



# “The organized encroachment of land developers”—Effects on urban flood management in Greater Dhaka, Bangladesh

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## ABSTRACT

This paper presents the results of a Global Position System (GPS) survey and questionnaire survey of 195 plot buyers in land and housing development projects located in Dhaka Metropolitan Development Plan (DMDP) area and violations of the DMDP policy on flood flow zones and retention ponds. The findings showed that developers have significantly converted 10,128.33 ha of lands in flood zones into housing projects and related project developments on natural water retention ponds violating the DMDP policy. Results highlighted that such development projects contribute to the cumulatively increasing intensity of urban floods and subsequent damages in Greater Dhaka. Review shows that although Dhaka has its flood management policies, but these are mostly involved with structural measures such as construction of embankments, floodwalls, retention ponds, and pumping stations. In addition, the paper analyzed the inherent lack of integrated planning, the lacunae within agencies in charge of urban management and resultant externalities in the built-environment. Finally, in order to protect the flood zones and retention ponds from further encroachments and severe future flood vulnerability of Greater Dhaka, the study proposed some structural and non-structural measures for policy makers to consider.

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## 1. Introduction

Intense human demands on the environment such as over exploitation of resources and uncontrolled land development that includes construction of buildings and infrastructures without considering the consequences had increased the impacts of natural disasters in terms of loss of human lives and damage to properties in the last few decades. In Bangladesh, flooding is a yearly phenomenon with 18 percent of the country getting flooded during the monsoon season each year. However, during the last few decades the loss of lives and damage to assets has increased quite significantly (Jahan, 2000), particularly in the country's growing megacity of Dhaka. The floods of 1988, 1998 and 2004 were particularly devastating as these affected almost all aspects of human lives in varying degrees, not only in terms of physical resources but also socio-economically as households suffered from reduced incomes, health problems and loss of occupation and livelihood. An analysis of the data on flood damages indicated that the extent of damage has increased in the last few decades along with increased intensity of flooding (Jahan, 1990). Moreover, the proportion of total area affected by flood has increased over the years (Table 1) despite the construction of huge embankments which cost huge

amount of money, with the purpose of establishing measures to put substantial portion of the country under flood control.

Dhaka megacity or Dhaka Metropolitan Development Planning Area/RAJUK planning area of 1528 km<sup>2</sup> is popularly termed as Greater Dhaka (Islam, 2005, p.10). Dhaka is the capital city of Bangladesh with a population of 13.4 million (UN-Habitat, 2008/2009), and where important government offices, industrial headquarters, high quality educational institutions, dependable health facilities, and private business enterprises are located. Proper functioning of these institutions is important for the development of the country; however the area of Greater Dhaka had been experiencing several serious and hazardous floods in recent decades, posing serious threat to the regular activities of such institutions and establishments as well as to the future livability and sustainability of the megacity.

Greater Dhaka is surrounded by a ring of eight rivers, namely: Buriganga, Shitalakhaya, Turag, Balu, Bangshi, Dhaleswari, Tongi, and Meghna. Water level in all these rivers rises in the monsoon season (June–September) due to seasonal natural flooding that makes the city very vulnerable to flood damage. Moreover, two-thirds of the DMDP area are characterized as flood zones and could remain under water during the whole monsoon season due to the overflow from the rivers and drainage channels. These flood zones and water retention ponds (water retention pond may be interpreted as water reservoirs, lakes, canals, ponds, ditches and drainage channels that are naturally lowlands and store water), are natural receptacles of storm and flood water, and in recent years, the human-made

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**Table 1**  
Percentage of area affected in different years by devastating floods.

Year	Area inundated in the country (%)
1955	55
1974	58
1988	70
1998	70
2004	66

Source: Tabulated from Jahan (1990) and Mahbub-ul-Kabir, Rahman, and Alam (2006).

floods that were particularly caused by the land filling activities conducted by land and housing development projects on the flood zones and retention ponds, had become a burning question for the city's sustainability. Land and housing development projects involve land development by the public and private sector, where the public sector acquires land and private sector purchase or grab and develop large areas of land, and subdivide it into plots and then obtain approval from the Capital Development Authority (RAJUK) for selling them. It is expected that planned residential development takes place with adequate social, physical and environmental infrastructures.

