

**Lund University  
Center for East and South-East Asian Studies  
Masters Program in Asian Studies  
South Asia Track  
Spring Semester 2011**

**RAPID URBANIZATION AND ENVIRONMENTAL DEGRADATION  
THE CASE OF MEGA CITY DHAKA**

Author: Mizanur Rahman  
Supervisor: Ann Kull

## **Abstract**

Dhaka the capital city of Bangladesh is one of the largest and most populous cities in the world. According to World Bank, Bangladesh has been experiencing a rapid urbanization over the last few decades, and Dhaka City's projected 20 million residents will make it the third-largest city in the world by 2020. Dhaka city is also one of the most densely populated areas of the world. This paper tried to explain the reasons of rapid and unplanned urbanization and relate it to the most challenging issues of environmental degradation. This case study used qualitative research and some part in quantitative as well. Dhaka city has been experiencing excessively higher land prices, a huge slum population, abnormal traffic congestion, regular water shortages, irregular electricity supply, inadequate sanitation and drainage, increasing air pollution, weak governance and poor law and order situation. Basic needs for the inhabitants were found totally inadequate. All these problems aggravated by the absence of an inclusive policy on urbanization and the lack of well-organized agencies to implement such a policy. Therefore, people living in Dhaka city have been continuing severe living condition with all kind of life risk ingredients due to extreme level of environmental degradation.

**Keywords:** Urbanization, Environmental Degradation, Dhaka City, Basic Needs, Urban Inhabitants.

## Table of Contents

Acknowledgements.....	4
List of Abbreviations.....	5
<b>1.</b>	
<b>Introduction.....</b>	<b>6</b>
1.2 Research Background.....	6
1.3 Purpose and Research Questions.....	7
1.4 Methodology Selection .....	8
1.4.1 Research Design.....	8
1.4.2 Data Collection, Delimitations and Presentation of Materials.....	9
<b>1.5 Theoretical Framework.....</b>	<b>10</b>
1.5.1 Urbanization.....	10
1.5.2 Internal Migration.....	12
1.5.3 Environment.....	12
<b>1.6 Disposition.....</b>	<b>14</b>
<b>2. Statistical Background Data.....</b>	<b>15</b>
2.1 Urban Population in the World.....	15
2.2 Basic Urban Services .....	19
2.3 Overall Urbanization in Bangladesh.....	21
2.4 Human Settlement in Dhaka .....	23
2.5 Comparison of Dhaka City and other Mega Cities.....	27
<b>3 The Economic and Social Situation of Dhaka City.....</b>	<b>28</b>
3.1 Economic Development .....	28
3.2 Land Use.....	28
3.3 Housing and living Condition.....	29
3.4 Problems of Poverty, Inequality and Insecurity.....	30
<b>4. Environmental Issues.....</b>	<b>31</b>



## **Acknowledgement**

I would like to thank all the teachers of Lund University Centre for East and Southeast Asian studies those have delivered enormous knowledge in their respective courses during whole study period. I am expressing my heartiest thanks and gratefulness to my supervisor Ann Kull who has given me so much time and mental support to prepare the thesis work better ways. She has been very much encouraging and cooperative throughout my courses and thesis work. I would also thank Dr. Parnille Gooch for her inspirational advice during her course development studies. I was actually motivated to write on urbanization at the time of development studies course. I am also grateful to some of my friend Geoffrey Gardella, Ahmad Usman, Muhammad Zia Ullah , Aslam Khan, Weibin Wang for their cooperation during different courses. I would like to thank my senior fellow student Muhammad Asiful Basar for his cooperation and advice. Finally I wish to thank my wife to support me throughout the study period.



## **List of Abbreviations**

BBS	Bangladesh Bureau of Statistics
BTTB	Bangladesh Telephone and Telegraph Board
BTCL	Bangladesh Telecommunications Company Ltd
DWASA	Dhaka Water and Sewerage Authority
DESA	Dhaka Electric Supply Authority
DESCO	Dhaka Electric Supply Company
DoE	Department of Environment
DCC	Dhaka City Corporation
DPDC	Dhaka Power Distribution Company
EPZ	Export Processing Zone
GNI	Gross National Income
GDP	Gross Domestic Product
NGO	Non Government Organization
RAJUK	Rajdhani Unnyan Kortripakhkha
UN	United Nations
UNCED	United Nations Conference on Environment and Development
WHO	World Health Organization
WB	World Bank

We have entered the urban millennium. At their best, cities are engines of growth and incubators of civilization. They are crossroads of ideas, places of great intellectual ferment and innovation...cities can also be places of exploitation, disease, violent crime, unemployment, and extreme poverty...we must do more to make our cities safe and livable places for all (Kofi Annan, 2000:1)

## **1. Introduction**

Inspired by the word of former UN Secretary General Kofi Annan this thesis describes and analyzes the reasons of rapid urbanization of Dhaka city in Bangladesh considering environmental issues. I became interested in this topic because of my practical experiences on urban reality in Dhaka city. This research subject actually came through observation in the social reality. I have been living in different areas of Dhaka city since 1984 when I was 10 years old. My in-depth observation encouraged me to select this topic. Also some reports like 'South Asia: State of the Environment' 2001 Published by the United Nations Environment Programme (UNEP) and some other articles on environmental degradation and population booming in the cities of Bangladesh encouraged me to select this matter. I have a personal feeling, even I can say worry, about the problem of inhabitants in Dhaka city that is the base of my motivation to write this thesis but I will now discuss the issue from an academic point of view.

### **1.2 Research Background**

Rapid urbanization is now becoming a threat to the environment and sustainable development on a global level. Two centuries ago there were only two cities with a million inhabitants, London and Beijing (Desai and Potter, 2002). But now it reached to 293 cities where most of the million-cities are within the developing world. The growth rate of these cities counted tenfold between 1950 and 1990. Some of these cities, such as Abidjan, Amman, Dhaka, and Harare are now defined as mega cities with 10 million inhabitants (Desai and Potter 2002: 244). Environmental degradation and booming populations in these cities are the burning issues of the present world in case of urbanization. In most of the developing countries, the respective governments fail to

provide basic needs to inhabitants in the cities due to rapid growth of urban population.

Urbanization can be defined as a part of the development process in developing countries in the present world. It has been seen through history that cities are the motivating force of respective country's economic and social development. Higher income, improved health, better life standard and all other better opportunities lead towards rapid urbanization but all these benefits have an environmental and social cost (South Asia: State of the Environment, 2001). Environmental cost associated with various economic activities. The exclusion of environmental cost from the calculation of GNI (Gross National Income) is largely responsible for the historical absence of environmental considerations from development economics. Damage to soil, water supplies, forest, air pollution and greenhouse gas emissions are the major environmental cost to economic activities (Todaro and Smith 2006). Rapid population growth with expanding economic activities in the developing world is likely to do extensive environmental damage. It has been observed that economists have become more conscious regarding the environmental issues in concern to economic development. "Rising pressure on environmental resources in developing countries can have severe consequences for self – sufficiency, income distribution, and future growth potential in the developing world" (Todaro and Smith 2006: 470).

### **1.3 Purpose and Research Questions**

Dhaka city is the metropolitan part of Dhaka Division. This research is mainly based on Dhaka city areas (see map 1 in appendix). Dhaka city will reflect the overall scenario of urban Bangladesh. According to World Bank development series 2007, Dhaka city is the fastest growing mega-city in the world. Most of its growing population is extremely poor people migrating to the city from rural areas. At present, the population of Dhaka city counts around 12 million, which is also projected to increase to 20 million by 2020 (World Bank, 2007). This huge migration puts in tremendous damage on already overpopulated city. Rapid urbanization eventually encourages the transformation of rural areas into urban through development activities.

The main aim of this research is to show the situation of environmental degradation in Dhaka

city due to rapid and unplanned urbanization and its effect on the life of urban people. Another aim is to investigate the reasons behind this process. An additional objective is to compare the situation with other cities of the world. The research questions are:

1. How has Dhaka city grown and developed since independence in 1971?
2. What problems do inhabitants in Dhaka city experience?
3. How do government, city authorities and NGOs engaged in urbanization and environment handle the situation of living conditions in Dhaka city?
4. How can the living condition and environmental situation be improved in the future?

## **1.4 Methodology Selection**

### ***1.4.1 Research Design***

This study is based on a single case study. Sometimes it seems that case study research is associated with qualitative research (Bryman 2008: 53). But it is also applicable that case study research be fulfilled by quantitative evidence that means case study can be based on both qualitative and quantitative facts. This study focuses on the living conditions of urban inhabitants of Bangladesh especially the mega city of Dhaka as a case study. In this study a qualitative research method is mainly followed with some part in quantitative approach as well. Qualitative research is preferred because the subject matter is intimately related to urban inhabitant's life status, which is supported by Silverman, "If you are concerned with exploring people's life histories or everyday behaviour, then qualitative methods may be favoured" (Silverman, 2005: 6). Initial observation worked as an important inspirational factor in this study to write on urbanization and environmental problems. "Qualitative methods are often identified with participant observation, in-depth interviewing, field work and ethnographic study" (Ragin, 1994:91). In qualitative research, one can start with a generalizing research question then select the relevant subject. Depending on the research question and subject, researcher can move towards collection of relevant data (Bryman, 2008). In this study, reports, books, article and journal are discussed as documents. As the studies mainly based on qualitative research, it emphasises social impact due to the lack of basic needs and facilities for urban inhabitants of Dhaka city. Therefore, the research work focused mainly on documents, discussions and

observation on urban facilities, environmental degradation, internal migration etc.

Some part of the study is also based on quantitative study. “Quantitative research can be construed as a research strategy that emphasizes quantification in the collection and analysis of data” (Bryman 2008:22). The most important nature of quantitative research is that in this approach, number and statistics dominate thesis work. This approach sometimes stated as static picture of society emphasising on the “relationship between variables” (Bryman, 2008:394). Quantitative methods often take on as supplementary of qualitative approach, “to infer from one case to larger population” (Silverman, 2005:128). The quantitative part of this research is the collection of data on environmental degradation due to rapid and unplanned urbanization in Dhaka city which helped to analyse the case. Statistical data was also important for comparison the problems of Dhaka city with other cities in the world. Relevant data collected from Bangladesh Bureau of statistics, NGOs, government organization and other reliable sources. Collected statistic is presented by table and chart made by the author.

#### ***1.4.2 Data collection, Delimitation and Presentation of Materials***

The main delimitation of this thesis work is that I was unable to do fieldwork due to practical reasons. It was my plan to go to Bangladesh for field work last January but I was not able to renew Swedish visa and consequently couldn't leave the country. It was very much disappointing not to do fieldwork as the fieldwork might be better for this case study research. Therefore this study is carried out on the foundation of secondary data in form of reports, journals, books, articles etc. Beside documents there are some personal observation also considered. This is a method defined by Bryman as “purposive sampling” (Bryman, 2008).

