APPLICATIONS OF GEO SPATIAL AND STATISTICAL METHODS FOR PREDICTION OF GROUND SUBSIDENCE A CASE STUDY FROM MATALE

M.K.C. Jayamali

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka

ABSTRACT

Land subsidence is a significant natural hazard that has been affecting lifestyle of people in Matale area over the past decade. Though several studies have been carried out to identify possible hazardous areas and a few mitigation measures has been proposed, it is still at the development stage. Therefore, the present case study was carried out to identify new approaches to predict vulnerable area for land subsidence more accurately.

An area of 1.8 km^2 was selected as the study area from Thotagamuwa to Kirigalpotta along the A9 road within Matale District.

First, based on field experience and literature survey, seven parameters were identified as causative factors for occurrences of land subsidence, namely; soil type, elevation, slope, depth to groundwater table, geology, distance to geological structures and distance to internal drainage system. Distribution of each factor within the study area was obtained as raster layers (referred to as factor maps).

Three approaches were tested to integrate the factor maps to produce a final risk level map. They were, Weighted Overlay Method and Weights of Evidence Method (WOE) in GIS environment and a Geostatistical approach.

The results were compared with the field data and the risk level map produced by NBRO. It is observed that the most promising results are produced by Weighted Overlay Method, which shows 81.8% positive correlation with field evidence whereas the existing map correlates only 18.18% with field evidence. The map produced by WOE method correlates 54.5% as successive rate compared to field evidence. A higher successive rate could have been achieved by this method if more realistic training points were used for the analysis.

It was revealed that the soil type and geological structures have the significant effect on the ground subsidence scenario and it implies the relative importance of an integrated model on multivariate spatial kriging for the predictions as further studies.

Therefore, based on the maps compiled, community can anticipate ground subsidence hazards, and plan for the land use development as well as drive polices efficiently.