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Landslide susceptibility map of Slovenia at scale 1 : 250.000

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Based on the extensive landslide database that was compiled and standardised at the national level, and analyses of landslide spatial occurrence, a Landslide susceptibility map of Slovenia at scale 1 : 250.000 was completed. Altogether more than 6600 landslides were included in the national database, of which roughly half (3257) could be used for the analyses. A random but representatively selected 65 % of located landslides were used for the univariate statistical analyses (χ^2) of landslide occurrence in relation to the spatio-temporal precondition factors (lithology, slope, curvature, aspect, distance to geological boundaries, distance to structural elements, distance to surface waters, flowlength, and landcover type) and in relation to the triggering factors (maximum 24-h rainfall intensity with the return period of 100 years, average annual rainfall intensity, and design ground acceleration with the return period of 475 years). These results were later used as a basis for the development of the weighted linear susceptibility model. The rest were used for the model validation. The analyses were conducted using GIS in raster format with the 25×25 m pixel size. Several susceptibility models with various factor weights variations based on previous research were developed. The results showed that relevant precondition spatio-temporal factors for landslide occurrence are (with their weight in linear model): lithology (0.3), slope (0.25), landcover type (0.25), curvature (0.1), distance to structural elements (0.05), and aspect (0.05).

Five groups of lithological units were defined, ranging from small to high landslide susceptibility: 1) units found on flood plains 2) carbonates and resistant igneous rocks 3) resistant metamorphic rocks, less resistant igneous (intrusive & pyroclastic) rocks and carbonates with inclusion of less resistant rocks 4) less resistant metamorphic

rocks, resistant clastites, clayey rocks, conglomerates, limestone with marl and anthropogenic sediments 5) clayey and marly soils, gravel, less resistant clastites and combination of soils of different fractions. The critical slopes for the landslide occurrence range from 11º to 29º. Among CLC 2000 landcover types, the following proved to have an influence on landslide occurrence: 1) Discontinuous urban fabric, 2) Vineyards, 3) Pastures, 4) Complex cultivation patterns, and 5) Land principally occupied by agriculture, with significant areas of natural vegetation. From the curvature aspect those critical for the landslide occurrence are the concave areas of slopes, related to pore water concentration. In terms of aspect, the southern slopes are the most susceptible to mass movements. Smaller fault systems tend to have influence on landslide occurrence. Average annual rainfall intensity above 1000 mm/year proved to be a critical triggering factor for the landslide occurrence in more loose soils with a figure of 1600 mm/year for less resistant rocks. Maximum daily rainfall intensity above 100 mm proved to be critical for landslide occurrence, especially in more loose soils and in less resistant rocks. The value of the design ground acceleration that proved to be significant for the landslide occurrence is 0.15 g.

Roughly 7 % of Slovenia and 8 % of its population are extremely susceptible to hazards posed by landsliding. 11 % of the population lives in the areas of high landslide susceptibility that spread over 17 % of Slovenia. In the areas of moderate landslide susceptibility (10 %) lives 5.7 % of Slovenia's inhabitants. 6.7 % of the population lives in the areas of small landslide susceptibility (21 %), 3.7 % of the population lives in the areas of extremely small landslide susceptibility (17 %), and the rest of the population (65 %) lives in the areas where landslides are not to be expected (28 %). The statistical test (χ^2) shows the similarity of the two distributions presented, despite the majority of the population that lives in the "safe" areas. The result indicates that people do not pay enough attention to less evident or less frequent natural phenomenon when choosing their location.