Below follows a presentation of the major materials used in this research. These are a) Dhaka city state of environment, 2005 prepared by the department of environment, ministry of environment and forest government of the People's Republic of Bangladesh in collaboration with United Nations Environment Program, Regional Resource Centre for Asia and the Pacific (UNEP RRC.AP) and Bangladesh Centre for Advanced Studies (BCAS). b) South Asia: state of the environment, 2001 published by the United Nations environment program. c) World Bank

report on Bangladesh country environmental analysis, Bangladesh development series paper no: 12, 2006 d) World Bank report on strategy for sustain growth Bangladesh development series Paper No: 18, 2007 e) World Bank report on Dhaka: improving living conditions for the urban poor, Bangladesh development series paper No. 17,2007.

Among all these report, Dhaka city state of environment 2005 by the UNEP is the most important in respect to the thesis issue. This report, focused on 21 factors which were found significant on environmental problems in Dhaka city. These are, “Unplanned urbanization, lack of enforcement of existing environment, traffic, industrial, and agricultural laws, policies and guidelines. Excessive population growth, improper transport and traffic management, poverty and migration, unplanned and rapid industrial development, lack of awareness, management constraints, lack of transparency and accountability, lack of effective coordination among core government agencies, inadequate and inefficient sewage management” (Dhaka city state of environment, 2005).

## **1.5 Theoretical Framework**

The concept of urbanization, megacity, internal migration and environment constitute the theoretical framework for this research.

### ***1.5.1 Urbanization***

In general, urbanization can be defined as the expansion of a city, the increase of total population or area in urban localities (cities and towns) over time (Usha, 2001). This phenomenon is due to a steady migration of people out of the villages into the cities. Most of the large cities and largest urban population in the world are now within the developing nations of third world (Desai and Potter, 2002). From 1950, rapid urbanization has become one of the principal hallmarks of developing nation.

By 1990, the average population of the world’s 100 largest cities was in excess of 5 million. In 1800, the equivalent statistic had stood at fewer than 200,000 inhabitants. Further by 1990, there were 12 ‘mega cities’

with over 10 million inhabitants, and most notably, seven were to be found in Asia, three in Latin America and two in the United States of America (Desai and Potter 2002, 241).

This statistics shows the rate of urbanization over time with the fastest trend being in Asia. More precisely, developing nations are facing this rapid growth but the developing nations are not able to provide adequate facilities or services even the basic needs to their inhabitants. As a result environmental degradation is severely affecting the developing nations (World Bank, 2007).

Rapid urbanization led to an urgent need for sound and effective environmental management. Moreover, rapid urbanization increased poverty in the urban areas. “Urbanization helped to reduce absolute poverty in the aggregate but did little for urban poverty reduction; over 1993-2002, the count of the ‘\$1 a day’ poor fell by 150 million in rural areas but rose by 50 million in urban areas. The poor have been urbanizing even more rapidly than the population as a whole” (Ravallion, Chen and Sangraula, 2007). Increasing urbanization in the world has a continuous progress because urban border has been extending regularly through suburbanization and introduction of newly formed satellite cities. Modernization in agriculture, economic sectors and demographic pressure forced inhabitants to migrate for urban-oriented employment. Moreover, cities in the world now become the center point for information, media, film production, entertainment, education, government etc. all of these together made the cities in many ways attractive for inhabitants (King, 2008).

Many research organizations and researchers argued that most of the world largest cities are going to be megacities within a short time. According to Desai and Potter (2002), cities are becoming megacities due to rapid increase of urban inhabitants. A metropolitan area with a population of more than 10 million is defined as a megacity (Rana, 2010). It is estimated by researchers that most of the megacities would be located in developing nations by 2015 and 12 cities will accommodate more than 15 million people each (Rana, 2010).

Some researchers distinguished urbanization in two perspectives for developing nation. They called it “dualistic nature of opportunities as well as challenges” (Rana, 2010). All developing

cities have been facing tremendous positive and negative consequences of urbanization. Positively, the cities are center places for country's all kind of development activities like modernization, industrialization, communication and overall economic development. However, developing cities are also increasingly dangerous to live in due to high level of environmental degradation associated with rapid increase of urban poor, terrorism, socioeconomic insecurity etc. It is also indicated by the researchers that rapid urbanization basically not minimized poverty, rather, brought extreme numbers of problem and challenges for urban inhabitants (Nazem, 2001).

### ***1.5.2 Internal Migration***

Internal migration can be defined as a demographic process that is in many ways related to environmental hazards in developing countries. Huge amount of migrations make the situation worse and make the locales vulnerable with increasing population density (Hunter, 2005). Hunter also considers migration as a factor shaping the level of environmental hazards. Excessive environmental hazards deliver disaster which happened in some occasions like earthquake and hurricane-prone regions of U.S. and the migration of poverty-stricken households to floodplain in Bangladesh. Internal migration has been seen as one of the major cause to rapid increase in urban population. Job opportunities are now more in industrial rather than in the agricultural sectors. Rural to urban migration estimated around 40 per cent in between 1970 and 1990 in developing countries of the South Asia region (South Asia: State of the Environment, 2001). Rapid urbanization has one common characteristic, the opportunities of better services and variety of occupation act as pull factor to encourage people to migrate in urban areas. On the other hand, push factors such as poverty, natural disaster and economic stagnation also make people internally migrate to the cities (Rana, 2010).

### ***1.5.3 Environment***

Environment can be defined as the surroundings of human life. Historically human beings changed their environmental surroundings in a situation which is now reversing and it can be said that environment moulds human activity (Desai and Potter, 2002). Nowadays environmental

issues are considered the most important dimension of development. From the Brundtland Commission in 1987, the concept of sustainable development got priority over economic development. Sustainability can be said as an aim in all development. “Environmentalists use the term sustainability to characterize the desired balance between economic growth and environmental preservation” (Todaro and Smith 2006). As stated in the Brundtland Commission, sustainability generally refers to “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Commission 1987). However, rapid urbanization without sufficient facilities for inhabitants, environmental degradation has been considered major concern for development in recent time. The United Nations Conference on Environment and Development (UNCED) also focused on environmental deprivation. The conference was held in Rio de Janeiro in 1992 and concentrated mainly to catalyze as a strong sustainable approach to development (Desai and Potter, 2002:273). The principal outcome of this Rio Earth Summit was Local Agenda 21. It encourages more community involvement in all forms of environmental decision making by the local governments. In some extent, economic growth in the developing nations limited due to environmental degradation because environmental issues are yet to be considered fully in business decision. Therefore, South Asian countries are well behind from their expected local production and international trade earnings (Alauddin, 2004).

Sometimes it was discussed by environmentalists that it is not only the developing or poor countries that are responsible for their environmental degradation, but rather the rest of the world have a significant role on this situation.

Environmental costs are passed on from one group of people to another, both within societies and between them. The north dumps much of its toxic waste and ‘dirty’ technology on poorer countries, and sources many of its ‘needs’, for energy, food and minerals, from the south (Desai and Potter, 2002: 277).

On the other hand, to maintain higher life standard rich and middle class people from developing countries misused their natural resources to meet present needs. Ultimate result is “we despoil

the present at great cost to the future” (Desai and Potter, 2002).

Rapid urbanization has a significant role on urban environment and the standard of urban life. Poor urban inhabitants are carrying the heaviest burden of urban environmental risk. In most cases of South Asian cities, rural migrants are not easily welcome to an already very problematic unemployment situation. Therefore, rural migrants are bound to settle down in squatter settlements and slum areas (South Asia: State of the environment, 2001). Severe condition of slum and squatter settlements is found mainly in the developing countries of the world. 90% of urban inhabitants living in slum areas of countries like Uganda, Ethiopia and Malawi (Rana, 2010). Another study showed that 31% of world urban inhabitants are living in slum areas or informal settlements, and 90% of them are found in developing cities. The research also notes that the estimated worldwide urban slum population would be around two billion by 2030 (State of World Population, 2007). The slum and squatter settlements are marked by a lack of pure water supply, highest density areas, substandard housing, lack of sanitation, and waste disposal opportunities. All these limitations multiply communicable diseases. Environment in urban areas suffer by three most important factors, adaptation of land to urban utilize, natural resources extraction and reduction and urban waste disposal (South Asia: State of the Environment, 2001). These three factors create severe pollution within the city areas. Household and industrial disposals pollute air, land and water in many ways.

## **1.6 Disposition**

The following part of this thesis is divided into five chapters. Chapter 2 presents statistical background data on world urbanization, urbanization in Bangladesh, megacity Dhaka and basic urban services. Relevant data is presented in tables and figures. In addition, this chapter shows a comparison of Dhaka city and other mega cities according to trend of urbanization and environmental impact on that. Chapter 3 discusses some features of Dhaka city’s socio economic condition. Chapter four presents environmental issues concerned to urbanization such as climate change, natural disasters, water and air quality, industrial pollution etc. In chapter five, roles of authorities like government, city authorities and NGOs related to services and management is discussed. Chapter six provide the analytical discussion and some concluding remarks.

## 2 Statistical Background Data

### 2.1 Urban population in the world

The present world is going to be fully urbanized within a short time according to many research organizations like UN population division, World Bank report etc. Modern technological revolution within developing nations already has been taken place with lots of opportunities but at the same time, developing nation destroying living condition of urban inhabitants with all sorts of environmental degradation which directly impacted on sustainability and livability of urban life (Rana, 2010). According to UN population division, more or less 90% of the growth of urban population would be within developing countries of Latin America, Africa and Asia. Also developing countries will be the place of 80% of the world's largest cities. Cohen (2006), states that 50% of world population is now living in the cities whereas it was only 3% in 1800. UN population division also forecast that by 2030, urban inhabitants will raise to 5 billion which is now counted 3.2 billion. All these statistics imply the upcoming opportunities and challenges for developing nations.

Table 1: Scenario of urban inhabitants in the world, 1950- 2030

Percentage of urban population

Region	1950	1975	2000	2030
World	29.7	37.9	47.0	60.3
Most developed region	54.9	70.0	76.0	83.5
Less developed region	17.8	26.8	39.9	56.2
Northern America	64	74	77	84
Latin America	41	61	75	83
Europe	52	67	75	83
Oceania	62	72	70	74
Africa	15	25	38	55
Asia	17	25	37	57

Source: World Urbanization prospect (2009), Rana (2010)

Table 1 shows the increasing trend of urban population in all regions of the world from 1950 to 2030. In 1950, world urban inhabitants were only 29.7% of total world population but projected to increase to 60.3% by 2030. Remarkably, less developed country's urban inhabitants would increase more than three times 17.8 to 56.2% within the time period of 1950 to 2030. The table also indicates that Asia and Africa have more challenge for urban population pressure because many of the cities in this region will count fastest increase of population and some of the cities already become mega cities.

