BIVARIATE BASED SUSCEPTIBILITY MAPPING FOR GULLY EROSION IN WANJOGA RIVER CATCHMENT UPPER TANA BASIN, KENYA

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ABSTRACT

Gullies often occur in semi-arid regions characterized by rainfall variability, seasonality and increased overland flow, affecting ecological fragility of an area. In most gully prone areas, extent of land affected by gullies is increasing. Thus, predicting susceptibility to gully erosion in semi-arid environment is an important step towards effective rehabilitating and prevention of gully erosion. Proneness to gully occurrence was assessed against; Land cover/land use, slope, soil characteristics, rainfall variability and elevation, and modelled using GIS-based bivariate statistical approach. The study assessed influence of geomorphological factors on gully erosion, analyzed and developed gully erosion susceptibility map and verified gully susceptibility images using error matrix of class labels in classified map against ground truth reference data. A total of 66 gullied areas (width and depth ≥ ranging 0.5m), were mapped using 15m resolution Landsat images for 2018 and field surveys to estimate susceptibility to gully erosion by Global Mapper software in GIS. The images were verified using 120 pixels of known 15 gully presence or absence to produce an error matrix based on comparison of actual outcomes to predicted outcomes. Influence of conditioning factors to gully erosion showed a significant positive relationship between gully susceptibility and gully conditioning factors with consistency value; CR =0.097; value< 0.1, indicating, individual conditioning factors influenced gully erosion. Slope (43%) and soil lithotype (25%), had most influence on gully susceptibility, while land cover/land use (12%) and rainfall (12) had least impact. Verification results showed satisfactory agreement between susceptibility map and field data on gullied areas at approximately 76.2%, an error of positive value of 4% and a negative value of 7%. Thus, production of susceptibility map by bivariate statistical method represents a useful tool for ending long and short-term gully emergencies by planning conservation of semi-arid regions.

Keywords; *Susceptibility, Gully, Bivariate, Land cover, GIS*

KyU is ISO 9001:2015