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**A Geospatial Analysis of Demarcating Landslide Susceptibility and Risk Assessment for Landslide Disaster Management: A Case Study of Rathnapura District**

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**Abstract**

Natural hazards are environmental phenomena that can significantly impact society and the surrounding ecosystem. In Sri Lanka, landslides are recognized as a major natural hazard, with nearly 20,000 km<sup>2</sup> spanning ten districts susceptible to landslides. Rathnapura District has historically experienced a high incidence of landslides. This study utilizes Geographic Information System (GIS) and multicriteria evaluation to identify landslide susceptibility and high-risk zones, providing geospatial insights aimed at mitigating adverse consequences on lives, property, and the environment. The study identifies slope, elevation, topographic wetness, vegetation cover, and annual average rainfall as the primary physical and environmental factors influencing landslide susceptibility. Employing Analytical Hierarchy Process (AHP) for ranking these factors, areas susceptible for landslides within the Rathnapura District were identified through geospatial analysis. Analysis revealed that Kalawana, Imbulpe, Rathnapura and Balangoda DSDs (District Secretariat Divisions) are the major four high susceptible zones for landslides than other ten DSDs of Rathnapura District. Assessing the vulnerability of landslides is crucial for mitigating impacts and minimizing damages to lives, property, and environment. Therefore, considering factors like built-up areas, road networks, and population data, this study identified socio-economic vulnerable zones within a 1,000 m buffer zone of highest four landslide-susceptible areas. Specifically, GNDs (Grama Niladhari Divisions) where susceptibility 50% or more out of area of the GNDs were selected for the vulnerability analysis. Out of the overall 308 GNDs, this research identified 96 GNDs as high landslide-vulnerable zones in four high susceptible DSDs. All 96 highly vulnerable GNDs have some level of landslide risk, as they meet at least one of the socio-economic vulnerability analysis criteria. As a non-structural mitigation approach for landslides, the results of this geospatial analysis can guide the implementation of structural mitigations in both susceptible and high-risk zones. This serves as the initial step in the disaster management cycle, ultimately enhancing disaster preparedness and prevention efforts.

**Keywords:** Landslide, Susceptibility, Geo-spatial approach, Analytical hierarchy process, Vulnerability