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Geological and Geomorphological Hazard in Historical and Archaeological Sites of the Mediterranean Area: Knowledge, Forecasting and Mitigation

Silvestro Lazzari

Cedat Europa – Centro Dati e Servizi per l’Ambiente e il Territorio – Via Ancona 37, 85100 Potenza – Italia

ABSTRACT

This work is part of a research programme promoted by the National Group for the Defence against Hydrogeological Catastrophes (CNR - G.N.D.C.I.) in order to evaluate the effects caused by high risk landslide movements in the historical-monumental urban centres. This work gives rather representative examples individualized in some regions of the Mediterranean sea (Italy, Greece, Spain, Crete, Albany), seats of important historical and archaeological settlements and structures, interested by a progressive degradation due either to structural or to natural causes (geological, geomorphological and seismic). It has been carried out an analysis of the geological and geomorphological conditioning factors and have been proposed the recovery solutions for the risk mitigation and preservation of the historical heritage, furnishing also useful technical elements for the conservation and protection of the historical heritage

The experiences and researches produced by several authors, as Bonilla (1959), Sarma (1975), D'Elia (1983), Keefer (1984), Harp et al. (1986), Ishihara et al. (1986), Maugeri and Motta (1986), have shown in these areas a rather narrow relationship between earthquakes and mass movements, that occur in some typical climatic, geomorphological and geotechnic configurations.

The danger level increases when these phenomena are simultaneous in the same site, so that their knowledge represents a very important preventive measure.

From a preliminary picture, it's possible to point out a not casual coincidence between perimediterranean zones, where the landslide are more evident, and those ones where the seismic activity is more frequent and intense (Algerian Tell, centre-southern Apennine, southern-Dynaric and Hellenic belt, Aegean Arch and Anatolic belt). The most recent and incoherent clastic deposits of the Pliocene and of the Quaternary, filling in the Euro-Asiatic and African basins emerging, show a considerable propensity to instability. The slope dynamics turns out more active in particular rainy and geological-structural configurations. The deep morphogenetic phenomenons are mobilized in consequence of high intensity rainy events which occurs in short-time periods of temperate-dry Mediterranean climates. The deposits more vulnerably are those prevalently clayey deposits subject to compressive and distensive stress, which have notably modified their structure and consistency.

In the studied areas are very frequent either the erosional or the landslide phenomenon but there are also evidences of deep gravitative motions, involving whole slopes.

Historical and bibliographical notes and direct experiences have enabled to check that several mass movement have been induced or reactivated by high intensity earthquakes, characterising the whole mediterranean areas. In conclusion, it has been pointed out that the landslides and earthquakes have conditioned whole civilizations, which paid for natural calamity with a stop of the economic and social evolution and development with considerable and irrecoverable structural damage.

The mitigation measures could be represented either by right consolidation interventions or by preliminary studies of the physical environment and characteristics of the single structures.