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MARIE SKŁODOWSKA-CURIE ACTIONS
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Executive Summary

Deliverable D8.1, “Report on Summer Schools and Training Materials,” encapsulates the scope, content, and impact of the four YADES summer schools conducted between 2021 and 2025. It serves as the principal documentation of the project’s training and capacity-building activities under Work Package 8 (WP8), which aimed to facilitate interdisciplinary knowledge exchange and enhance the skills of researchers and professionals in the field of cultural heritage (CH) preservation under climate and hazard-related threats.

The report details:

- The design and implementation of each summer school (Athens, Milan I & II, and Messinia), including objectives, thematic focus, methodologies, and participant engagement.
- The pedagogical strategies used to blend scientific modelling, environmental monitoring, and policy analysis with hands-on training.
- The development, distribution, and legacy of training materials tailored to diverse audiences.

A key outcome of the deliverable is the demonstration of how well-structured and thematically progressive training events can foster sustained engagement, skill acquisition, and collaboration. Through these events, YADES promoted a multi-disciplinary learning environment, bridging engineering, climate science, cultural studies, and risk governance. In addition to professional development, the summer schools strengthened partner integration, reinforced the alignment of project goals, and established a foundation for long-term research collaboration.

The deliverable also underscores the importance of adaptive formats (in-person, virtual, hybrid) in ensuring access and continuity of learning despite external constraints such as the COVID-19 pandemic. The rich archive of materials created through these schools—recordings, datasets, tools, and manuals—remains a valuable asset for further dissemination and use in educational settings across Europe.

In summary, Deliverable D8.1 documents a key achievement of the YADES project: the creation of a training ecosystem that not only transmitted technical knowledge but also nurtured a resilient, collaborative community committed to safeguarding Europe’s cultural heritage.

1. Introduction

Cultural Heritage (CH) sites across Europe are increasingly threatened by the compounding effects of climate change, urbanization, and natural hazards. As our planet warms and extreme weather events become more frequent, the vulnerability of ancient monuments, historical urban fabrics, and archaeological sites becomes more evident. These sites, which embody collective memory and cultural identity, require sustainable strategies for resilience and conservation. Responding to these pressing needs, the YADES project — under the European Union's Horizon 2020 MSCA-RISE framework — was launched to establish an interdisciplinary framework that combines climate science, engineering, geospatial technologies, and cultural studies to enhance the sustainability and protection of CH areas.

One of the core missions of YADES is to ensure that knowledge generated within the project is effectively shared, validated, and expanded through training and education. To this end, Work Package 8 (WP8) has focused on Transfer of Knowledge, Training, and Networking through a series of thematic summer schools. These events aim to:

- Disseminate project innovations and methodologies;
- Foster interdisciplinary collaboration among researchers, professionals, and institutions;
- Equip early-stage researchers and staff with advanced tools and concepts for CH preservation;
- Engage with local contexts and integrate diverse cultural, scientific, and technical perspectives.

The summer schools organized by YADES have covered a broad spectrum of topics, ranging from climate modelling and hazard assessment to participatory heritage planning, remote sensing technologies, and socio-economic resilience frameworks. They have served not only as educational platforms but also as incubators of interdisciplinary dialogue, cross-institutional partnerships, and innovation in cultural heritage science.

This deliverable (D8.1) provides a comprehensive report on the four summer schools conducted under YADES from 2020 to 2025. It includes detailed summaries of each school, thematic focuses, speaker highlights, participant profiles, and the training materials developed. The document also reflects on the strategic role of these events in achieving the project's objectives, their contributions to European research capacity building, and the lessons learned for future training initiatives.

