

## **URBAN ENVIRONMENTAL HEALTH & SUSTAINABILITY: THE EXPERIENCE OF DHAKA**

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### **Summary:**

Bangladesh is suffering from a number of environmental problems and so is its over crowded capital Dhaka. For development, specially in the scenario of Dhaka, to be meaningful and sustainable over a longer period, environmental concerns must be integrated with all development activities and through a radically improved development path. (SoE, 2001) ). As Islam (2000 p.36) argues, economic growth may actually suffer as a result of environmental degradation. The World Bank has already insisted that Dhaka has to improve its environmental performance for support from the Bank (World Bank 1999).The environmental problems of Dhaka are mostly the outcome of high in-migration and unplanned urbanization. Sultana (2000, p.1) has observed that, with its growth, Dhaka has become a showcase for almost every urban problem imaginable-land use alterations, inadequate shelter, water/sanitation, and other facilities in slums and other urban poor areas, degradation of community ambient environment, and little control of industrial waste emissions. which often greatly compounds the problem of environmental pollution due to inadequate management of human and domestic wastes (SoE 2001, p.2.21). The government has formulated environmental rules which again are primarily violated by Government institutions. Corruption amongst Government service providers further aggravates the scenario. The current Development Plan (DMDP) formulated in 1995 has provisions for improvement of slums and overall urban settlement pattern. The need to live a safe and healthy life, as basic need as food and shelter, for the urban citizens is not yet on the prime agenda of the Government. Urban health still relates to a few vaccination programs or setting out small family care centers. The broad perspective to ensure ecological as well as human environmental health yet need to be recognized rigorously.

## Introduction

Bangladesh has been striving for economic as well as technological growth to reduce poverty. The process is often carried out at the expense of the environment. The poor in countries such as Bangladesh tend to destroy their immediate environment in the struggle for life, often without knowing the impact of their actions. Promoting development at the cost of environment, and considering environmental conservation a luxury, have been convincingly challenged by the 'sustainable development' movement over the past decade (Lee 1994; Islam 2000, p.35). It is increasingly being recognized in Bangladesh, as in other parts of the world, that for development to be meaningful and sustainable over a longer period, environmental concerns must be integrated with all development activities. Islam (2000 p.36) argues that economic growth suffers due to environmental degradation which again is reflected by the World Bank's assertion for continued support provided environmental performances of Dhaka are improved.

Bartone et al (1994) defined the 'urban environment' as 'the physical, social, economic, political and institutional features of the ecosystems that surround and support human life and ultimately determine the quality of life' (cited in Lee 1994, p.391). Based on this definition Lee asserts that, 'the notion of urban environment is human-centred, and it concerns both the built environment of the city and natural environment that provides resources for the city and is in turn affected by urban growth.' Environmental problems, according to Leitmann (1999), can be divided into four categories: problems of access to environmental infrastructure and services; problems of pollution from urban waste; problems of resource degradation and emissions; and problems of environmental hazard. Low-income countries such as Bangladesh face all of four these of these categories. The problems occur simultaneously. Often interaction between problems may cause a new problem. The environmental problems of Dhaka are mostly the outcome of high in-migration and unplanned urbanization. Sultana (2000, p.1) has commented that, 'with its growth, Dhaka has become a showcase for almost every urban problem imaginable, most of which are due to over density of population.' Un-planned growth has involved (i) land use alterations, (ii) inadequate shelter, water/sanitation, and other facilities in slums and other urban poor areas, (iii) degradation of community ambient environment, and (iv) little control of industrial waste emissions, which often greatly compounds the problem of environmental pollution due to inadequate management of human and domestic wastes (SoE2001, p.2.21). The environmental aspects that dominate the urban environment of Dhaka, as identified by Islam (2000, pp.156-63), are the physical destruction of nature, water supply, sanitation and drainage, waste disposal, air pollution and health.

