

**Policy**

Europe: EU Soil Strategy for 2030 COM(2021) 699 final, Thematic Strategy for Soil Protection [SEC(2006)620] [SEC(2006)1165]

Italy: Decreto Legislativo 3 aprile 2006, n. 152

Campania: Piani Stralcio per l'Assetto Idrogeologico (Rischio Frane)

First draft

TOOL LANDSLIDES – *Territorial Scale: Campania*

WHY

Landslides are complex natural phenomena representing a severe geohazard in many countries. The knowledge of spatial and temporal distribution of landslides is crucial for assessing the related hazard and risk as well as for investigating landscape evolution and soil loss. Campania is one of the Italian regions with the highest percentage of areas prone to landslide hazard (about 60%) and number of people exposed, 302783 (Trigila et al., 2018). Specifically, peri-Vesuvian and Phlaegean slopes are among areas of Italy mostly affected by rainfall-induced flow-like shallow landslides involving soils of pyroclastic origin. Among the main catastrophic landslide events, resulting in casualties and damage to infrastructures and buildings, are to be cited: Salerno and Lattari Mountains events in 1910 and 1954; Sarno Mountains event in 1998; Cervinara event in 1999; Nocera Inferiore event in 2005; and Monte di Vezzi (Ischia Island) event 2006. Consequently, Campania region has developed a complex strategy built on the integration of structural and non-structural measures for the landslide risk mitigation. Given this hazardous condition, the knowledge of the real distribution of landslide phenomena and risk is a crucial point and represents a major goal that can be achieved also by using new technologies of monitoring and data management (such as spatial database, web-GIS or remote sensing). Non-structural measures, such as several study on landslides, highly improved the knowledge of landslide distribution, activity, and geology. For such scope, this Geospatial Decision Support (S-DSS) LANDSLIDES tool was built to address landslides in Campania region where their inventories are usually not of public domain and their applicability is often limited by spatial inhomogeneities in mapping and different classification criteria used. Such issue represents the major restriction for studies focused on landslide susceptibility and risk assessment, from local to regional scales. To overcome this problem, a revised landslide inventory for the entire region, resulting from the processing of existing landslide inventories, was carried out. The LANDSLIDES tool has been conceived as a facilitator for the user to quickly query the whole landslide inventory and connect it to other environmental data. This integrated approach makes the information accessible to multiple categories of users, also to drastically reduce those existing limitations for landslide susceptibility and risk assessment in the area.

FOR WHOM

The “LANDSLIDES” tool is designed for a wide range of users, such as public managers, geologists, researchers.

HOW – if you want to select your *Region Of Interest (ROI)*ⁱ

The tool allows the free selection of a region of interest (ROI) in the entire territory of Campania region by following a very simple procedure:

Operational procedure

- Simply select the Administrative Limits or;
- Click on the "Draw (Polygon)" button on the top bar and draw the ROI boundary;
- Assign a name to the selected ROIⁱⁱ;
- Click on the "Save" button to keep the ROI available in the system for further queries.

HOW

Operational procedure

By users' clicking on icon i. Land degradation/Landslides a "model requester" appears, allowing to choose a Region Of Interest (freely drawn or selecting administrative boundaries). Finally, the computation of the tool will run after clicking the "evaluate" button. Consequently, the system will automatically open the "Results" sub-folder; by clicking the last elaboration performed, in the "Elaboration detail" folder the users can view - and download – a report (as .pdf format) containing processed result. This report contains information about number and type of landslide falling within the ROI, their state of activity and other several geological, geographical and environmental information. Specifically, the report also includes additional statistics about geology, soils, land use, forest landscape integrity, loss of organic carbon and many other environmental information (such as elevation, slope, aspect, NDVI, habitat quality).

What for

The "LANDSLIDES" tool allows user to obtain an overview of landslides in any selected Region Of Interest in Campania, including their main details, to support understanding of slope instability distribution and landslide risk assessment as well as correct land use and management. The S-DSS tool uses, connects and communicates multiple environmental databases, among them a revised landslide inventory implemented for the Campania region. The latter resulted from the processing of existing landslide inventories, not completely accessible by users. The implementation of the inventory, with its 83284 records, enabled to drastically overcome current limitations when analysing landslide susceptibility and risk assessment at detail scale (e.g. municipal scale). In addition, the tool connects with other databases reporting the impact of landslide in terms of forest integrity, habitat quality and vegetation indexes

LIMITATIONS

The user should be aware of the following limitations.

The "LANDSLIDES" tool was developed firstly implementing a revised landslide inventory of the Campania region through processing of existing public domain inventories: of the Unit of Managements (UoMs) of Southern Apennine Hydrological District (SAHD; distrettoappenninomeridionale.it); of the Italian Landslide Inventory (IFFI; difesa.suolo.regionecampania.it); of published data, scientific articles and reports (Carratù et al., 2015; Finicelli et al., 2016; Confuorto et al., 2021; Miele et al., 2021). UoMs and IFFI inventories are updated to 2016, while to 2020 for the other ones. For this reason, statistical computations may be rather limited due to not updated inventories. Moreover, cases of lack of information may exist, inevitably affecting accuracy of landslide description. Furthermore, the type of geometry (dot or polygon) associated to a record may affect statistics (e.g. extension of affected areas).

Statistics produced do not give temporal information relating to landslides.

Information relating to the computation of the removed organic carbon content is affected by different approximations (soil depth and bulk density).

FUTURE DEVELOPMENT

The following future developments can be expected:

(i) improvement of the landslide inventory; (ii) implementing of new tools upon request from stakeholders.

References

- Carratù M. T. et al. - Comparison of bivariate and multivariate analyses for landslide susceptibility mapping in the Phlegraean district: the case study of Camaldoli hill (Napoli, Italy). *Rend. Online Soc. Geol. It.* 35, 50–53, 2015.
- Confuorto, P. et al. - Intervention model for natural and anthropogenic risk scenarios in the framework of Municipal Emergency Plans. *International Journal of Disaster Risk Reduction*, 58, 102204, 2021.
- Finicelli G. F. - Multivariate Statistical approach vs. Deterministic physically based model for landslide susceptibility assessment. *Rend. Online Soc. Geol. It.*, 41, 151-154, 2016.
- Miele P. et al. - SAR data and field surveys combination to update rainfall-induced shallow landslide inventory. *Remote Sensing Applications: Society and Environment*, 26, 100755, 2021
- Trigila A. et al. - Dissesto idrogeologico in Italia: pericolosità e indicatori di rischio, (in Italian), 2018.

ⁱ Special care is required when user draws/selects the Region Of Interest. In fact, LANDSUPPORT is a multi-scale decision support system. Each of the 15 available tools is designed for a specific application and for a specific scale. Furthermore, the databases use specific standards required for that specific scale. Users of LANDSUPPORT web platform must therefore be well aware of the limitation embedded in the different maps that they require for a specific application. Users must be expert on their specific problem and must understand if input data offered by the platform are suitable for their problem. In light of the above, the system provides very reliable results only if used appropriately.

ⁱⁱ It is also possible to draw a ROI with numerous polygons. In this case, it is possible to assign different values (e.g. numbers) to each of the drawn polygons.