Application of expert systems and weighted overlay analysis for military planning using remote sensing and GIS in Mulona Sululta district, Ethiopia

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The successes of military operations depend on how decision makers and planners evaluate the battle field prior to the deployment of armed forces on the ground. Off-road trafficability of the terrain is one of the key military operations that should be provided for military commanders at all levels in a real time scenario. This paper evaluates the state-of-the-art of spatial modeling techniques for off-road trafficability of wheeled military vehicles using GIS and remote sensing techniques. The expert systems and Weighted Overlay Analysis (WOA) were compared for modeling off-road trafficability. Similar data layers of land-use/land-cover, soil, slope, rivers and manmade obstacles were used to generate the off-road trafficability maps from the two methods. The goal of comparison of these decision making tools was to test whether data in an ordinal scale from the WOA to produce comparable result with the Expert system that use hierarchy of decisions. There was a strong spatial correspondence between the outputs from the two methods with a spatial correlation of 0.78. A zonal cross tabulation between results showed that the two methods strongly accord to each other in the SLOW-GO and NO-GO trafficability classes with 86% and 75% summarized in the same zone, respectively. There was also a significant disagreement between the two methods in the GO and VERY SLOW-GO classes with only 53% and 31% summarized in the same zone, respectively. This study as a whole can explore variations of these two methods of the military planning and its relationship with existing roads.

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