

Potential hazards and vulnerability in urban development of Dhaka city, Bangladesh

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ABSTRACT: Bangladesh, dictated by its inherent geology and conditioned by its geographical location, suffers from natural calamities on a regular basis. Dhaka city, the capital of the country, is faced by rapid urbanisation caused by a very high rate of migration by rural people, many of whom are battered by natural calamities. The problem is further aggravated by limited land supply in urban areas, lower land utilisation and lack of proper policy and planning of landuse. The rapid influx of population to Dhaka city results in excessive increase in land prices and, consequently, the last decade has witnessed the narrowing down or blocking up of several natural canals for the purpose of construction of roads and buildings of different types. Unregulated disposal of garbage, many of which are non-biodegradable, in the canals have also filled them up. High land price encourages construction of multistoried buildings which, invariably, exerts added pressure to the various, ill-planned, utility services. During occasional floods and regular water-logging due to rains, water mixes with sewage and waste water from septic tanks and pit latrines, decomposes garbage dumps and deteriorates the environment beyond any health limit. Outbreak of fatal diseases in such circumstances is thus rampant. The paper tries to identify how natural calamities like cyclone, flood, etc. and man-made tragedies like fire in high density settlements, environmental pollution, failure of structures due to poor design, etc. affect the life and development of metropolitan Dhaka.

1 INTRODUCTION

During the last four decades, Dhaka city, the capital of Bangladesh, has recorded a phenomenal growth in terms of population and area. Dhaka at present is one of the fastest growing metropolises in the world. The urban development, however, seems to lack in planning and the problems of urbanisation are intensified by high population growth and rural-urban migration. Again, Bangladesh suffers from natural calamities every now and then and the urbanisation of metropolitan Dhaka is also affected by it. The existing utility services are not capable of coping with the increased demand of the urbanisation process. Faulty planning, lack of coordination among various agencies and an overall disregard to environmental issues, also prevents Dhaka city from having a healthy growth.

2 LANDFORMS AND FLOOD

Most of the Bangladesh is an extremely flat delta which consists of a large alluvial basin flooded primarily with Quaternary (Pleistocene, early recent

and recent) sediments deposited by the Ganges-Padma, the Brahmaputra-Jamuna, and the Meghna river systems and their numerous tributaries and distributaries. Figure 1 shows generalized contour and major geomorphological zones of Bangladesh. Whereas half of the country lies within an elevation of 10 meters above the mean sea level, the elevation of its capital Dhaka is only 5 meters above the mean sea level. Floods in Bangladesh are mainly caused by heavy rainfalls during monsoons and sometimes by excessive flow of water from the upper riverine countries such as India and Nepal. Excessive rainfalls flood the low lands and submerge all settlements in these areas. Understandably, Dhaka city is affected by floods time to time.

During the monsoons of 1987 and 1988, Bangladesh suffered two of the most serious floods on record. During these floods, vast areas of the capital city Dhaka, with a huge population of about 4.8 million people, were inundated to a phenomenal degree with flood levels about 150 cm above normal for periods up to four weeks. It is estimated that about 200 sq. km of the total of 260 sq. km area of Dhaka city was submerged to depths ranging between 30 to over 450 cm. About 60% of the

LEGEND

INTERNATIONAL BOUNDARY	—
GREATER DISTRICT BOUNDARY	- - - - -
RIVER	~~~~~
RECTIFY FLOOD PLAIN AND PRESENT ALLUVIUM	
LIFTED PLEISTOCENE ALLUVIUM TERRACES	
TERTIARY AND PLEISTOCENE HILL FORMATIONS	



Figure 1 Map showing major geomorphological zones and generalized contour map of Bangladesh

Dhaka city population was directly affected by these floods. Figure 2 shows the level of flooding in a poor neighborhood of Dhaka city in 1988.

3 INADEQUATE DRAINAGE

Dhaka city virtually swamps under water in almost all places as rains drench the city for some time. These days it has become a common scenario to find most parts of the city water-logged and several areas under 30 to 60 cm of water whenever it rains continuously for some time. The city's outworn and ill-planned sewerage system fails to cope with the discharge at every occasion. As a result of the water-logging, traffic at some major city intersections have to move with great difficulty while many cars and other vehicles go out of order after getting stuck in water-logged roads. Pedestrians have to wade through mud and filth as the water in most of the places of Dhaka city remains knee-deep

in such circumstances. The grave condition that prevails in Dhaka city roads can be visualised from Figure 3 where a push-cart can be seen transporting a three-wheeler.

