TRIQUETRA's Pathway for Cultural Heritage Policy Adoption

Charalabos IOANNIDIS, Styliani VERYKOKOU, Chryssy POTSIOU, Anastasia ANASTASIOU, Vasiliki CHARALAMPOPOULOU and Panagiotis GEORGIADIS, Greece

Key words: Cultural Heritage; Climate Adaptation; Decision Support System; Risk Assessment; Mitigation Planning; WebGIS.

SUMMARY

Cultural heritage (CH) sites face accelerating pressures from climate change and natural hazards. However, decision-makers often lack evidence-based tools to prioritise protection and investment, especially when they must compare sites with different exposure and value. The TRIQUETRA Horizon Europe project ("Toolbox for assessing and mitigating Climate Change risks and natural hazards threatening cultural heritage", Grant Agreement No 101094818) addresses this gap by delivering a Knowledge Base Platform (KBP) with an operational Decision Support System (DSS) that brings together risk quantification and mitigation planning across both terrestrial and underwater CH sites. The KBP aggregates literature and site-specific evidence with WebGIS exploration, ensuring that all stakeholders can access a single, authoritative source of information. At the same time, the DSS integrates: (i) a Risk Severity Quantification module that organises qualitative and quantitative indicators into transparent risk profiles and (ii) a Mitigation Measure Selection and Optimisation module that ranks alternative measures using multi-criteria decision analysis and user-defined priorities.

Our work synthesises cross-pilot insights into actionable guidance for authorities and CH managers, demonstrating how the same methodology can be applied to sites with very different environmental, administrative and heritage condition. We translate these findings into policy recommendations at three levels: at EU level, at national and regional level and at site level. For the FIG community, TRIQUETRA illustrates how geospatial practice, such as surveying-grade 3D documentation, inland, coastal and underwater mapping and Earth Observation workflows, can be operationalised in a policy-facing DSS to support climate-resilient planning. The approach is transferable, complements parallel EU efforts and is designed for sustained learning across projects and jurisdictions, reinforcing the role of geospatial professionals in risk-informed heritage management.

TRIQUETRA's Pathway for Cultural Heritage Policy Adoption

Charalabos IOANNIDIS, Styliani VERYKOKOU, Chryssy POTSIOU, Anastasia ANASTASIOU, Vasiliki CHARALAMPOPOULOU and Panagiotis GEORGIADIS, Greece

1 INTRODUCTION

Across Europe, Cultural Heritage (CH) is increasingly affected by climate-driven and geohazard processes (e.g., sea-level rise, flooding, erosion, extreme events and environmental degradation), requiring approaches that are both scientifically defensible and operationally usable by authorities and site managers. A persistent barrier is that risk information is frequently produced in fragmented studies or single-hazard analyses, which limits comparability across hazards and sites and makes investment prioritisation difficult. The TRIQUETRA research project (Ioannidis et al., 2024) demonstrates an alternative: an integrated, end-to-end workflow that links evidence, modelling outputs and decision-support functions within a single operational environment, aiming to support routine heritage risk management rather than one-off assessments.

TRIQUETRA proposes a technological toolbox and a methodological framework for tackling climate change risks and natural hazards threatening CH in the most efficient way possible. Its main strategic objectives include: creation of a repository of knowledge on effects of climate change and natural hazards on CH; identification of upcoming risks and hazards to CH; use of novel technologies for efficient and accurate quantification of threats to CH; increased awareness of the public regarding CH risks and preservation.

The project's methodology is structured around 3 fundamental stages: identifying, quantifying and mitigating risks ("trifecta" approach). This approach constructs a robust framework for evaluating and addressing the following categories of risks: climate-related risks; extreme water, snow and ice hazard risks; geological and geophysical risks; chemical and biological risks. Furthermore, it assesses the damage and failure modes of CH structures and the compounded effects of various stressors on CH sites. TRIQUETRA has been validated in eight CH sites.

The above strategic objectives were fulfilled by achieving the following: assessing the precision of flash LiDAR for 3D mapping of underwater CH sites and validating its applicability for erosion monitoring; developing a novel spectroscopic sensor for water quality monitoring; further increasing the accuracy of climatic models; developing models on risk quantification stemming from water, ice and snow extreme events, for geohazard risks and for structural damage risks; assessing chemical and biological hazards based on in-situ sensing; providing and applying novel techniques for application of remote sensing in CH sites; and developing a platform that allows multi-hazard impact assessment and acts as an advanced Decision Support System (DSS) towards risk mitigation and CH site remediation.

