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Use of mathematical model as a tool for urban drainage study: Improvement in surface water drainage system of Comilla City Corporation in Bangladesh (Case Study)

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Due to urbanization and increase in population, urban regions of Bangladesh require immediate improvement in drainage systems. Realizing the importance of this issue, the Government of Bangladesh (GOB) has emphasized this matter and has already taken the initiative to develop or improve the drainage system of the Township/ Municipal areas/City Corporations in Bangladesh. In this regard, under the Feasibility Study and Master Plan Review (FSMP) project, the Comilla City Corporation has been identified for a drainage improvement study. At present, the urban infrastructures of the Comilla City corporation — especially drainage, sewage, solid waste and piped water supply facilities — are not sufficiently developed, which cause flooding and water logging in many locations of the city area every year. Considering the inadequate drainage system of the city area and the necessity for the improvement of drainage systems, the objective is set up a study of the improvement of existing drainage situations leading to reductions in yearly flooding and water logging of the city area. It is worthy mentioning that nowadays the computer-based mathematical models are being increasingly used by engineers in Bangladesh for water resources system planning, design, management, and as well as the study of the impact of various existing and proposed projects for improving urban drainage systems.

The bed levels of drainage systems are increasing due to siltation: as a result water levels increase significantly in the drainage systems, specially during high flow. A one-dimensional mathematical model is applied to simulate the water level due to the change of bed levels (siltation) in the drainage system of Comilla City Corporation in Bangladesh. The results show the potential of computer-based simulation models for evaluating the existing condition of the drainage system. Such models are very versatile and permit the rapid simulation of wide range of conditions. Given the data describing the topography and boundary conditions, the model will simulate the performance of the system. The system may then be altered according to certain design proposals and return to simulate the effect. So, a mathematical model constitutes a useful tool for the development, control and utilization of water resources.