to its proximity to Dhaka city and also low house rent, low land value, future potential as a prosperous area, development of private residential land projects and so on. Among the causes, it seems that economic causes are more prominent than others. Due to growth of garments factories, job and business opportunities in the fringe areas of Dhaka such as Bhatara, 52.24 percent people have moved here (Field survey, 2009).

Environmental Impact in the Study Area: Analysis and Findings

Evidently, rapid urban growth and its allied process have made considerable impact on land, water, solid waste and pollution on the surrounding environment of Bhatara Union. The study findings and analysis is stated below:

Impact on Land

Increased Built-up Areas and Landfills: Built-up areas (e.g. residential, commercial, mixed use, industrial, slums and squatters and paved road networks) have increased in a substantial percent in the post-independent period (nearly 400 percent) (see table 1 and map 2). Slums and squatters were increased from 47 to 71 from 1996 to 2009 (Center of Urban Studies, 1996; Center for Urban Studies et al., 2006). However mixed use areas, slums and squatters, residential, commercial, industrial and paved road networks were increased significantly from 1975 to 2009 (Figure 3). During 1975, there were negligible landfills or bare soil which increased to 19.58 percent in 2009. Because two private sector land developers-Building Design and Developers Ltd. (BDDL) and Bashundhara Housing-are implementing large scale residential land development projects by filling up agricultural land, wetland, water bodies and low lands.
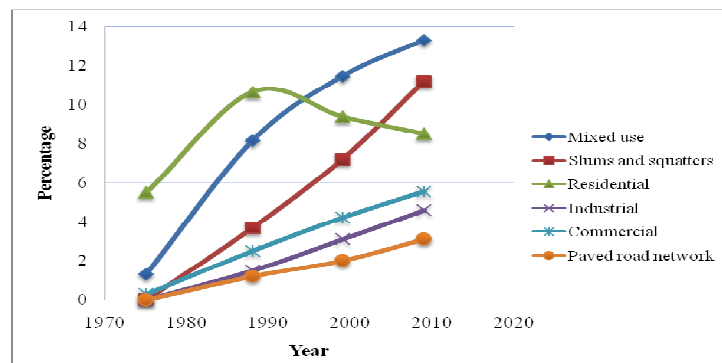

Fig. 3: Growth of built-up areas in Bhatara Union, from 1975 to 2009.

Loss of Agriculture Land, Lowland/Wetland and Water Body: Extensive built-up of residential, mixed use, commercial, industrial land and growth of slums and squatters has resulted loss of natural resources i.e. loss of agriculture land, low land, wetland water bodies etc. Before 1970, the Eastern part of Dhaka and its surroundings were mostly low-lying areas and a few settlements existed there. In the process of urbanization, the areas slowly developed through land filling by sand or earth. Table 1 shows the land use change in different years leading to gradual loss of natural resources. It demonstrates that between 1975 and 2009 agricultural land was decreased by approximately 636.05 acres, wetland/lowland by 141.35 acres, water bodies by 101.07 acres, vacant land by 13.58 acres. Thus it can be said that agricultural land was reduced from 51.54 percent in 1975 to 10.67 percent in 2009. Wetlands decreased to 141.35 acres due to land filling by land developers, encroachment and so on. The green space and vacant land (*are called the lungs of an area*) is declining due to landowners motivation to switch their land use to commercial land market.