### Overview of World Urban Population

Table 2: World urban population by region 1950- 2010

Urban population (million of inhabitants)

Region	1950	1980	2010
Africa	33	130	458
Asia	244	706	1816
Rest of world	404	685	849

Percentage of population living in urban areas

Region	1950	1980	2010
Africa	14.6	27.3	43.6
Asia	17.4	26.7	43.6
Rest of world	55.3	70.5	78.00

Proportion of world's urban population living in

Region	1950	1980	2010
Africa	4.4	7.4	12.8
Asia	32.5	40.3	50.6
Rest of world	53.9	39.0	23.7

Source: Desai and Potter (2002)

(Rest of the world includes all countries in Europe, Northern America and Oceania)

Table 2 shows the increasing trends of urban population from 1950 to 2010. The increase of urban population in the Asia region is more than double compared to rest of the world, in Asia there are 1816 million people living in urban areas whereas urban population in rest of the world is only 849 million. Moreover, rate of increase of urban inhabitants in Asia also significant from 1950 to 2010. It is seven times higher in 2010 than 1950. In the same period the rest of the world is around two times higher. The percentage of population living in urban areas same in both Asia and Africa region but proportion of urban population living in Asia is remarkably higher than Africa and rest of the world. It is four times higher to Africa and more than two times to the rest of the world.

Table 3: Number of million and world's 100 largest cities

Number of million cities

Region	1950	2010
Africa	0	27
Asia	1	126
Rest of the world	1	102

Number of world's 100 largest cities

Region	1950	2010
Africa	4	26
Asia	64	44
Rest of the world	29	34

Source: Desai and Potter (2002)

In table 3, part one, million cities of the world are shown. Asia region holds 126 by 2010 but it was only 1 in 1950. In part 2, among 100 largest cities in the world Asia were ranked highest both in 1950 and 2010, which clearly indicate that fastest increase of urban inhabitants is in the Asia region.

As discussed before a megacity is a metropolitan area where the population is more than 10 million (Rana, 2010). According to UN, in the beginning of 21<sup>st</sup> century there were only 19

megacities in the world. It is now increased to 26 and remarkably many of them are from developing nations. The report said that all new million cities are located in developing countries, moreover, the 12 largest cities in the world also found in these countries. In 1950, there was only one megacity with 10 million people and it was New York. Below is a table showing world 10 largest cities in different times.

Table 4: Megacities in the world 1900- 2015

Population in millions

Rank	1900		1970		2005		2015	
	City	Popul.	city	Popul.	City	Popul.	City	Popul.
1	London	6.5	Tokyo	16.5	Tokyo	35.2	Tokyo	35.5
2	New York	4.2	New York	16.2	Mexico	19.4	Mumbai	21.9
3	Paris	3.3	Shanghai	11.2	New York	18.7	Mexico	21.6
4	Berlin	2.7	Osaka	9.4	Sao Paulo	18.3	Sao Paulo	20.5
5	Chicago	1.7	Mexico	9.1	Mumbai	18.2	New York	19.9
6	Vienna	1.7	London	8.6	Delhi	15.0	Delhi	18.6
7	Tokyo	1.5	Paris	8.5	Shanghai	14.5	Shanghai	17.2
8	St. Petersburg	1.4	Buenos Aires	8.4	Kolkata	14.3	Kolkata	17.0
9	Manchester	1.4	Los Angeles	8.4	Jakarta	13.2	Dhaka	16.8
10	Philadelphia	1.4	Beijing	8.1	Buenos Aires	12.6	Jakarta	16.8

Sources: Rana (2010), UN (2006)

Above, table 4 is showing megacities in the world in between 1900 and 2015. An important feature of the table is the increasing trend of Asian cities to urban population. By 2015, Asian

cities will dominate the percentage with seven out of ten of the world's largest cities. Still, it was only one in 1900, four in 1970 and six in 2005 respectively. Dhaka city, Bangladesh will be added within 10 largest cities by 2015.

## **2.2 Basic Urban Services**

Basic urban services described as engineering utilities like water supply, sewerage, power supply, transport facilities, road access etc., in addition to other community social services like community center, school, health care center etc. To provide all these services, city development authority needs a management body capable in efficiency, effectiveness, responsiveness and equity concern (Moinuddin, 2010). Urban services in Dhaka city are very much short in supply and irregularity. Researchers indentified some reasons behind the inadequate services like often out of order, limited resources capacity to expand, bureaucratic complexities, lack of transparency and accountability, something that leads to a continued failure to provide better services and living condition. Beside substandard living conditions, sustainable economic growth and competitive business environment also has been hampering in Dhaka city. Inhabitants in Dhaka city experiencing three to five hours power cut, irregular water and gas supply every day. This power supply shortage accounted the loss of domestic product equivalent to USD 116 million per year (Moinuddin, 2010).

In the last couple of decades Dhaka city has experienced a constant gap between service option and the growth of inhabitants. Basic services option expanded approximately 4% where as inhabitants increased at a rate of 7% (Moinuddin, 2010) which means that supply of basic services never met with requirements. Moreover, rapid urbanization always creates pressure on housing and other utility services option in a weak economic condition (Habib, 2009). A joint survey report by local NGO Proshika and World Bank in 2002 presented some statistics on Dhaka city's services options. 78% inhabitants in Dhaka city have access to water supply, 56% have access to sewerage network, 100% have access to legal electric network, 36% have fixed line telephone access and 63% have access to good road service, however, a survey on consumer satisfaction showed a different figure. 57% expressed their satisfaction of water supply and sewerage option, 42% of power supply, 47% of telecommunication and 22% of road services

expressed their satisfaction. Yet, the recent condition on service option becomes worse. The following table 5 will give better picture of the situation and is showing some core basic services provided by the Dhaka city authority compare to the actual demand for the services according to the numbers of inhabitants. The table is showing statistics for recent couple of years.

Table 5: Scenario of services provided by city authority compare to existing demand in Dhaka city

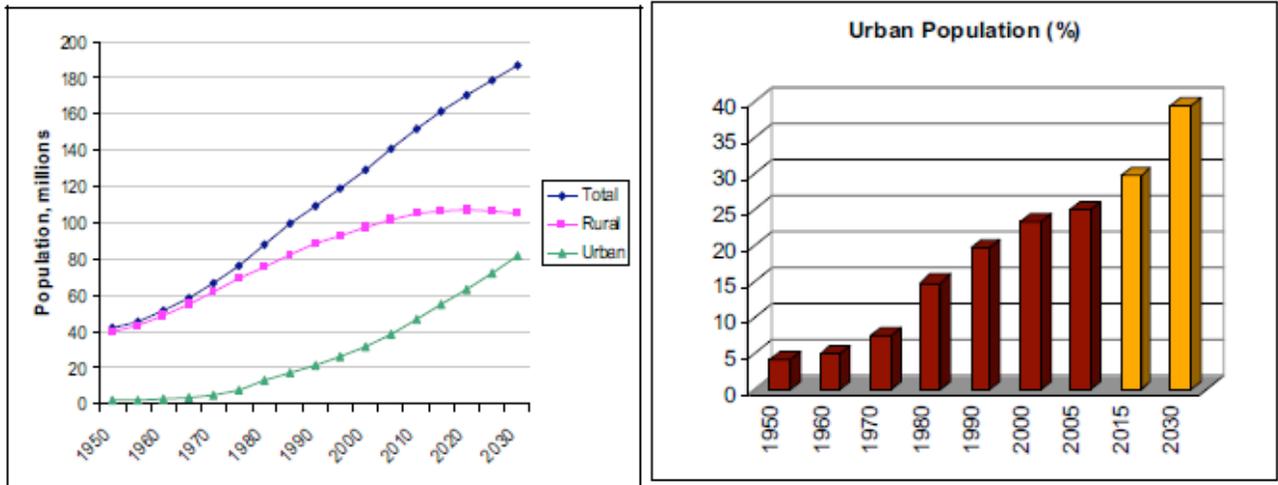
Service category	Service provider	Demand	Supply	Shortage
Water supply	DWASA <sup>1</sup>	2050 million litre/day	1700 million litre/day	350 million litre/day
Sewerage		360 sq.km. or 100% of DCC area	Covers 110 sq.km or 30% of DCC area	250 sq.km or 70% of DCC area
Drainage		360 sq.km or 100% of DCC area	Covers 140 sq.km or 38% of DCC area	220 sq.km or 62% of DCC area
Telecommunication (Fixed lines)	BTCL <sup>2</sup>	596476 connections	542265 connections	54211 connections
Power supply (in DCC area only)	DESCO <sup>3</sup>	450 Mega Watt	290 Mega Watt	150 Mega Watt
	DPDC <sup>3</sup>	950 Mega Watt	500 Mega Watt	450 Mega Watt
Urban Roads	DCC <sup>4</sup>	5300 km	1868 km (Includes all categories of road)	5700 km

Sources: Moinuddin, (2010)

Table 5 shows some basic services by the Dhaka city authorities and all of them are well short in supply. Sewage and drainage service covered less than 50% area of the city. Other services are also not adequate to meet the demand of the inhabitants. This shortage in supply creates many additional problems in daily life of the residents.

### 2.3 Overall Urbanization in Bangladesh

Figure 1: Urban population in Bangladesh



Source: UN World urbanization prospect, (2007)

According to World Bank Bangladesh Development series 2007, urbanization in Bangladesh has been running at a significant pace. After independence in 1971, the country's national population growth was 2.2% but the urban population growth was 7% yearly. According to UN population division, around 35 million, on 25% of country's total population, is living in urban areas. This 35 million is expected to exceed 80 million by 2030 which is shown vertically by above figure no (1). In the left side of the figure, it shows total population with both rural and urban. Total and urban population is clearly rising upward indicated by blue and green line in the figure. Dhaka city is the largest among four big cities. The other three large cities of Bangladesh are Chittagong, Rajshahi and Khulna. Dhaka city estimated more than 13.1 million inhabitants that is around eightfold increase since 1971. It is estimated by UN population division that by 2015 the urban population would reach 22 million which will make the city the sixth largest city in the world and third largest in Asia. Other research shown different statistics, estimated the population 16.8 million by 2015, which is shown in table 4 (Rana, 2010).

