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Analyzing Impacts of Road Network on Vegetation Using Geographic Information System and Remote Sensing Techniques

Authors : Elizabeth Malebogo Mosepele

Abstract : Road transport has become increasingly common in the world; people rely on road networks for transportation purpose on a daily basis. However, environmental impact of roads on surrounding landscapes extends their potential effects even further. This study investigates the impact of road network on natural vegetation. The study will provide baseline knowledge regarding roadside vegetation and would be helpful in future for conservation of biodiversity along the road verges and improvements of road verges. The general hypothesis of this study is that the amount and condition of road side vegetation could be explained by road network conditions. Remote sensing techniques were used to analyze vegetation conditions. Landsat 8 OLI image was used to assess vegetation cover condition. NDVI image was generated and used as a base from which land cover classes were extracted, comprising four categories viz. healthy vegetation, degraded vegetation, bare surface, and water. The classification of the image was achieved using the supervised classification technique. Road networks were digitized from Google Earth. For observed data, transect based quadrats of 50*50 m were conducted next to road segments for vegetation assessment. Vegetation condition was related to road network, with the multinomial logistic regression confirming a significant relationship between vegetation condition and road network. The null hypothesis formulated was that 'there is no variation in vegetation condition as we move away from the road.' Analysis of vegetation condition revealed degraded vegetation within close proximity of a road segment and healthy vegetation as the distance increase away from the road. The Chi Squared value was compared with critical value of 3.84, at the significance level of 0.05 to determine the significance of relationship. Given that the Chi squared value was 395, 5004, the null hypothesis was therefore rejected; there is significant variation in vegetation the distance increases away from the road. The conclusion is that the road network plays an important role in the condition of vegetation.

Keywords : Chi squared, geographic information system, multinomial logistic regression, remote sensing, road side vegetation
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