

Determining the Sources of Sediment at Different Areas of the Catchment: A Case Study of Welbedacht Reservoir, South Africa

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Abstract : Sedimentation includes the processes of erosion, transportation, deposition, and the compaction of sediment. Sedimentation in reservoir results in a decrease in water storage capacity, downstream problems involving aggregation and degradation, blockage of the intake, and change in water quality. A study was conducted in Caledon River catchment in the upstream of Welbedacht Reservoir located in the South Eastern part of Free State province, South Africa. The aim of this research was to investigate and develop a model for an Integrated Catchment Modelling of Sedimentation processes and management for the Welbedacht reservoir. Revised Universal Soil Loss Equation (RUSLE) was applied to determine sources of sediment at different areas of the catchment. The model has been also used to determine the impact of changes from management practice on erosion generation. The results revealed that the main sources of sediment in the watershed are cultivated land (273 ton per hectare), built up and forest (103.3 ton per hectare), and grassland, degraded land, mining and quarry (3.9, 9.8 and 5.3 ton per hectare) respectively. After application of soil conservation practices to developed Revised Universal Soil Loss Equation model, the results revealed that the total average annual soil loss in the catchment decreased by 76% and sediment yield from cultivated land decreased by 75%, while the built up and forest area decreased by 42% and 99% respectively. Thus, results of this study will be used by government departments in order to develop sustainable policies.

Keywords : Welbedacht reservoir, sedimentation, RUSLE, Caledon River

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