Quantitative and Comparative Analysis of Slope Instability in Karaj-Chaloos Road (Karaj-Gachsar section) and the Under-Construction Highway of Tehran-North (Tehran-Soleghan section) Using Logistic Regression Method

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The Karaj-Chaloos road and the Tehran-North highway are two routes that connect the capital Tehran with the southern shores of the Caspian Sea. This contribution aims to study slope instabilities along these roads (Karaj-Gachsar and Tehran-Soleghan sections, respectively) using logistic regression method. In this regard, 14 layers of effective factors were created in the GIS environment and then correlated with the existing instabilities and their density was calculated. Results obtained by applying logistic regression model showed that the most important factors affecting the slope instabilities in the Karaj-Gachsar road area are distance from river, climate and SPI, while those for the Tehran-Soleghan road area are distance from fault and road and climate. According to the prepared maps, the southern and middle parts of the Karaj-Gachsar road, as well as another part in the northwest of the study area have the highest potential for the occurrence of landslides, whereas in the Tehran-Soleghan road area, the middle and southern parts and a small section in the north of the area have the highest potential for landslide occurrence. 34.95% of the Karaj road area has medium to high potential for the occurrence of slope instabilities and 4.97% of this area has very high potential. It is while 27.14% of the Soleghan road area possesses medium to high potential for instabilities and 4.57% of it exhibits very high risk. By comparing these two areas, it is conceivable that areas with medium to high potential of slope instabilities in the Soleghan road area are less than those of the Karaj road area (27.24% and 34.95%, respectively). However, the percentage of instabilities occurred in the Soleghan road area is much higher (86.26%) than the Karaj road area (54.87%). Finally, it can be mentioned that the logistic regression model was effectively applicable for preparing the zonation of the instability occurrence probability along the slopes overlooking the studied roads. It can also be concluded that in addition to natural factors, the human-made factors and particularly unsystematic road construction can play an important role in the landslide occurrences on the slopes overlooking the roads and in order to reduce the relative risks and increase the stability of the slopes, it is necessary to avoid manipulating the ecosystem and changing the current land use as much as possible, along with policy making for constructions in accordance with geomorphological and geological features of the area.