2 A BASELINE-TO-DECISION WORKFLOW FOR CULTURAL HERITAGE RISK MANAGEMENT

TRIQUETRA's core contribution can be summarised as a baseline-to-decision logic: (i) consolidate evidence and site context through an evidence backbone (Bibliography and WebGIS), (ii) quantify risk via site-ready single- and multi-hazard models organised in hazard families, and (iii) translate risk into action through ranked and filterable mitigation portfolios. This integrated "Identify → Quantify → Mitigate" workflow is designed to function as a practical bridge between policy objectives and day-to-day management decisions.

The main contribution of TRIQUETRA is the delivery of an operational, web-based Decision Support System (DSS) Platform that consolidates the project's end-to-end "evidence-to-action" workflow in one environment (Figure 1). The platform integrates (i) the TRIQUETRA Knowledge Base Platform (KBP), combining a searchable Bibliography with a WebGIS interface for site context and evidence management, (ii) a Risk Severity Quantification module for transparent, comparable risk profiling across hazards, (iii) a Mitigation Measure Selection and Optimisation module that supports the identification and ranking of tailored mitigation portfolios, and (iv) a Digital Twin–oriented visualisation layer that connects decision outputs to the site's digital representation. The TRIQUETRA DSS Platform is accessible at: https://dss.triquetra-project.eu/.

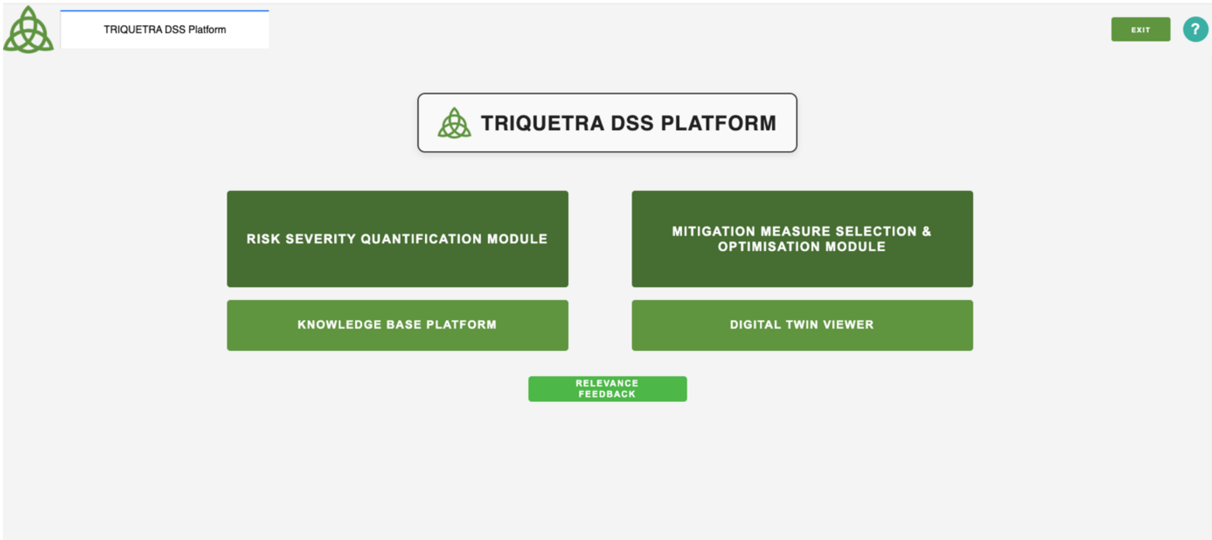

Figure 1. Landing page of the TRIQUETRA DSS Platform.

2.1 Evidence backbone

The evidence backbone is delivered through the TRIQUETRA Knowledge Base Platform (KBP) (Figure 2), which combines a curated Bibliography (for rapid retrieval of risk and mitigation knowledge) with a WebGIS environment that organises pilot-site datasets and contextual layers, supports consistent spatial referencing, and enables integration of external geospatial services (Anastasiou et al., 2025). This coupling is significant from a geospatial perspective: it connects "why" (documented evidence) to "where" (site context and spatial data), supporting faster screening and more defensible model selection.

Figure 2. TRIQUETRA Knowledge Base Platform.

2.2 Multi-hazard risk quantification

A key methodological choice is a hazard-family approach that preserves hazard-specific modelling logic while enabling cross-hazard comparability through a harmonised interpretation layer. Risk modelling is organised across six domains (climate-related; extreme water/snow/ice; geological–geophysical; chemical–biological; structural response and damage/failure modes; and compound/multi-hazard scenarios), and the DSS exposes models explicitly, allowing users to select site–hazard–model combinations rather than forcing heterogeneous processes into a single paradigm. Operationally, this workflow is implemented within the TRIQUETRA DSS Risk Severity Quantification Module (Figure 3), which hosts the site-ready single- and multi-hazard models and provides harmonised guidance and outputs (e.g., severity charts and interpretable visualisations) to support consistent risk reading across domains. Multi-hazard reasoning is supported in two complementary ways: (i) side-by-side assessment of multiple hazards for the same site to identify dominant risk drivers, and (ii) dedicated compound-hazard models that are designed to represent how hazards interact and jointly affect the site.