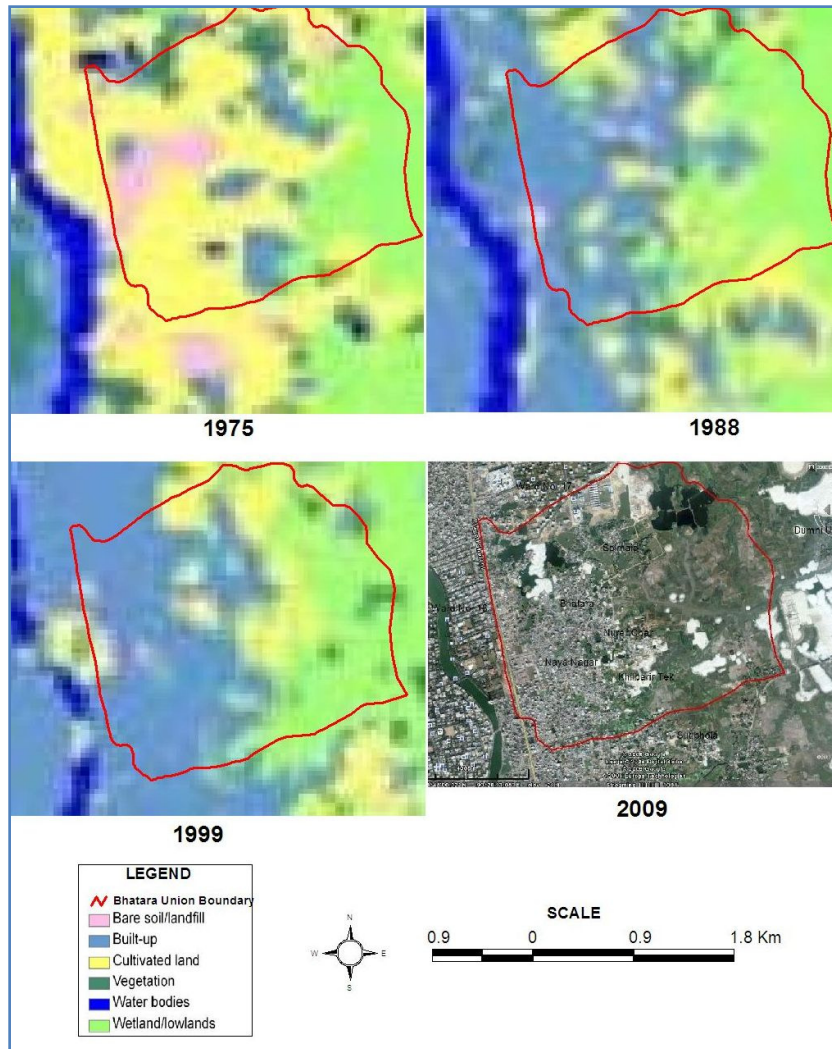Table 1: Land use change for the year 1975, 1988, 1999 and 2009.

Land use types	1975		1988		1999		2009	
	Area (acre)	%	Area (acre)	%	Area (acre)	%	Area (acre)	%
Water bodies	216.57	13.93	195.30	12.56	176.75	11.37	115.5	7.43
Wetland/lowland	395.30	25.42	310.05	19.94	274.50	17.65	253.95	16.33
Agriculture/ cultivated land	801.95	51.58	493.50	31.74	320.20	20.59	165.9	10.67
Built-up	110.50	7.11	430.50	27.69	580.42	37.33	703.5	45.24
Bare soil/land fill	5.45	0.35	105.52	6.79	185.00	11.90	304.5	19.58
Vacant	25.10	1.61	20.00	1.29	18.00	1.16	11.52	0.74
Total	1554.87	100.00	1554.87	100.00	1554.87	100.00	1,554.87	100.00

Source: Dewan *&* Yamaguchi, 2008; Google Earth, 2009, Rajdhani Unnayan Katripakkha, 2009
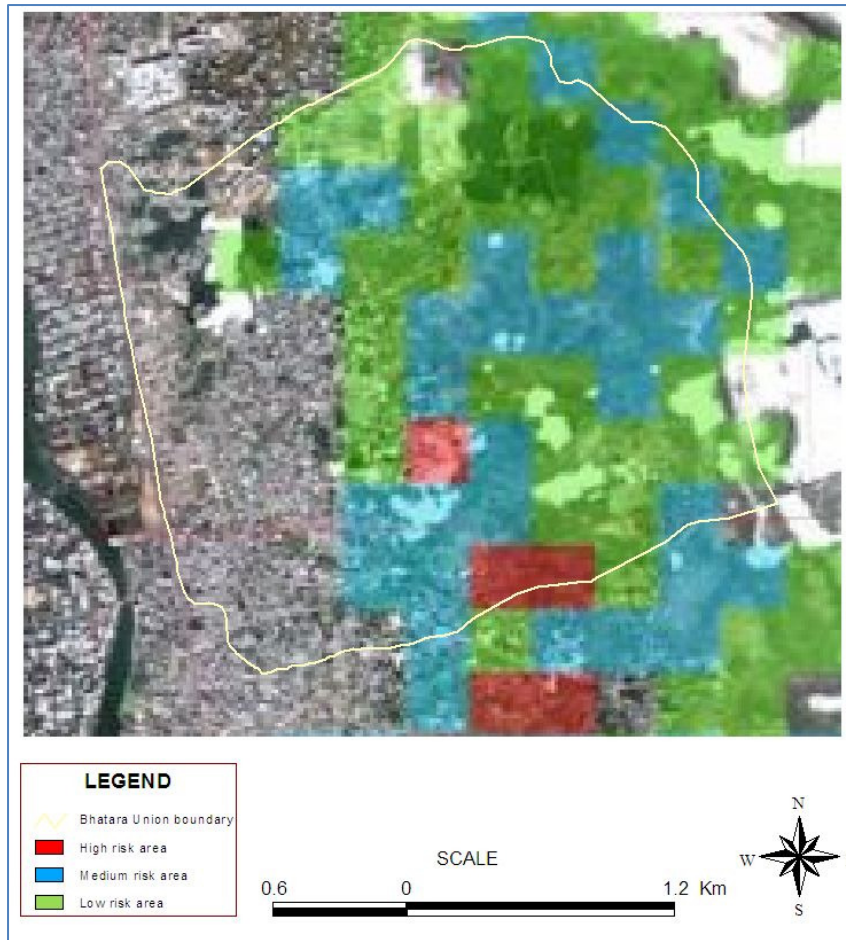
Impact on Water

