

Governing Urban Climate in Bangladesh: An insight to Dhaka Megacity in Bangladesh

¹Dr. SM Shafiqul Alam, ²Dr. Mohammad Zulfiqar Hossain

¹Associate Professor, Department of Public Administration, Islamic university, Kushtia, Bangladesh

&

Researcher, SUDE-VET and EquJust, the Faculty of Education and Culture, Tampere University Tampere, 33014, FinlandE-mail:smalamuta@gmail.com

²Professor, Department of Public Administration, Islamic university, Kushtia, Bangladesh

Abstract: Dhaka, the capital of Bangladesh, is the largest and densely packed megacity in the world, has become an extremely vulnerable megacity to climate change in Asia and World as well. On the other hand, due to the increase of industrialization, electricity consumption and motor vehicle use, generation of greenhouse gases (GHG) and air pollution, Dhaka are now at danger level. Moreover, Dhaka is the most vulnerable flood-prone city both from the rivers and rainfall beyond the capacity of the city. On the other hand, in practice, governance of Dhaka megacity has become complex due to the multiplicity and lack of coordination among its agents. Consequently, Dhaka city dwellers have been facing multifarious problems, e.g., water-logging, poor sanitation, irregular waste disposal, massive traffic jams, inadequate supply of drinking water, scarcity of electricity and gas, unplanned housing, widespread poverty, proliferation of slums and squatter settlements, inadequate educational and health facilities, high degree of air and water pollution and a deteriorating law and order situation, etc. These problems intensified the climatic problem of the city. Failing to address the climate change impact will be a great hindrance to economic development and the existence of the city in the long-run. In this circumstance, a question rose that how Dhaka Megacity governance does adapts and implements the issue of climate change? This paper discussed the general scenario of urban climate governance in Bangladesh and existing policies, adaptations, and mitigation programs have taken in Dhaka for climate change in specific.

Keywords: inadequate educational, health facilities, climate change in specific.

1. INTRODUCTION

Climate Change is the greatest global threat to sustainable development and natural resource management that we face today. Asia is the most populous and arguably the most vulnerable continent in the world because of the highest risk of climate impacts and the low adaptive capacity (WWF, 2009). Bangladesh is likely to be one of the worst sufferers due to climate change -- an apprehension that grips many. Especially, cities in developing countries are at risk of the impact of climate change. Dhaka, the capital of Bangladesh, is a largest and densely packed megacity in the world. Due to the over population, critical geographic location, unplanned human and industrial settlement, unplanned land use and infrastructural settings and environmental degradation, Dhaka has become an extreme vulnerable megacity to climate change in the Asia and World as well. On the other hand, due to increase of industrialization, electricity consumption and motor vehicle use, generation of greenhouse gases (GHG) and air pollution of Dhaka is now in danger level. Moreover, Dhaka is most vulnerable flood prone city both from the rivers and rainfall that beyond the capacity of the city. During the last 20 years, the city has faced three major floods, each causing huge damage and economic loss.

The governance, development and management setting of Dhaka City are under a multiple organizational jurisdictions and responsibilities, where as many as 40 institutions are involved for its affairs. In practice, governance of Dhaka megacity has become complex due to the multiplicity and lack of coordination among its agents. In consequence, Dhaka

city dwellers have been facing multifarious problems, e.g., water-logging, poor sanitation, irregular waste disposal, massive traffic jams, inadequate supply of drinking water, scarcity of electricity and gas, unplanned housing, widespread poverty, proliferation of slums and squatter settlements, inadequate educational and health facilities, high degree of air and water pollution and a deteriorating law and order situation. These problems intensified the climatic problem of the city. Failing to address the climate change impact will be a great hindrance to economic development and existence of city in the long-run. In this circumstance, a question rose that how Dhaka Megacity governance does adapt and implement the issue of climate change? This paper discussed the general scenario of urban climate governance in Bangladesh and existing policies of adaptations and mitigation programs taken in Dhaka for climate change in specific. This paper has been prepared based on the secondary sources of data through literature review. The results of the paper indicated that there are no comprehensive and integrated efforts in urban governance of Dhaka to address the existing threats and challenges of climate change in future. However, few policy guidelines and initiatives for adaptation and mitigation programs on climate change impact found separately by various agents of urban governance in Dhaka. The paper recommends integrated urban climate governance for adaptation and mitigation of climate change challenges in Dhaka Mega-City.

