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# New digital applications to promote the geological heritage of Cretan UNESCO Geoparks under GEOIN project

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Geosites are outcrops with significant geological value that can contribute to the restoration of the geological evolution of an area (Gray, 2004). All together constitute the geological heritage of a territory. Areas of outstanding geological value including geosites of international significance that are under a holistic conservation and management plan for the local sustainable development can be nominated as UNESCO Global geoparks (UGGp). Since 2015 Crete hosts two among the five UNESCO Global geoparks of Greece, those of Psiloritis and Sitia. Core aim of the UGGps is the conservation and promotion of geological heritage and incorporation them with other natural and cultural values for the development of geotouristic activities (UNESCO, 2019). In addition, geoparks have to develop educational and training activities to inform visitors and inhabitants on the value of their natural environment and raise awareness on critical geological issues and geohazards.

Under the GEOIN project (www.geo-in.eu) that supports the Geotourism in insular Geoparks of Greece and Cyprus, the Natural History Museum of the University of Crete has undertaken the development of three web-based applications to promote geoheritage, support visitors' needs and educate through entertainment, at Psiloritis and Sitia UGGps. The first application is a web-gis based interactive map of each of the two areas. It has been scheduled to be compatible with desktop and mobile devices connected with the web, but are also used for static digital displays with touch screens. This WebGIS application is separated in two distinct parts, the map panel on the left and the side panel on the right, which interact with each other. The side panel is further distinguished in major units, each one of them comprising points of interest and other information related to the geological, environmental, cultural and religious heritage of the two geoparks. Clicking upon every unit will add the correspondent layers on the map panel, while the content of that unit slides down as an accordion. All the information is presented as an interactive list in harmony with the map. When clicking on a point on the map, the side panel automatically scrolls until the equivalent information appear on top and vice versa, when clicking on a specific information on the side panel, the map zooms in to that location. The geosites of the two UGGps of Crete have been assessed and categorized in various types following international standards and procedures (Fassoulas *et al.*, 2011; Fassoulas *et al.*, 2013). Based on these categories the geosites are presented in the application both in the core map and the interpretation part offering simple information of their type and features and an accompanying image (Figure 1). This application may be used thus as a geography book with interactive chapters and to perform a virtual tour in the Psiloritis and Sitia Geoparks.

The second application comprises the development of Storytelling maps for Psiloritis and Sitia geoparks. Story telling maps are widely used nowadays for the complete and interactive presentation of a story using various multimedia means such as videos, animations, spherical panoramas and images (ESRI 20019). A good example for the use of Story maps to interpret and promote geological heritage using web-gis tools is the Santorini Volcano Story map produced by Staridas (2018) that received the First place at the 2019 ESRI contest for the Travel, Recreation and Destination category. One story telling map has been produced for each of Psiloritis and Sitia UGGps that presents the geological heritage of the areas along selected routes. Each map is built up with data gathered from the two geoparks but also data acquired during the project such as, earth based and aerial spherical panoramas that combine site interpretation information through text, sketches and animations. Scrolling down through the various chapters of the story telling maps, information is displaced at the left part of the web page, while interactive maps alternate with videos, images and animations appear at the other side, to fully present the geological content of each route.

The third application developed, is the e-geodiscover educational application. This is developed as an app compatible with android devices that can be downloaded for free and stored in a mobile device to run, even without Wi-Fi access. The educational approach is based on the treasure handing games, forcing users to discover an area using a digital map with location tracked through the device's gps, identify geosites and other locations of natural and cultural importance, and select the correct answer in selected spots. The proximity of the device in a predefined buffer zone around a spot area is identified by the gps permitting the pop up of introductory information for the site and then of predefined answers in the form of simple phrases, images, or true/false options. Correct response within three tries enables the appearance of complementary information about the site and guidance to discover the next. The application has the ability to trace players' response and can count the first provided answer per site to evaluate the total performance of the player at the end. The applications have been scheduled along three of the geo-routes of the two geoparks; the Migias and Gonies trails at Psiloritis, and the Upper Zakros trail at Sitia.