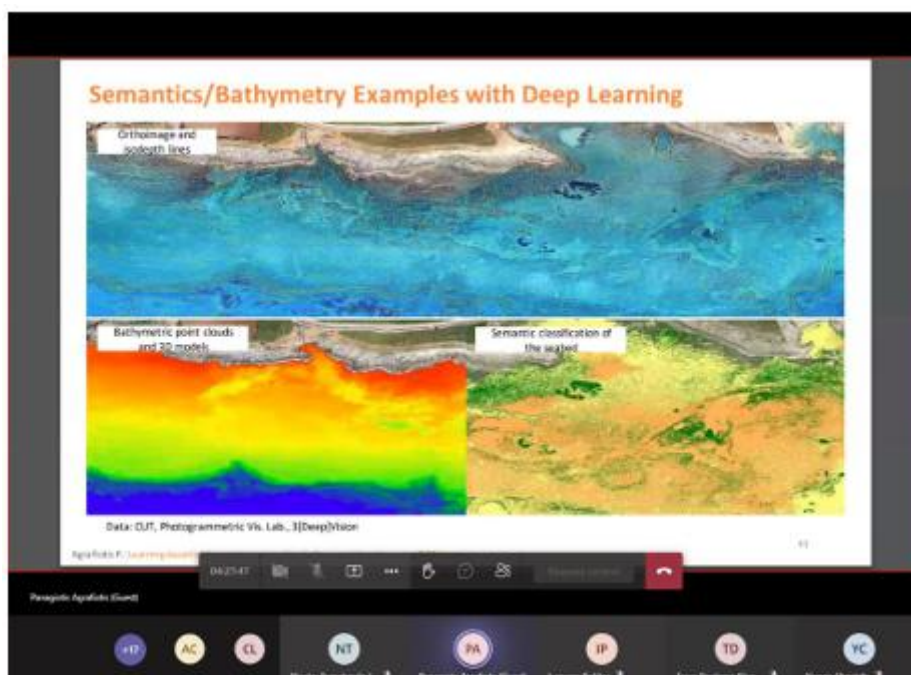


Figure 3: YADES 1st training school. Content

Key Themes Covered:

- Fundamentals of atmospheric modelling
- Assessment of climate data
- Tools for structural and geotechnical vulnerability analysis
- Risk evaluation frameworks specific to historic buildings and archaeological sites

Expert sessions included demonstrations on software tools used in the project, including platforms for modelling heat and moisture transport and tools for mapping urban climate phenomena. A particular emphasis was placed on integrating environmental and material sciences to simulate deterioration risks in CH sites.

Interactive Components: Hands-on sessions gave participants access to anonymized data sets from selected YADES pilot sites, allowing them to practice running simplified simulations. A roundtable discussion enabled researchers and young professionals to exchange ideas on practical constraints, data availability, and adaptation strategies in real-world contexts.

Outcomes and Feedback: Feedback from participants was overwhelmingly positive, with particular praise for the hands-on exercises and real-time data demonstrations. The event fostered relationships among consortium members and initiated dialogues that were later expanded in secondments and other project activities.

2.2 2nd Summer School – Milan, Italy (May 2022)

Organized by Politecnico di Milano (POLIMI), the second summer school was conducted virtually due to pandemic-related travel restrictions. Despite this, the event succeeded in delivering engaging and impactful content on risk perception, participatory planning, and urban resilience.



