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Reliability analysis of rainwater tanks under different climatic and spatial conditions: A case study for Sydney

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A daily water balance model was developed using daily rainfall data, contributing roof area, leakage/evaporation loss factor, available storage volume, tank overflow and rainwater demand. In order to assess reliability of domestic rainwater tanks in augmenting partial household water demand in Sydney area, the developed water balance model was used for three different climatic conditions (i.e. dry, average and wet years). The traditional practice of rainwater harvesting volume/size design is based on historic annual average rainfall data. However, design of rainwater harvesting volume based on annual average rainfall data is not realistic. As a stormwater harvesting system designed considering average rainfall will not provide much benefit for a critical dry period. In several earlier studies, a single representative year was selected for each of the dry, average and wet years. Dry, average and wet years were defined for the years having an annual rainfall of 10 percentile, 50 percentile and 90 percentile values respectively. However, as a particular year may have an unusal rainfall pattern, this study considered five respective years for each of the dry, average and wet years. Model was used for selected five years and average outcomes were calculated. Comparisons of calculations based on one year data and five years' data are presented. To assess the spatial variablity, the model was used for the performance analysis at two different regions of Sydney (Australia); Central and West. These regions of Sydney are characterised by notable different topography and rainfall characteristics. For any reasonable size rainwater tank, it is likely that during some non-rainy periods of the year rainwater tank will be unable to supply the intended demand. As such augmentaion supply is usually connected with the townwater supply system (in the cities where townwater supply exist). Townwater augmentation amount is an important factor for the end useres as the users would prefer to minimise such supply to reduce the water cost. In this study, 'townwater supply' is used for the assessments of rainwater tank outcomes.

Biography

Monzur Imteaz is working as a Senior Lecturer within Civil Engineering group of Swinburne University of Technology at Melbourne, Australia. He has received his B.Sc. in Civil Engineering from Bangladesh University of Engineering & Technology and M.Eng. in Water Resources Engineering from Asian Institute of Technology (Thailand). He has completed his Ph.D. in 1997 on Lake Water Quality Modelling from Saitama University (Japan). After his Ph.D., he was working with Institute of Water Modelling (Bangladesh) in collaboration with Danish Hydraulic Institute (DHI). Later he has completed his post-doctoral research at University of Queensland, Brisbane. Before joining at Swinburne he has been involved with several Australian local and state government departments. At Swinburne, He is teaching subjects 'Sustainable Design', 'Urban Water Resources' and 'Integrated Water Design'. Also, he has been actively involved with various researches on sustainability, water recycling and modelling, developing decision support tools, rainfall forecasting using Artificial Neural Networks.

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