VEGETATION AND SLOPE STABILITY IN ITALY BASED ON THE ITALIAN LANDSLIDES **INVENTORY (IFFI) AND CORINE LAND COVER DATABASES**

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OBJECTIVES

The aim of the work is the analysis of the relationship between vegetation cover and landslides distribution in the hilly and mountainous territory of Italy, based on the information provided by the Corine Land Cover 2000 and the IFFI project (Italian Landslides Inventory).

METHODOLOGY AND INPUT DATA

The relationships between landslides and some predisposing factors have been evaluated through GIS processing and statistical analysis. Different types of mass movement require separate analyses. In fact, rock falls, slow earth flows, rapid debris flows, large landslides (DGPV) etc... occurr under different lithological, geomorphological and hydrological conditions.

The input data used in this study are:

a) Italian Landslides Inventory (IFFI Project); b) Land use and vegetation cover (CORINE Land Cover 2000): c) Lithological map of Italy:

d) Digital Elevation Model (20 m resolution) and its derived products



Extremely-rapid mud and debris flows Sarno (SA) - Campani

THE ITALIAN LANDSLIDES INVENTORY (IFFI PROJECT)

The Italian Landslides Inventory aims at identifying and mapping slope instabilities over the whole Italian territory, based on standardized criteria. So far, about 400,000 landslides are included in the database. The IFFI Website, accessible at the address: http://www.apat.gov.it/site/it.IT/Progetti/IFFI, allows to explore the geographical data and obtain detailed information on the most important recommender in the relations. parameters of landslides.

. The project has been financed with 4 million euro by the Committee of Ministries for the Soil Protection, established by the law n. 183/89. The project has been manifed in the accomplishment of the IFFI Project are: a) APAT - Deam references and Soli Protection. The institutions involved in the accomplishment of the IFFI Project are: a) APAT - Deam references and Soli Protection. Italian Geological Survey, with the task of organizing and coordinating the activities, verifying the data conformity, building up a database and a WebGIS; b) Regions and Autonomous Provinces, charged to gather and organize the historical and activite data conformity. affected by landslides and validate the results

The chosen methodology is based on aerial photo-interpretation, search of published sources and historical documents, field surveys. The working scales vary between 1:10,000 and 1:25,000. The geodatabase includes vector layers of landslides and an alphanumeric archive of landslide attributes.

The logic structure of the archive follows the Landslide Form devised by APAT, organized The togic structure of the archite follows the Landshite Forth Gerseu by ArA ; diganized in three information levels: the fist level contains the basic data on landshite location, type of movement (fig.1) and state of activity; the 2nd level provides data on morphometry, geological setting, lithhology, land use, main causes of activation; the 3rd level gives geological setting, lithology, land use, main causes or acuvation, the ora local setting detailed information on damages, vulnerable structures and engineering measures for risk reduction

Landslides are represented with a georeferenced point, located at the highest point of the crown, with a polygon when the surface is wider than 10,000 square meters or with a line when the width is very narrow, as in the case of ranid mud flows.

VEGETATION AND LANDSLIDES

It is well known that the vegetation cover, forest in particular, can assume a relevant role in the stability of slopes and in the regulation of water erosion. Specifically, it controls the hydrologic processes and the shear strength of soils. The landslide index (%) related to land cover classes has been assessed. The reference value (8.9%), shown in figure 2, is the ratio between landslide area and the whole hilly-mountainous territory of Italy.





lex landslide, Chies d'Alpago (BL) - Veneto Extremely-rapid debris flow, Fiames - Cortina (BL)



Affected area by multiple anathere

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Status.

Fig. 1: types of movement (%)

Soil slip, Me

CORINE LAND COVER 2000

Corine Land Cover 2000 (CLC2000) is an update for the reference year 2000 of the first Corine Land Cover database, which was finalised in the early 1990s as part of the European Commission programme to CoORdinate Information on the Environment (Corine). It provides consistent information on land cover and land cover changes during the past decade across Europe. CLC2000 is based on the photointerpretention of satellite images by the national teams of the participating countries. The resulting national land cover inventories are further integrated into a seamless land cover may of Europe. The resulting European database is based on standard methodology and nomenclature.

Forty-four classes are used to map land cover. In the present study only Agricultural areas (2) and Forest and seminatural area (3) have been processed



andslide Pollenza (MC) - Marche



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Fig. 3: statistical distribution of land cover classes in landslide areas, for each type of movement



LITHOLOGY

Lithological map is derived from existing Geological Map at 1:500,000 scale (Italian Geological Survey) by grouping the 128 geological units into 13 lithological domains. SLOW EARTH ELOWS

Over the Italian territory, a detailed analysis has been carried on slow earth flows. In figure 4: 49,472 landslides mapped, covering an area of 1686 km².

The distribution of slow earth flows among lithology, slope angle and land cover classes is shown in figures 5, 6 and 7. The input vector layers have been converted into raster datasets.

By GIS overlaying (fig.8) of land cover, lithology, slope angle and landslide themes (Raster calculator), a new map has been automatically derived.

The area affected by slow earth flows has been estimated for each unique combination of predisposing factors. In table 1 the landslide area is sorted in descending order.

The combination of arenaceous-marl flysch, slope angle between 8° and 15° and non-irrigated arable land is the most represed in landslide areas.



Fig. 4: distribution of slow earth flows

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Table 1: landslide area for each unique conditio

CONCLUSIONS

The IFFI inventory represents, for dimensions, guality and homogeneity of the data and coverage of the territory, a capable tool for hazard and risk

The statistical analysis and GIS processing performed in this study represents a first attempt to estimate the relative influence of each predisposing factor in
generating landslides and to evaluate the protective role of the different vegetation classes to contrast slope movements.



zia per la protezione

PROGETTO IFFI

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Slope angle is automatically derived from a 20x20 m resolution DTM and reclassified into 5 slope classes. Mountainous and hilly areas have been extracted from alluvial plains filtering areas with slope angle < 3°





Fig. 6: distribution of slow earth flows among lithology classes



Fig. 5: distribution of slow earth flows among land cover classes







Fig. 7: distribution of slow earth flows among slope angle classes