Dhaka city is one of the most densely populated cities in the world as well as Bangladesh as a country. Urban population growth has been outstanding since its independence in 1971. Bangladesh counted urban population 13.5 million in 1981, 22.9 million in 1990, in 2000 the urban population was 37.3 million and in 2005 it was 46.4 million (Chowdhury and Amin, 2006). There are some elements like lack of equal development and resources distribution, natural hazards, limited job opportunities in rural areas that uplift urban growth in Dhaka (Rana, 2010). According to Islam, three factors mostly work behind rapid urbanization. These are “(1) A high natural increase in native urban population (2) the territorial extension of existing urban areas and a change in definition of urban areas, and (3) rural to urban migration” (Islam, 2001, quoted Rana, 2010 ). As per as government statistical organization BBS (Bangladesh Bureau of Statistics) push and pull factors work intensively on growth rate of urban inhabitants during 1974-1981, they indicated pull factors are better life status, educational opportunities, transport facilities, comparatively better social security, employment opportunities etc. On the other side push factors such as natural calamities like river erosion, cyclone and floods as well as poverty, lack of job and availability of higher education force people to migrate to the cities (BBS, 2001). According to the World Bank, 300,000 to 400,000 new people migrate to capital city Dhaka each year (World Bank development series, 2007). Therefore, migration plays an important role to Dhaka’s rapid urbanization.

As mentioned before Dhaka is the largest among four populous cities in Bangladesh and the other three are Chittagong, Khulna and Rajshahi. Dhaka has 35% of the total urban population where together all four cities have 60 % (BBS, 2001). According to World Bank, capital city Dhaka is the fastest growing megacity in the world. They also estimated that Dhaka city will be the third largest city in the world by 2020 (WB, 2007), but socio economic stability and the environmental condition of the city looks very much poor. As a result tremendous environmental degradation associated with unplanned urbanization, often flooding, severe urban poverty, huge amount of slum growth, misuse of resources and cultivable land are common phenomenon in Dhaka city (Dewan and Yamaguci, 2009).

Table 6: The major city population of Bangladesh in 2009 (thousand)

City	2009
Dhaka	14648
Chittagong	4961
Khulna	1682

Total population in thousand (2010)

Rural population	118276	
Urban population	46149	
Percentage of urban population	28.1	

Source: UN Population Division.

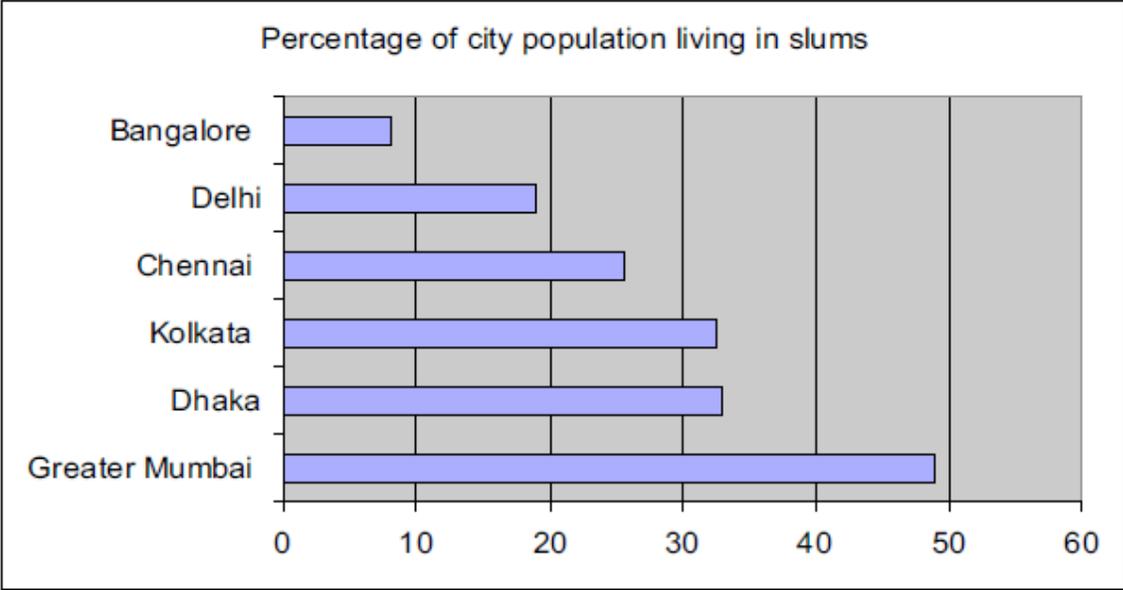
Table 6 shows the three major cities population of Bangladesh in 2009 and Dhaka city conceded almost three times higher than second largest city Chittagong. According to the Bangladesh's total population, the percentage of urban population is 28.1.

## 2.4 Human settlement in Dhaka

It has been mentioned several times that the natural population growth rate is high in Dhaka city area with continuous rural urban migration. As a result human settlement is very much critical. In 2001, Dhaka City Corporation (DCC) had only 276 km<sup>2</sup> area where human settlement was over 5.3 million. It becomes 5.9 million in 2004 (Dhaka city state of environment, 2005). The report also stated that 3007 informal settlements housed 30% of total inhabitants in Dhaka city. And 30 to 35% of total inhabitants live in slum areas where the number of people living per hectare range from 1700 to 10400 persons. This statistics clearly indicated overcrowding and unhygienic situation. Many of slum areas are out of utility services (like water supply, sanitation) coverage. Inhabitants in slum areas keep waste in open places, cook food also in open places near to living spaces, which sometimes become the sources of fire incident in the slum areas. It was found in this study that rapid urbanization resulted in huge number of slum areas and squatter settlement in all developing cities. However, Dhaka city is among the highest for slum

areas and squatter settlement. According to some research prediction, slum population would be around 50% of total urban population. Increasing trend of slum areas in Dhaka also indicate a greater environmental pressure. It was only 1125 slum areas in 1988 but increased to 3007 by 1996 (DCC, 2006). Most recent research shows that 3.4 million of Dhaka's inhabitants living in 5000 slum and squatter settlements (Rana, 2010). All-most all developing cities have been facing challenges regarding the rehabilitation and human settlements in slum areas. In Mumbai India more than 50% of the urban inhabitants are living in informal slums and squatter settlements (Islam, 2001).

Figure 2: Estimated proportion of population living in slum areas in some Indian cities and Dhaka city



Source: WB Report, (2007)

Figure 2 shows the proportion of population living in slum areas in some Indian cities and Dhaka city. Only greater Mumbai shows higher percentage than Dhaka city's population living in slum areas.

Table 7: Increasing trend of total population, area and density of Dhaka division

Year	Area (Km <sup>2</sup> )	Population	% Increase of population	Density (Km <sup>2</sup> )
1951	85.45	411,279		4813.09
1961	124.45	718,766	74.76	5775.54
1974	335.79	2,068,353	187.76	6159.66
1981	509.62	3,440,147	66.32	6750.41
1991	1352.82	6,844,131	98.95	5059.16
2001	135282	10,712,206	56.51	7918.43

Sources: BBS, (1991) and (2001), Dhaka city state of environment, (2005)

Increasing trend of total population, area and density of Dhaka city Corporation

Year	Area (Km <sup>2</sup> )	Population	% Increase of population	Density(Km <sup>2</sup> )
1981	208	2,816,805	-	13,542.33
1991	276	4,486,421	59.27	16,255.15
2001	276	5,378,023	19.87	19,485.59

Sources: BBS, (1991) and (2001), Dhaka city state of environment, (2005)

In table 7, part one showing total population of Dhaka division with its size of living area and density per km<sup>2</sup>. Part two showing same components for Dhaka city corporation area. Both area's increasing trend of population and density are quite high especially the density in Dhaka city corporation.

Table 8: Urban Population, Development and the Environment 2007

## Part 1

Country	Total population ('000) 2005	Land area (km <sup>2</sup> ) 2005	Urban Settlements (% of land area) 2000	No of Urban Dwellers ('000) 2005	As % of total population 2005	Average annual growth Rate (%) 2000-'05	Density (per km <sup>2</sup> of urban extent 2005	% living in slum areas 2005
Bangladesh	153 281	130170	7.8	39 351	26	3.6	3 863	71
India	1 134 403	2 973190	6.9	325 563	29	2.4	1 592	35
Pakistan	158 081	770 880	3.4	55 135	35	2.8	2 093	72
Sri Lanka	19 121	64 360	5.3	2 895	15	-0.3	838	..
Japan	127 897	364 500	28.6	84 363	66	0.4	810	..

## Part 2

	% access to improved sanitation 2004	% access to improved water source 2004	GDP per capita International Equivalent to 2005	Value added by industry and services as % 2005	Energy use (kg of oil equivalent per capita) 2004	Carbon dioxide emission (metric tons per capita) 2004	Motor vehicles in use (per 1000 population 2000-2005
Bangladesh	51	82	1901	80	151	0.2	..
India	59	95	3 331	81	513	1.2	18
Pakistan	92	96	2 348	78	479	0.8	13
Sri Lanka	98	98	4 754	83	496	0.6	41
Japan	100	100	30 707	98	4 172	9.8	579

Sources: UN Population Division (2007)

This table 8 can be very much appropriate to the subject matter rapid urbanization with environmental degradation. Four major South Asian countries have been taken as examples and all these countries are developing countries. For better comparison, Japan has been added as well. In this table, indicators like population density per km<sup>2</sup> of urban extent, percentage living in slum areas, access to sanitation, access to water source, carbon dioxide emissions (metric tons per capita) are presented which will make clear the rapid urbanization and its impact on environmental degradation and how serious the situation is for urban inhabitants in Dhaka city.

## 2.5 Comparison of Dhaka City and Other Mega Cities

According to World Bank country environmental analysis 2006, pace of urbanization in Bangladesh is almost double compare to other two neighboring countries India and Pakistan within the time period of 1990 to 2000. Inhabitants are accounted more than 13 million with an area of 1,353 km<sup>2</sup>. Dhaka city has been ranked highest population growth rate of any major city in the world for last decades (State of Environment Dhaka, 2005). The number of Dhaka's urban inhabitants living in the slum areas is ranked second highest in the world. The report also noted that environmental health risk would be around 22% of total burden of disease in Bangladesh. Population density in Dhaka city is among the highest in the world and accounted one thousand people per square kilometer with growing rate 1.7% per year (World Bank country environmental analysis, 2006). According to Bangladesh Bureau of Statistics (BBS), population density in Dhaka city estimated 19,286 per km<sup>2</sup>. This figure is more than double compare to mega city's average of population density, which is 7,918 per km<sup>2</sup> (BBS, 2001). Dhaka city generally is characterized by tropical monsoon weather where 25 degree Celsius is the average temperature and with 2000 mm of average annual rainfall (Dhaka city state of environment, 2005). Dhaka city ranked highest in the density of lead in the air in the dry season with 463 monograms per cubic meter, other major cities in this category are Mexico City 383 monograms per cubic meter, and Mumbai 360 monograms per cubic meter (Rana, 2010). As huge numbers of urban inhabitants are living in slum areas of Dhaka city, the shortcomings of the living condition made it physically poor and deliver higher mortality rate. Rana states that, infant mortality (80 per 1,000 live births) and age under 5 mortality rates (140 per 1,000 live births) in Dhaka city is the highest in the world (Rana, 2010). According to World Bank Bangladesh country environment analysis 2006, respiratory infections and diarrheal disease rate are higher in Bangladesh compare to other South Asian countries. These two diseases mainly come through environmental problems and indicate the environmental quality in Bangladesh. Dhaka City State of Environment report 2005, mentioned Bangladesh number one in the world in case of land degradation and soil contamination due to the cause of unwise use of agricultural inputs and inefficient land management (Dhaka City State of Environment report, 2005). In the next

chapter some basic characteristics of Dhaka city would be discussed which are regarded as major concerns of environmental degradation.

