1. Urban Flooding of Greater Dhaka in a Changing Climate: Building local Resilience to Disaster Risk

Intense rainfall floods Dhaka, Bangladesh, one of the world's fastest-growing megacities, year in and year out, and those in the city's slums and shanties are usually the most affected. Low-lying flood plains, rivers, and canals that once drained water are gradually filling up as a result of indiscriminate urbanization, and now magnify, rather than help solve the problem. The climatic outlook for South Asia in the 21st century signals heavier and more erratic rainfall during the monsoon season, according to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change and the World Meteorological Organization. Thus, climate change may further aggravate Dhaka's flood vulnerability.

Dhaka needs to better manage its flood drainage infrastructure and strengthen the city's climate-disaster resilience and adaptive capacity. But climate-smart policies require local planners to better understand the likely damage from current flooding, potential damage from climate-related risks, and measures that can be taken to cope with current and future flooding and adaptation costs. In this presentation, Susmita Dasgupta will report a recent multidisciplinary research conducted by a team of hydrologists, economists and regional planners for building local resilience to flood-disaster risk. The research assesses Dhaka's preparedness for urban flood emergencies, estimates probable damage from extreme rainfall events by 2050 with or without climate change, develops structural adaptation measures to cope with current and future flooding, evaluates the reduction in economic damage resulting from implementing these measures, and estimates adaptation cost.

Earlier analytical work on climate-proofing Dhaka's infrastructure has been confined mainly to case studies, with relatively limited sets of locations, impacts, and adaptation measures. This study fills that critical knowledge gap by providing itemized estimates of the incremental costs of infrastructure adaptation out to the year 2050. Local decision-makers indicated that the study is of prime importance, as it identifies vulnerable populations and infrastructure, quantifies outstanding deficits in addressing current climate-related risks, and estimates the adaptation cost of avoiding further damage due to climate change. Equipped with a host of investment options designed to address current flooding and improve climate-proof urban infrastructure, Dhaka WASA and Dhaka City Corporations have started developing location-specific infrastructure planning based on the study recommendations.

2. Minimizing Ecological Damage from Road Improvement in Tropical Forests

This paper develops and applies a spatial econometric model that links road upgrading to forest clearing and biodiversity loss in the moist tropical forests of Bolivia, Cameroon and Myanmar. Using 250 m cells, the model estimates the relationship between the rate of forest clearing in a cell and its distance to the closest point on the nearest road; the transport distance-minimizing route to the nearest urban market, with an explicit control for road quality; terrain elevation and slope; the agricultural opportunity value of the land; and its legal protection status. The model takes into account spatial autocorrelation and simultaneity in the relationship between forest clearing and road location.

The findings emphasize the road transport results; forest clearing is highly responsive to the distance to the nearest urban market which comprises of the distance of the cell to the closest point on the nearest road and the transport distance-minimizing route to the nearest urban market the distance from market. The responsiveness of forest clearing to distance from the nearest market is lower for primary road links, because their higher average vehicle speeds and lower maintenance costs reduce the effect of distance to market. Using the estimated forest clearing response elasticities and a composite biodiversity indicator, this research computes an index of expected biodiversity loss from upgrading secondary roads to primary status in each 250 m cell. The results identify areas in Bolivia, Cameroon and Myanmar where high expected biodiversity losses may warrant additional protection as road upgrading continues. In addition, they provide ecological risk ratings for individual road corridors that can inform environmentally-sensitive infrastructure investment programs.