

Alterations of the Coastal Zone in Kamari Beach (Santorini Island, Cyclades Greece)

V. Chondraki ^{1*}, V. Kapsimalis ², S. Poulos ¹, P. Nomikou ¹, D Vandarakis.², S. Petrakis ¹

(1) Section of Geography & Climatology, Department of Geology and Geoenvironment, National and Kapodistrian University of Athens, Panepistimiopolis Zografou, Attiki 15784, Greece (*v.chondraki@gmail.com)

(2) Hellenic Centre for Marine Research, (HCMR), 46,7 km Athens Sounio ave., P.O. Box 712, P.C. 19013 Anavyssos, Attica, Greece

Introduction

The present study focuses on the mapping of the coastal and submarine morphology of the Kamari coastal zone in Southeast Santorini Island. Furthermore, its aim is to illustrate the physiographic features and the displacement of the coastal area for the period 1945-2016. By collecting and processing spatial data, aerial photographs and satellite images, habitat and several vulnerability maps were created, in order to determine the erosion processes of the coastal area. Kamari is a popular tourist attraction with a coastal area at risk, due to its extensive urban development. In order to protect the coastal area, 4 groins and 2 detached parallel breakwaters were constructed in 1991.

Methods

In order to create the habitat map, bathymetric and echo-sounding data was collected with the use of a Side-Scan Sonar and processed through Sonar Wiz (version6) software. For the study of the historical coastline displacement during the 70-year period (1945-2016), coastlines from aerial photographs and satellite images were georeferenced, digitized and compared with the use of ArcGIS 10.4. Moreover, marine surficial sediment samples were collected and granulometric analysis was carried out in order to understand the sedimentary processes that take place in the area.

Results

From 1945 to 2016, Kamari coastline has retreated by 18.5 m. In general, the coastal zone presents a variation in the volume of sediment deposition, as the rate of erosion is quite large. Specifically, during the first 15 years, an enormous rate of erosion has been observed, which, at some areas, exceeds 52m. For the next 13 years (1960-1973), the deposited sediment has advanced in some areas at the coastline by more than 38m. The start of a corrosive course of the coast is observed during the period of 1978-2003. Groins and breakwaters were constructed in 1991, which decreased the erosion rate in the area. However, during the following years the beach has stabilized against erosion. In 2012 a disastrous storm hit the area of Kamari, causing catastrophic damages. Finally, during the period 2015-2016 the beach presents an average retreat of approximately 4 m when maximum retreat accounts as much as 26.8 m and a maximum accretion of 15.4 m.

Main Conclusions

Due to the high rate of human activity, the coastal zone of Kamari has been heavily influenced. Undoubtedly, the construction of the breakwaters was a catalyst factor which contributed to the reduction of erosion rate. However, although the sediment supply is sufficient, the rate of erosion is rising rapidly and the beach's ability to recover almost non-existent. The intense annual winds and waves in the area, extensive settlement development and inadequate infrastructure exacerbate the erosion.