2. UNDERSTANDING CONCEPTS

Climate Change and Local governance

Climate change is the variation in global or regional climates over time. It reflects changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the Earth, external forces (e.g. variations in sunlight intensity) or, more recently, human activities (Arctic Climatology and Meteorology). In recent usage, especially in the context of environmental policy, the term "climate change" often refers only to changes in modern climate, including the rise in average surface temperature known as global warming. In some cases, the term is also used with a presumption of human causation, as in the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC uses "climate variability" for non-human caused variations. (IPCC, 2001). Climate Change issues have traditionally been broken into two basic categories – those related to mitigation and those related to adaptation. Mitigation refers to efforts to reduce or stabilize GHG emissions; adaptation is about coping and dealing with the consequences of CC. However, there is increasing recognition that there is a continuum between these two areas of work, and that more integrated approaches are needed. The financing opportunities created by carbon markets, if instituted properly at national and sub national levels could reduce local vulnerabilities.

Local governance refers to the ways in which local level decision-making is carried out. The normative term "good local governance" implies that decision-making in the arena of local public affairs is, to varying degrees, subject to the scrutiny and oversight of citizens, open and transparent, rule-bound, and participatory. Local governments, in that sense, are one dimension (albeit an important one) of local governance. Thus, "Local governments" are formal institutions, mandated to deliver a variety of public goods and services at the local level. They constitute, in a sense, the local state. Regarding the role of local governance, it is crucial to consider the characteristics of the local government in question, as they largely determine the kinds of climate change issues it faces and the ways that it does or can respond. Much of the existing documentation on local government and climate change issues tends to be insensitive to these differences (UNDP, 2009, for example, does not systematically distinguish between tiers of the LG system. Much of the work on urban CC issues does not distinguish between large metropolitan cities, smaller towns and agglomerations).

3. METHODOLOGY

This entire paper has been prepared based qualitative methodology using secondary sources of data through literature review of government documents, national and international published reports, books, journal articles and web resources.

4. DHAKA MEGA-CITY PROFILE

Dhaka, a capital city of Bangladesh, has emerged as one of the fast-growing mega cities of developing countries in recent times. At present population of Dhaka near about 16 million and or above. However, the population of this city was 2.2 million in 1975. There is no city in the world, which has experienced such a high growth rate in population during this period. The United Nations (1999) describes the rapid population growth of this city as 'exceptional'. During 2000-2015 it is expected to grow at a 3.6% annual growth rate and reach a total population of 21.1 million in 2015 which will stand in 4th position on the list of the world's mega cities (UN 1999). Dhaka, covers an area of 154 square kilometers', is

situated between latitudes 23°42' and 23°54'N and longitudes 90°20' and 90°28'E. The city is bounded by the rivers Buriganga to the south, Turag to the west, Balu to the east, and TongiKhal to the north. The city has three distinct seasons: winter (November-February), dry with temperatures ranging from 10° to 20°C; the pre-monsoon season (March-May), with some rain and hot temperature reaching up to 40°C; and the monsoon (June-October), which is very wet with temperatures around 30°C. Dhaka experiences about 2,000 mm of rain annually, of which about 80% falls during the monsoon (CP, 2006). Therefore, Dhaka city is characterized by a hot, wet and humid tropical climate. With an ever increasing population, Dhaka has significant problems with congestion, pollution and relatively low level of public services, lowering its already low adaptive capacity. Besides, poverty is massive in Dhaka. The annual per capita income of Dhaka is estimated at US\$500, with 48% of household living below the poverty line. Many people come from rural areas in search of employment and survive on less than US\$10 a day. However, the Dhaka is the capital and center of political, cultural and economic life in Bangladesh (WWF:11, 2009).

