

Spatio-temporal Dynamics of Erosion and Sedimentation on Mt. Elgon, Eastern Uganda

By

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Abstract

Mt. Elgon located in Eastern Uganda is a transboundary extinct volcano, found in both Uganda and Kenya; and an important watershed for the Nile Basin. Although Mt. Elgon is generally susceptible to soil erosion and sedimentation due to the steep slopes and high annual rainfall amounts, historical reports and studies of the 1990 indicated that erosion and sedimentation were not serious problem largely due to the deep volcanic soils. Anecdotal evidence in the early 2000's manifested through the brown to reddish color of the water in major streams, increased flood incidences, reported reduction in crop yields indicated that the situation could have changed for the worst. However, knowledge and information on the magnitude, rates and patterns of erosion and sedimentation on Mt. Elgon was lacking, and the processes are not well understood. The gist of this ongoing study is to assess the dynamic patterns of erosion and sedimentation across varied spatial and temporal scales on Mt. Elgon. Geospatial techniques were used for watershed and subwatershed delineation on Mt. Elgon. Twelve (12) runoff plots measuring 150m² for runoff and soil loss monitoring were then established in the selected watersheds across two major land uses, three slope gradient categories and where replicated twice. In addition, H-flumes coupled with automatic discharge loggers were established at 5 stream outlets for monitoring of discharge and Total Suspended Sediment (TSS). Historical discharge and TSS data for gauged streams on Mt. Elgon were also gathered from the Water Resources Management Directorate (WRMD) of Uganda. Preliminary findings indicate that the current rates of runoff erosion and sedimentation are generally high, depicting a drastic change from the historical rates. With respect to soil loss, the averaged annual rates varied significantly ($P < 0.05$) from 7.5 t/ha/yr in the perennial land uses to 24 t/ha/yr in the annual land uses. Noteworthy is that in all cases, the rates are above the generally acceptable soil loss tolerable rates of 5 t/ha/yr in Uganda. Expectedly the steep slopes in annual land use are generating more sediment. In terms of sediment loading in the streams, the observed load ranged from 5.2 to 621 megatonnes per year in a 10 year period, with the highest load observed in 1999; while the sediment yield varied from 13.6 to 1630 tonnes/km²/yr. A distributed GIS-SEDEM model will be used to determine the sediment annual patterns across the landscape, including sources and sinks.