

Geološki zavod Slovenije (GeoZS)

Decision support systems (DSS) for coastal vulnerability assessments

GeoZS has implemented a DSS that creates susceptibility maps for mass-movement processes such as landslides, rockfalls, and debris flows in Slovenian coastal areas (Komac et al., 2018). The system uses various input parameters in both absolute value (e.g. slope) and assigned values (susceptibility of lithologic units to specific mass-movement processes). These parameters are weighted before they are aggregated to produce the final susceptibility map. The resulting susceptibility maps are colour coded. Each colour on the map corresponds to a specific recommendation for spatial planners regarding the suitability of an area for construction or infrastructure projects.

MASPREM is another DSS used by GeoZS. It is a nationwide warning system in Slovenia, established in 2011 to predict and warn about landslides, especially after heavy rainfall. The system operates automatically twice daily and uses open-source software on a scale of 1:250,000. It incorporates Slovenia's landslide susceptibility map, landslide triggering threshold values, and the rainfall forecast models ALADIN/SI and INCA. Using fuzzy logic, the probability of landslides is calculated and output to a 4-level warning scale. Electronic warnings are sent to responsible authorities if necessary. GeoZS has also created a web application ('Atlas Voda') for landslide inventory and emergency services, providing early warnings and support in case of increased hazard (Jemec Auflič et al., 2016; Peternel et al., 2024).

Input parameters mentioned in the figure may comprise multiple sub-parameters. For more information on the input parameters see Larsen et al. (2025; Table 1, p 17).

Further reading

Jemec Auflič, M., Šinigoj, J., Krivic, M., Podboj, M., Peternel, T., & Komac, M. (2016). Landslide prediction system for rainfall-induced landslides in Slovenia. *Masprem Geologija*, 59(2), 259–271.

Komac, M., Jež, J., Dang, K., Sassa, K., Arbanas, Ž., Yamagishi, H., McSaveney, M., Casagli, N., & Guzzetti, F. (2018). TXT-tool 1.386-2.1 Landslide susceptibility assessment method. In *Landslide Dynamics: ISDR-ICL Landslide Interactive Teaching Tools* (pp. 133–138). Springer International Publishing AG. https://doi.org/10.1007/978-3-319-57774-6_9

Larsen, I. R., Ernsten, V. B., Maspataud, A., Dakin, N., van Heteren, S., Koutroulli, A., Poyiadji, E. & the GSEU T5.4 Consortium (2025). EGDl multifunctional 2D/3D decision-support module v1. GSEU Report on Deliverable 5.7, 165 pp.

Peternel, T., Jemec Auflič, M., Krivic, M., Kumelj, Š., Domej, G., & Šinigoj, J. (2024). MASPREM—the Slovenian landslide forecasting and warning system. Congress of the CAIAG 20th Anniversary: Past Achievements and Future Challenges of Applied Geosciences in Central Asia (Conference paper).