Dhaka is predominantly characterized by its limited land for physical development because of the surrounding massive areas of lowlands and wetlands as well as its bordering ring of rivers. Nevertheless, in the absence of appropriate plans, laws and regulations, and weak enforcement of such laws, housing project developers continue to convert the flood zones, wetlands/lowlands, and retention ponds of the DMDP area into various infrastructure projects. As a result, Greater Dhaka experienced a number of devastating floods especially in 1988, 1998 and 2004 with crucial and significant flood damages (Table 2). The quantitative assessments of these floods revealed that in 1988 alone about 47.1% of Greater Dhaka was flooded, while in 1998 and 2004, approximately 53% and 43% of the city areas were inundated (Dewan, Islam, Kumamoto, & Nishigaki, 2007; Dewan & Yamaguchi, 2008; Dewan, Yeboah, & Nishigaki, 2006), respectively.

The flood in 1988 caused damages to housing units and infrastructures which amounted to US\$ 2.2 million, while in 1998 and 2004, the damages were estimated at US\$4.4 million and 5.6 million, respectively (Ahmed, Gotoh, & Hossain, 2006). The flood in 1998 lasted for more than two months making it the longest flood in the history of Dhaka City (Faisal, Kabir, & Nishat, 2003), however the most severe impact in terms of damages was experienced during the flood in 2004 (Table 3) when 100% of the 119 km<sup>2</sup> of eastern fringe and about 50% of the 117 km<sup>2</sup> area of the western part of Dhaka where most of the housing projects are located, were inundated (Alam & Rabbani, 2007). Such calamity was believed to be the result of poor urban planning and continued land filling development activities in the restricted areas such as the flood zones, wetlands/lowlands and retention ponds by land and housing development projects, which otherwise could have made Dhaka City free from flooding.

**Table 2**  
Effects of three devastating floods in Greater Dhaka.

Year	Inundated area (%)	Flood damage (US\$ million)	Population affected (million)	Flood duration (week)
1988	47.1	2.2	1.9	4
1998	53	4.4	4.55	8>
2004	43	5.6	5	–

Source: Tabulated from JICA (1990), Hye (2000), The Daily Star (2004), Dewan et al. (2006), Ahmed et al. (2006), Alam and Rabbani (2007), Dewan et al. (2007), and Dewan and Yamaguchi (2008).

**Table 3**  
Area affected during three devastating floods in the Greater Dhaka.

Year	Inundated area (%)	
	Eastern fringe of Dhaka (119 km <sup>2</sup> )	Western part of Dhaka (117 km <sup>2</sup> )
1988	100	75
1998	100	23
2004	100	<50%

Source: Adapted from Alam and Rabbani (2007).

During the floods, city life is usually severely disrupted and specifically after the 1988 flood, the government was under huge pressure to undertake long-term flood protection and mitigation measures along with the development of appropriate plans, laws and regulations with strict enforcement for their implementation to prevent similar disasters in the future.

Against the backdrop this study tries to analyse the flaws in planning and development and shows how the rapid growing unplanned land and housing development projects by powerful developers pose severe threat to the urban flood management of Greater Dhaka. Where many projects have developed without appropriate planning approval from RAJUK (Rajdhani Unnayan Katripakha the Capital Development Authority is the regional planning organization for Dhaka responsible for planning, development and control of the 1528 km<sup>2</sup> area of Greater Dhaka) under the loopholes of existing rules and regulations (Alam & Ahmad, 2013) posing. As a result developers' are comprehensively violating flood zones and flood retention pond policy of DMDP.

## 2. Methodology

This study is a part of doctoral research by the author and the article is based on the data and information collected for that research during January to April 2008. The study followed a mixed method comprising qualitative techniques for analyzing the land conversion and development process and reviewing the policies including the DMDP reports and maps, whereas quantitative analysis was employed to interpret the data gathered from the GPS survey and questionnaire survey. Qualitative techniques were also used to analyze the data gathered from reviews, interviews and discussions. Two different types of maps were collected from RAJUK to clarify the objective of this study: Dhaka Metropolitan Development Plan (1995–2015) map and Flood Flow Zone (FFZ) map.

This paper made use of the results of a GPS survey and questionnaire survey of 195 plot buyers in the land and housing development projects in DMDP area. During the reconnaissance survey for the study many developers have been observed to pursue development projects violating the DMDP flood flow zone and retention pond policy. Finally, this study suggested some strategies that could be used as reference in the development of flood management policies and approaches for the protection of the flood zones, flood retention ponds and wetlands/lowlands in other cities in Bangladesh and elsewhere to avoid severe impacts of flooding in the future.

To perform the GPS study, a list of the projects was collected from various sources: for example, RAJUK, Bangladesh Land Developer Association (BLDA) and Real Estate Housing Association of Bangladesh (REHAB, the association of private developers in Bangladesh). After compiling the list, to identify the location and physical condition of projects, a GPS survey was conducted from January to April 2008. All data, both spatial and non-spatial, collected from different sources were analyzed. The spatial data were

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