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Development of Suitability Index for Locating Rock Quarrying Sites in Sri Lanka

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Abstract

Rock quarrying industry in Sri Lanka has been widely expanded during the last few decades due to the rapid increase in the demand for the basic raw material in construction industry. Thus, rock quarries are operated throughout the country, which has resulted in several social and environmental issues. Most of the issues are due to unsuitable locations of these quarry sites. Therefore, finding of economically viable, environmental friendly sites for rock quarrying is a requirement. Present research is aimed at formulating an index to locate most suitable sites for the quarry mining based on the surrounding land use patterns.

Gampaha and Anuradhapura districts were selected as the study area. Both these districts have large scale quarries with comparatively different land use patterns, geological and geomorphological settings. Representing both districts, 15 large scale quarry sites which are currently in operation and other 9 outcrops where there are potential reserves to establish rock quarries were used for the study. Using proximity analysis, 100 m, 250 m, 500 m and 1000 m buffer zones were created and percentage of areas of major five land use classes were calculated. Ranks and weights (from 0 to 1) were given to all land use patterns considering the sensitiveness of each land use pattern in different buffer zones. Based on the rank and the weight of the land use and the distance from the quarry, the cumulative suitability index for each site was calculated and classified. Based on the index, all sites were rated as either suitable or unsuitable for mining.

In Anuradhapura district, 33% of the sites from existing quarry mines and 60% from untouched rock outcrops were rated as suitable locations. In Gampaha district, from existing mines only 17% mines were in suitable condition. However 50% of untouched rock outcrops were rated under suitable category. Therefore results revealed that in both districts, untouched rock outcrops locations are better than the existing quarry mines. The index developed in this study can be applied to all other districts for locating sustainable environmental friendly quarry sites.

Keywords: Aggregates, Anuradhapura, Gampaha, Rock outcrops, GIS