5. DHAKA AN EXTREME VULNERABLE MEGA-CITY TO CLIMATE CHANGE

Dhaka is one of many cities across Asia that is vulnerable to climate change. A 2009 World Wildlife Fund report on the 'risks of climate change in ten Asian cities' put Dhaka, along with Manila and Ho Chi Minh city, as especially vulnerable to climatic threats. Other cities experiencing similar levels of climatic threats include Kuala Lumpur, Hong Kong and Singapore, are all less vulnerable since they possess the adaptive capacity to manage threats (CP, 2006). According to a recent global survey conducted by Maplecroft international, based on factors such as over-population, poor governance, corruption, poverty and other socio-economic factors, Dhaka is at the highest risk of adverse climate change due to its inability to absorb the shock of any severe natural disaster (Financial express). The capital city of Bangladesh might be affected in different ways such as flooding, drainage congestion and heat stress. It is also predicted that the negative consequences of climate change are likely to be felt by many people, especially the urban poor who live in flood-prone and water-logged areas (CP, 2006). More particularly, we can guess the risk of Dhaka from the report of UNHABITAT that mentioned "Take one of the most unplanned urban centers in the world, wedge it between four flood-prone rivers in the most densely packed nation in Asia, then squeeze it between the Himalaya mountain range and a body of water that not only generates violent cyclones and the occasional tsunami, but also creeps further inland every year, washing away farmland, tainting drinking water, submerging fertile deltas, and displacing villagers as it approaches – and there you have it: Dhaka, the capital of Bangladesh and one of the world's largest megacities"(UN-HABITAT, 2009). UN-HABITAT, predicts that Dhaka city will be affected by climate change in two major ways: flooding and drainage congestion, and heat stress. The elevation in Dhaka ranges between 2 and 13 metres above sea level, which means that even a slight rise in sea level is likely to engulf large parts of the city. Moreover, high urban growth rates and high urban densities have already made Dhaka more susceptible to human-induced environmental disasters. A recent mapping and census of slums conducted by the Centre for Urban Studies in Dhaka shows that nearly 60 per cent of the slums in the city have poor or no drainage and are prone to frequent flooding. Approximately 80 per cent of the slum population lives in dense slum clusters of between 500 and 1,500 persons per acre. The survey found that more than one-third of Dhaka's population lived in housing where almost all the structures were too weak to withstand large-scale environmental disasters (CUS, 2012).

In addition, floods can lead other health hazards of urban poor residents. Flood waters in slums can mix with raw sewage and breed water-borne diseases, such as diarrhoea, typhoid and scabies. Water supplies also become contaminated during floods, as pipes in slum areas are likely to be damaged or to leak. Experts believe that the melting of glaciers and snow in the Himalayas, along with increasing rainfall attributable to climate change, will lead to more flooding in Bangladesh in general, especially in cities located near the coast and in the delta region, including Dhaka. Dhaka may also experience increased temperatures from rising levels of vehicle exhaust emissions, increased industrial activity and increased use of air conditioning (OCHA/IRIN & UN-HABITAT, 2007; Rabbani, 2007; Centre for Urban Studies, National Institute of Population Research and Training & Measure Evaluation, 2006). On the other hand, as of 2010, nearly a third of the estimated 14 million inhabitants of Dhaka City lives in rickety shanties that dot scores of squalid slums, many of which have sprouted up along the water's edge, making this sizeable population vulnerable not only to flooding but earthquakes. This view is further reinforced by the Stanford-based earthquake disaster risk index (ERDI) that lists Dhaka as one of the top 20 most vulnerable cities in the world to earthquakes (The independent, Friday, 25 February 2011, Syed Mansur Hashim). Furthermore, Dhaka may also face "heat island" problems because temperatures in the city are a few degrees

higher than in the surrounding areas. Indeed, vehicle exhaust emissions, industrial activity and increasing use of air conditioning are contributing to heat generation and this will increase in the future.