### 1. Physical Destruction of Nature

Dhaka has lost extensive natural resources in the process of urbanization. Political decisions further contribute to this destruction. The early victims of this process were the *khals* (the canals) of Dhaka, most of which have disappeared and the few remaining are continuing to disappear under built structures and illegal encroachments. The low-lying areas, lagoons and wetlands on the fringe of the city are constantly being occupied for future development- a more popular trend of land development introduced by the private real estate sector. The filling up of the natural waterways running through the city has led to water-logging which is exacerbated by the poor drainage capacity of the sewerage system especially in the rainy season. There are allegations that the greater Dhaka flood protection dam, completed after the disastrous flood of 1988, is also causing water-logging as the embankment retards the natural drainage process (Islam 2000, p.158). A perfect example has been the devastating flood of 2003 that almost stalled urban life. Suction pumps, which again were susceptible to frequent power failure, used for pumping out the water were merely a gimmick of attempting to the problem. Uncollected garbage on top of the standing flood water made life even more miserable. People acutely suffered from skin diseases as well as diarrhoea. Illegal encroachment of river bank of the Burigंगा adds to the situation in every flood. Such encroachments has been like vicious circle- each time the banks are cleared; structures start showing up within a few weeks- often with the help of the concerned authority.

Like the canals, wetlands and water bodies the park systems and gardens are disappearing gradually. Important park locations are occupied by illegal settlements, and approved developments. Depredations include the felling of trees at the Usmani Uddyan (park) for a five star hotel and the destruction of part of the Chandrima Uddyan for construction of the NAM (Non Allied Movements) Convention Centre (Huq 1999). In these instances, political leaders and decision-makers supported the park encroachments. Large roundabouts in all major avenues had plantation islands at crossings; that are reduced to nothing claiming to ease traffic jam. However the attempt was a back to square one effort- nothing eased.

## 2. Water Supply

The Water Supply and Sewerage Authority (WASA) is responsible for water supply and sewerage disposal services in Dhaka city. The water supply system consists of two production systems- a surface water treatment plant and an extensive production system of collecting water from deep wells. The municipal water supply is mainly derived from groundwater storage (90%). The surface water contribution is only 10%. However the capacity of these systems is inadequate to serve the huge population of the city. According to official sources, WASA is now producing 128 to 130 crore litres per day, which as Hasan (1996) states, barely meets 50% of demand. In the dry season, November to March, water shortages become so acute that the Government has had to deploy the army to prevent water theft in Dhaka (Lawson 2002). A study by UNDP (United Nations Development Programme) showed that deep well water extraction leads to lowering of the ground water table during the dry season. The water table is lowering at the rate 0.75m per year due to over exploitation (Hasan 1996). In a city of 12 million people there are only 1,150,000 water connections (Islam 2000, p.158).

The sewerage system is equally inadequate. In the 1990s, Dhaka had 40,000 connections and 460 km. of sewer line (Islam 2000). Most households in the formal residential districts that do not have access to the sewer systems use septic tanks. Most slum dwellers use latrines located near their settlements, or the nearest surface water source, or defecate in the open-air. These human waste disposal methods are the fundamental cause of poor hygiene in the slums and informal settlements.

## 3. Sanitation and Drainage

The surface water quality of the rivers running through Dhaka is a major environmental problem for the city. The three rivers which flow through the metropolitan area - the Buriganga, Sitalakhya and Balu river systems - receive a large quantity of waste from the city directly or indirectly. The untreated chemical waste from the tanneries and nearby industries as well as municipal drains carrying untreated sewage and sullage, are the prime pollutants of surface water. However, a substantial amount of drinking water for the city comes from the Buriganga River. Illegal encroachments on the banks (see fig.-2), as well as into the river, are narrowing the channel and thus reducing the flow capacity. The most significant source of pollution in the Buriganga River is industry, particularly the tanneries at Hazaribagh (see fig.-1). In the Buriganga, the Dissolved Oxygen level becomes very low or non-existent in the dry season and the river becomes toxic (SoE 2001). Water quality data from two stations, Hazaribagh and Chadnighat, on the Buriganga river in 1998 revealed that Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD) exceeded the tolerable limit in the months of January, February, March and December, of which the worst situation prevails in the months of January and February (see Figure 3). The Sitalakhya River flowing east of Dhaka is not as affected as the Buriganga. The Dhaka Metropolitan Development Plan has mapped Water Quality Protection Zones along the Sitalakhya system as constraints to future urban development (DMDP 1995 vol.I).



