

Modeling Sediment Yield and Deposition Using Swat Model: A Case Study of Cubuk I and Cubuk II Reservoirs, Turkey

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Abstract. Sediment deposition in a reservoir alters not only the esthetic quality but also the useful life of the reservoir as a result of lost storage capacity and operating flexibility. The research reported here enhances understanding of correlations between potential control variables and the resulting sediment yield to reservoirs. Better understanding of which factors determine sediment yield rate to reservoirs can facilitate estimation of the probable lifespan of a reservoir and appropriate mitigation measures to limit reservoir sedimentation. The Soil and Water Assessment Tool (SWAT) was applied to the Ankara Cayi Catchment, which includes 4932 km² in Turkey. SWAT was calibrated for monthly data at an upstream sediment gauging site draining approximately 322 km². Data from 1987-1993 were used for calibration and from 1980-1984 for validation because of non-available observed data at the main outlet. A local sensitivity analysis was performed on 34 input parameters in terms of model outputs such as water and sediment yield. The most sensitive model parameters affecting sediment yield are ALPHA (Base Flow), ICN (Curve Number), CN_F (Initial Runoff Curve Number), ESCO (Soil Evaporation Compensation Factor), SLSUBB (Average Slope Length), and SOL_Z (Soil Depth). In the study, NS (Nash-Sutcliffe Coefficient) and RE (Relative Error) were used for assessing compatibility of the model. SWAT outputs indicate that the model performs reasonably on stream flow (NSE=0.55) and relatively well on suspended sediment (NSE=0.85). Testing the SWAT model applicability in the watershed and identifying the source of uncertainty lay the groundwork for further research in the region.

Keywords: Calibration, Reservoir Sedimentation, Sediment yield, Soil Water Assessment Tool (SWAT), Suspended sediment, Validation.