

USING SCS CURVE NUMBER AND GIS TO ESTIMATE RUNOFF VOLUME: CASE STUDY WADIS ZAHR, HARAD AND AL GHAYL IN YEMEN

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ABSTRACT

The water crisis in Yemen has great impact on its food insecurity which is among the highest in the world. The water resources are not sufficient to cover human needs and agricultural uses. The Yemen's present population of about 25 million is likely to be doubled in about 20 years which will reduce the present per capita availability of water from 120 m³/year to 55 m³/year in 203. This rate is considered the lowest in the world and in the region. Accurate estimation of runoff in Wadis is very important to manage the scarce water resources and mobilize wadi flows properly. Therefore, the need of management of scarce water resources has necessitated the development of methods and tools for the purpose of runoff estimation. Advances in computational techniques and growing availability of spatial data have made it possible to predict the runoff accurately. The possibility of rapidly combining data of different types in a Geographical Information System (GIS) has led to significant increase in its use in hydrological applications. In addition to the geospatial properties of SCS method which is suitable to be applied in GIS technique since it is based on spatial data such as land use, land cover, and soil maps. Many methods are used to estimate the runoff from a watershed. The curve number method, also known as the hydrological soil cover complex method, is a versatile and widely used procedure for runoff estimation. This method includes several important properties of the watershed namely, soils permeability, land use and antecedent soil water conditions which are taken into consideration. In the present study, the runoff from SCS Curve Number model modified for Yemeni conditions has been used by using conventional database and GIS for Wadis Zahr, Harad and Al Ghayl in Sana'a. This study has used SCS method with GIS to estimate the runoff from the Wadis as a case study. The Wadis are located in the Southwest of Sana'a City, the capital of Yemen. The geographical area of the Wadis is 352.4 km² and the average annual rainfall is about 240 mm/year. Rainfall and land use data are used along with the data of soil classification and infiltration rate for the estimation of the runoff for the study area. The results of the study show that the average annual runoff depth for the study is 168 mm, and the average runoff volume is 59 Mm³/year. The amount of runoff represents 70.0% of the total annual rainfall. The methodology used for the determination of runoff for the Wadis using GIS and SCS method was described in this study. This approach could be applied in other Yemeni Wadi for the purpose of planning and developments and management of available water resources.

Keywords: Rainfall, Runoff, Wadis, SCS Curve Number, GIS, Yemen.