Developing landslide EWS for the Philippines through landslide-rainfall thresholds, geospatial tools, and radars

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The geographical location of the Philippines makes it vulnerable to various types of hazards that often lead to devastating disasters affecting lives and causing great damage to properties. Yearly, numerous landslide events are being reported nationwide, mostly triggered by the approximately 20 tropical cyclones that enter the Philippine Area of Responsibility, along with other wet weather disturbances.
“Project LIGTAS" or Landslide Investigations on Geohazards for Timely Advisories in the Philippines is a research project that focuses on developing a holistic approach as a preventive method to mitigate losses in lives because of landslide disasters.
Landslide susceptible areas were identified and ranked using Geographic Information Systems (GIS) tools and remote sensing techniques, incorporating a decision-making criteria matrix. For this, local leaders and science experts were interviewed to identify causative factors that, based on their experience and opinion, contribute to slope failures. Scores were subjected to the Analytical Hierarchy Process (AHP), applied to the geospatial information, and analyzed in a GIS environment to produce localized weights that were used to generate enhanced landslide susceptibility maps for the study areas.
Rainfall-landslide thresholds for areas characterized by different physical characteristics were also derived from historical and recent landslide occurrences. Currently, the project has derived a median value of I =92.806 D-0.3817 from 48 landslide events with durations between 4h to 271h for the volcanic terranes of Southern Luzon island. Another volcanic region, the Bicol peninsula, registered average values of I = 27.103 D-0.424, from 207 events with duration between 24 to 384 hrs. In the upland province of Benguet, an average value of I = 12.96 D-0.175 from 192 events with durations between 12 to 648 hrs were computed.
To complement these, efforts were also made to derive local R(Z) relations using disdrometers for improving radar data interpretation with the long term goals for improving rainfall-landslide thresholds statistics and, more importantly, for developing timely early warnings.In terms of improving rainfall intensity data using radar, the best performing R(Z) relation derived is $Z=250R^{1.20}$ which is being utilized for generating rainfall intensity maps in validated landslide areas. With the ongoing data collection and correlation, values can be further improved and be used in the formulation of localized early warning systems protocol for the study areas.

Keywords: Landslides, GIS, Rainfall-landslide thresholds, disdrometer, Philippines