All applications will be hosted at and accessed from the new geoparks websites that are under development. These application not only contribute in the promotion of the geological heritage of each geopark, increase of their visibility and attract visitors of young ages, but being web-based can serve the needs of future visitors to schedule and design their trip in the two geoparks. Moreover, these applications can serve the needs of disabled people, especially those with mobile

disabilities, to visit remote sites being inaccessible to them, explore the nature and geology values of the two geoparks from their home places, and possibly trigger them to visit other accessible places of the two areas. Finally, as all applications will be also available at geopark's info centers, and educational facilities, will strengthen the provided environmental education and enrich their didactic methodologies.

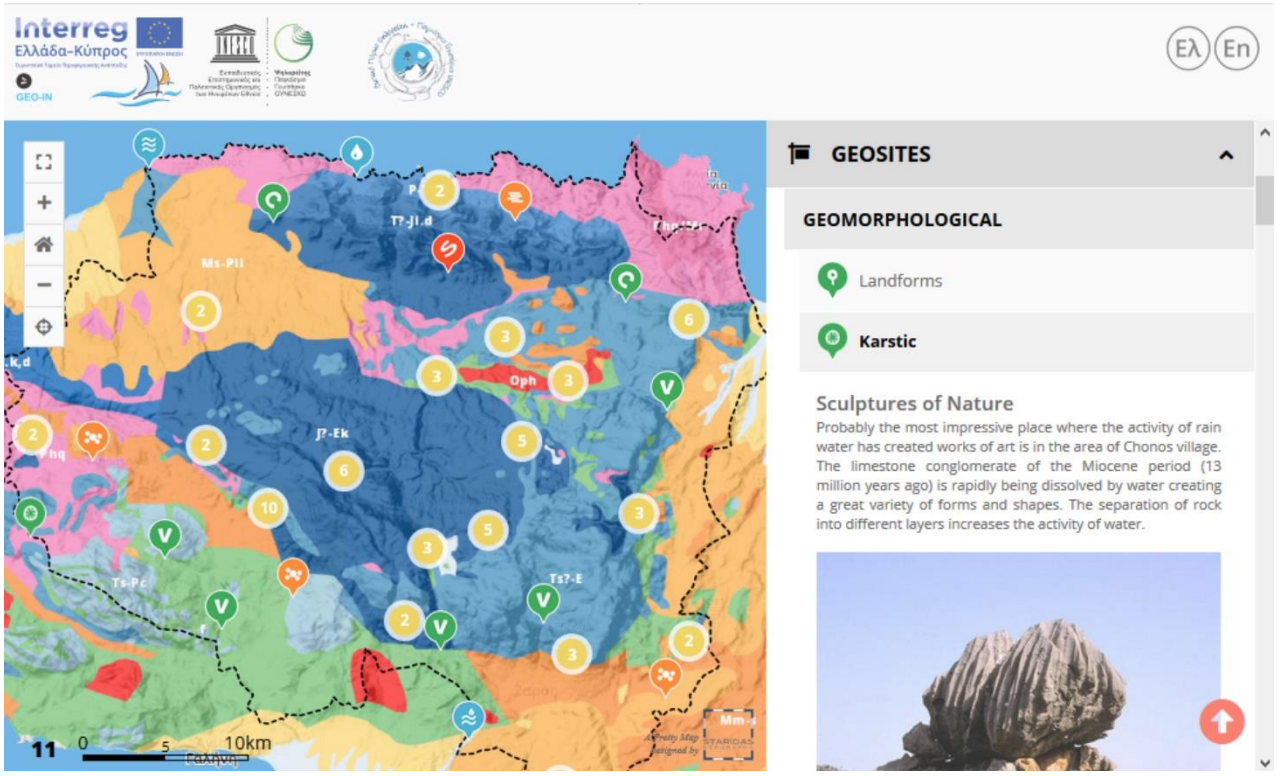


**Figure 1. Image of the Interactive web-map for Psiloritis UNESCO Global Geopark presenting a simplified geological map with location of geosites and information at the right part on the Geomorphological, Karstic geoisties.**


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