Development of Qatar Rainfall and Runoff, National Guidelines: Opportunities and Challenges

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Extended Abstract

Qatar is going through a rapid infrastructure development in recent years. This remarkable development has prompted the need for Qatar to have a comprehensive and world class guidelines or code of practices for planning and infrastructure design to meet future demand. For design and operation of water infrastructure, and many other environmental and stormwater management tasks, design rainfall is a fundamental input. Design rainfalls, is generally known as intensity-duration-frequency (IDF) curves. For Qatar, the old IDF data was developed in 1991 based on a limited data set and basic statistical approaches. Since then there have been significant developments in statistical techniques to derive IDF data and moreover at many locations in Qatar, the length of the observed rainfall data has increased notably. The Ministry of Municipality and Environment (MME) of Qatar is currently undertaking a comprehensive rainfall study for estimation of design rainfall for Qatar. This study is aimed at preparation of single comprehensive National design guidelines titled Qatar Rainfall and Runoff (QRR) manual for the design of storm and surface water infrastructure in Qatar. The findings of this study provide important insights into the nature of rainfall variability in Qatar, which will be useful in water resources planning tasks in Qatar and nearby countries.

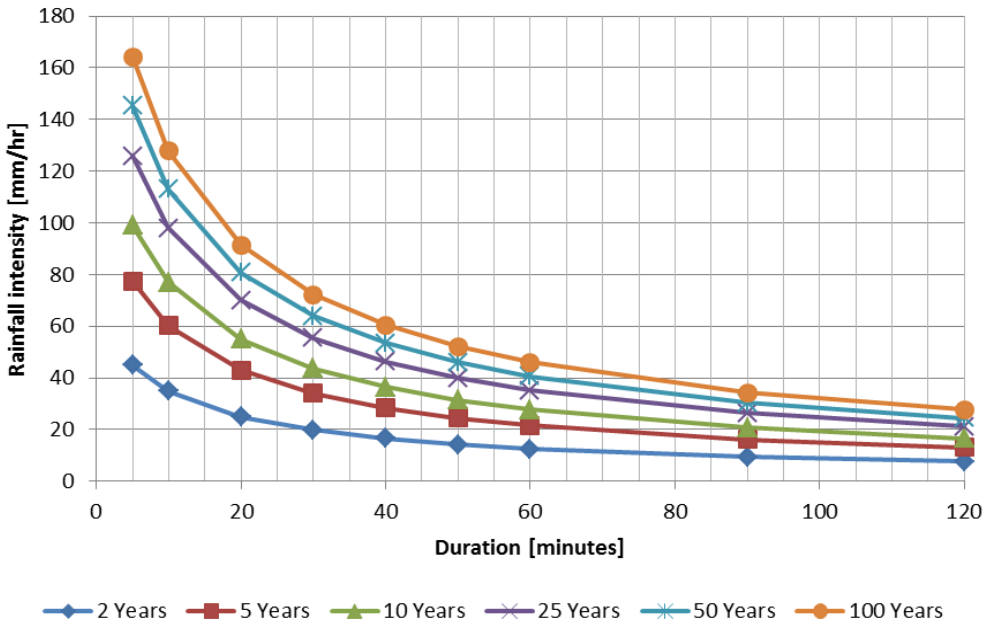

Figure 1: Final set of derived IDF curves at Doha International Airport

Qatar is mainly covered by barren desert with relatively flat topography. The climate of Qatar is dominated by mild winters and very hot summers. The average annual rainfall values for Qatar are found to be in the range of 55.5–99 mm. A sharp gradient in average annual rainfall was noticed, with north having higher values than the south. The rainfall analysis in arid regions such as Qatar appears to

be a challenge due to the limited availability of high resolution, long record rainfall data of acceptable quality. In addition, a higher proportion of missing data at many stations, inadequate rain gauge density and a lack of skilled personnel for effective database management make rainfall analysis difficult in this region. Rainfall data from over 30 stations located in Qatar and nearby Gulf countries were examined in this study. The method of L-moments and index regional frequency analysis approach are employed for derivation of new set of IDF data for Qatar. Climate change can affect the magnitude, frequency and spatial variability of rainfall. A statistical trend analysis is therefore also being carried out as part of this study for evaluating the possible impacts of climatic change and climate variability on rainfall data in Qatar. A number of rainfall characteristics were examined including annual rainfall, monthly rainfall, daily maximum rainfall and the number of rainy days using Mann–Kendall (MK) and Spearman's Rho (SR) tests. In general, the trend tests have shown both positive and negative trends for all precipitation indices throughout the country. The preliminary findings of this investigation indicate that in general, rainfall in Qatar is changing.

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