HYDROLOGICAL ASSESMENT OF DIFFERENT SLOPE-ADJUSTED CURVE NUMBER MODELS UNDER VARYING INITIAL ABSTRACTION COEFFICIENT.

by

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Centre of Excellence in Water Resources Engineering
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ABSTRACT

The applicability of the curve number (CN) model to estimate runoff has been a conundrum for years, among other reasons, because it presumes an uncertain fixed initial abstraction coefficient (λ = 0.2), and because choosing the most suitable watershed CN values is still debated across the globe. Furthermore, the model is widely applied beyond its originally intended purpose. Accordingly, there is a need for more case-specific adjustments of the CN values, especially in steep-slope watersheds with diverse natural environments. The assumption of slope in the NRCS handbook is taken as 5% but it does not apply to all watersheds due to variability in their slope. Hence, the present study evaluated the efficacy of three slopes adjusted CN_2 models i.e., Sharpley and Williams, 1990 (Model 2); Huang et al. 2006 (Model 3); Ajmal et al. 2016 (Model 4) as well as original SCS-CN method (Model 1) using ASTER DEM data. The performance of these models was also evaluated for three different values of initial abstraction coefficient (λ), i.e., 0.05, 0.1, and 0.2 for the Dharabi and Chirah Catchment regions in the Pothohar region of Pakistan using R^2, RMSE, and 1:1 Scatter Plot. The comparative analysis of these models resulted that the Model 4 for λ = 0.05, and 0.1 showed the lowest RMSE and highest R^2, whereas discrepancies in Model 4 efficacy were found in the case of λ = 0.2. In the Chirah Catchment, Model 2 performed better in terms of RMSE and R^2 for = 0.05, 0.1, and 0.2 in contrast to the other models. Furthermore, in the comparative assessment for best suitable λ, all selected models performed well at λ =0.1 as compared to λ= 0.5 and 0.2. The findings suggest that the slope of a watershed and selection of λ have a significant impact on runoff generation and that it should be taken into account for estimation of runoff to design soil and water conservation structures.