Figure 4: 2nd Summer school of Yades

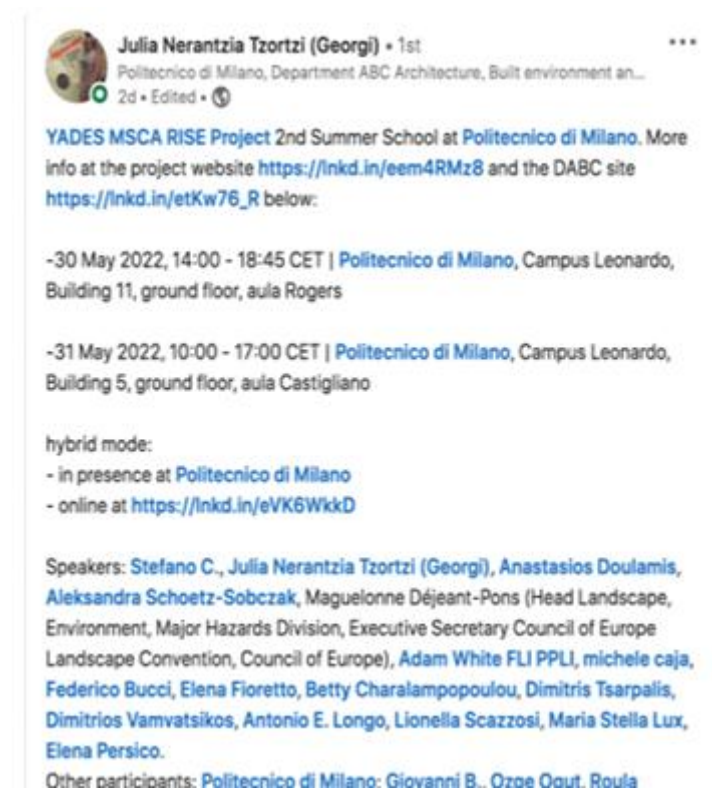


Figure 5: Calendar of the second Summer School. (source: YADES linkedin)



Figure 6: YADES 2nd training school virtual presentation

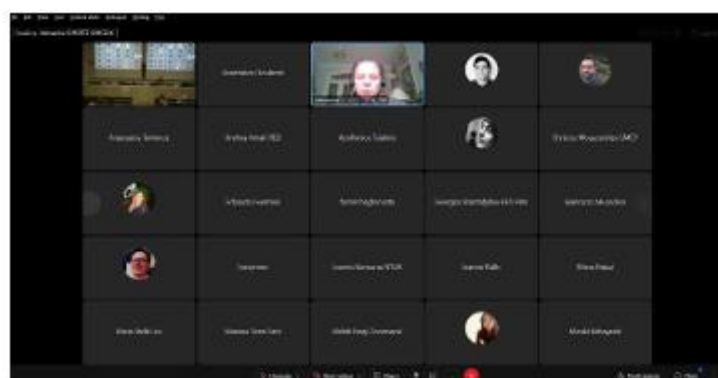


Figure 7: YADES Project Officer speech

Key Themes Covered:

- The role of governance and policy in CH risk management
- Participatory methodologies for heritage conservation
- Tools for stakeholder engagement and co-creation
- Strategies for risk communication and perception management

One of the highlights was the participatory lab methodology workshop. Using breakout rooms and collaborative tools, participants tackled real-world challenges in cultural heritage adaptation planning, simulating community engagement scenarios.

Speakers and Content: Notable contributions came from urban planners, social scientists, and digital humanities experts. These diverse voices added unique insights into how soft sciences can intersect with hard data in risk modelling.

Outcomes and Feedback: The virtual format allowed wider participation, including professionals who could not travel. Participants emphasized the value of exposure to participatory tools and highlighted the applicability of these strategies in their own countries and contexts.

2.3 3rd Summer School – Milan, Italy (May 2023)

Returning to Milan for the third summer school, POLIMI hosted a hybrid event that combined in-person lectures and online sessions. This edition advanced the technical depth of the

program and introduced emerging themes in engineering seismology and real-time CH monitoring.



Figure 8: YADES Conference and 3rd Summer School in Milan organised by POLIMI.

Key Themes Covered:

- Seismic hazard modelling for heritage sites
- Use of sensor networks and real-time data feeds
- Integration of Earth Observation data with structural models
- Socioeconomic metrics in CH vulnerability assessment

Workshops were held in tandem with ongoing research presentations, allowing participants to both observe and participate in state-of-the-art demonstrations. A case study on the seismic risk of a Roman amphitheatre was explored using OpenSees and GIS tools.

Participants and Activities: Participants were a mix of PhD students, early-career researchers, and practitioners. Group exercises promoted problem-solving on disaster risk scenarios using interdisciplinary data inputs. Social events were also arranged to enhance informal networking.

Outcomes and Feedback: The hybrid format maximized reach while preserving the immersive benefits of in-person learning. The inclusion of real-time data analysis and a guided tour of Milan's historical centre highlighted how technical solutions can support heritage site monitoring.

2.4 4th Summer School (Winter School) – Pylos, Messinia, Greece (January 2025)

The final summer school of YADES took place in the winter of 2025 in the coastal town of Pylos, Messinia. Hosted by NTUA with support from the University of the Peloponnese, the

event was held at the Navarino Environmental Observatory, a facility known for its focus on sustainable development and climate research.