The water-logging of Dhaka city is not a new problem. It is undoubtedly linked with the bad drainage system of the city and directly affected by flood. It is worth mentioning here that Dhaka city is bordered on the south, east and west by rivers Buriganga, Balu and Turag. These rivers are directly fed by natural system of canals from the city centre. A number of canals/khals viz. Begunbari khal, Gerani khal, Dholai khal etc. have served in the past as natural channels for excess water drainage. Unfortunately, the last decade has witnessed the narrowing down or blocking up of part of these canals for the purpose of construction of roads and buildings. All these were apparently done for an ever increasing number of city population.

At present, the whole city is devoid of any storm water drainage system. Consequently, water is collected in roads, ditches and low land areas. Under Flood Action Plan (FAP), Dhaka Integrated Flood Protection was formulated to save Dhaka from the onslaught of flood water. In practice, apparently, the project has turned out to be one of the causes of water-logging problems of the capital. The primary objective of the project was to construct embankments and flood walls along the perimeter of the city. The work was to be complemented by the provision of pipe sluices, cleaning and repair of internal drainage canals and improvement of sewerage system. The embankments, in addition to preventing water from entering the city, are impeding excess water to be drained out of the city. Figure 4 shows an under-construction reinforced concrete box culvert to be used as storm sewer. Ironically, the vast areas on either side of the culvert was a natural drainage channel only a few years ago, which was subjected to human interference. The storm sewer system is yet to be completed and commissioned as court order prevents construction of some of its segments on petition of the land owner. Unfortunately, like the private developers, the Dhaka City Development Authority (known as *Rajdhani Unnayan Kartipakkhya* - RAJUK) has earth filled, in the recent past, about half of the width of Banani-Gulshan lake (Figure 5) and allotted plots. Thus, even if the storm sewerage functions according to design, deficient natural drainage will invariably invite floods, water-logging and, of-course, misery to the life of the metropolis and impede its development.

In order to save Dhaka city from the miseries of water-logging, indiscriminate closure of natural drainage channels and low lying areas should be stopped immediately. Existing drainage systems should be improved and use of non-biodegradable packaging materials (viz. polythene bags) banned.

Present administrative framework is to be modernised as it is not capable of catering for the intricate co-ordination needed for flood control, water resource management and drainage of Dhaka city.



Figure 2 Extent of flooding in a poor neighbourhood of Dhaka city in 1988



Figure 3 A water-logged Dhaka city road



Figure 4 Storm sewer construction while earth filling surrounding natural drainage channel

4 URBANISATION AND THE ENVIRONMENT

Unregulated disposal of garbage, many of which are non-biodegradable, in the canals have also filled them up. During the flood of 1988 these canals overflowed their banks and immersed roads and housing areas in their vicinity. The flood or stagnant water understandably mixes with sewage and waste water from septic tanks and pit latrines, decomposes garbage dumps and deteriorates the environment tremendously (Seraj, 1994). Outbreak of fatal diseases in such circumstances is thus rampant.

Banani-Gulshan lake, located in a residential area where the very rich and the very poor slum dwellers coexist (Figure 6), receive primarily domestic sewage without any treatment and surface runoff. The situation is complicated by the fact that part of the lake was reclaimed through landfilling using solid wastes from various sources. No precautionary measures have been taken to divert the leachate generated from the decomposition of organic wastes and no lining has been provided. Thus, leachate from the landfill area goes directly into the lake water. In August 1996, episode of widespread fish kill have been recorded by the Department of Health. However, no study has been conducted to identify the cause of this fish kill episode.

Deposition and atmospheric fallout of pollutants from industrial and vehicular emission during rainfall, in addition to the increased surface runoff due to change in landuse pattern, increase the heavy metal inputs to the city lakes. The surface water in Dhaka city is being polluted daily through indiscriminate domestic and industrial sewage disposal without treatment directly in to the water bodies. Dhanmondi lake, located in a densely populated residential area, water quality studies indicate that Pb and Cu concentration in the surface water during dry season is way above the acceptable limit. In addition, accumulation of these heavy metals in the sediment through years of input has increased the concentration in the sediment layer. A study on bottom feeding fish for lead accumulation (Ahsanuzzaman, 1996) has revealed that about 4.7 mg/kg of wet mass of Pb is present in the gills of Nilotika fish caught from the Dhanmondi lake.

5 WATER SUPPLY SITUATION

Dhaka Water and Sewerage Authority (DWASA) provides water to only 55% of the population within its service area. About 2.7 million people have house connections and an additional 300,000 obtain water from 1209 street hydrants. The rest rely on private hand tubewells, lake/river water. Assuming a daily per capita consumption of 180 litres, DWASA's present water production could serve

70% of the population in its service area. But with 26% water loss due to system leakage and another 30% due to poor revenue collection, the total unaccounted for water in Dhaka stands at 56% (GKW, 1989). Understandably, a large number of people suffer from chronic water shortage.



