Case Study Paper

Megacity – Mega Challenges:

A case of Dhaka City – Capital city of Bangladesh

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Abstract

Bangladesh's capital Dhaka is the 7th largest megacity of the world having 20 million of the population with an annual growth rate of 3.60% and by 2030 it will be the fourth biggest city in the world with 28 million inhabitants. Like other megacities of the global south, Dhaka is facing the combination of high pressure of housing, high population density, and rapid population growth, consequences in urban growth taking place in natural hazard-prone areas. The city is characterized by rapid mass urban transformation, high level of social vulnerability and high level of poverty, shortage of infrastructure, housing and social services, poor quality of the social and physical environment, lack of urban governance and ineffective urban management. The paper aims to explore the physical, geographical and social characteristic of Dhaka city which transformed into a megacity in recent decades. This research is based on secondary data analysis and literature review and also highlights some recommendations.

Keywords

Dhaka City, Megacities, Climate Change, Population growth,

1. Introduction

The capital city of Bangladesh – Dhaka is one of the fastest-growing cities in Asia and by 2030 it will be the fourth largest megacity of the world (UN, 2008). This city consists of 38% of the whole country's urban population with an estimated number of 17.6 million which covers 1528 sq. km of land (area of Dhaka metropolitan) and by 2035 this number will be raised up to 28 million (The World Factbook, 2015; RAJUK, 2015; UN, 2016). Dhaka metropolitan comprises of six municipalities named as Dhaka North City Corporation (DNCC), Dhaka South City Corporation (DSCC), Gazipur City Corporation, Savar Paurashava, Kanchan Paurashva, Narayanganj City Corporation, and many other sub-district towns (known as 'Upazila') and rural areas as well (RAJUK, 2015). Geographically, Dhaka is located on the north bank of 'Buriganga River' and Geo-morphologically which is flood plain of the world's largest river system (Dewan, 2013).

In recent decades Dhaka has transformed into a megacity which is not proportionate with its development pattern. Hossain (2006) has highlighted four major characteristics of Dhaka. They are – 1) Shortage of housing, infrastructure, and social services. 2) High level of poverty and social vulnerability. 3) Poor quality of the physical and social environment. 4) Inefficient urban management.