### **3. The Economic and Social Situation of Dhaka City**

#### **3.1 Economic Development**

Researchers indicated economic development as one of the factors towards rapid urbanization in Dhaka city. Statistics on Dhaka's GDP (Gross Domestic Product) share to national income prove this argument. In 1975, GDP share of Dhaka was only 113 12 million Taka but recent research states that GDP share to national income now reached to 345,240 million Taka and this amount of GDP accounted 19% share (BBS, 2005). On the same ground World Bank (2007) estimated that GDP share from urban activities raises 26% in 1972-73 to more than 42% by 1998-99. The major part of Dhaka's GDP came through garment industries. As per as WB report 2007, 80% of the country's garments industries are located around Dhaka City where more than two million people are working. Due to massive development activities associated with garment industries and its subsidiary factories, huge number of rural urban migration occurred for this purpose (Islam, 1993, quoted Rana, 2010). Dhaka city contributed 40% of total industrial development in Bangladesh. Ultimately overall economic and industrial development in the city has a decent impact regarding higher rate of urban growth (Dewan and Yamaguchi, 2009).

#### **3.2 Land Use**

Rapid and unplanned urbanization eventually encouraged the transformation of rural land into urban areas through a range of development activities. It is estimated that 809 km<sup>2</sup> of agricultural land is converted to cities, roads and infrastructure every year (Dewan and Yamaguchi, 2009). Regular use of agricultural land into urban development work discouraged agricultural activities whereas agriculture is still the largest economic sector of Bangladesh. The ultimate result is concomitant loss of cultivated land, which contributes to the increasing problem of landlessness. Recent food crisis due to shortage of food made the economy vulnerable. Agricultural land use for urbanization usually occurred by the name of land development in Dhaka city. All sectors like private, public and individual-household are mainly responsible for unplanned land development in the cities. Recently property development has proliferated in Bangladesh.

Property developers continue developing both wetlands and agricultural lands without any consideration for environmental cost (WB, 2007).

Sometimes land price speculation remarkably influenced development of sub-urban areas. This is because of increasing land prices and growing demand for housing. The government has not been able to implement any environmentally-friendly policy for land. As stated by Dewan and Yamaguchi, “The rapid pace of urbanization in Dhaka means that it has not been possible for the municipal government to provide basic urban amenities to the population, which has led to a wide range of environmental problems, for example, urban development facilitated by land filling has been shown to have a negative impact on natural habitat and biodiversity” (2009:397). Moreover, use of land for urbanization has been increasing in recent years. Urban areas increased from 6131 ha during 1975-1992 to 4422 ha during 1992-2003, which indicates the fastest use of land in urbanization. This rapid urbanization of land decreased the areas of water bodies, vegetation, wetlands and the cultivated areas. Dewan and Yamaguchi also identified some elements behind the expansion of Dhaka’s urban growth as the establishment of economic zone which know as “export processing zones” (EPZ) in some big cities of Bangladesh including Dhaka. These zones expended diversity of economic activities in the affected cities (2009). Redefinition of metropolitan areas and reclassification of urban boundaries with rapid infrastructural development in the city have become a major impact on urban growth.

### **3.3 Housing and Living Conditions**

Housing conditions in Dhaka city look more problematic than other issues. It is a challenge for the poor migrant people to secure a shelter. Due to the continuing migration, poor people often end up in illegal settlements on insecure lands with major environmental concerns. Creation of slum areas are common in Dhaka city and the slum areas are located throughout the city, but the services or facilities for the slum areas are very inadequate (World Bank, 2007). Slum areas in the city reflect negative impact on environment with excessive numbers of people and limited access to basic services. “Vulnerability to flooding and the growth of slum areas have been the main negative outcomes associated with the rapid urban development. Urban land expansion has been largely driven by elevation, population growth and economic development” (Dewan and Yamaguchi, 2009). Around 89% of poor household in Dhaka city live in a single room house and

the average floor per single person counted 3.7 m<sup>2</sup>. The situation is worse in densely populated slum areas of Dhaka city where the floor space is only 1.2 m<sup>2</sup> per person (Begum, 2007). Although people live on the street in most third world cities, it is in South Asia where homelessness has become a significant issue with 7.8% of the population living on the street (Desai and Potter, 2002). An abnormal high population density of these slum areas and squatters makes the city environmentally degraded surroundings (See photos 6 and 7 on slum areas).

The growth in Dhaka's inhabitants has come at remarkable pace. In addition, huge rural urban migrations because of various push and pull factors made the city vulnerable in terms of living status. Excessive growth ultimately raised demand for required utility services and basic settlements. Absence of basic utility services pushes inhabitants in both formal and slum settlement. Capital city Dhaka's administrative structure is organized as one City Corporation and five municipalities, Narayanganj, Kadamrasul, Savar, Tongi and Gazipur . Dhaka City State of Environment identified nine key environmental issues to analyze the city's living condition in respect to environmental aspects; these are air pollution, water, land, noise, environmental health, solid waste management, sewage management, slum and squatter areas and natural disasters (Dhaka city state of environment, 2005). Environmental issues are discussed in chapter four.

### **3.4 Problems of Poverty, Inequality and Insecurity**

Rapid urbanization also increases rapid poverty in the city and it is now considered one of the major urban problems. "The world's poor once huddled largely in rural areas. In the modern world they have gravitated to the cities" ( Ravallion, Chen and Sangraula, 2007). Researchers call this the "urbanization of poverty". The city needs a clear policy and mandated agency to address the challenges of urban development, urban poverty and service delivery (World Bank, 2007). Urban poor increase more than the population increase as a whole so the poverty reduction also measured lower than average pace. It is a general estimation that poverty levels are higher in rural than urban areas but absolute number of poor people are increasing in the urban areas and especially in developing cities. It is also estimated that poverty is the main reason behind unstable conditions of the cities (Rana 2010). Poverty has contributed to raise and

growth of social problems like drug addiction, crime, violence and unemployment in the city areas. In Bangladesh, urban areas are the center place for hijackers, murders and drug suppliers. Regular increase of people living in slum areas and their illegal actions is identified as an increasing social problem for Dhaka city (Rana, 2010). Urban poverty is considered a significant problem for city development in Bangladesh. Poverty alleviation becomes complicated due to rapid growth of urban inhabitants through rural urban migration (World Bank, 2007). Urban poor are unable to afford proper housing and other utility services in the city. Moreover, neither government sectors nor any other private bodies are able to overcome the poverty situation for poor in the city (Islam, 2001).

Social inequality in urban Bangladesh is going to be one of the dangerous elements on the path of urban development. “Needless to say, most cities and urban center in Bangladesh are either indifferent to the needs of great majority of its people, or at best are focused to the demands of the rich and the powerful, at the cost of majority” (Ali, 2002). Social inequality makes inhabitants desperate to earn money illegally and even in violent ways, which also increases insecurity. All these insecurity makes city life complicated and unhappy. Dhaka city ranked 127<sup>th</sup> out of 130 cities in the world in the categories of “livable city” (Rana, 2010). Inhabitants in Dhaka city are always under threat of property, person and life whatever he or she holds his position in the society. Most of dangerous crimes like murder, mugging, hijacking, extortion and bomb blasting go unpunished (Ali, 2002). Law enforcing agencies are very much inactive or corrupted which makes for poor law-and-order and social-insecurity situation (Rana, 2010). Density of people with limited or no facilities indicates a violation of human rights. “As of 2003, 29.8 percent of the population of South Asian countries lives in urban areas. Such unplanned urbanization has important implications for various aspects of access to services, the lack of which is currently infringing important human rights” (Begum, 2007). People do not trust each other and social behavior and community actions are rare in society. All these short comings make Dhaka city a place of low quality of living condition.

#### **4. Environmental Issues**

Dhaka city already has a number of environmental problems associated with risk related natural disaster and most of them are human induced. For example flooding all most every year, bad air quality both indoors and outdoors, surface water contamination, decrease in ground water, inadequate solid waste and sewage management. Some other important environmental problems are transport congestion due to the density of people and vehicles, draining congestion because of extreme rainfall and flooding rivers. All of these environmental problems bring serious damage to human health and livelihoods in Dhaka (World Bank, 2006). In addition, global change of climate has resulted in higher temperature, increasing flooding, water shortages and rising sea levels specifically for coastal cities. But as a mega city Dhaka has fewer of the recourses required to adopt or respond to the impact of climate change (Alam and Rabbani, 2007).

#### **4.1 Natural Disasters**

Flooding in Dhaka also frequent in numbers, major flooding occurred nine times from 1954 to 2004. Flood comes often in Bangladesh and cities are become hazardous through severe outcome of it. There is always a natural cause of flood but some other fundamental problems like insufficient drainage, unplanned infrastructure development and natural flows of river interrupted with decreasing water bodies. All these elements have been added due to human activities and made Dhaka city more vulnerable for flood. Almost 2.5 million inhabitants were affected through flood in 2004, among them 20 died (Rana, 2010). In a flooding situation, the most vulnerable groups are people living in slum areas and more than 60% of these areas were affected by flood in 2004 (State of the Environment 2001). Because of flooding, inhabitants lose job, housing, domestic properties and finally effected by water bearing diseases. Researchers argued that flood extended Dhaka's water logging extensively and the poor are extremely helpless in flood hazards ( Alam and Rabbani, 2007). Another problem is that Dhaka city is in a risk of damaging earthquake. A report from the United Nations indicated Dhaka and Tehran as the two most probable cities to have earthquake disaster risk (Rana, 2010). In the time period of May and April the city become high temperature zone and often deliver cyclone which ultimately count the loss of human lives and wealth each year. Fire occurrence comes quite often in the city in this time period. Shopping malls, office buildings, garment factories are the major places experienced with huge fire damage of people and property in Dhaka city. The lack of

alternative exit of respective building and lack of up-to-date fire control appliance lead to additional casualties (Ahmed, 2007).