Figure 5 Land filling in Banani-Gulshan lake



Figure 6 Coexistence of richer population and slum dwellers



Figure 7 A seven storied building after collapse

6 SANITATION SITUATION

Sanitation coverage by waterborne sewerage system in Dhaka is around 18%. About 40 % have septic tanks, 15% sanitary pit latrines and the remaining population resort to unsanitary latrines and open defecation. Some 87% of inhabitants in slums and squatters in Dhaka rely on low quality *kutchra* latrines (CUS, 1988). Children defecating in open drains in slum areas are a common sight. The transient nature of settlements and poor awareness of health-sanitation relationships deter the building of sanitary latrines in squatter settlements. Availability of public sanitation facilities is scarce.

7 LACK OF BUILDING REGULATIONS

In Dhaka city, like any other place in Bangladesh, structures are designed and constructed without abiding by specific building regulations. The main reason for which lies in the absence of any such unified regulations in this country. Although, at present, a Bangladesh National Building Code is available, it may still take some time to make it a law.

RAJUK has so far failed to ensure that the structures built under its jurisdiction are safe from structural design point of view. Recently, in September 1996, a seven-storied framed structure completely collapsed at Kalabagan (Figure 7). The structure was badly designed and poorly constructed. In order to ensure safety of life, old and potentially dangerous dilapidated buildings should be identified and demolished, if economic renovations are not possible.

The non-existence of Building Code has obvious disastrous consequences. In recent times fire has become a common hazard in high density residential as well as commercial areas. Dhaka has witnessed fire in the United States Information Service building in the central business district of Dhaka; the tall structure had no fire fighting facility. Fire incidences in garment factory buildings is very common. In the past, fire broke out in a garments factory in Mirpur, Dhaka. The owner of the factory along with twenty female workers succumbed to fire injuries. The cause of the death of so many persons was simple. The stair of the factory building was too narrow to allow escape of too many frightened people. There was no alternative escape either. In addition to regular incidence of fire in godowns, markets and other inadequately housed commercial and industrial settlements, fire is very common in the squatter settlements and shanties and cause damage to life and property. Absence of fire prevention Code, lack of fire exit, inadequate fire drill, setting of industries in residential buildings and mushroom

growth of slums - all are contributing to the ever increasing number of fire related disasters in the city.

The Bangladesh National Building Code, has to be given legal status and its effective application has to be ensured. However, it is to be remembered that Code is an ever developing activity and unless it is updated on a regular basis, its use will be inappropriate. Here, the Code has been written as a fixed-rate consultancy project with its inherent limitations of time and resources. Whereas in the Western world, there are many institutions which continuously do research and incorporate their findings into the Code, in Bangladesh a very limited number of research institutions are present. Understandably, many specifications of Bangladesh Code are adapted from established foreign Codes. Thus, apart from constituting a Code Enforcement Authority, a research institution has to be created which shall conduct research on Bangladesh Code provisions, gather information regarding changes in the Codes which form the basis of Bangladesh Code and regularly update it.

8 ENVIRONMENTAL HAZARDS IN SLUMS

In the metropolitan Dhaka, slums of various descriptions grow up on vacant public lands, along railway tracks and around bazaars and natural lakes. They proliferate by the day, because of the ever worsening poverty level of the rural as well as urban poor. No real survey seems to have been made of the city's slums. It is estimated that about 50 percent dwellers of Dhaka city live in slums. Thus the city's slums have taken on an unusually enlarged dimension. Slum dwellers are no tax payers. They are not voters either. Therefore, politically they do not exist. On the other hand, humanly and nationally they very much do exist and constitute a vital segment of the people.

Usually cardboard, bamboo, straw matting, pieces of plastic sheet or tin or any other cheap material are used in the construction of the temporary structures in the slums. Needless to say that the slums are breeding grounds of diseases and epidemics because of the extreme poverty, starvation and malnourishments of their dwellers. The minimum municipal facilities like access, water, electricity, sanitation and sewerage are either inadequate or completely denied to them. Social facilities like education, health and recreation are also nearly absent. The housing of the low income people are most affected and, commensurate with the length of the monsoons, the poor are subjected to the mercy of the natural disasters almost half the year. Their misery is not only being rendered homeless, but also being forced to live in unhygienic and inadequate conditions even after the ravages of nature subside.

Apparently, nobodies sensibilities are affected by their continuing plight.