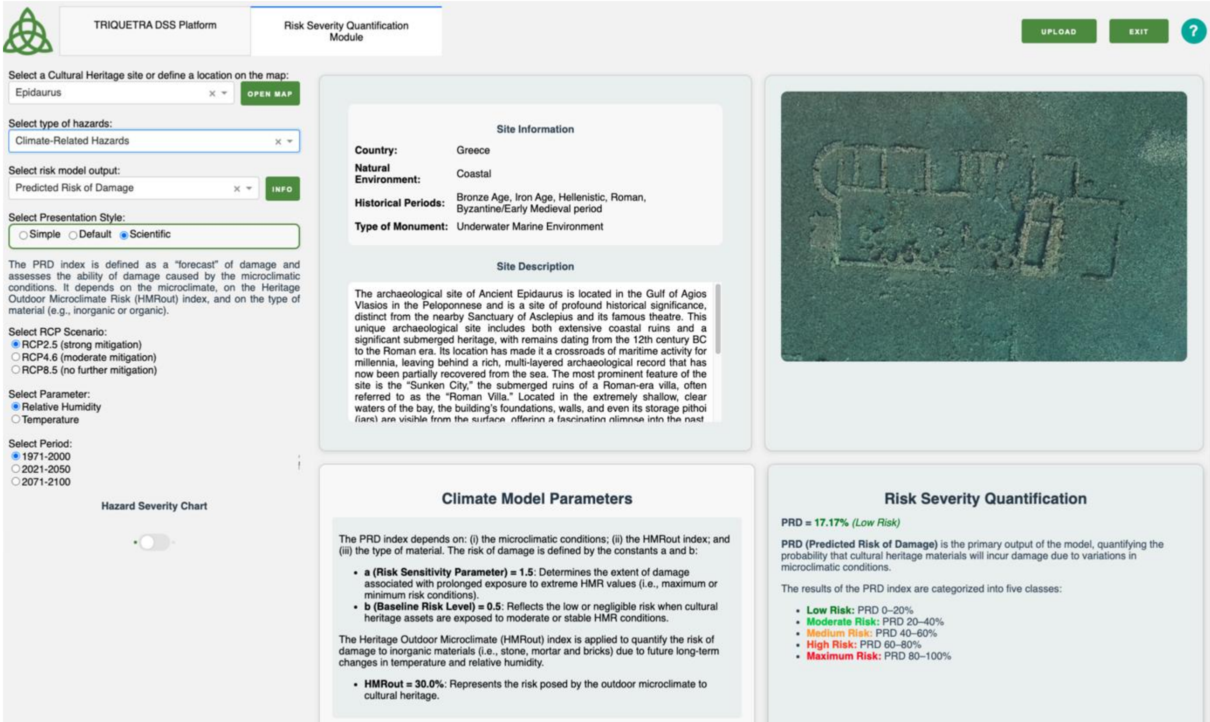

Figure 3. Risk Severity Quantification Module of the TRIQUETRA DSS Platform.

2.3 Comparability and traceability

TRIQUETRA underlines that comparability and traceability must be designed, not assumed. The DSS uses harmonised severity representations, i.e., geohazard severity charts (Sokolicek et al., 2025) to read heterogeneous hazard indicators on a uniform scale, enabling diagnosis, cross-site comparison and prioritisation of processes that warrant deeper modelling, monitoring or mitigation. Cross-hazard ranking is supported through integrated Multi-Criteria Decision Analysis (MCDA) tables within the DSS.

3 GEOSPATIAL OPERATIONALISATION INSIDE THE DSS

3.1 Digital Twin viewer

A distinctive geospatial feature is the Digital Twin viewer (Figure 4), which loads site 3D models (photogrammetry-based or underwater LiDAR-based) and allows overlay of risk outputs and decision layers in a shared 3D context. Forecasting panels (where available) enable exploration of time-dependent Earth Observation (EO) indicators (e.g., snow cover and EVI) alongside hindcasts, while MCDA tables enable transparent cross-hazard comparison in the same environment.