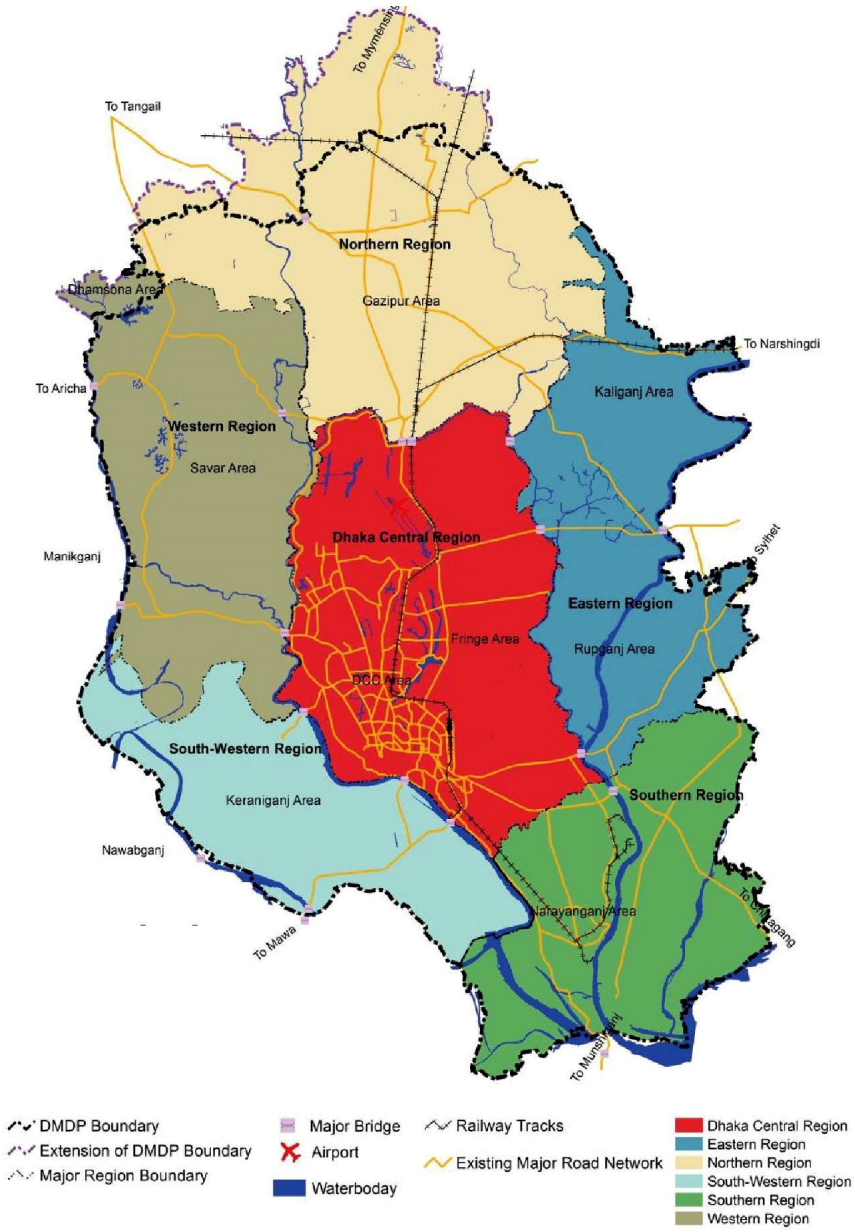

Figure 1 Map of Dhaka City **Source: RAJUK (2015)**

2. What is Megacity?

United Nations has defined a megacity as an urban area with a minimum population of 10 million. There is no standard of geographical area or population density to define a city as a megacity. In the current world, there are 37 megacities and by 2030 there will be 41 megacities (Omondi, 2018). Among these megacities, 80% are in Asia, Africa and Latin America (Kuo, 2016). According to Hossain (2006), these megacities, especially from developing countries, have some problems like – 1) High Population Growth 2) Urban

Poverty 3) Massive Infrastructure Deficit 4) Pressure on housing and land 5) Environmental Degradation 6) High risk on public health 7) Economic dependency on federal/state government and Capital scarcity.

3. Major challenges of Dhaka city

According to the Economist Intelligence Unit's (EIU) survey, Dhaka is the second least liveable city in the world (Mohiuddin, 2019). In recent decades, the overall condition of Dhaka is getting worse. The major challenges and problems of Dhaka city are described in this chapter.

3.1. Population growth and rapid urbanization

The estimated growth rate of Dhaka's urban population is 4% each year since 1971 whereas the national growth rate was 2.2% (World Bank, 2007). According to the Dhaka Structure Plan (2016-2035), there are three major reasons behind this high population growth rate of Dhaka city. They are – 1) Reclassification of rural areas into urban areas – 2) Natural urban population growth – 3) Rural to urban migration (Only 16% of the total population of Dhaka city is local people and rest of 84% is migrated from the other part of the country).

Dhaka has 400 years of history. In course of time, the geographical boundary of the city, population, and density has been changed. In last, 60 years Dhaka city is expanded geographically by 1.8 times and the population density is increased by 27 times. Some statistics are given below:

Year	Area (sq. mile)	Population (million)	Density(Person/sq. mile)
1956	320	0.40	1,250
2019	590	20.00	33,900
2035 (Projected)	590	28.00 (Projected)	47,457 (Projected)

Source: Mahmud (2017); World Population Review (2019); RAJUK (2016)

Rapid urbanization and population growth are one of the main reason for increasing land values of Dhaka which resulted in haphazard fillings of flood plains and low lands and sprawling peripheral land developments (Alam, 2011). The annual increase rate of the land value is 22.26% between 1990 and 2000. In the next ten years (2000 to 2010) the land values have increased by an average annual rate of 74% (Alam,2018) whereas, the price hike of land values of the neighboring cities are not that high. For example, The average increase rates of land price in Karachi (Pakistan), Kolkata (India), Kathmandu(Nepal) are 70%, 50%, and 50% respectively (Makathy 2008; Seraj 2007; Mayo 1998).

Rapid urbanization consequences environmental changes at multiple scales and like other big cities of developing countries, Dhaka has faced rapid urbanization due to land use change in large scale (Dewan et al. 2012). Persistent population growth creates extreme pressure on existing land use and land recourses. In the last few decades, Dhaka has been undergone break-neck and unplanned urban growth through expansion in adjacent low-lying areas. This kind of expansion has some negative impacts on the land market, socio-economic and environmental arena.