Apart from implementing the existing slum improvement programmes faithfully, economic emancipation of the whole country and natural disaster mitigation in other parts of Bangladesh is a prerequisite to off-load Dhaka city from an ever increasing amount of rural-urban migration.

9 INTERACTION OF URBANISATION WITH POPULATION GROWTH

The problems of urbanisation in Bangladesh in general and Dhaka city in particular are intensified by high population growth and rural-urban migration. For Bangladesh the problem is further aggravated by limited land supply in urban areas, lower land utilisation and lack of proper policy and planning of landuse. The ever-growing urban population is creating an increasing demand for space. This rapid influx of population to the (capital) city results in sky-rocketing land prices and provides some stimulus to construction of high-rise buildings.

At present the Dhaka metropolitan area consists of the inner city which is almost built-up and surrounding areas which are semi-builtup. During the period from 1981 to 1991, the greater Dhaka population grew at an average rate of 5.5% from about 2.8 million to 4.6 million. During the same period the built up area increased from 104 sq. km (39% of the city area) to 114 sq. Km (43%). The estimates of 1993 show that the population of greater Dhaka city is about 4.8 million. The surrounding areas of Savar, Tongi, Narayanganj, Keraniganj and the fringes contain a further 2.2 million people, for a total Dhaka conurbation population of about 7.0 million. The actual population of 2001 will be higher because Dhaka will grow beyond the assumed 1981 statistical metropolitan area boundary by the year 2001. This additional population in the coming decade will add new dimensions to the urban fabric of metropolitan Dhaka. The main reasons for the huge anticipated increase of Dhaka population in the coming decade is due to unbalanced urbanisation and presence of primacy in the city size distribution pattern. Compared to other developed and developing countries, it is evident that, although the overall extent of urbanisation in Bangladesh is not much, the average growth rate in the major cities is very high.

The value of land in Dhaka city, mainly in the central area, has increased at a rate much higher than the rate of any other commodity. While between 1969 and 1979 the cost of living in Dhaka has increased 4 folds, the price of high class residential land has increased approximately 25 to 35 times.

Another source quotes that the land prices in Central Dhaka has soared from Taka 3/sq. m. in 1950 to more than Taka 8,000 /sq. m. in 1990.

In Dhaka city, high-rise buildings have established an efficient setting for corporate business enterprise. They act as a significant source of revenue and a business focus for the entire metropolitan area. The high-rise buildings have, however, enjoyed only limited success in residential and manufacturing uses. At present, high-rise buildings for residential purposes are being seriously considered in an effort to provide a sensible answer to urban housing problems. However the suitability of such propositions, in the context of conditions prevailing in Dhaka city must be studied in great depth before adopting high-rise buildings for residential purposes.

Because of the great size and height, the development of tall buildings usually involves active interaction of public and private decision makers. Successful public and private collaborations is expected to revitalise the urban environment of Dhaka city. However, in the absence of proper urban planning and design, high-rise buildings of Bangladesh are responsible, in many instances, for several problems leading to disadvantages for Dhaka city dwellers. Unplanned tall structures destroys the harmony in sky line. In Figure 8, structures of various heights can be seen. Presence of a few very tall structures in a neighbourhood which was not originally planned to accommodate such tall buildings, undoubtedly put pressures on utility services like water supply, gas and electricity. It increases traffic congestion and parking problem and creates problems of light and ventilation for adjacent small structures. Apart from disturbing the social and environmental harmony, unplanned construction of tall structures usually result in lack of community space, lack of children's play area and Socio-psychological problems.



Figure 8 Lack of harmony in Dhaka's skyline

10 CONCLUSIONS

This paper examines the prospects and problems of urban development of Dhaka in the light of population increase, land value, land use and from the point of view of urban planning, design and environmental concerns.

The urban development of Dhaka city is hindered by both man-made and natural hazards. In order to successfully implement any flood control and drainage system, an effective and all-encompassing institutionalised management cell has to be developed.

The performance of various agencies related to the provision of essential utilities like electricity, gas, water, sewerage, etc. have to be improved in line with the growing number of city dwellers. Concerted efforts by the planners, architects, engineers and administrators are needed for a planned and economical urban development of the Dhaka city. In high-rise / high density zones, co-ordination between utility agencies should be increased to plan in advance for high capacity utility mains.

Proper rules and regulations for building construction should be formulated and implemented. Zoning law for Dhaka city in terms of use, class and height should be formulated and strictly enforced. Building rules related to lift, parking and fire fighting should be strictly monitored and enforced by concerned agencies.

All development activities should be preceded by a detailed environmental impact study in order to achieve a sustainable urban development of Dhaka city. Again, the needs of least privileged and most vulnerable slum dwellers should be carefully looked into for balanced city development.

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