6. IMPACTS OF CLIMATE CHANGE IN DHAKA MEGACITY

Sea level rise, storm surge, and flooding are the biggest threats to Dhaka and the city ranks 8 out of 10 for exposure. It is estimated that with a 1m rise in sea level, Bangladesh would lose approximately 1,000km² of cultivated land and much of its sea product culturing area. Exacerbating the effects of sea level rise, Bangladesh and Dhaka sit only meters above current sea level and unfortunately the Dhaka city is sinking due to subsidence, estimated at 0.6 to 1.9m. As a result, Dhaka has already a high degree of vulnerability because it is exposed to so many impacts. From 1974 to 2003, a total 174 natural disasters happened in the city (WWF:11-12). Thus, Dhaka serves as an example of a mega-city prone to climate change impacts. The climate vulnerability of the city results from damaging and costly flooding both from the rivers and from erratic rainfall that generates runoff that is beyond the capacity of the drains. In recent history, Dhaka experienced major floods in 1954, 1955, 1970, 1974, 1980, 1987, 1988, 1998 and 2004 due to overflowing of surrounding rivers. Of these, 1988, 1998 and 2004 floods were the most damaging in central and south western city districts (Alam and Rabbani, 2007:86). Nearly 50% of the city people live in low lying areas where water logging and drainage congestion due to river floods and excessive rainfall during the monsoon cause serious damage and immense social and economic effects on local communities. During the recent floods, especially urban poor suffered from lack of water and food, degradation of sanitation and other serious damages (C40 Cities climate leadership group, 2009b:17). Besides, the followings are the current threats to the city that intensify the climatic problem:

6.1 Geo-environmental changes: Rapid urbanization without considering the geological aspects has brought significant changes in the geo-environment of the city area. Water logging, pollution, changes in the hydro geological system, localized land subsidence, and building collapse are the hazards associated with these changes in the geo-environment (CP, 2006).

6.2 Excessive rainfall and water logging: In recent years Dhaka City is facing extensive water logging during the monsoon (May to October) as a common and regular problem of the city. Most of the respondents (90%) face water logging quite frequently. In Dhaka, 58.7% are poorly drained (CUS, 2005). Slum settlements are often found on land which is in most cases unsuitable in this sense for proper housing. For instance, low lying areas, marshes, sewage canals, riversides, railway tracts and embankments are frequently the site of slums. These sorts of places are prone to suffer from poor drainage and hence water logging (stagnation of water) particularly during the rainy season.

6.3 Trends of extreme temperature: Climatic variability for the period 1981-2003 over Bangladesh has shown that in all seasons the mean maximum temperature is increasing except in winter for the northwest and middle zone (-0.004 °C/year and -0.007°C/year). Overall the temperature is increasing over the whole country (the rate of max temp is +0.028°C/year) concurrent with the global temperature increase (Sarker, 2009).

6.4 Spreads of health hazards: For informal settlement/Slums a significant per cent of the slums in the city have poor or no drainage system and are very much prone to frequent flooding and the problems are being increasingly compounded, given that the quality of housing and living is poor in all such overcrowded slums. Slum dwellers are being affected by diarrhoea, typhoid etcetera and different water borne diseases.

6.5 Over stressed civic amenities: Climate change has already become an adverse threat to the potential agricultural growth in many areas in Bangladesh including Dhaka. Heavy precipitation might result in worst flooding. The sea-level rise might be a threat to millions of people who live in the low-lying areas. As a result, more and more people from various parts of the country are migrating to Dhaka for their survival. But the city is already over-burdened beyond its capacity to absorb the fall-out -- more pressure on the slums and the already stressed civic amenities (ibid).

6.6 Environmental pollution: The mushrooming of the industrial settlement, overpopulation, traffic congestion and heat stress pushed Dhaka into severe environment pollution including water, sound and air pollution.

