Name: Mehebub Sahana

Supervisor: Prof. Haroon Sajjad

Department: Geography

Ecological and Socio-economic Vulnerability Assessment to Climate Change: A Study on Sundarban Biosphere Reserve, West Bengal

Abstract

Vulnerability to climate change and its potential impact on natural amd human systems is an important issue in the era of global climate change. Coastal areas are the most productive and transitional areas between land and sea. These ecosystems are more vulnerable to climate change induced natural hazards like coastal inundation, storm surge, tsunamis, shoreline change, sea level rising, cyclone and typhoon globally. The Sundarban coastal region, in South Asia, is prone to cyclones, storms, erosion and storm surge flood (Chaudhuri AB, Choudhury A 1994). Further, human activities like agriculture, shrimp culture and honey collection have made the area more vulnerable. The geographical location of Sundarban and its topographical characteristics have made this region easily vulnerable to natural disasters (Ali, 1996; Agarwala et al., 2002). Most of the researches on vulnerability assessment focused on Bangladesh Sundarban region and the Indian Sundarban has as yet received scant attention for vulnerability assessment. This study intends to assess composite ecological and socio-economic vulnerability for Sundarban Biosphere Reserve.

The study is based on both primary and secondary sources of data. The primary data for examining ecological, social and economic vulnerability were collected through field survey using a structured questionnaire. Secondary data was derived from various sources. Various methods namely Standard deviation (SD), absolute mean deviation (AMD), and mean absolute inter-annual variability (MAIV), probabilistic analysis, forest fragmentation, Normalized

difference vegetation index (NDVI), Normalized difference moisture index (NDMI) and Modified normalized difference water index (MNDWI) and household perception was used to examine the socio-economic and ecological vulnerability.

The rate of increase of air temperature, annual average rainfall and sea level rise in SBR is higher than the world average. High salinity also recorded in upper part of the Reserve. The water-logged area has increased in the upper part of the Biosphere Reserve due to practice of prawn cultivation in the last 25 years. The study demonstrates drastic changes in land use land cover in the study area. The average rate of erosion (5.98 m2/year) in SBR is higher than the accretion. Agricultural land has been transformed into fallow land and fish farm area (waterlogged area) causing ecological degradation. More than 50% coastline of SBR has been subjected to high and very high vulnerability. Hydrological alteration, salinity and cutting of forest nearby built up area have been the prime reasons for hampering forest density in the study area. Non-forested areas in patch and edge have increased outside the core forest while these have decreased in perforated class within the core during 1990-2011. Very high vulnerability was found in along the coastline of Holliday, West Dulibhasani, East Dulibhasani, Ajlmalmari, Bulcherry, Chhotardi, Pirkhali, Moushuni, Jambudwip, Jharkhali and Hamilton. Poor coastal zone management, limited livelihood facility, low level of infrastructural development, insufficient institutional arrangement all have made Sundarban coast more vulnerable to the climate induced disasters. The coastal blocks are more vulnerable and impoverish in socio-economic status than the blocks situated in the northern part of the Reserve. Study calls for efficacious management of coastal blocks by constructing earthen embankment, improving early warning system, poverty eradication through provision of employment opportunities, establishment of cyclone centres and scrupulous government assistance.