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Research Article

Evaluation of the effects of constructed rehabilitation dams on maximum and volume of watershed discharge

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Extended Abstract

Introduction

Flood control through the construction of corrective dams is a critical method for managing water resources and mitigating flood risks. This study evaluates the impact of corrective dams on flood characteristics in the Khaveh watershed, located in Markazi Province, Iran. The primary focus is on assessing changes in flood peak discharge and volume before and after the implementation of watershed management structures. By simulating flood hydrographs using the HEC-HMS model, the study aims to quantify the effectiveness of these structures in reducing flood risks and improving water resource management.

Materials and Method

The Khaveh watershed, covering an area of 2,819 hectares, was selected for this study. The methodology involved estimating annual runoff using the Justin method and simulating flood hydrographs for various return periods (5, 10, 20, 50, and 100 years) using the HEC-HMS model. The model inputs included rainfall intensity, curve numbers (CN), and time of concentration for the watershed. Two scenarios were considered: pre- and post-construction of corrective dams. The post-construction scenario accounted for reduced channel slopes due to sediment accumulation behind the dams, which increased the time of concentration and delayed peak discharge.

Results and Discussion

The results demonstrated significant reductions in peak discharge and increases in hydrograph base time following the construction of corrective dams. For return periods of 5, 10, 20, 50, and 100 years, peak discharge decreased by 50%, 43%, 44%, 45%, and 44%, respectively. The base time of the hydrograph increased by 64%, 74%, 72%, 76%, and 176% for the same return periods. Additionally, the time to peak was delayed by approximately 3.5 hours. These changes indicate that the corrective dams effectively attenuated flood waves, reducing peak flows and prolonging the duration of runoff. The study also estimated

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the total annual runoff of the watershed to be 1.51 million cubic meters, with 0.2 million cubic meters temporarily stored behind the dams.

Conclusion

The construction of corrective dams in the Khaveh watershed has proven highly effective in reducing flood peak discharge and increasing the base time of hydrographs. These structures play a crucial role in flood risk management by attenuating flood waves and delaying peak flows. The findings highlight the importance of watershed management practices, particularly corrective dams, in mitigating flood risks and enhancing water resource sustainability. Future studies should focus on long-term monitoring of these structures to assess their performance under varying climatic conditions and sediment accumulation scenarios.

Keywords*:* Check dams, Discharge peak, Flood, Khaveh