6.7 Ground water withdrawal: Groundwater withdrawal has increased more than 90% over the last 30 years resulting in groundwater mining and lowering of the water level by 20 m. Water resources of the city are being polluted by the indiscriminate disposal of untreated industrial and municipal wastes in swamps and natural channels in and around the city (CP, 2006).

7. CLIMATE ADAPTATION AND MITIGATION INITIATIVES IN DHAKA

7.1 Adaptation: Adaptation activities can be anticipatory or reactive, planned or spontaneously and are commonly referred to as 'adjustments in ecological-socio-economic systems in response to actual or expected climatic stimuli, their effects or impacts' (Smit et al. 2000: 225). With a view to this, Dhaka in its city level, as part of a large-scale structural adjustment strategy the 'Greater Dhaka Flood Protection Project' (GDFPP) was established in 1989 as a coordinated effort. The Bangladesh Water Development Board, the Dhaka City Corporation, the Dhaka Water and Sewage Authority, the Rajdhani Unnaon Kartipokho (RAJUK), Civil Aviation Authority of Bangladesh, and Bangladesh Army were the main coordinated partner of GDFPP (Breitmeir, Kuhn and Schwindenhammer, 2009:15). In the following decade, most city structures were constructed or improved: The western part of Dhaka, as the urbanized part of the city, became encircled by embankments and flood walls. Important components of the flood protection measures are: Approximately 30 kilometres of earthen embankment along the Tongi canal and the Turag and Buriganga rivers, approximately 37 kilometres of raised roads and floodwalls, a total of 11 regulators along the embankment at the outfall of *khals* (canals) to the surrounding rivers, one regulator and 12 sluice gates on the *khals* at the crossings with the Biswa, DIT, Pragati Sarani and Mymensingh roads and the railway line at Uttar Khan, one pumping station at the outfall of the Kallyanpur *khal* into the Turag River and another at the outfall of the Dholai *khal* to the Buriganga River (Alam and Rabbani 2007: 94).

Although embankments in the western part of Dhaka helped to protect more than 50percent of the city from the floods in 1998 and 2004 and saved people and property from complete inundation, they simultaneously caused water logging and internal drainage congestion, which becomes severe during heavy rainfall. This may be due to inadequate pumping facilities and a lack of proper planning and design of infrastructure (Alam and Rabbani 2007: 94). According to Chowdhury, the poorly governed problems resulting from the flood protection measures stimulated urban poor to settle in floodplains with the consequence of bastee formation in flood-prone areas as are action to the government's structural adjustment policies (Chowdhury 2003). Most problems in the implementation of building measures to adjust to the risk of flooding result from the absence of coordinated policy strategies such as a land use plan for Dhaka. Moreover, Dhaka also shows some engagement in adaptation activities on the transnational level. The city is one of the participants of the C40 initiative. In 2008, one official representative of the Dhaka City Corporation joined the C40 conference in Tokyo where adaptation measures for cities have been discussed and agreement has been reached with regard to the implementation of 13 Joint Actions for urban adaptation to the impacts of climate change (C40 Cities Climate Leadership Group 2009a: 4). Input from the scientific community was provided by the Bangladesh Centre for Advanced Studies (BCAS) contributing to the symposium 'The Growing Threat of Climate Change and Adaptation Measures for a Low Carbon City'. One representative highlighted Dhaka's interest and need to engage in adaptation: 'Due to global warming, temperatures in Dhaka exceed 40°C at times, and are affecting the health especially of the poor. Dhaka is therefore extremely interested in participating in the joint action' (Mallick cited in C40 Cities Climate Leadership Group 2009c: 33).

7.2 Mitigation: Even though Bangladesh's contribution to the generation of greenhouse gases is very low, Bangladesh also tries to reduce emissions now and in the future. For mitigation, Bangladesh has been taken following action plan in 2008 and accordingly implementing different programs such as; (i) develop a strategic energy plan and investment portfolio to ensure national energy security and lower greenhouse gas emissions; (ii) expand the social forestry program on government and community lands throughout the country; (iii) expand the 'greenbelt' coastal afforestation program with mangrove planting along the shoreline; (iv) seek the transfer of state-of the art technologies from developed countries to ensure that we follow a low-carbon growth path (e.g., 'clean coal' and other technologies); and (v) review energy and technology policies and incentives and revise these, where necessary, to promote efficient production, consumption, distribution and use of energy.