Photo Courtesy: The Daily Star

Fig.-1 chemical waste from tanneries being released into the river Buriganga



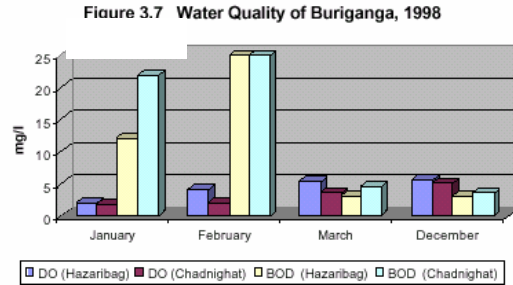
Photo Courtesy: The Daily Star

Fig.-2 Illegal encroachment of the river Buriganga

## 4. Waste Disposal.

Around 5400 tons of human, 3500 tons of solid and a similar volume of industrial and other waste are released in the air, surface and ground water table in and around Dhaka city everyday (*The Daily Star*, 19 November 2000). The amount is increasing everyday with the ever increasing population. However due to the subsistence nature of the economy, most household wastes are recycled (United Nations 1987, p.26). Dhaka City Corporation is responsible for collecting most of the garbage. The city corporation uses 100 trucks and 2380 hand trolleys to collect and dispose the waste and 50% of the waste is never collected (Islam 2000, p.159). The DCC with its limited resources, lack of technical know-how, and inadequate policy

Figure 3. Water Quality of the Buriganga River at Dhaka, 1998



Source: SoE 2001, p. 3.24

Frame work is facing an insurmountable task in cleaning the city to an acceptable level. Garbage is openly dumped in the streets and water bodies. The City Corporation now encourages private waste management Initiatives. This private level solid waste management have proven that people are in fact ready to pay more for better services (Changemakers 2002). In order to keep the neighborhoods clean at the local level more than 200 neighborhoods in 90 wards of Dhaka city have organized, on a self-help basis, their own primary house-to-house waste collection system with contributions in the form of service charges by the community. Community-based collection of solid waste in the capital city has been in operation for more than a decade. It provides waste collection service from house-to-house and transports the waste to nearest municipal bins or demountable containers. These community based initiatives have led to a clean neighborhood but at the same time given a dirty look to the city, due to non-removal of waste from secondary waste collection points like bins and containers. The collected garbage is left open, often as landfill, untreated contributing to health risk, air pollution and pollution through leaching (see fig-4). The representatives of Bangladesh at the Johannesburg summit in 2002 urged that, instead of dumping bins, a small plot in every ward should be used as a transfer station. It is not that the citizens need to be compelled to dump their garbage properly at designated places or bins; it is the weak enforcement of law that encourages them to act illegally. For example, the Government has banned the use of polythene bags in Dhaka since 1 January 2002, an initiative which was welcomed as well as strictly implemented by the citizens (*The Daily Star*, 26 December 2000). However polythene retains its use in a restricted way, which often is tried to stop by raiding in fresh food markets.



Photo Courtesy: The Daily Star  
Fig-4 garbage dumped into the water ways

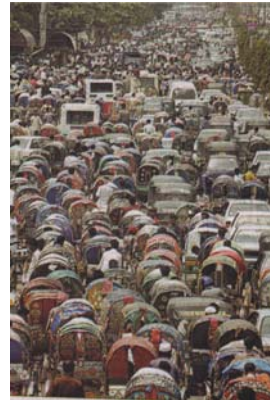


Photo Courtesy: The Daily Star  
Fig-5 Glimpse of traffic jam.

## 5. Transportation & associated air pollution

Ambient air quality of Bangladesh is clean in general but the quality of air in the major cities has become a major concern. With growing urbanization, the number of vehicles and industry is also rising rapidly and contributing more and more to air pollution. The ambient air quality of Dhaka is dependent on many factors such as air movement, traffic volume, congestion, uncontrolled emissions from motor vehicles and associated suspended particulate matter (SPM), dust particles and other activities related to the extremely high population density, give rise to severe air and other forms of pollution. Table 1 compares air pollution

levels in Dhaka with WHO and US standards. this study, carried out at different places and on different days, recorded VOC (volatile organic compounds), in addition to the other air pollutants.

