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**The Thesis Submitted for the Degree of M.Sc (in the
field of Irrigation hydraulic Structures)**

Estimation of soil erosion and sediment yield in Kardeh basin using USLE, RUSLE and MUSLE

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Abstract

Soil erosion is one of the serious environmental issues and due to its high rate, applied research is needed to reduce its risks. The requirement for this work is to have some data so that critical areas can be identified and managed. In order to conduct a comprehensive research, it is necessary to use new techniques and technologies of remote sensing and GIS. Also, the lack of statistics and information on soil erosion in many watersheds of the country makes the use of appropriate experimental methods to estimate soil erosion unavoidable. In the current research, the spatial distribution of soil erosion risk was evaluated in the form of USLE, RUSLE and MUSLE models using GIS and RS in the watershed of Karde Dam. In this study, the calculation of the Rainfall erosivity factor (R) using the rainfall data recorded in the rain gauge stations inside and around the basin for the years 1995-2015, the estimation values erodibility of the soil, based on the Wischmeier diagram, By using interpolation using the normal kriging method, the values of the Cover Management factor were determined using the NDVI vegetation index and the topography factor using the 30-meter elevation map of the basin. The results showed that the erosion values at the basin level for USLE, RUSLE and MUSLE models are variable between 0.143 to 1.181, 0.003 to 2.951 and 0.012 to 5.194 tons per hectare per year, respectively. The amount of sediment in the USLE and RUSLE models based on SDR for the three method Boyce, USDA and Vanoni in the SATEEC system is 0.260, 0.285, 0.130 and 0.649, 0.712, 0.325 tons per hectare per year, respectively. Considering the observed sediment yield of the basin at the rate of 0.259 tons per hectare per year, the Boyce method in the USLE model has a more accurate estimate of the amount of sediment and as a result the erosion of the basin. According to the soil erosion map prepared in the USLE model and its erosion and sedimentation classes, it was observed that 45%, i.e. 200 square kilometers, of the area of the basin has low and very low erosion and sedimentation, and 33%, i.e. 148 square kilometers of the basin. It has a lot of erosion and sediment. The average annual sediment yield in the MUSLE model was also obtained based on the semi-distributed SWAT model for the years 2000-2015 at the rate of 4.73 tons per hectare per year compared to the observed sediment yield at the rate of 0.33.

Keywords: Estimation modeling, USLE, SATEEC, SWAT, Kardeh Dam