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Title of the Research: Assessment of the Impact of Overflows from Special Sewage Diversion Structures (SSDSs) on the Water Quality of Hatirjheel

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Hatirjheel serves very important hydrologic functions of draining and detaining storm water from a large area (~30 km<sup>2</sup>) of Dhaka [1,2]. The low-lying areas of Hatirjheel used to receive storm water discharges through storm sewer outfall. However, due to illegal connections, the storm sewers also carry domestic/industrial sewage [3]. As a result, Hatirjheel was turned into a virtual wasteland and contributed to deterioration of water quality in the Begunbari Khal-Balu-Sitalakhya river system [4,5]. As a part of a major restoration project, special sewage diversion structures (SSDSs) have been constructed at 11 outfall locations surrounding Hatirjheel. The SSDSs are now diverting the entire dry season flow consisting of domestic/industrial sewage through large diameter “main diversion sewers” laid along the periphery of Hatirjheel. During wet season, a part of the combined flow of storm water and sewage overflows into Hatirjheel through SSDSs causing pollution of the water body. It was expected that gradual separation of domestic/industrial connections to storm sewers would improve the situation. However, there is no sign of this taking place; on the contrary, with increase in population, the pollution load is increasing, intensifying the pollution of Hatirjheel.

The SSDSs and the main diversion sewers of Hatirjheel were designed based on surveys carried out in 2007. Water quality modeling suggested reasonable water quality of Hatirjheel, except for a brief period at the beginning of each wet season [6]. However, continuously increasing population density and expansion of storm sewer network are putting extra pressure (both hydraulic and waste-load) on Hatirjheel water management system. Water quality of Hatirjheel deteriorated significantly during wet seasons of 2012 and 2013 due to huge overflows of mixed rainwater-sewage; there was significant spatial variation in water quality, depending on locations of SSDSs. It is important to assess whether the SSDS and the main diversion sewer system of Hatirjheel would be able to handle the hydraulic load and extent of water quality deterioration of Hatirjheel for future years if no corrective measures are adopted.

The specific objectives of the study were:

1. Estimation of storm water flows through the SSDSs considering catchment areas under each SSDS, and analysis of storm water network of DWASA.

2. Estimation of present and future (up to 2015) wastewater flows through storm sewers discharging into Hatirjheel SSDSs, and overflow of rainwater-sewage into Hatirjheel.
3. Assessment of the capacity of the SSDSs and the associated sewer systems to accommodate present and future storm water and sewage flows.
4. Monitoring of water quality of Hatirjheel at specific locations in order to assess spatial and temporal variation of water quality of Hatirjheel.

Findings/conclusions from the research: The combined total catchment area of all 11 SSDS of Hatirjheel is about 23.75 km<sup>2</sup>. The SSDS-1 and SSDS-10 have the highest catchment areas; 6.1 km<sup>2</sup> and 4.87 km<sup>2</sup>, respectively. A map has been prepared showing catchments of individual SSDSs.

The adequacy of Hatirjheel main diversion sewer system has been evaluated by estimating dry weather flow (i.e., domestic sewage) for the catchment areas of individual SSDS for present and future times (2015, 2021, 2025); it shows that the main diversion sewer system may not be able to accommodate the increased sewage flow in the near future (2015 and beyond).

Under the existing condition, the water quality of Hatirjheel will deteriorate significantly during the wet season; the water quality is likely to improve during the dry season, when there will be no overflows from SSDSs.

Due to increase in wastewater/sewage flow, the overflow of sewage-storm water mixture into Hatirjheel during the wet season will continue to increase in the future; in fact, in the future, overflow of sewage from SSDSs could take place even during the dry period. This is likely to cause significant pollution of Hatirjheel throughout the year.

In order to improve water quality of Hatirjheel, the domestic sewer connections to the storm sewer system must be disconnected gradually by DWASA. In this regard, catchment of SSDS-1 should be given priority. If domestic sewer connections to storm sewer could be disconnected within this catchment, then pollution load discharging into Hatirjheel (through SSDS-1) would be reduced significantly and water quality of Hatirjheel is expected to improve considerably.

Efforts should be made to assess possible diversion of sewage flows from certain sections of the Hatirjheel catchment in order to avoid overloading of the main diversion sewer system of Hatirjheel. For example, DWASA should consider possible diversion of domestic sewage from the southern parts/periphery of Hatirjheel toward the Pagla Sewage Treatment Plant. Similarly, DWASA should also consider diversion of portion of sewage reaching the main diversion sewer at SSDS-10.

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