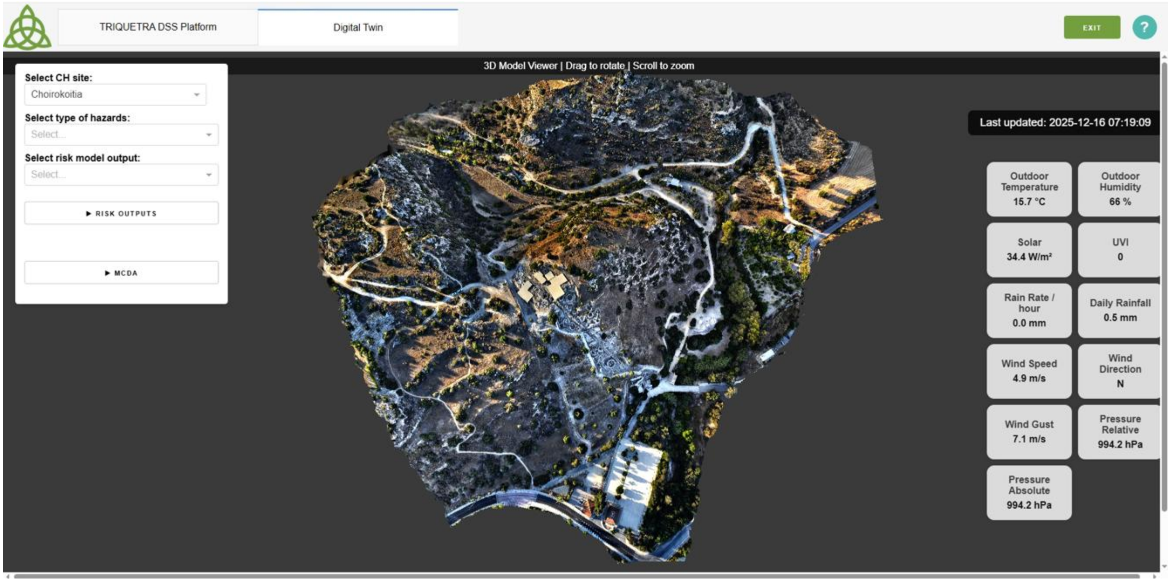

Figure 4. Digital Twin viewer of the TRIQUETRA DSS Platform.

3.2 3D modeling framework

The proposed homogenised 3D geometric documentation workflow within TRIQUETRA is framed around explicit “decision gates” for terrestrial versus underwater constraints, aiming to produce comparable 3D models that can be reused for monitoring, change detection and downstream decision workflows. Treating the resulting 3D models as long-term baselines (rather than one-off deliverables) enables repeatable monitoring workflows and supports evidence-based decisions over time, as reflected in the project’s pilot-site 3D documentation activities (Ioannidis et al., 2025; Potsiou et al., 2025; Alexopoulos et al., 2025; Plattner & Gschwind, 2025; Themistocleous, 2025).

3.3 Underwater documentation and monitoring

The toolbox also addresses domains where routine policy implementation often lacks deployable monitoring tools, especially underwater CH and chemical/biological stressors. TRIQUETRA reports a flash imaging underwater LiDAR capability for rapid 3D documentation in low-visibility conditions and in-situ water quality analysers for physicochemical monitoring relevant to degradation mechanisms. These components support integrating underwater evidence into the same risk-to-decision workflow used for terrestrial sites (Ioannidis et al., 2024; Bosch et al., 2025).

4 FROM RISK OUTPUTS TO ACTIONABLE MITIGATION PORTFOLIOS

The Mitigation Measure Selection and Optimisation module of the TRIQUETRA DSS Platform (Figure 5) links assessed risk to intervention options by generating ranked mitigation portfolios from two complementary scenario inputs: literature-driven scenarios (keyword matching to published cases) and site/pilot-oriented scenario descriptions aligned with user needs. Outputs can be refined through practical optimisation filters (e.g., cost, implementation timeframe, area of application and risk-score thresholds) (Anastasiou et al., 2025).

