Land use change and urban flood risk after construction circle levee in Dhaka Metropolitan zone
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1. Introduction

Urban flood is a common problem for megacity Dhaka. It occurs to be accelerated surface runoff due to inadequate drainage facilities for disposing of such runoff in many cities of developing countries. Direct inundation by river floods and inland inundation are the other type of urban flood problem, particularly for those cities located in low-lying floodplain environments like Dhaka city. Moreover, the higher rate of increase population against the limited amount of land has recently been accelerated flooding vulnerability in every year. While flash floods on streets following heavy rainfall have become routine events in recent years, large areas of the city, including its business districts and administrative headquarters, were inundated during the catastrophic flood of 1988, 1998, 2004 and 2007 [1]. The Dhaka City Flood Control Project covers an area of 265 km² and can be divided into two distinct phases. The first phase of the project which began in 1989 and was completed until late 1990, consists of 30 km circle levee along the western perimeter of the metropolitan area, stretching from Tongi in the north to the bank of the Burhiganga River in the southwest. The second phase consists of a plan to construct a 29 km embankment along the eastern perimeter, stretching from Uttara in the north to the Shitalakhya River in the southeast. These flood control works were prepared and rearranged based on the study of flood mitigation and storm water drainage plan in the Master Plan for Greater Dhaka Protection Project [2].

2. Data and Methodology

Mega flood in 1988 gave the government to construct the circle levee for flood protection of Dhaka metropolitan area, however, the second stage of land use change has be leading mega floods again in 1998, 2004 and 2007. In these floods, inside water stagnation was occurred in circle levee area. Regarding to urban flood, land use change, social structure and landform are important relationships with each other under the mega flood inside the circle levee area in Dhaka metropolitan area. Satellite Image interpretation is the method for analyzing the recent trend of land use/land cover change. The Remote Sensing Images (TM, ETM and DEM) for this study were acquired of 28 Feb., 1989; 24 Nov., 1999; 8 Aug., 2009 and 10 Oct., 2011. Also, field investigation was conducted for the determination of the existing scenario of the land use. The Spatial data analysis was conducted with GIS software of Arc map 10.0. The cross section profile has been drawn in three river station points and compare with the water level data, we tried to find out the vulnerability of flooding risk over the embankment due to overflowing water.

3. Result

In this study, we try to evaluate the flood risk and resilience by using satellite data and socio-economic data. The study reveals an effective way to utilize the collected satellite data so that it represents the land cover, which is easy to identify the various land use. The socio-economic data has been used to provide information related to flood inundation risk on the basis of various land cover units. This study evaluated the temporal and spatial changes of land use/land cover related with urbanization of Dhaka city. In the study area urban land use has been increased by 12% during 1989 to 1999 and 34% from 1989 to 2009, which resulted in a significant decrease in the area of agriculture land use, water surface, bare land and vegetation cover. In the study area, the amount of agricultural land has reduced substantially, largely as a result of the increasing demand of land for urban land use. In the study area during recent two decades, the rapid urbanization without urban sprawl was the important driven factor of population growth and economic activity.

Compared with the DEM map and the land cover map, there are higher amounts of settlement and built-up zones are located in the low lying high hazard zones and the surrounding suburban city area [3]. Built up area (22%) have been developed in almost all elevation range (1m - 6m). Agricultural land use associated with high elevation range has been converted mostly into built up area and bare land, and at the same time low elevated agricultural land is converted to build up zone to meet the demand for housing to accommodate rapid growing migrate population. The middle and lower middle classes of Dhaka are forced out of the land market, whereas about 50 percent of the populations are living in slums and squatter areas in Dhaka.

4. References


