

## Advances, problems and potential for innovative accelerator science and technology approaches to sustainable Heritage Management in Cyprus, the Eastern Mediterranean and the Middle East (EMME)

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Sustainable Heritage Management requires complex knowledge, transdisciplinary approaches, and diverse competencies to meet the multiple challenges of heritage management, policy, and research. Understanding and appreciating the links between humans, the environment, and anthropogenic, tangible cultural heritage are critical in this endeavour. Innovative accelerator science and technology approaches, and advances within these domains, including synchrotron radiation enabled approaches, are key components in this process. These approaches provide critical data not only on structure, composition, age, manufacturing technology and techniques, the source of materials used, alterations, and conservation treatments of material culture, but also multiple types of data on ancient human remains and culturally relevant environmental samples.

This paper scrutinizes the advances and problems in, and potential for, innovative accelerator science and technology approaches to sustainable Heritage Management in Cyprus in particular, as well as draws comparisons within the Eastern Mediterranean and the Middle Eastern (EMME) region. This is done through (1) showcasing the application of accelerator science and technology for characterization and treatment of heritage objects, archaeological materials and remains, using specific case studies from Cyprus and the EMME region; (2) case studies on interpretation, presentation and dissemination of the scientific results; and (3) consideration of Cyprus' access, and regional access to research infrastructures, and international as well as regional collaborations and networks. On the latter point, the importance of feeder facilities, such as the BioMERA Platform (<https://biomera.cyi.ac.cy>), initiated through a 1-million-Euro grant from the Research and Innovation Foundation of Cyprus, are discussed in the context of synchrotron use, and SESAME synchrotron (Synchrotron-light for experimental science and applications in the Middle East) in particular. Further, the potential impact of scientific service companies in the context of Cyprus, and the EMME region is discussed.

The paper also reviews Sustainable Heritage Management policies and modalities in the context of Cyprus, Open Science and dissemination of knowledge in the Cypriot context, as well as research resources and funding structures relevant to accelerator science and technology approaches to sustainable Heritage Management in Cyprus.

The paper concludes with case studies and success stories from Cyprus and the EMME region (Eastern Mediterranean and the Middle East) on how to make science tangible, and how to promote public awareness of the transdisciplinary combinations of science and heritage studies leading to new holistic approaches. Novel methods and approaches in education and outreach, as undertaken within the framework of the FF-MAC project (Face to Face: Meet an Ancient Cypriot; a 1-million-Euro integrated project including enterprises and societal stakeholders as partners, together with research and governmental organisations; <https://face2face.cyi.ac.cy>), and their potential impact in the context of Cyprus will be explored.

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