3.2. Traffic congestion

Traffic congestion is a curse for Dhaka city. A study of World Bank shows that the average traffic speed has dropped from 21 kmph to 7 kmph in last ten years. It is also predicted that the speed might be dropped to 4 kmph by 2035 which is slower than general walking speed. Traffic congestion also causes great economic loss. Another study by BRAC Institute of Government and Development mentioned that In Dhaka, the amount of loss of working hour is 5 million hours/day which costs 31.2 million USD. On the other hand, traffic jam can cause serious mental and physical problems (Haider, 2018).

The accident rate in Dhaka is also high. According to Bhuiyan and Islam (2018), more than ten thousand accidents occurred in Dhaka between 1998 and 2014 and around 4,514 pedestrian have died.

3.3. Hazards and Disasters

Dhaka is among the most vulnerable cities in the world with its high population density and rapid urbanization located in an area of valuable assets. Unplanned physical development and along with increased population has made it susceptible to diverse natural and manmade hazards like urban flood, earthquake and fire hazard. The unique geographic location and topographic condition also contribute to exacerbate the disaster situation. The city's exposure to hazard is often aggravated by the multitude pressure of climate change. Intense poverty and poor governance are also likely to amplify the impact of these disasters. Distinct urban characteristics of Dhaka associated with a various dimension of vulnerabilities has made its urban communities more fragile and sensitive to this adverse condition. Besides, there is no specific demarcation of duties and responsibilities among the authorities and agencies and there is negligence in duties as well. Lacks of co-operation among these organizations and misunderstanding between implementing agencies and local people make several policies unimplemented in the field.

The main natural hazards affecting Dhaka include floods, which are associated with river water overflow and rainwater stagnation. The city is endowed with a network of rivers, numerous 'khals' and canals: the 'Turag' on the west, the 'Buriganga' on the south, the 'Balu' on the east and the 'Tongi Khal' on the north (Faisal, 1999). On the other hand, the elevation of 70% of the total City varies within 0.5 to 5 m which is very low and act as a temporary detention basin for flood water (Rahman, 2006). The scenario of floods in Dhaka is most common during the monsoon season (June to September) due to water level rise in these rivers and trans-boundary flows. The City experiences about 2000 mm annual rainfall, of which more than 80% occurs during the monsoon season (Dewan et al, 2007). Flooding due to drainage congestion is also a regular phenomenon here. Encroachment of flood retention ponds and agricultural lands for constructing building and industries by land developers is leading to rapid loss of natural drainage system and severe drainage congestion in the city. According to the city development authority, 12% of the urban area should be set-aside as retention ponds Currently the total area of retention is about 365 ha which is only 4% of total DCC area and it is gradually decreasing with an increasing population (Faisal,1999). The problem is further aggravated by poor maintenance of the surface and underground drainage network of the city, inadequate embankment, culverts, and pumping facilities. In addition, lack of institutional coordination has significantly contributed to worsening the flood situation. (Faisal, 1999). Dhaka has experienced many disastrous floods in the past of which the 1998 flood is said to be the worst in memorable records (Dewan et al, 2007).

Floods in 1998 were caused by extreme river levels, 23% of the area of the western city was inundated. Other catastrophic floods hit Dhaka in 2004 and in 2007 mainly caused by prolonged seasonal rainfall overwhelming the capacity of the urban drainage system (Khan et al., 2018). Experts fear that the flood vulnerability of Dhaka is likely to exacerbate in the effect of the probable climatic change. (Dewan et al, 2007).In the past floods, people experience severe waterborne diseases caused major health impacts. Innundation of roads often causes traffic congestion and thereby massive economic losses. Although all parts of the urban area are distressed by these floods, dwellers of slums and squatter settlements are particularly vulnerable to flooding, because of inadequate provision of storm sewers in there (Rashis et al., 2007).

The city is one of the active seismic regions of the whole world for being located at the junction of several active tectonic plate boundaries: the Indian plate, the Eurasian plate, and the Burmese microplate. The city is believed to be awaiting a destructive earthquake at any time due to the shifting of or collision between these plates (Ahmed and Morita, 2018). Besides the locational disadvantage, the city is poised to more threat due to its enormous population, highly dense structure, unplanned growth, and poor management systems. The demand for housing settlement, infrastructure, and other facilities is increasing gradually with population expansion. Vertical expansion has become the common development trend of Dhaka to cope with the extensive population pressure. Most of the buildings do not follow minimum standard though there is a comprehensive set of rules and regulation and a complete guide for building design and construction named as Bangladesh national building code (BNBC 2015). Additionally, haphazardly grown settlement on filled up marshland and low-lying flood flow zones have also made the capital highly vulnerable to earthquake. According to statistics, 30% of buildings of Dhaka city are constructed on soft soil by filling up the low land (Sadat et al., 2010). Theses densely constructed, unreinforced and non-engineered buildings are increasing the risk of damages by a disaster. There are some incidents of building collapse even without an earthquake like ‘Rana Plaza’ Incidents. Therefore, the risk of an earthquake in Dhaka is easily imaginable. It has estimated that about 72,000 buildings which are 90 percent of the total buildings would collapse in a major earthquake of 7.0 or greater magnitude on the Richter scale (Haque, 2016). In addition to structural vulnerability, people have little knowledge about this hazard and precautionary measures because there were no big earthquakes in the last 100 years. They are not aware of the adverse effects an earthquake may bring upon them.