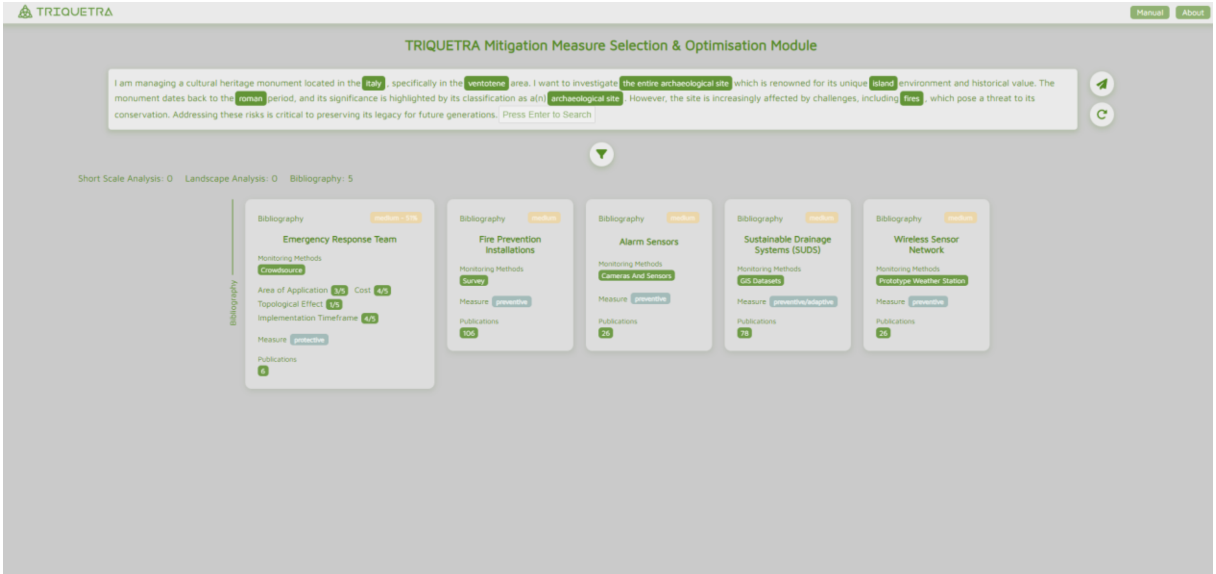

Figure 5. Mitigation Measure Selection and Optimisation module of the TRIQUETRA DSS Platform.

5 ADOPTION PATHWAY: USABILITY, CAPACITY BUILDING AND GOVERNANCE

TRIQUETRA evidence indicates that adoption depends as much on interfaces, training and governance as on technical performance. To support non-expert users and institutional readiness, the DSS includes presentation modes and lightweight relevance feedback logic for explanations.

In parallel, the project developed (i) a training-oriented platform using scenario-based storytelling grounded in hazard contexts and mitigation strategies, complemented by a handbook (Figure 6), and (ii) a web-based AR application for on-site awareness, guided inspection and structured, geo-tagged crowdsourced photo contributions that can strengthen observations and help update evidence over time (Themistocleous, 2025; Themistocleous et al., 2025).

Finally, governance is operationalised through protection-aware FAIR practices via a dual dissemination model: openly reusable outputs deposited with persistent identifiers and metadata, alongside controlled-access handling for sensitive or third-party datasets and platform-mediated visualisation. This approach aims to balance openness and long-term reuse with security and site protection needs.

Figure 6. TRIQUETRA Training Platform.

6 LIMITATIONS

While the integrated TRIQUETRA toolbox demonstrates feasibility, several implementation constraints remain relevant for practitioners. Risk assessment outputs depend on data availability and quality, and not all authorities can systematically produce reliable 3D documentation—particularly for underwater or remote sites. Multi-hazard modelling inevitably carries uncertainties linked to assumptions and scenarios; thus, outputs should be interpreted as decision-support evidence rather than deterministic predictions. Institutional adoption is also a non-technical risk, requiring organisational readiness, staff training and alignment with existing procedures. Finally, sensitive sites may face data governance constraints that limit full sharing, reinforcing the need for clear frameworks and controlled access.

7 UPTAKE AND TRANSFERABILITY ACROSS PILOTS

Across the TRIQUETRA pilots, a consistent finding is that decision support becomes practically usable when the workflow is organised around a small set of repeatable building blocks: (i) an evidence backbone that links documented knowledge and site-specific context, (ii) harmonised risk profiling that supports comparison across hazards and sites, and (iii) mitigation portfolio ranking that can be constrained by practical implementation factors. While hazards, data availability and governance settings differ substantially between sites (including terrestrial and underwater assets), the same baseline-to-decision logic remains applicable when data and models are exposed transparently and outputs are presented in an interpretable, traceable form. In this sense, the project's contribution is not limited to individual model performance but includes the operational packaging of evidence, risk and mitigation steps into a workflow that can be repeated as new observations, monitoring results, EO indicators or updated 3D models become available.

7.1 Adoption considerations across governance scales

The cross-pilot experience also shows that sustained uptake depends on factors that extend beyond modelling. At the strategic level, alignment with existing risk management and heritage governance routines is crucial, so that DSS outputs can be used in prioritisation and budgeting cycles rather than remaining "stand-alone" technical results. At the programme/organisational level, adoption is enabled by interoperability with existing spatial data infrastructures and clear data governance arrangements that balance openness with the protection needs of sensitive sites. At the operational/site level, uptake depends on usability, role-appropriate interfaces, and capacity building that helps non-technical stakeholders interpret risk outputs and translate them into implementable actions. These considerations recur across pilots and suggest that a decision-facing platform should be evaluated not only by analytical sophistication, but also by whether it fits organisational workflows, supports accountable documentation of decisions, and remains maintainable under real-world constraints.