## 4.2 Management of Solid Waste

In Dhaka city, the high population density means excessive levels of consumption, which deliver abundant quantities of waste. It is not only the case for Dhaka city but rapid urbanization with increasing level of population and their raising consumption resulted in huge quantity of solid waste in the whole Asia region. According to WB, 1.5 billion people will add to Asia's total population by 2020. These additional people require sufficient infrastructure and services. At the same time, service like solid waste collection and disposal is big challenge for a developing city like Dhaka, to make sure that the environmental condition is safe enough to live in. In case of solid waste management South Asian countries have a different problem compare other region. Their generated solid waste is higher because of high density urban population with low quality of technology to disposal the waste. On the other hand climate also not favoring the situation, excessive rainfall and humidity hamper the disposal of solid waste (World Bank, 2007).

In the south Asian developing cities, open dumping is a common way of solid waste disposal (see photos 3, 4 in appendix). With the development of all areas of life, urban inhabitants have been using paper packaging and plastic items in a substantial amount, which result in a large volume of waste and consequent expenses to disposal of this waste. Moreover, all solid waste is not collected by concerned bodies because of inadequate solid waste management and lack of sufficient budget. For example New Delhi in India, has been produced 3.888 tons every year but collected only 2420 tons. Disposal situation is even worse for Dhaka city. They only manage to collect 50% of the waste they generated (South Asia: State of the Environment, 2001). Another research shows that in slum areas 45% inhabitants have no specific place to dispose the garbage and 35.1% have no garbage collection system. The official solid waste management authority in the city area, Dhaka City Corporation, can only collect 42% of total 3000 - 3500 metric tons generated solid waste daily. The rest of the solid waste ends up in low lying areas and open spaces (Rana, 2010). Solid waste management indicated very much poor by the researchers in Dhaka city. The responsible authorities, like municipalities and pourashavas, have not enough resources to collect and disposal of solid waste. As most part of solid waste is remaining in the roads and open places, it becomes a source of air and other pollution (Islam, 1993).

### **4.3 Industrial Pollution**

Unplanned industrial development in Dhaka city pollutes the environment in many ways. Around 200 tanneries have been established in city areas by the recent time. Approximately 2000 garments industries also set up around Dhaka city areas. Other major industries are jute, dying and textile, printing, metal, cement, rubber, chemicals, battery, plastics, brick manufacturing etc. All these different industries are located near the living areas of the city. As a result air, water and soil pollution is out of control. In some cases occupational health problems also occurred due to the waste outcome from tanneries, chemicals and textile industries (Dhaka City State of Environment, 2005). A report identified that the carelessness on the condition of cities environment made the emissions of carbon monoxide, nitrogen oxides, sulphur oxides sometimes go beyond the safety level of Bangladesh. Dhaka is surrounded by four rivers Buriganga, Turag, Shitalakshya and Balu River(see map in the appendix). All these rivers are extremely polluted by chemical and microbial contamination from different industries located on the banks of the rivers. Unprocessed sewerage discharge from different part of the city also goes into the rivers. All polluted rivers contribute to the spread of diseases like respiratory infections, cardiac problems, asthma, emphysema, diarrhea, gastrointestinal problems, skin diseases etc. (Dhaka City State of Environment, 2005). Environmental problems due to industrialization have been seen mainly in third world cities. Rana found in his research that urbanization and industrial development took place in one or two cities of the countries in the third world. Dhaka city can be one of them as an example along with Bangkok, Mexico City and Sao Paulo where the city face huge proportion of industrial pollution (Rana, 2010).

### **4.4 Infrastructure and Transports**

From the very beginning of Bangladesh's independence, the expansion of urban areas and urban inhabitants in Dhaka increased much faster than the infrastructure facilities and respective utility services. Most of city's population is out of access to basic utility services and infrastructure in every time of city's development steps (Rana 2010). It is difficult to live without or with minimum services like housing, electricity, gas, water, sanitation etc. Housing problem is

indicated as the most demanded infrastructural problem in Dhaka city according to the various studies. The statistics on slum areas and squatters, 5000 slum areas for 3.4 million inhabitant's settlement proved the argument properly (Islam, 2000, quoted Rana 2010). Roads for inhabitant's transportation in Dhaka occupy only 8 % (2,230km) to the total surface area, but to maintain minimum standard to provide a transport service at least 25% space is required from surface area. Man ride rickshaws accounted 300,000 which constitute 56% of total vehicles and engage 73% road surface in Dhaka city. The city failed to facilitate and improve road facilities due to excessive population growth and unplanned settlements (Dhaka City State of Environment, 2005).

#### **4.5 Water and Air Quality**

Water supply authority WASA can supply only 1300 - 1500 million liter every day to the inhabitants of Dhaka city but the actual requirement is more than 2000 million liters per day. Same scenario is found in sanitation also where inhabitants of Dhaka city generate around 1.3 millions of m<sup>3</sup> sewage per day and sewage treatment plant can treat only 40,000 m<sup>3</sup>. Remaining sewage goes directly to the rivers around the city by open drains and canals (Dhaka City State of Environment, 2005). Dhaka's surface water quality has been remaining another serious issue. Lots of garments factories emerged within city areas with many other different factories but most of them are established without any proper planning. It was discussed earlier that Dhaka is surrounded by the rivers Buriganga, Balu, Turag and Shitalakshya and all of these rivers are the place now to receive bulk amount of untreated sewage, industrial liquid waste and uncollected municipal waste. All these waste goes to the rivers through canal and by direct disposal (State of environment Dhaka, 2005). As a result water quality of surrounding rivers now reached an alarming situation. Researchers argued that the quality of water already exceeded standard limit according to many water quality parameters. The report identified some reasons behind the serious pollution of surface water "nearly 50,000 m<sup>3</sup> of industrial waste is disposed off in the surrounding river systems, huge amount of sewage, solid waste disposal, large amount of pesticide and agricultural residue waste out to the river" (State of environment Dhaka, 2005). Simultaneously groundwater has every possibility to be polluted shortly by recharge from low quality surface water.

Industrial and vehicular emissions are major sources of air pollution in the city which makes Dhaka city one of poorest air quality regions in the world. There are many industries within the city areas like brick kilns, spinning mills, fertilizers factories, tanneries, chemical and pharmaceuticals which are major industrial sources of air pollution. On the other hand, two-stroke three wheelers, out dated old buses, trucks and other old vehicles which are not running properly are other sources of air pollution (Rana 2010). According to Bangladesh Atomic Energy Commission, “50 tons of lead is emitted into Dhaka’s air annually, and the emission reaches its highest level in dry season”. Research work identified some air pollutant ingredients like carbon monoxide, oxide of nitrogen, sulfur dioxide, ozone, lead, volatile organic compound (VOCs), suspended particulate matter (SPM) etc. in Dhaka’s air which makes both indoor and ambient air quality below standard. Some of them like SPM, ozone, oxide of nitrogen are remain higher level in dry season in Dhaka city (State of Environment Dhaka, 2005).

According to World Health Organization (WHO), around 120,000 children die annually because of respiratory problem and most of them are estimated severely exposed to SPM. In addition, one of the vital reasons of Dhaka’s environmental degradation is the lack of awareness among the inhabitants. Most of them do not know that the environment is polluted and why they should keep themselves out of pollution. According to professor M M Akash of Dhaka University, inhabitants in slum areas are living in a totally unhygienic situation. They are worsening environment pollution by daily activities like burning of biomass, unsanitary practices in a hazardous way (Dhaka City State of Environment, 2005). This lack of awareness is due to inhabitant’s low grade of education and poverty as well.

To some up, urbanization has spot on as a part of development activities in the cities of third world. But it was drawn in different research in the same subject that rapid urbanization produces massive socioeconomic and environmental challenges for urban sustainability (Islam, 2000). Urbanization in Dhaka city is in many ways different in compare to other development cities, which has been discussed in some other parts in this writing. In Dhaka city, the growth rate of urban inhabitants is not reach with the pace of utility service provisions (water, sanitation, waste

disposal, housing etc.) for the inhabitants. Moreover, natural disasters and man induced hazards made the situation even worse.

## **5. Performances of Government, City Authorities and NGOs**

The study found that the three most important performers, government, city authority and NGOs are working on urban problems and environmental degradation. It seems that the concerned authority is aware of the situation on environmental degradation and rapid urbanization but fail to negotiate the problem. Sometimes it is out of control and unpredictable to estimate how large the rural to urban migration would be (Rana, 2010). Moreover, local government has negligence on sustainable living condition and access to basic needs for urban inhabitants. Previous research work find that the outcome of these lack of good governance and negligence are socio economic insecurity, huge traffic jam with accident, environmental degradation etc. It should be mentioned here that respective government authorities entitled to the city development are powerful according to relevant law, policies, guidelines and other administrative support but they are severely lacking in transparency and accountability to make the city livable and environment friendly (State of Environment Dhaka, 2005).

### **5.1 Different City Authorities Working Together Without Coordination**

The key utility service providing organizations in Dhaka city are

Dhaka City Corporation (DCC), Dhaka Metropolitan Police (DMP), Dhaka Water and Sewerage Authority (DWASA), Dhaka Electric Supply Authority (DESA), Titas Gas Limited, Bangladesh Telephone and Telegraph Board (BTTB), Rajdhani Unnyan Kortripakhkha (RAJUK), Dhaka electric Supply Company (DESCO) and Development of Environment (DoE) (Dhaka city state of environment, 2005).

Different researchers argued that there is no comprehensive policy or policy implication strategy by government of Bangladesh initiated to face these challenging circumstances of rapid urban growth and its consequence impact on environment. Different government and non-government

organizations are involved in one way or another in urban issues in Dhaka city with little or no coordination and planning. For example, when DWASA complete their renovating responsibility, DCC starts their refurbishing work immediately to do their part in the same place but it could be done together. Due to lack of coordination among the service providers this happen quite often in Dhaka city. Constant digging and filling the city roads for different purposes, city dwellers have to face hours long traffic congestion every day (Moinuddin, 2010).

Due to the absence of coordination and planning in different bodies, huge gaps have been seen in services and infrastructure. The outcome is limited electricity supply, inadequate land and housing options and tremendous traffic congestion (World Bank, 2007). Bureaucratic deadlock is another critical factor affecting the provision for urban services (Begum, 2007). Lack of coordination also sometimes results in lost economic funding. For example, in 2002, World Bank withdrew around 50% of USD 220 million which was allocated to Dhaka Urban Transport Project (DUTP) for improving transport infrastructure. However, they failed to implement the project on time and WB withdrew the fund. The fail was due to the lack of coordination between Dhaka City Corporation and Roads and Highways Department (R & HD), the two responsible organizations to implement the project. Both organizations were just blaming each other for the decision of WB to withdraw the fund (Moinuddin, 2010).

