

## **Structural Stability Risk Assessment for Nafplio and Lavrion part of the EnCeladus hellenIc Supersite**

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This study aims to highlight the potential of structural stability risk assessment for the areas of Nafplio and Lavrion part of the EnCeladus hellenIc Supersite under the terms of the research project STructural stABiLity risk assEssment (STABLE). The project will introduce a strategy and select most efficient methods and tools for harmonization of data, criteria and indicators to be addressed for tracking of impact of environmental changes on tangible cultural heritage (CH) assets, buildings and monuments, including structural deterioration processes at a city/village scale. The material and structural properties of heritage buildings, with special attention to foundation conditions, will be the focus of interest in order to assess their behaviour when exposed to ground motions.

These valuable information need to be complemented, calibrated and tested with ground data (e.g. geotechnical information), site scale monitoring (e.g. ground monitoring stations, laser scanners et c.) and risk forecasting models (earthquake) to derive end-user driven products (e.g. hazard, vulnerability and risk maps). The target customers of the project are the public bodies in charge to preserve the CH, Urban Planners, Academic Communities and private enterprises active in the specific sector. The project addresses the design and development of an IT service platform, combining advanced satellite technologies with existing ground-based data and risk forecasting modelling for the long term and continue monitoring and update of structural stability of the architectural heritage and in particular of historical centers affected by geo-hazards. The platform will provide alert models (geotechnical/structural risk forecasting models) based on a fixed infrastructure where technical parameters, gathered in the GIS environment (EO products, ground-based data, documentation etc.), are implemented for each test site. The platform will offer information in support to prevention of damage at CH in the form of regularly updated maps of element at risk, allowing to follow and predict the evolution of a risk, and consequently being able to give information usable for a priori actions before damages or disaster can occur. This information will enable the authorities responsible for the preservation of CH sites to carry out an effective planning and implementation policy of preventive maintenance and drastically improve the resilience factor of the CH asset. STABLE aims to bring together the excellence of Research Centers and SMEs with interdisciplinary skills built around CH but ranging from Civil and Geo-technical engineering, to Information Technology and remote sensing. The project implements knowledge exchange and interdisciplinary actions, to go forward in research towards novel techniques and improved monitoring and managing tools specifically developed for CH.

More specifically, the objectives of STABLE are the following:

- Obj-1: Collection of data from different monitoring techniques, such as satellite, terrestrial and autonomous airborne inspection systems as well as ground techniques, to perform the monitoring of CH sites and related surrounding areas, thus integrating novel remote sensing technologies.
- Obj-2: Definition of risk modelling systems enabling the forecast of structural stability of CH in different scenarios of seismic movements. More specifically, the objective will focus on the use of novel models taking advantage of data derived from satellite and ground-based techniques, for the definition of ad-hoc risk models of the structural stability of the CH and its resilience to different earthquakes scenarios.
- Obj-3: Development of a web-GIS tool for risk analysis of structural stability of CH integrating risk forecasting models with ground and remote sensing datasets. Demonstration activities will be carried out in the selected test cases in order to validate the approach.
- Obj-4: Address the importance of new technologies for sites monitoring and management with specific focus on the viability and sustainability of future commercial services based on the technologies improved, developed and verified in Obj-1 to Obj-3.
- Obj-5: Push innovation through the development of an initial research and training network that will focus its activities on the development, effective integration and increased utilization of existing and innovative technologies in the field of structural stability of CH.
- Obj-6: Provide researchers and professionals with the opportunity to go beyond the current state-of-the-art in the specific field, through a multidisciplinary and international approach based on a wide spectrum of technological tools and methods that can contribute to a more effective CH preservation and conservation.
- Obj-7: Build up specific complementary and market oriented skills to allow the European researchers and professionals to face the new challenge in terms of technology development and future services and improve their ability to face new opportunities in the emerging markets.

In order to carry out the demonstration and validation of the platform, 2 Greek case studies have been selected: i) the old city center of Nafplio and ii) the ancient Lavrion. Both are located in the area of the EnCeladus hellenIc Supersite.

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