TRIQUETRA also distilled multi-level implications for uptake that map to three governance layers—EU, national/regional, and site management—reflecting the different decision points at which risk evidence and mitigation planning are acted upon (strategic coordination and standards alignment; implementation capacity and resourcing; and site-level operational routines). In this paper, we focus on the geospatial and methodological aspects that enable such uptake, while the detailed policy-oriented formulation of these recommendations is reported separately in the project's policy brief.

7.2 Implications for the FIG community

For the FIG community, TRIQUETRA illustrates a concrete pathway for operationalising core geospatial practice in climate-resilient heritage management. Surveying-grade 3D documentation and repeatable 3D models provide a robust reference for monitoring and change detection; WebGIS and contextual GIS layers support evidence organisation and spatial comparability; EO-derived indicators and monitoring observations extend the evidence base beyond site campaigns; and decision-oriented interfaces (risk profiling and mitigation ranking) translate geospatial evidence into prioritisation and intervention planning. This reinforces the role of geospatial professionals not only as data producers, but as integrators who connect measurement, modelling and decision workflows in a traceable and governance-aware manner.

8 CONCLUSIONS

TRIQUETRA illustrates how geospatial practice—surveying-grade 3D documentation, WebGIS-based evidence management, EO indicators and digital-twin visualisation—can be operationalised in a decision-support workflow that supports multi-hazard risk comparison and actionable mitigation planning. Its main contribution is the integration of an evidence backbone (KBP: Bibliography and WebGIS component) with a Risk Severity Quantification Module, a Mitigation Measure Selection and Optimisation Module and a Digital Twin layer, enabling users to move from documented evidence to comparable risk profiles and ranked intervention options within one workspace. The transferable value lies less in any single model and more in an auditable baseline-to-decision design that promotes comparability, traceability and repeatability as new data become available. Finally, cross-pilot experience indicates that sustained uptake requires alignment with decision processes across governance levels (strategic coordination, regional implementation capacity and site-level operations), reinforcing the role of geospatial professionals as integrators of measurement, modelling and decision workflows in climate-resilient heritage management.

ACKNOWLEDGMENTS

This work is based on procedures and tasks implemented within the project "Toolbox for assessing and mitigating Climate Change risks and natural hazards threatening cultural heritage—TRIQUETRA", which is a Project funded by the EU HE research and innovation program under GA No. 101094818.

REFERENCES

Alexopoulos, M. J., Iliopoulou, T., Modé, P., Istrati, D., Spyrakos, C. C., Soile, S., Verykokou, S., Ioannidis, C., & Koutsoyiannis, D. (2025). A novel and scalable flood risk assessment framework for cultural heritage based on unmanned aerial vehicle photogrammetry and multi-scale rain-on-grid hydraulic modeling. *Science of The Total Environment, 998*, 180256. https://doi.org/10.1016/j.scitotenv.2025.180256

Anastasiou, A., Magkoufis, E., Tegopoulos, A., Mpotonakis, K., Kontopoulos, C., Georgiadis, P., & Charalampopoulou, V. (2025). An advanced knowledge base platform and a decision support system for safeguarding cultural heritage. *Italian Journal of Engineering Geology and Environment*, 133–140. https://doi.org/10.4408/IJEGE.2025-01.S-10

Bosch, E., Langenegger, F., Gege, P., Roulet, J.-C., Nguyen, D., Holzer, J., Cerra, D., Wuethrich, S., & Pache, C. (2025). Preserving underwater cultural heritage: Combining satellite images with a novel flash LiDAR platform. *Italian Journal of Engineering Geology and Environment*, 25–33. https://doi.org/10.4408/IJEGE.2025-01.S-02

Ioannidis, C., Papadimitriou, K., Tourtas, A., Soile, S., Bourexis, F., Tokmakidis, P., Tokmakidis, K., Verykokou, S., & Potsiou, C. (2025). The geometric documentation of the Greek cultural heritage sites participating in the TRIQUETRA project. *Italian Journal of Engineering Geology and Environment*, 7–24. https://doi.org/10.4408/IJEGE.2025-01.S-01

Ioannidis, C., Verykokou, S., Soile, S., Istrati, D., Spyrakos, C., Sarris, A., Akritidis, D., Feidas, H., Georgoulias, A. K., Tringa, E., Zanis, P., Georgiadis, C., Martino, S., Feliziani, F., Marmoni, G. M., Cerra, D., Ottinger, M., Bachofer, F., Anastasiou, A., ... Anyfantis, G. C. (2024). Safeguarding Our Heritage—The TRIQUETRA Project Approach. *Heritage, 7*(2), 758-793. https://doi.org/10.3390/heritage7020037