Water Scarcity: In terms of water resources, increased built-up area, land fillings, reduced water bodies, wetlands and lowlands led to less infiltration for groundwater (i.e. reducing the water level) which created water scarcity. The average annual decline of ground water in Bhatara Union is relatively better (Dhaka Metropolitan Area decline rate 2-3 m) and it varies from 1 to 2 meter (Bhatara Union *Parishad*, 2009). Private sector provided many deep tubewells in the past with a deep around 170-180 ft. But presently these tubewells do not get enough water due to declination of water level.

Water Logging and Flood Sensitivity: This growth ultimately resulted in a major portion of fully (32 percent) and partially (32 percent) water logged area. Growth of slums and squatters and unplanned construction of houses, lack of maintenance by government makes a substantial percent of poor and moderate drainage condition which result in flooding, waterborne diseases, odor and mosquitoes. Sixty eight percent respondents are facing mosquito problems and 50 percent are facing water logging (Field survey, 2009). Heavy rainfall yet small duration causes water logging in most of the built-up areas in the Union. It becomes a key source of waterborne diseases.

Source: Dewan *&* Yamaguchi, 2008; Google Earth, 2009.
Fig. 4: Landuse Change in Bhatara Union from 1975 to 2009.

Masood (2008) assessed flood risk in Mid-Eastern part of Dhaka (see map 3). According to his assessment, high risk zone covers very few areas at the Southern side of the Union because area coverage with houses is high i.e. population density is also high in the area. He again observed that the Western built-up area is risk-free though the area is densely populated. However maximum part of the area is medium risk and low risk area where inundation depth is high but population density is very low. This area mostly covered by agricultural field.

Source: Masood, 2008
Fig. 5: Flood risk map in Bhatara Union.

Impact on Pollution

Rapid urban growth and sprawl based development in the *Progoti Sarani* results a greater volume of transportation movements in the study union. The means of tranasportation i.e. the motorized and non-motorized vehicles have grown four times from 1990 to 2009 (Bhatara Union *Parishad*, 2009). It is because of numerous constructions of buildings, land filling and number of commuting population. A major percent (41.67 percent) of people think that air pollution is mainly caused by motor vehicles. Twenty five percent respondents feel that toxic fume from growth of garments factories is one of the main sources of air pollution. On the other hand, 25 percent observes that household kitchen smoke and haphazard waste dumping also result in air pollution (Field survey, 2009). These multiple causes of air pollution result in hypertensions, cancer, heart diseases, headaches and also harms to the plants by acid rain.

Water pollution (i.e. surface water pollution) mainly occurs from domestic waste water (37 percent) and untreated industrial effluent (41 percent) which adversely affects the biodiversity and ecobalance. With expansion of urban area, the noise pollution is on the rise with the increasing number of motor vehicles, market places, industries etc. Respondents mainly face

noise problems by hydraulic horn of motor vehicles which impacts blood pressure and sleep loss (Field survey, 2009).

