



## **Assessment of slope protection works in the middle Eastern part of the Friuli Venezia Giulia Region (Italy) from “CGT” Project data**

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This study is based on the comparison and overlapping of maps for landscape characterisation.

A complete landslides dataset, slope protecting works and relative building procedures and state of preservation has been provided by the “Carta Geologico Tecnica” Project (CGT).

The used CGT maps are: The Applied Geomorphological Map, which shows the meaningful geomorphological elements (e.g. erosion escarpments, anthropic banks, quarries, dumps, levelled areas, anthropic works); the Hydrogeological map, which maps the natural and artificial hydrological grid, water-table contours, water flows, sources, the overflows and the flooded areas, broken stems, surface runoff, damp areas, stretches of water and the location of sills, barrages and hydraulic gates; the Instability Areas Map, in which landslides store areas, landslides niches and instability areas noted during the survey are mapped; the Acclivity map.

In 2005, the creation of a GIS has started thank to the large amount of data, with the aim of developing a highly customized and user-friendly system to harmonize and manage the data. The SIT-CGT (GIS of CGT) has been designed in an ORACLE-ArcSDE platform and it operates using ArcGIS, which has been specially customized for this project. The system has been created using a customized ESRI environment. All CGT data are stored in Oracle Geodatabase Enterprise Edition 10g R1 with Spatial option.

The studied area is located in the Middle-Eastern part of the Friuli Venezia Giulia Region. This area includes the “Collio Orientale” and the “Collio Goriziano” zones, 600 km<sup>2</sup> wide. Mountains cover the 62% of the surface, while the remaining part 38% is flat. Natisone, Isonzo, Cosizza and Iudrio are the main rivers, while Alberone, Erbezzo, Chiarò and Grivò are the main streams. From a geological point of view, a Cenozoic flysch sequence outcrops in the most part of Collio Orientale and Goriziano. The plain is covered by the fluvio-glacial and alluvial Quaternary deposits. From a structural point of view the area is characterized by many thrusts.

The maps overlapping shows that landslides are concentrated on the slopes and along the river banks. 600 slope protecting works have been surveyed and mapped (e.g. stonewalls, bearing walls, fan guards, wire nettings). Their state of preservation is fairly good.

In the Collio Orientale area (313 km<sup>2</sup>), the landslide sites are mainly concentrated on 20 to 90 degrees slopes: 114 of these sites are inactive while 300 are still active; slope protecting works are not enough to protect a dozen of villages and some roads from landslides.

In the Collio Goriziano area (61 km<sup>2</sup>) the landslides are instead concentrated on 20 to 50 degrees slopes and along the banks of the Isonzo river (between 8° and 35°): 78 of these sites are inactive while 121 are still active; in this area, only 6 villages are lacking of slope protecting works.

Our study has demonstrated that there are some small and medium villages involved in active or quiescent landslides. Sometimes, these villages are lacking of slope protections works or the latter are in bad conditions.