Plattner, S., & Gschwind, M. (2025). Exploring the UNESCO World Heritage property in the shallow waters at Rose Island using unmanned surface vehicles (USV). *Italian Journal* *of Engineering Geology and Environment*, 35–45. https://doi.org/10.4408/IJEGE.2025-01.S-03

Potsiou, C., Basiouka, S., Verykokou, S., Istrati, D., Soile, S., Alexopoulos, M. J., & Ioannidis, C. (2025). Impact of Climate Change and Other Disasters on Coastal Cultural Heritage: An Example from Greece. *Land, 14*(10), 2007. https://doi.org/10.3390/land14102007

Sokolicek, A., Grechi, G., Tanner, A., Berger, L., Rivellino, S., Montagnese, M., Marmoni, G. M., Hussain, Y., & Martino, S. (2025). Engineering-geological and geophysical surveys for archaeological risk assessment in view of mitigation measures at Aegina Kolonna, Greece. *Italian Journal of Engineering Geology and Environment*, 107–122. https://doi.org/10.4408/IJEGE.2025-01.S-08

Themistocleous, K. (2025). Innovative methods for safeguarding cultural heritage. *Italian Journal of Engineering Geology and Environment*, 123–132. https://doi.org/10.4408/IJEGE.2025-01.S-09

Themistocleous, K., Evripidou, V., & Toumbas, K. (2025). Monitoring cultural heritage sites at risk using citizen engagement through crowdsourcing. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XLVIII-G-2025*, 1435–1440. https://doi.org/10.5194/isprs-archives-XLVIII-G-2025-1435-2025

BIOGRAPHICAL NOTES

Charalabos IOANNIDIS
Professor of National Technical University of Athens (NTUA), Greece. Director of the Lab of Photogrammetry, School of Rural, Surveying and Geoinformatics Engineering. Director of the Interdisciplinary Programme for Postgraduate Studies in ‘Geoinformatics’. He was the Dean of the School for the period 2018-2024. Member of the Ethics Committee of NTUA. Alternate member of the Central Council of Modern Monuments of the Greek Ministry of Culture. He was President or member of various Committees and Working Groups of International Organizations and Associations. Teaches courses at the undergraduate and postgraduate level in the fields of Photogrammetry and Computer Vision, Cadastre, Geometric documentation of monuments. He has supervised 6 completed doctoral theses and 1 postdoctoral research. He has given lectures in many national and international seminars on various topics, such as Photogrammetry, Earth Observation methods, Remote Sensing, Geometric documentation of Cultural Heritage, Augmented Reality, etc. He has published more than 240 peer-reviewed papers. He serves as a reviewer in several journals and books. He has been the scientific supervisor of 21 research projects in the last 20 years (funded by EU, national projects, etc); he has participated as principal investigator in another 30 research projects.

Styliani VERYKOKOU
Dr. Styliani Verykokou is a researcher at the Lab. of Photogrammetry of the School of Rural, Surveying and Geoinformatics Engineering (SRSGE) of the National Technical University of Athens (NTUA), Greece. Her research interests lie in the fields of photogrammetry and computer vision. She obtained a diploma in Rural, Surveying and Geoinformatics Engineering (2013) from NTUA. She has been awarded several scholarships and awards by the National Institute of Scholarships of Greece, the NTUA, the Academy of Athens, the Technical Chamber of Greece, the Thomaidion Foundation (Greece) and the Limmat Foundation (Switzerland), as a result of her performance in her studies. She obtained her doctoral degree in Photogrammetry from SRSGE, NTUA in 2020. The subject of her doctoral dissertation was “Georeferencing procedures for oblique aerial images” and it was supported by the Eugenides Foundation scholarship. In the context of her postdoctoral research, which was held in the Lab. of Photogrammetry of NTUA (2020-2022), she dealt with 3D modelling procedures for special applications. She has participated in several research projects and has authored more than forty publications. Currently, she serves as adjunct lecturer in SRSGE for the courses of “Photogrammetry II” and “Summer Course in Photogrammetry & in Remote Sensing”.