Nature of urbanization in Bangladesh makes the situation more crucial. Rural - urban migration almost out of control, no good governance at all for urban inhabitants. Unequal resource distribution has an important role for this situation. It is common in urban Bangladesh that urban inhabitant living in an informal insecure settlement. The authority acknowledged the situation but avoid the issue claiming that they have resource limitation in addition to administrative and political problems (Rana, 2010).

## **5.2 Party Politics and Corruptions**

Dhaka city is the center for most of the political turmoil and conflict in Bangladesh. Historically developmental progress of the country has been tremendously hampered by political instability (Rana, 2010). As Dhaka city become the primary place for political showdowns, both ruling and

opposition parties often arrange political meeting in the open space of busy city areas, there by blocking the roads of the city. They even try to showdown power through terrorist activities by the name of politics. The government has no intention towards general development of the city areas or inhabitants. As a result unequal development and resources distribution makes city people in different classes. It was found in study that there are some organization and agencies working on city planning and development but it is not adequate as per as volume of inhabitants (Islam, 1993). The city planning and development authorities do not reach targeted stages of their detail plan due to the lack of skilled personnel and enough resources. Political discrimination and corruption in the planning of city development extended poor governance and failure status. Undue political interference weakens the law and order situation and terrorists often remain unpunished in the city. Crime and violence under political shelter often hampered inhabitant's daily life (Islam, 2002, quoted Rana, 2010).

According to WB report, Bangladesh could achieve 3% more GDP growth if the country can minimize corruption from public sector. Not only that Bangladesh has been ranked highest in the world from 2001 to 2004 in the level of corruption as per as Transparency International's (TI) Corruption Perception Index (CPI). Transparency International Bangladesh (TIB) indicated corruption as the fundamental barrier on the path of massive poverty reduction, increasing economic growth and foreign investment in Bangladesh. TIB also identified some public sectors where corruption was massive like land administration, police, law and order implementing agencies, health care, education and power supply. According to TIB report 2004,

Corruption, lack of transparency and accountability in public life continue to be a burden on the economy, states the report. Over the past decade, negative points have included deterioration of law and order, non-governance, lack of implementation of election pledges, political instability, abuse of governmental power and lack of access for public's redress for human rights violations (Transparency International Bangladesh, 2004).

Political nepotism and corruption can thereby be regarded as the two more fundamental causes for the absence of good governance.

### **5.3 Capacity and Resources**

The Dhaka city authorities have many limitations in resources and in capacity. They do not have enough funds to facilitate the utility services and development activities to city dwellers. Dhaka City Corporation (DCC) operate only 382 conservancy vehicles and trucks for city's waste collection but they need at least 510 conservancy vehicles and trucks as per as the volume of waste. According to development associate organization Japan International Cooperation Agency (JICA), Dhaka city authority need to increase 25% of conservancy vehicles and trucks every five years for smooth operation of waste collection (Dhaka City State of Environment, 2005). DCC is an autonomous authority that should work independently but it has to wait for financial allowance and staff appointment approval from the central government. DCC also not allowed planning and implementing major policies and roles in city development. The authority is very much controlled by the Ministry of local government and Rural Development Cooperatives (WB, 2007). All authorized service providers in Dhaka city either work under a ministry or semi-government sector corporation so their activities only justified by respective ministries or directors but there is no accountability from service provider to consumer of the city. Therefore, inhabitants do not get any response for service complaint from service provider (Moinuddin, 2010).

### **5.4 Role of NGOs**

NGOs have limited access to work in the urban areas of Dhaka city. According to Habib, all the big NGOs are mainly working in rural areas in Bangladesh. There are some contributions from NGOs found in urban Dhaka mainly in the field of health, education, water, sanitation, solid waste management and credit (Habib, 2009). NGOs are working as mediators in water supply system in slum and squatter settlement areas mandated by Dhaka Water and Sewerage Authority (DWASA). Number of NGOs working in all these service increased from nine in 1995 to 25 in 1999 (Islam, 2000). In the field of housing NGOs access is not easy because of government

restriction on urban land and distribution system (Habib, 2009). NGOs are found actively working in solid waste collection and disposal, traffic rules and regulation, community policing etc. but they do these services in some part of the city under different ministries (Moinuddin, 2010). NGOs contribution sometimes controlled by the donors as NGOs are very much dependant on foreign donors. The dependency therefore restricts the work through guidelines and policies which does not always match with the socio cultural condition of the work place. NGOs in this respect fail to implement their work in Dhaka's urbanization and environmental problems (Habib, 2009). NGOs limited contribution is also due to lack of coordination between city authorities and NGOs in solving these problems (Islam, 2000).

## **6. Discussion**

This study presented overall urbanization of Dhaka city. Urban population growth has been extreme since the country's independence in 1971. National population growth of Bangladesh was 2.2 % and the urban population growth was 7% yearly. Country's urban population was 13.5 million in 1981 and the number reached to 46.4 million in 2005. Dhaka city has 35% of the total urban population of the country and the city become one of the most densely populated cities in the world. Dhaka city is defined as a megacity and the population size will make it's position within the ten largest cities in the world by 2015. Growth of urbanization consequently created severe environmental degradation. In the discussion of environmental problems, the study found that in many steps of urbanization, environmental problems in Dhaka city experiences the highest level in the world. For instance, pace of urbanization, population growth rate in the city, total number of inhabitants living in slum areas, population density, environmental health risk, density of led in the air, respiratory infections, land degradation, soil contamination and finally access to basic needs or utility services.

The study also found that rural-urban migration is the core reason behind the rapid urbanization in Dhaka city, beside the high rate of natural increase in city population around 7% annually. Push-pull factors are very much active in Bangladesh due to the overall socio economic condition of the country. Pull factors like job opportunity, better life status, better education and transport attract people move toward to city. At the same time, natural calamity like flood, river

erosion and cyclone, in addition to mass poverty act as push factors in rural-urban migration. The yearly rural-urban migration is estimated by the World Bank to 300,000 – 400,000, which indicates a severe pressure of population in a place that is already over populated.

The rapidity of urbanization never met with the utility services or basic needs options provided by the city development authorities in Dhaka city. Inhabitants have been living with minimum or no service facilities that ended living condition vulnerable and the situation in Dhaka is becoming worse day by day. In some respect, inhabitant's living conditions look inhuman with all kind of life risk ingredients. Inadequate services and facilities for the increasing population in Dhaka city led inhabitants settle down in slum and squatter settlements. The situation reached a high number of 5000 slum areas for 3.4 million inhabitant's settlement. Living condition in slum and squatter settlements has been observed totally unhygienic and hazardous. High density of people resulted insanitary disposal of solid waste, which caused serious pollution of surface and ground water. Substandard and unhygienic living weakens the capacity of poor to survive in a challenging and risky city life. Limited inhabitable land as per as Dhaka's landscape, inadequate infrastructure and very low quality of public services make the city more vulnerable to environmental degradation. However, unplanned land use is probably the most important reason for environmental degradation in Dhaka city.

Although rural-urban migration sometimes seems unpredictable and even out of control, this research also acknowledged that respective authority entitled to basic services options and better environmental condition has limitations both concerning resources and expertise. It is also found in this study that beside limitations, city development authorities have negligence on sustainable living condition and access to basic services. In addition, there is no accountability of service providers especially to city dwellers. Moreover, political party interventions within the government activities make the respective city development authority weak or even inactive. The lack of government policy on urban development and urban poverty results in a conflicting power structure between the Dhaka City Corporation, other city development authorities and the Government of Bangladesh. Therefore, lack of coordination among the service providers has been found vital in response to service development.

Corruption is another leading factor delaying better services options. Corruption report on Bangladesh by Transparency International, clearly measured the lack of transparency and accountability in public life to be a heavy burden on the economy. It leads to deterioration of law and order, non-governance, political instability, mistreatment of governmental power and lack of access for public's right. Therefore, corruption in some respect can be said to cause human rights violations. Not only that, political instability in Bangladesh has been hampering progress of the country in every part of development. The present living condition in Dhaka city is also to some extent due to political instability and undue political advantage. The role of NGOs in Dhaka city is very much limited either in number of NGOs and or their services. Historically in Bangladesh all the big NGOs are working within rural areas.

To be able to improve the overall situation of environmental issues, Dhaka city badly needs good governance with adequate transparency, accountability and coordination among the service rendering agencies. Dhaka's continuous growing populations require a decentralized administrative structure, and the authorized agencies should be independent in planning, development and budget. NGOs should get more access in urban development and rehabilitation activities. Administrative and institutional reform is desperately needed in order to cope with urban development and environmental problems in Dhaka city.

Still, we must acknowledge that the urbanization process of Dhaka city is extreme in comparison with other megacities in the world. The pace of urbanization in the cities of Bangladesh is double compared to the neighboring countries India and Pakistan. Actually population growth rate in Dhaka city is the highest compare to any other city in the world for last few decades, also the population density. More than 13 million inhabitants have been living in an area of 1,353 km<sup>2</sup> which made the population density more than double compared to megacity average of population. To sum up, due to above discussed situation, Dhaka city achieved 127<sup>th</sup> position out of 130 cities in the world in the categories of 'livable city'.

## **Conclusion**

Urban centers in Bangladesh have an enormous economic potential and have become hallmarks of development. However, the following rapid urbanization and its impact on environment in Dhaka city now turn into huge challenge for inhabitants to survive, and for city development authorities and Government of Bangladesh to solve the problems and ensure better living condition. Basic needs or facilities for a growing population are very much short in supply and environmental degradation is escalating. Presently, it is acknowledged that environmental degradation is the major limitation to sustain growth of all types of developments. More specifically sustain growth in production to support an increasing population. Over populated mega city Dhaka needs for a series of policies which will incorporate the setting of all instruments to the development of environment friendly Dhaka city.

## References:

### Books and Articles

Ahmed, N (2007) *The time is ripe: The heat is on*. The Daily Star. March 30, 2007, Dhaka, Bangladesh.

Ali, K (2002) Towards a livable city. *CUS Bulletin on Urbanization and development*, No. 43. Dhaka, Bangladesh: Center for Urban Studies.

Alam, Mozaharul & Rabbani, Golam (2007) “Vulnerabilities and Responses to Climate Change for Dhaka”. *Environment and Urbanization*, 19: 81. DOI: 10.1177/0956247807076911.

Alauddin, M (2004) “Environmentalizing Economic Development: a South Asian Perspective”. *Ecological Economics*, 51: 251–270.