Public Opinion and Suggestion

The dwellers opined that lack of government support and lack of citizen awareness are the two main causes of environmental degradation in their area. They also think that local initiatives, NGO support and social mobilization are needed to address environmental issues. They suggested that government should engage in monitoring and investment and communities should also act together to campaign for social awareness as a way to check environmental degradation in Bhatara (Field survey, 2009).

Case Studies

The three case studies from Bhatara somewhat echo the citizen survey results. The Union *Parishad* chairman has explained the administrative failure on environmental degradation of his Union *Parishad*. He realized that government should impose its legal power against illegal development and pollution to save Bhatara from further environmental degradation. A local businessman has realized the economic, physical and environmental change in Bhatara but suggested that government should provide adequate infrastructures and facilities to the villagers and take appropriate action against environmental degradation as soon as possible. A traditional rich landowner has also explained rapid land use change and its negative impact on environment in his village. He feels that villagers must be aware about the environmental consequences of growth, and suggests that Union *Parishad*, CBOs, and NGOs should take collective action to protect the area from land encroachment, solid waste hazard and other environmental problems.

Recommendations

Based on the analysis and findings of the study, some policy suggestions for environmental protection in Bhatara Union are made in this research, which are as follows:

Land Use Restrictions and Density Control

The extensive land use change in the study area requires that the planning authority (RAJUK) should enforce land use restrictions by zoning and density control. It should be implemented by recognizing the present land use. Further land use changes should be restricted to certain uses to be determined by the planning authority. It should be done in consultation with the local stakeholders. Otherwise, haphazard and spontaneous construction, encroachment, and illegal land fillings in the water bodies, wetlands, low-lying areas from private residential land development projects will continue by violating the Natural Water Body, Open Space, Playground and Park Protection Law, 2000; Flood Action Plan 8A and other relevant acts and plans that are developed by RAJUK. Density control with required facilities and infrastructures for the future must include in the upcoming plans in the study area.

Capacity Building of Bhatara Union Parishad

The Union *Parishads* in Bangladesh are basically involved in development and administration of rural infrastructures. They also have provision for the management of environment. However they are not performing their environmental role due to capacity and budget constraints. As environment management is a profound issue for Bhatara, government should empower the Union *Parishad* with grant and training support to pursue appropriate environmental management strategies and actions.

Effective Coordination amongst the Local Authorities

All the local authorities such as Bhatra Union *Parishad*, RAJUK, DoE are aware of the root causes of urban growth vis-a-vis environmental impact in Bhatra Union. The authorities thus

can take collective steps to take coordinated action to cope with the environmental challenges. Such coordination will help to reduce pollution and to improve the quality of life. This effort will help the authority to execute and impose legal power in their jurisdiction.

Involvement of NGOs, CBOs and Local Stakeholders

The NGO and CBO participation has proved to be an effective tool for community based environmental management. In Bhatara Union, environment is mainly polluted by dwellers themselves and other allied processes of urban growth. Thus NGOs and CBOs can take various programmes (like surveillance, awareness raising, campaign, social mobilization etc.) to improve waste management, to provide drainage and primary health care services. On the other hand, such programmes will be fruitful if they involve local stakeholders in all stages of planning, implementing, maintenance and monitoring.

Priority Projects

A significant portion of Bhatara Union is already a built-up area. Thus serious attention should be given to the need for improving urban strategies, which will promote efficiency in resource use. Such strategy will reflect the demand of land, water, and other urban services and tackle the problem of population growth in Bhatara Union in a rational manner. However, urgent attention should be given to reduce water pollution which is the main source of creating health hazard. It can be done by involving NGOs to take a project in waste collection, treatment, and disposal and by imposing government rules and regulations for the garment industries and other polluters of environment.

Conclusion

Bhatara Union in Dhaka megacity has a great importance as a local government and urban fringe at the periphery of DCC. Thus appropriate legal, institutional and community action must be taken by promoting sustainable development in Bhatara. Such a move will lead to regulate a well planned settlement, to defeat the loss of natural resources, to improve the living environment and to reduce local pollution. It should emphasize growth control, economic development and environmental management. It is also important that the concerned authorities including DCC and RAJUK will adopt a similar strategy to help improve the urban environment in Dhaka megacity.

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