Along with flood and earthquake, a rising trend in the number of fire incidents in Dhaka has become a key concern for the citizens. Notable fires incidents have taken place like ‘Nimtoli' Fire, ‘Bashundhara' City Complex Fire, Bangladesh Steel and Engineering Corporation (BSEC) Bhaban Fire and ‘Tazreen Garments' Fire, etc. (Rahman et al., 2015). According to the Fire Service and Civil Defence (FSCD) Department, there were about 80 fire accidents in Dhaka city last year alone. The deadliest fire in recent times was the ‘Chawkbazar' fire this year (Helali, 2019). Fire hazard also affecting the readymade garments sector, which is generating 78% of the country's total foreign earnings (Wadud et al., 2013). Vulnerability of Dhaka City dwellers to fire hazards has been increased due to reckless building construction and disobedience of Fire Protection Act, 2003 and BNBC (Islam et al, 2008). Sometimes these rules are not sufficient because they are only concerned about only fundamentals of fire safety. These rules often do not consider the surrounding land uses and does not identify the risk emerging from the collective impacts of storing different hazardous materials together..

The coexistence of housing and unsafe factory, warehouses and business establishments in the same locality and multipurpose use of a building especially both as a residential and a workshop or factory are dangerous for public safety. The structural inefficiency of buildings and no maintenance of setback between buildings may aggravate the situation. Most of these buildings lack in precautionary measures like wide fire safety stairs, up to date fire extinguisher, smoke alarm, auto sprinkler system, etc. Even if all the precautionary measures exist in a building, most of the dwellers do not know how to use the fire fighting equipment for combating the fire. On the other hand, narrow road hinders the rescue activity after a hazard. Institutional inefficiency, insufficient equipments and lack of proper training of firefighters are worsening the situation. Therefore, institutional reform, strengthening of capacity at the individual and institutional level is needed in order to reduce fire hazard risks of Dhaka City. But it is not possible to bring an overnight change to the infrastructures of this city.

3.4. Climate change

There is a complex relationship between climate change and cities-based activities. Cities may contribute significant amounts of greenhouse gases in the atmosphere which in turns affecting earth's energy budget and thereby resulting in gradual global warming. However, increasing of earth's temperature is one of the major characteristics of climate change. On the other hands, cities are often more vulnerable to the impacts of climate change like urban heat island effects, heat waves and cold waves, groundwater depletion, water shortage, seasonal climatic variability, excessive rainfall, increased water logging, etc.

Dhaka, the capital city and only megacity of Bangladesh is considered as one of the most vulnerable cities to climate-induced hazards. It contributes a major portion of Bangladesh's greenhouse gases although the contribution is negligible relative to total emissions worldwide (Alam and Rabbani, 2007). But the generation of greenhouse gases is increasing with the city's population expansion, rapid urbanization and industrialization, electricity and fuel consumption and growing motor vehicle use. Deforestation combined with the encroachment of agricultural land to meet the demand for housing of growing population is also worsening the situation. At the same time, Dhaka is facing multitude pressures of different climate-induced hazards along with other non-climatic challenges and stresses. Unpredictable changes in temperature and rainfall causing increased frequency of floods and droughts. It is posing adverse effects on different sectors including infrastructure, industry transportations, utility services, sewage management, and human health and livelihoods, especially for the poor.

Dhaka is acting as a concentrated urban island, a renowned phenomenon that absorbs heat and exerts profound effects on both regional weather and global climate. This phenomenon is associated with a number of local problems such as biophysical hazards (e.g., heat stress), air pollution and associated public health problems. The city is experiencing a slight increase in average temperature over long term (Rabbani et. al., 2011) Climate-induced temperature fluctuations, heat and cold waves pose additional challenges for city dwellers in Dhaka particularly for children and the elderly. These events have been observed frequently in recent years. While there is no significant change in the annual average rainfall, the number of days without rainfall is increasing (Alam and Rabbani 2007) and winter in Dhaka is decreasing (Rabbani et. al., 2011). Non-climatic factors like poverty, poor living standard, increasing slum and squatter settlements are aggravating the overall situation.