Table 1. Air Pollution in Dhaka compared to WHO and US Standards.

Pollutant	Averaging Time	Ambient Concentration in Dhaka**	Bangladesh Standard*	WHO Standard	US Standard
CO	Annual	N/A	N/A	500-7000 $\mu\text{g}/\text{m}^3$	N/A
	8 hour	N/A	1000-5000 $\mu\text{g}/\text{m}^3$	10 $\text{mg}/\text{m}^3$	9 ppm 10 $\text{mg}/\text{m}^3$
	1 hour	11 ppm (instantaneous average)	N/A	30 $\text{mg}/\text{m}^3$	35 ppm 40 $\text{mg}/\text{m}^3$
NO <sub>2</sub>	24 hour	0.126 ppm 252 $\mu\text{g}/\text{m}^3$	N/A	0.075 ppm 150 $\mu\text{g}/\text{m}^3$	N/A
PM <sub>10</sub> *	24 hour	244.8 $\mu\text{g}/\text{m}^3$	N/A	150-230 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$
PM <sub>2.5</sub> *	24 hour	445.2 $\mu\text{g}/\text{m}^3$	N/A	N/A	65 $\mu\text{g}/\text{m}^3$
VOCs	24 hour	1,131 $\text{mg}/\text{m}^3$ (instantaneous average)	N/A	N/A	193 $\text{mg}/\text{m}^3$

\* PM<sub>2.5</sub> and PM<sub>10</sub> measured at different locations and days.

Source: Karim 2001, p.3

Dhaka has the worst air pollution due to vehicular and industrial emissions. Industrial areas are located in and around Dhaka city contributing to the low air quality. The number of vehicles is increasing with the population. The worst source of vehicular pollution used to be the two stroke engines which produced 30 times more pollutants than an ordinary car (Karim 2001). However these are replaced by Converted Natural Gas (CNG) driven four stroke engines baby-taxis. And with the banning of 2-stroked vehicles emphasis was given on mass transportation. To improve the quality of service the Government has banned vehicles more than 20 years old as well. This has again encouraged private sector investment and sadly enough, permissions are given for innumerable small cabs adding to the already over crowded streets of the city (see fig.-5). Most people are dependent on low-cost public transport. Faint attempts are made to solve the traffic congestion by constructing elevated express way. Benefit of such projects are yet to be realized as the project is not finished yet. The proposed ring road around the city along the city protection dam is not fully explored yet.

The lead concentration in Dhaka has exceeded the tolerable limit for human population. About 50 tons of lead is emitted annually with seasonal variation and emission reaches its highest level in the dry season. The air which the urban dwellers breath contains lead in concentrations almost ten times above the government safety standard set by the DoE.). The quality of lead in air of Dhaka city is 463 nanogram per cubic meters, the highest in the world. In contrast, lead concentrations are 383 nanogram in Mexico City, 360 nanogram in Bombay and only 70 nanogram per cubic meter in Los Angeles. (SoE 2001, pp.3.34-3.36).

## 6. Health

Urban health improvement initiatives in Dhaka mostly refer to few vaccinations and few health centres such as UFHP for catering to the huge population. Urban health is also largely affected by environmental conditions. The people living in the slums and informal settlements are more exposed to air as well as water pollution. The most commonly found diseases among the slum and squatter dwellers are gastro-intestinal disorders, colds, fever, measles, typhoid, cholera, tuberculosis, syphilis, gonorrhoea, malaria, various types of female disease and chronic malnutrition (Islam 2000, p.159). A study of disease among slum dwellers revealed that diarrhea (13 in 1000), respiratory tract infections (11 in 1000), and tetanus neonatorum are the leading causes of mortality in slums (Islam 2000, p. 160). Generally, the public health issues among the urban poor of Dhaka are the clearest indicator of the environmental health of the city.