Bryman, Alan (2008) *Social Research Methods*. New York: Oxford University Press. Third Edition.

Begum, Anwara (2007) “Urban Housing as an Issue of Redistribution through Planning? The Case of Dhaka City”. *Social Policy & Administration*, 41:4, 410-418.

Chowdhury, F. J., & Amin, A. T. N. (2006) “Environmental assessment in slum improvement programs: some evidence from a study on infrastructure projects in two Dhaka slums”. *Environmental Impact Assessment Reviews*, 26: 530-552.

Cohen, B (2006) “Urbanization in developing countries: current trends, future projections, and key challenges for sustainability”. *Technology in Society*, 28, 63-68.

Desai, Vandana & Potter, B. Robert (2002) *The Companion to Development Studies*. Oxford University Press Inc., New York.

Dewan, Ashraf & Yamaguchi, Yasushi (2009) “Land Use and land Cover Change in Greater Dhaka, Bangladesh: Using Remote Sensing to Promote Sustainable Urbanization”. *Applied Geography*, 29: 390–401.

Hunter, Lori M (2005) “Migration and environmental hazards”. *Population and environment*, 26:4,273-302.

Habib, Enamul (2009) “The role of government and NGOs in slum development: the case of Dhaka City”. *Development in Practice*, 19: 2, 259-265.

Islam, N (1993) “The Bangladesh situation in urban management capacity”. *CUS Bulletin on Urbanization and development*, No. 24 and 25. Dhaka, Bangladesh: Center for Urban Studies.

Islam, N (2000) “Settlements of the urban poor in Bangladesh. The Bangladesh situation in urban management capacity”. *CUS Bulletin on Urbanization and development*, No. 38. Dhaka, Bangladesh: Center for Urban Studies.

Islam, N (2001) “Good urban governance: an issue reemphasized (Editorial Notes)”. *CUS Bulletin on Urbanization and development*, No. 41. Dhaka, Bangladesh: Center for Urban Studies.

Islam, N (2002) “The Bangladesh Urban Environment (Editorial Notes)”. *CUS Bulletin on Urbanization and development*, No. 43. Dhaka, Bangladesh: Center for Urban Studies.

King, T Victor (2008) *The Sociology of Southeast Asia*. Transformations in a Developing Region. Nias Press.

Moinuddin, Golam (2010) “Metropolitan Government and Improvement Potentials of Urban Basic Services Governance in Dhaka city, Bangladesh: Rhetoric or Reality?” *Theoretical and Empirical Researches in Urban Management*, 5:14, 59-81.

Nazem, N. I. (2001) “The concepts of urbanization and development” in Islam, N., ed.: *Urbanization, urban planning and development and urban governance: a reader for students*. Dhaka, Bangladesh: Center for Urban Studies.

Rana, Md. Masud Perves (2010) “Urbanization and Sustainability: Challenges and strategies for sustainable urban development in Bangladesh”. *Environment, Development and Sustainability*, 13:1, 237-265. DOI 10.1007/s 10668-010-9258-4.

Ragin, Charles (1994) *Constructing Social research*. Sage: Pine Forge Press.

Silverman, David (2005) *Doing Qualitative Research*. London: Sega publications.

Todaro & Smith (2006) *Economic Development*, Prentice Hall: Ninth Edition.

## **Reports**

Bangladesh Bureau of Statistics BBS, (2001), *Bangladesh Population census*. People’s Republic of Bangladesh.

Bangladesh Bureau of statistics BBS, (2005), *Statistical pocket book*. People’s Republic of Bangladesh.

Dhaka City State of Environment, 2005, Department of Environment, Ministry of Environment and Forest Government of the People’s Republic of Bangladesh in collaboration with United Nations Environment Programme, Regional Resource Centre for Asia and the Pacific (UNEP RRC.AP) and Bangladesh Centre for Advanced Studies (BCAS).

( <http://www.rrcap.unep.org/pub/soe/dhaka-soe-05/1-1dhaka-Cover.pdf>)

South Asia: State of the Environment, 2001. United Nations Environment Programme.  
([http://www.rrcap.unep.org/pub/soe/sa\\_part2\\_4.pdf](http://www.rrcap.unep.org/pub/soe/sa_part2_4.pdf))

Transparency International of Bangladesh (TIB), 2004, Transparency International (TI) Report on Corruption in Bangladesh. Dhaka, Bangladesh.  
(<http://www.transparency.no/article.php?id=160&p>).

World Bank, 2007, *Bangladesh: Strategy for Sustained Growth*: Bangladesh Development Series Paper No: 18

World Bank, 2006, *Bangladesh Country Environmental Analysis*: Bangladesh Development Series Paper No: 12

World Bank, 2007, *Bangladesh Country Environmental Analysis: Dhaka Improving Living Conditions for the Urban Poor*, Bangladesh Development Series Paper No: 17

### **Internet Sources:**

*Source*: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision and World Urbanization Prospects: The 2009 Revision*, <http://esa.un.org/wup2009/unup/>, Accessed Wednesday, February 23, 2011; 5:46:23 AM.

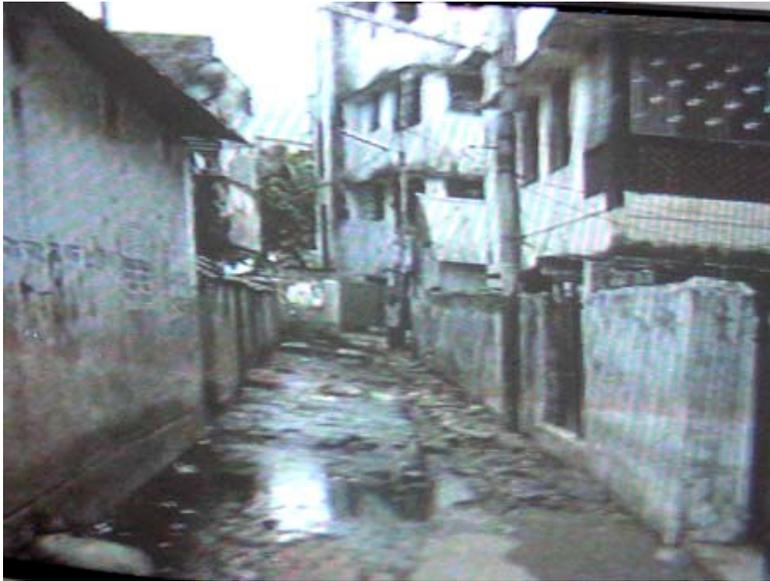
Anan, K (2000) Inaugural Speech at Urban 21: Global Conference on the Urban Future, Berlin.  
(<http://www.un.org/News/Press/docs/2000/20000705.sgsm7479.doc.html> ) Accessed on February 20, 2011.

Ravallion, Martin Chen, Shaohua & Sangraula, Prem (2007) *The Urbanization of Global Poverty*. Development Research Group, World Bank.  
(<http://siteresources.worldbank.org/INTDECINEQ/Resources/Urbanizationpoverty.pdf>) Accessed February 20, 2011.

Usha, A (2002) Urban Environment – Sustainable Development, Working Paper Series, K 32.  
([http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=955789](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=955789)) Accessed on March 7, 2011.

## Appendix

Photo: 1



Sewage overflows in old Dhaka  
Source: Dhaka City State of Environment, 2005

Photo: 2



Temporary landfill site at Hazaribagh, Dhaka city.  
Source: Dhaka City State of Environment, 2005

Photo: 3



Permanent landfill site at Matuail, Dhaka city.  
Source: Dhaka City State of Environment, 2005

Photo: 4



Traffic Congestion in Dhaka city.  
Source: Dhaka City State of Environment, 2005

Photo: 5



Pollution from Brickfield in Dhaka city  
Source: Dhaka City State of Environment, 2005

Photo : 6



Train passing through slum areas in Dhaka city

Source:<http://www.dpreview.com/challenges/Entry.aspx?ID=273292&View=Results&Rows=4>

Photo: 7



Slum areas in Dhaka city

Source: <http://www.pbase.com/billmccabe62/image/76613826>

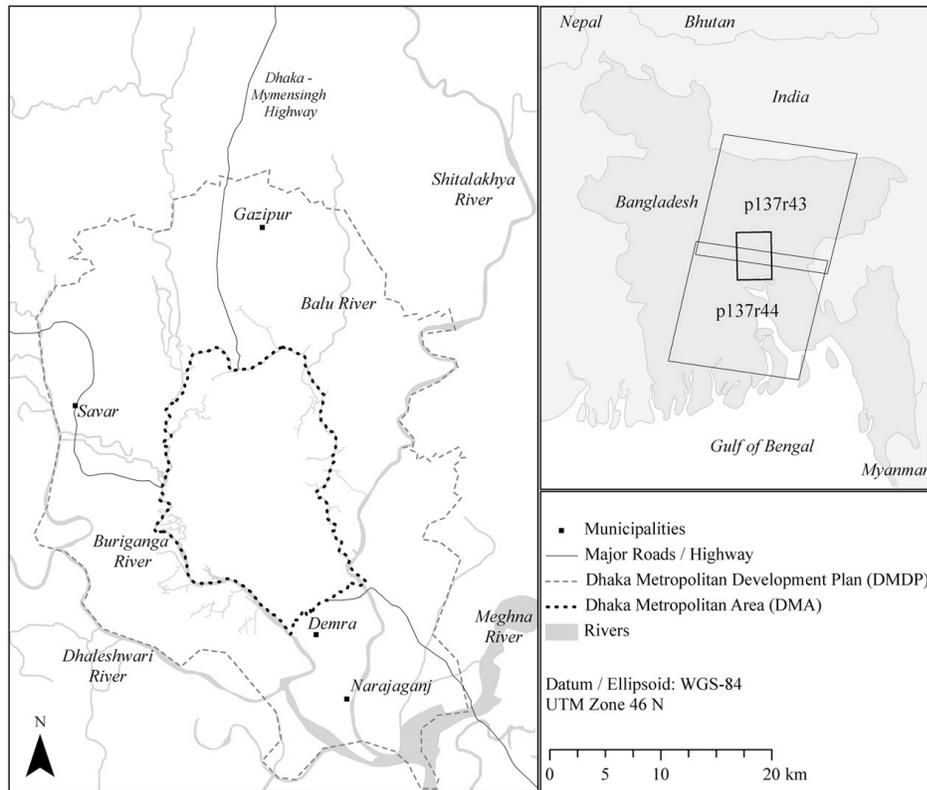
Photo: 8



Informal settlement in Dhaka city.

Source: Dhaka city state of Environment, 2005

Map: 1



Source: Griffiths, Hostert, Gruebner, Linden(2010)

Regional overview of the study site with localities and administrative units (main frame) and location of the study region in Asia with land sat footprints (small frame).