8. MODE OF GOVERNANCE OF DHAKA MEGACITY?

Looking for the modes of governance prevailing in Dhaka, city officials often make use of hierarchical non-inclusive steering instruments relating to a top-down policy approach towards urban governance. Therefore, Dhaka is not solely prone to flooding, but also suffers from difficulties in urban governance. Failures in city planning, infrastructure and the city's health care system facilitate social and economic problems. Although there are more than 40 canals within Dhaka's city area that could have remarkable contribution in drainage service, the whole system is not functioning properly due to encroachment of these canals and improper management and overload of sewerage (UNEP 2005: 19). This diagnosis corresponds with findings that show various governance deficits in Dhaka's urban governance system. (Rahman 2002)

referring to badly managed impacts of floods with negative effects on the city's water, sanitation and health systems or on local industries. Local government also makes use of hierarchical steering managing the rapidly formal and informal city growth and urban migration dynamics. Currently, 30-50 percent of the urban populations are either homeless or inadequately housed in informal settlements due to their inability to break into the formal economic sectors of the cities to which they have migrated. Informal settlements are termed with the special indigenous word *bastes* which describes the phenomenon of expanding slums and squatter settlements in Bangladesh, parts of India and Pakistan (Rahman 2002: 270). Stimulated by unemployment in rural areas, urban migration increased and accelerated the rate of *bastees* formation in Bangladesh after independence in 1971. Currently, Dhaka faces a growing demand for the provision of new land for slums which, however, predominantly emerge in flood-prone areas. Although the National Housing Policy (NHP) of Bangladesh recognizes the right of the poor to proper housing, the local government, however, fails and ignores these policy provisions. Local government often practices forced eviction and uses hierarchical top-down regulation. The inhabitants of *bastes* (slum), the *basteebashees* (slum dwellers), increasingly organize and gradually become aware of their rights. Policies have been framed and programs have been announced in the areas of urban development and housing. But hardly any of these measures have been implemented by local government (Rahman 2001: 59-60). For Dhaka City, governance challenges start from the very first layer of the urban planning with the governmental bodies that get to determine what goes where. The main planning and development agency for Dhaka Metropolitan Area is the Rajdhani Unnayan Kartipakkha (Rajuk), which reports to the Ministry of Housing and Public Works. Rajuk formulates what are known as master plans, establishes the developmental controls, and implements major public works projects. The determination of what goes where however cannot be separated from who does what, particularly in terms of providing essential services. Depending on how one is doing the counting, Rajuk should work with some 20 to 40 different units of the government as well as Dhaka City Corporation (DCC) for the administration of basic services from sanitation to telephone. Besides, there are at least 30 other public agencies in Dhaka for governing its affairs. These agents are uncoordinated and work as reactive mode, often without any degree of consistency, regularity and transparency. Thus, the coordination and efficiency challenges on the planning and service delivery are now the main concern for the governance of Dhaka.