3.5. Environmental Pollution

Environmental pollution including air and water pollution in Dhaka is a growing concern as it poses a significant impact on public health. Most of these environmental problems are human-induced, resulting in either from a lack of compliance with national policies, rules, and regulations, or from resource constraints to implementing different measures (Alam and Rabbani, 2007).

Air pollution is a major environmental risk to health throughout the world. Bangladesh is the fourth, among 91 countries with the worst urban air quality in its recent air pollution monitoring report of the World Health Organization, 2016 (Alam et al., 2018). Deferent air pollutants such as VOC, CO2, CO, O2, SO2, NOx, H2S, SPM, PM10, PM2.5, and Pb are significantly responsible for the deterioration of air quality. Most of these air quality parameters have been significantly increased at different locations in Dhaka (Alam et al., 2018). Problems associated with air pollution have been enhanced due to the increasing number of automobiles, industrial operations, urban constructions and adjacent brick kilns around the city. Meteorological parameters like temperature, rainfall, relative humidity, and wind speed are also one of the important factors to influence the urban air quality. According to national standards, the daily particulate matters exceed the optimum limit during the dry season, whereas it has been reported slightly lower during monsoon(Kayes et al., 2019). Air pollutants pose several health risks such as eye irritation, headaches, damage to kidneys and central nervous system, skin cancer, cardiovascular diseases, nausea, asthma, and anemia (Alam et al., 2018).

Dhaka city is surrounded by a number of rivers and canals of which Turag, Buriganga, Dhaleshwari, Balu, and Shitalakhya are the important ones. The quality of water in these rivers have reached a very critical situation and are not suitable for instant use due to different anthropogenic activities like the dumping of industrial, medical and household waste and untreated sewage effluent into these rivers. Inadequate solid waste and sewage management and lack of the water resources management plan and policies are also contributing to deteriorating the water quality gradually. The poisonous waters of these rivers have not only been killing all its aquatic life but also been posing health hazards to the dwellers of the city (Haldar and Islam, 2015). By using river water for washing clothing and bath many water born disease like yellow fever, cholera, dengue, malaria, and other epidemic diseases spread man to man. The people live nearby these rivers are also suffering from the odor pollution.

Waste management is also an important sector which may significantly contribute to improving the quality of the environment. The rate of the waste generation in Dhaka city is increasing with the growing population. Dhaka City produces more than 4000 Metric Tons of solid waste per day of which 200 Metric Tons waste contain toxic chemicals, radioactive elements and pathological substances (Yasmin and Rahman, 2017). Management of this huge quantity of waste is difficult as they are generated at a faster pace. Unsuitable methods of waste disposal, poor selection of dumping sites and lack of public awareness and adequate policies are making the waste management practices in this city most unsatisfactory. The most common problems associated with improper dumping include: diseases transmission, fire hazards, odor nuisance, atmospheric and water pollution, aesthetic nuisance and economic losses (Yasmin and Rahman, 2017).

4. Recommendations and Conclusion

4.1. Recommendations

- **Decentralization:** Dhaka is packed with a large number of physical structures and people. This kind of unplanned expansion can be solved through rapid political decentralization. It means strengthening the various tiers of the local government. In Bangladesh, most of the local government is not truly dependent. They are dependent on the central government to discharge their duties.
- **Good Governance:** Dhaka is a good example of lack of good governance. According to RAJUK(2015), *'It is a system that individuals and institutions, whether public or private, plan and follow to manage the common affairs of a city'*. In Dhaka, there are some strong government and development agencies. It needs proper coordination among these bodies of different levels.
- **People-Oriented Development:** In recent decades, the physical growth of Dhaka doesn't represent the picture of development. All the development steps should be people oriented and demand driven.
- **Law Enforcement and Implementation:** There are several rules, regulations, and projects to control the unplanned development of Dhaka city. It needs proper implementation of rules, regulations and Law enforcement.

4.2. Conclusion

The megacity – Dhaka plays an important role in the national economy of the country although it covers only 1% of the whole country. Its contribution to GDP is 36% and provides 44% of the country's total employment (Haider, 2018). The government and the dwellers of Dhaka should work in a collective way to revive this city.

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