

Comparative Assessment of Rainwater Management Alternatives for Dhaka City: Case Study of North South University

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Abstract : Dhaka, the capital of Bangladesh, faces two contrasting problems; excess of water during monsoon season and scarcity of water during dry season. The first problem occurs due to rapid urbanization and mismanagement of rainwater whereas the second problem is related to climate change and increasing urban population. Inadequate drainage system also worsens the overall water management scenario in Dhaka city. Dhaka has a population density of 115,000 people per square miles. This results in a 2.5 billion liter water demand every day, 87% of which is fulfilled by groundwater. Over dependency on groundwater has resulted in more than 200 feet drop in the last 50 years and continues to decline at a rate of 9 feet per year. Considering the gravity of the problem, it is high time that practitioners, academicians and policymakers consider different water management practices and look into their cumulative impacts at different scales. The present study assesses different rainwater management options for North South University of Bangladesh and recommends the most feasible and sustainable rainwater management measure. North South University currently accommodates over 20,000 students, faculty members, and administrative staffs. To fulfill the water demand, there are two deep tube wells, which bring up approximately 150,000 liter of water every hour. The annual water demand is approximately 103 million liters. Dhaka receives approximately 1800 mm of rainfall every year. For the current study, two academic buildings and one administrative building consist of 4924 square meters of rooftop area was selected as catchment area. Both rainwater harvesting and groundwater recharge options were analyzed separately. It was estimated that by rainwater harvesting, annually a total of 7.2 million liters of water can be reused which is approximately 7% of the total annual water usage. In the monsoon, rainwater harvesting fulfills 12.2% of the monthly water demand. The approximate cost of the rainwater harvesting system is estimated to be 940975 bdt (USD 11500). For direct groundwater recharge, a system comprises of one de-siltation tank, two recharge tanks and one siltation tank were designed that requires approximately 532788 bdt (USD 6500). The payback period is approximately 7 years and 4 months for the groundwater recharge system whereas the payback period for rainwater harvesting option is approximately 12 years and 4 months. Based on the cost-benefit analysis, the present study finds the groundwater recharge system to be most suitable for North South University. The present study also demonstrates that if only one institution like North South University can add up a substantial amount of water to the aquifer, bringing other institutions in the network has the potential to create significant cumulative impact on replenishing the declining groundwater level of Dhaka city. As an additional benefit, it also prevents large amount of water being discharged into the storm sewers which results in severe flooding in Dhaka city during monsoon.

Keywords : Dhaka, groundwater, harvesting, rainwater, recharge

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