



## **Uncertainty into statistical landslide susceptibility models resulting from terrain mapping units and landslide input data**

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There are multiple sources of uncertainty within statistically-based landslide susceptibility assessment that needs to be accounted and monitored. In this work we evaluate and discuss differences observed on landslide susceptibility maps resulting from the selection of the terrain mapping unit and the selection of the feature type to represent landslides (polygon vs point). The work is performed in the Silveira Basin (18.2 square kilometres) located north of Lisbon, Portugal, using a unique database of geo-environmental landslide predisposing factors and an inventory of 81 shallow translational slides. The Logistic Regression is the statistical method selected to combine the predictive factors with the dependent variable.

Four landslide susceptibility models were computed using the complete landslide inventory and considering the total landslide area over four different terrain mapping units: Slope Terrain Units (STU), Geo-Hydrological Terrain Units (GHTU), Census Terrain Units (CTU) and Grid Cell Terrain Units (GCTU). Four additional landslide susceptibility models were made over the same four terrain mapping units using a landslide training group (50% of the inventory randomly selected). These models were independently validated with the other 50% of the landslide inventory (landslide test group). Lastly, two additional landslide susceptibility models were computed over GCTU, one using the landslide training group represented as point features corresponding to the centroid of landslide, and other using the centroid of landslide rupture zone. In total, 10 landslide susceptibility maps were constructed and classified in 10 classes of equal number of terrain units to allow comparison. The evaluation of the prediction skills of susceptibility models was made using ROC metrics and Success and Prediction rate curves. Lastly, the landslide susceptibility maps computed over GCTU were compared using the Kappa statistics.

With this work we conclude that large differences can be observed on final susceptibility maps depending on the chosen terrain mapping unit. The grid cell terrain units proved to be the best choice, providing the reliable spatial accuracy of the landslide inventory. Additionally, a single point per landslide proved to be effective to generate accurate landslide susceptibility maps, as long as the landslides are of small size, thus minimizing the possible existence of heterogeneities of predisposing factors within the landslide boundary.

Although, during last years the ROC curves have been preferred to evaluate the landslide susceptibility model performance, we found evidence that the model with the highest AUC ROC is not necessarily the best landslide susceptibility model.

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