9. CONCLUSION

The study concluded that Dhaka City is an extreme vulnerable to Climate Change issue in South Asia in terms of flooding in monsoon, earthquake, water logging for high precipitation, sinking risk for sea level rise, scarcity of drinking water, environmental pollution and overpopulation and most importantly heat stress. The mitigation and adaptation are the options available, though mitigation and adaptation are the opposite sides of a coin. Adaptation implies that individual actors, i.e. the people, communities and states, can and will pursue their own specific strategies. About mitigation, by contrast, installing more efficient energy and modes of transportation, planting trees and the like will benefit not only the individual doing it but also the world at large. Mega-city Dhaka seems to be growing in all directions but hardly in a planned way. Lack of vision and long-term planning has created multidimensional climatic problems in the city. The study realized that if the climate problems and issues are not addressed within a short span of time the situation might become unmanageable in the long run. Although Bangladesh is found to be in full conformity with the integrated approach of adaptation, there is lack of taking initiative and implementations of adaptation and mitigation activities. However, mainstreaming adaptation in development thinking and practices has been recommended as a priority (Ahmed and Haque, 2002; Huq *et al.*, 2003). In order to mainstream adaptation to climate change, specific institutional guidelines need to be developed, which will provide for mechanisms on how inter-ministerial coordination will be achieved, how inter-ministerial policy conflicts will be resolved and who is supposed to mainstream adaptation to climate change, in which direction (Ahmed, 2005a). On the other hand, Bangladesh already has several policies in place to deal with natural disasters like the Comprehensive Disaster Management Policy to deal with the aftermath of a disaster. What is required is to take collective actions that include both State and Non-State actors to prepare for calamities to come, so that the prolonged suffering of Dhaka City residents may be reduced. Keeping in mind the urgency and threats of climate change impacts of Dhaka, city authorities should undertake different programs with high priority that can address capacity building, assessment of hazards and vulnerability, restrict the un planned infrastructure; construction of dams and dykes; establishing early warning systems and land-use planning, environmental protection and community education. For successful implementation of adaptation and mitigation programs, there is urgently need an integrated urban climate governance in Dhaka Mega-City to avoid bureaucratic complexity and multiplicity of governance layers.

REFERENCES

- [1] Ahmed, A.U. and Haque, N., 2002. Climate Change and Sustainable Development. Paper presented at the Dhaka Meet on Sustainable Development, March 14-18, 2002. Incorporated in Q.K. Ahmad and A.U. Ahmed (eds.), Citizens' Perspectives on Sustainable Development, Bangladesh Unnayan Parishad (BUP).
- [2] Alam, Mozaharul/Rabbani Golam 2007: Vulnerabilities and Response to Climate Change for Dhaka, in : Environment and Urbanization, 19:1, 81-97
- [3] Bangladesh Climate Change Strategy and Action Plan 2008.
- [4] C40 Cities Climate Leadership Group 2009b: Report of the C40 Tokyo Conference on Climate Change (www.c40tokyo.jp/en).
- [5] Center for Urban Studies (CUS), 2005.
- [6] Dhaka Extreme Vulnerability to Climate Change: (Ref: United Nations Human Settlements Programme (UN-HABITAT), State of the World Cities 2008/2009- The Case Study Dhaka)
- [7] Geographical setting of the City, CP Dhaka July 2006.
- [8] GOB, 2005. National Adaptation Programme of Action (NAPA), Final report: November 2005, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh (GOB), Dhaka, 48 p.
- [9] Intergovernmental Panel on Climate Change (IPCC), 2001a. Climate Change 2001—Impacts, Adaptation, and Vulnerability: Summary for Policymakers and Technical Summary of the Working Group II Report. IPCC, Geneva, 89 pp.
- [10] Intergovernmental Panel on Climate Change (IPCC), 2001b. Climate Change 2001: Synthesis Report. Cambridge University Press, Cambridge, 397 pp.
- [11] OCHA/IRIN & UN-HABITAT, 2007; Rabbani, 2007; Centre for Urban Studies, National Institute of Population Research and Training & Measure Evaluation, 2006.
- [12] Report of United Nations 1998 and 1999
- [13] Sarker, M.S.H., 2009. *Climate variability and its trend over different region of Bangladesh* American Meteorological Society, 89th Annual Meeting, Phoenix, AZ, 11—15 January
- [14] The independent, FRIDAY, 25 FEBRUARY 2011, SYED MANSUR HASHIM
- [15] The Financial Express, VOL 18 NO -370 REGD NO DA 1589 | Dhaka, Tuesday November 1 2011, Shafiqul Alam
- [16] WWF (2009), Mega-Stress for Megacity-Cities-A Climate Vulnerability Ranking of Major Coastal Cities in Asia.