The effect of air quality on human health generally occurs as a result of exposure to the different components of air pollution. Each pollutant has its distinctive affect on the human body. The impact of air pollutants on health and their sources is detailed in Table 2. In another study of lead concentration in the air of Dhaka, ambient levels of this dangerous pollutant were again found to be among the highest known in the world with a value of 53 micrograms/dl, whereas in New York it is only 15.0 microgram/dl (SoE 2001).

Table 2. Health Effects of Air Pollutants

Pollutant	Sources	Impact on health
(1)Suspended Particulate Matters (SPM)	Motor vehicles Wood burning Industrial activities	Respiratory infection Throat irritation Aggravate asthma
(2) Sulphur Dioxide	Vehicles (diesel using) Factory emission Affect respiratory tract	Bronchitis Emphysema\n Asthma Plant growth reduction
(3)Nitrogen Dioxide	Vehicles motor Power station	Respiratory diseases Chest congestion Eye irritation Headache
(4)Lead	Windblown dust Vehicles Coal & wood burning Consumption Metal production Phosphate fertilizer	Affects central nervous system Renal damage Hypertension Children are 3 times more at risk than adult
(5)Carbon Monoxide	Petrol vehicles	Reduces the ability of blood to carry oxygen
(6)Aromatic Hydrocarbon	Unburned fuel from diesel engines	Drowsiness Eye irritation
(7)Benzene	Unleaded petrol Emitted from Catalytic converters	Carcinogen Affects central nervous system

Source: SoE 2001 p. 3.36

A study of rickshaw pullers, baby taxi drivers, traffic police, tempo assistants, petrol pump operators and motor vehicle service men of some selected areas of Dhaka city showed that the mean blood lead levels of rickshaw pullers was 248 microgram/dl; baby taxi drivers 287 microgram/dl; traffic police 272 microgram/dl; tempo assistants 255 microgram/dl; and petrol pump operators 249 microgram/dl (Islam 2000). The values are higher than accepted standards and the acuteness of health impacts is highly sensitive to the duration of exposure to pollutants. Lead poisoning causes delay in growth and neurological impairments in children. At the Shishu Bikash Kendro (Child Development Centre) of Dhaka Children Hospital, lead concentrations were found to be around 800 nanogram/L to 1800 nanogram/L, 7 to 16 times higher than the limit of 100 nanogram/L determined by the US Center for Disease Control and Prevention (SoE 2001, pp.3.38). The SoE also documents the fact that Volatile Organic Compounds (VOCs) in Dhaka city are beyond tolerable limits. Some of the compounds are known carcinogens. Emissions from two-stroke auto rickshaws contain 4 to 7 times the maximum permissible level of VOCs. (SoE 2001).

## Conclusion

In response to the environmental scenario of Dhaka as stated above, the Government has formulated environmental rules and regulations which again are broad based applicable in general at national level addressing issues such as bio-diversity, land degradation and arsenic contamination. Urban area specific rules are not formulated as such. Since 1992, the Government of Bangladesh has certainly responded to the environmental challenge posed by the Brundtland Commission, the Rio declarations and subsequent UN initiatives leading up to the 2002 Johannesburg WSSD. Embedded in all the broad policy documents developed at the national level, urban environmental concerns can be identified. However, they are not brought together as a clear policy imperative which the pattern of population growth, and population concentration, in the nation clearly demands. With Dhaka the dominant urban agglomeration and a megacity of world scale - current population 12.1 million people - the capital city presents unique problems. To date, these have not entered the national environmental agenda as a discrete set of issues, demanding clear programs of action. All these could be efficiently carried out once the detail area plans of the Dhaka Metropolitan Developed Plan are formulated and implement.



Physical, social and economic aspects of city life have an important bearing on the health of citizens. According to WHO, health is a state of complete mental, physical and social well being. The health of urban populations is closely linked to activities such as changes in the natural environment, built form and increased population movement. For Dhaka, the environmental planning and management structure of the future must embrace the fundamental recommendation of the Habitat II Agenda to integrate top down and bottom up planning processes. NGOs and related organizations that are currently working at the grass roots, in initiatives such as slum improvement and waste management, need to be empowered so that their activities are not piece-meal, short-lived interventions but truly build a living city

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