M.Sc. THESIS

RAINWATER HARVESTING OPTIONS AND ISSUES: A CASE STUDY OF LAHORE

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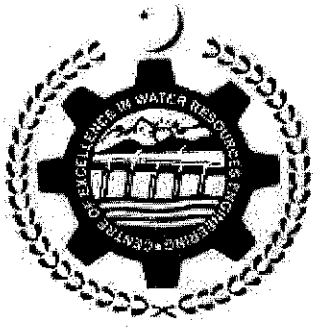

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ABSTRACT

The considerable amount of annual rainfall makes rainwater harvesting a logical solution to overcome water shortage in Pakistan. The ground water resources are also depleting due to higher usage. As the growing population in the urban areas and higher demand of water for crops are putting increased load on underground aquifer, whereas in the last decade, the groundwater level in Lahore has decreased by more than 30 feet. The amount of rainfall the Lahore city receives may be one of the options to recharge the aquifer. Rainwater harvesting during the rainy season can reduce the load on sewage and rainwater collection system which helps in ground water build up.

Data from primary as well as secondary sources was used for this study, which aims to find out the potential of rainwater harvesting in Lahore and proposes various conservation options after conducting analysis on; (i) land use and rainfall pattern of the study area of Lahore, (ii) simulation of rainfall runoff and estimation of runoff in the Central Drain Catchment using HEC-HMS, (iii) different design options of various rainwater harvesting systems consisting of groundwater recharge and rooftop rainwater harvesting, (iv) implementation of proposed options and estimation of subsequent impacts in the study area.

The results showed that the rainfall pattern in the study area does not have a particular trend but there is significant potential for the implementation of rainwater harvesting systems in Lahore. Various beneficial design options are introduced as pilot study which demonstrate beneficial techniques.

The results of rainfall analysis on temporal basis for the duration 1931 to 2013 depicted that there is substantial year to year variability in rainfall pattern and rainfall pattern is generally erratic in nature. It was analysed and observed that the area under different landuses of the basin did not change with time due to fully developed old urban study

area. The analysis of the hydrological simulation results on selected extreme event basis indicated that the total 24 hour rainfall of 288 mm, produced 2,669,700 m^3 of surface runoff volume and 87 m^3/s peak flow. These results obtained and expressed in this study can be a comprehensive and effective tool for learning and designing rainwater harvesting systems both for the users and for the professionals in Pakistan.