Chryssy POTSIOU
Prof Dr Potsiou is professor of Cadaster and Spatial Information Management in the School of Rural, Surveying and Geoinformatics Engineering of NTUA, with a long and successful international activity. Since 1983, she contributes to the International Federation of Surveyors (FIG) having served from various positions including the period 2015-2018 when she served as the President of the Federation. She has also a long period of contribution to the UN Economic Commission for Europe-Working Party on Land Administration (UNECE-WPLA). Since 2001, she is member of the WPLA Bureau (in the period 2019-20 she served as Vice

Chair), leading joint research in the fields of land management and formalization of informal development in the UNECE region. Since 2023 she is an elected Advisory Board member of the Academic Network of UNGGIM with a mandate to support the aims and objectives of the Committee of Experts of UNGGIM with science and research in setting the agenda for the development of global geospatial information and promoting its use to address global challenges. She has organized more than 40 international conferences/workshops. She has published more than 200 peer reviewed publications, as well as another 120 presentations in scientific conferences. She has been an invited speaker in 45 and a keynote speaker in 17 international conferences.

Anastasia ANASTASIOU
Anastasia Anastasiou is a Surveying and Rural Engineer, holding a Diploma from the School of Rural, Surveying and Geoinforomatics Engineering (SRSGE) of the National Technical University of Athens (NTUA). She also holds a Master's degree from the postgraduate interdisciplinary programme "Protection of Monuments" at the School of Architecture of NTUA. She has experience in the geometric documentation of monuments, using both geodetic and photogrammetric techniques, and has contributed as a researcher at the Laboratory of Photogrammetry of the School of Rural and Surveying Engineering at NTUA. Her technical skills include laser scanning processing and management software, photogrammetry and 3D reconstruction software, CAD software, image and video processing tools, and GIS software. She also contributed as a volunteer field surveying engineer to the Tenea Project—the excavation of ancient Tenea—for five consecutive years (2018–2022) in Chiliomodi, Corinthia. She is currently employed at GEOSYSTEMS HELLAS as a photogrammetry expert and R&D project manager.

Vasiliki CHARALAMPOPOULOU
She is a geologist, with a specialization in remote sensing, photogrammetry and GIS applications. In 1992, she graduated from the National and Kapodistrian University of Athens and since then, she has been working on research projects in the area of photogrammetry, Earth observation and geoinformatics. Since 2011, she is the CEO of Geosystems Hellas S.A., providing consulting, solutions and services on GIS and WebGIS, photogrammetry and Earth observation applications. As CEO and President she has established methodologies and formulated strategies, gaining many distributions and collaborations. She has also established several international collaborations with EARSC, ESA, CNR, ESA, NASA, ISA, UNESCO, FIG, OGC, etc. and several international universities, local governments and industries, under the framework of collaborative H2020 and Interreg calls participation. In 2012, she established the company's R&D division and had successful R&D projects under her supervision, with transferability to many industries and countries. She is also responsible for the distribution of roles and responsibilities in the company.

Panagiotis GEORGIADIS
Panagiotis Georgiadis is the Head of Business Development at Alpes Lasers S.A. who identifies novel scientific concepts and engineering solutions and turns them into real-world applications that tackle modern challenges. With a broad, hands-on technical range such as photonics/ICT

(incl. sensors), big data & analytics, smart cities, circular economy, water & wastewater, waste & recycling, renewables, smart grids, ITS/transport, logistics & smart ports, and nanotechnology and he has built and led partnerships and projects across multinationals, SMEs, municipalities/regional authorities, government institutions, and international NGOs.

CONTACTS

Prof. Charalabos Ioannidis
School of Rural, Surveying and Geoinformatics Engineering, NTUA
9 Iroon Polytechniou St.
Athens
GREECE
Tel. +302107722686
Email: cioannid@survey.ntua.gr
Web site: http://users.ntua.gr/cioannid/

Dr. Styliani Verykokou
School of Rural, Surveying and Geoinformatics Engineering, NTUA
9 Iroon Polytechniou St.
Athens
GREECE
Email: st.verykokou@gmail.com
Web site: http://users.ntua.gr/sveryk

Prof. Chryssy Potsiou
School of Rural, Surveying and Geoinformatics Engineering, NTUA
9 Iroon Polytechniou St.
Athens
GREECE
Tel. +302107722688
Email: chryssy.potsiou@gmail.com
Web site: http://users.ntua.gr/cpotsiou/

Anastasia Anastasiou
Geosystems Hellas S.A.
225 Imittou, 11632
Athens
GREECE
Tel. +302102846144-145
Email: a.anastasiou@geosystems-hellas.gr
Web site: https://orcid.org/0009-0009-6647-2063

Vasiliki Charalampopoulou
Geosystems Hellas S.A.
225 Imittou, 11632
Athens
GREECE
Tel. +302102846144-145
Email: b.charalampopoulou@geosystems-hellas.gr
Web site: https://orcid.org/0000-0002-6947-5114

Panagiotis Georgiadis
Alpes Lasers SA
Avenue des Pâquiers
2072 St. Blaise, Switzerland
Tel. +41327299510
Email: panagiotis.georgiadis@outlook.com
Web site: https://www.alpeslasers.ch/