Figure 9: 4th summer school of Yades

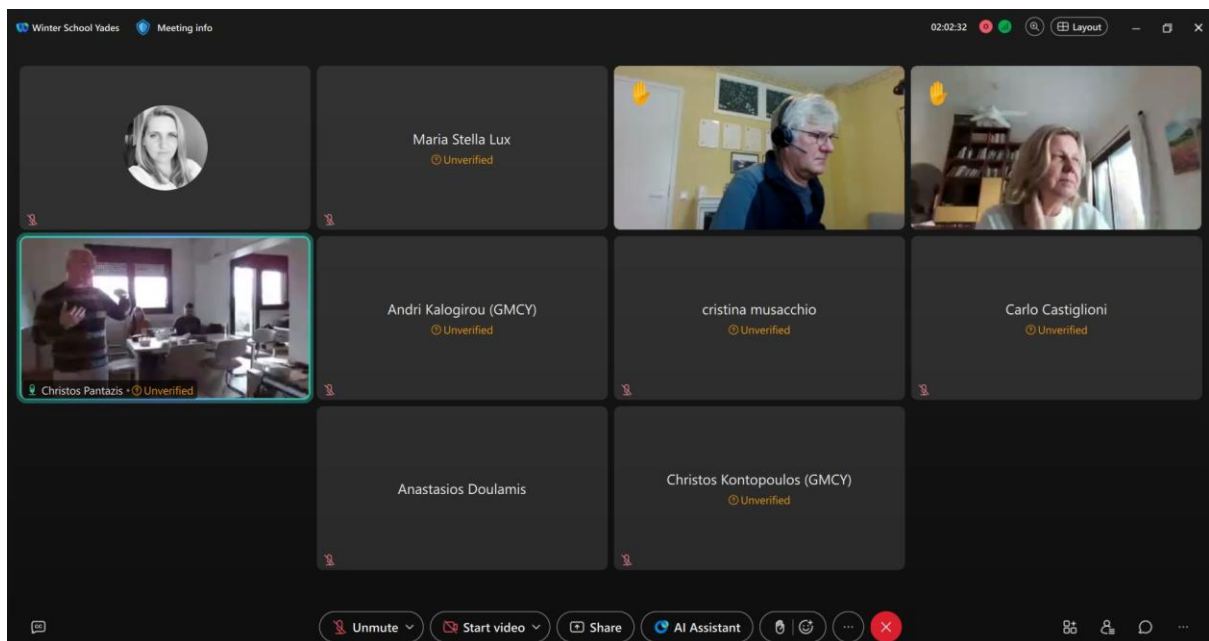


Figure 10: 4th YADES summer school online participants

Key Themes Covered:

- Urban heat islands and thermal comfort in Mediterranean cities
- Mobile climate monitoring methods
- Remote sensing and 3D modelling for CH preservation
- Historical landscape conservation
- Advanced seismic vulnerability assessment for ancient structures
- Multi-hazard risk frameworks for coastal cities

This school was designed as a high-level interdisciplinary seminar that brought together climate scientists, engineers, archaeologists, and geospatial analysts. A notable feature was the hands-on use of mobile meteorological equipment and a site visit to the Palace of Nestor.

Speakers and Highlights: The event featured:

- Prof. Panagiotis T. Nastos (NKUA) on climate and urban dynamics
- Antti Hellsten (FMI) on local climate scenario modelling
- GEOMATICS on digital CH documentation
- Maria Stella Lux (POLIMI) on linking past and present in landscape conservation
- Dr. Vayia Panagiotidis on cultural narratives of Messenia
- Prof. Dimitrios Vamvatsikos (NTUA) on seismic design principles
- Paola Ceresa (RED SPA) on integrated adaptation strategies

Outcomes and Feedback: This final school was considered a capstone experience by many participants. The interdisciplinary approach and stunning location offered a unique opportunity to synthesize insights from across the project. The event concluded with a panel discussion summarizing lessons learned and outlining future directions for CH resilience research.

3. Training Materials

An integral component of each YADES summer school was the development and delivery of high-quality training materials tailored to the needs of diverse participants—from doctoral students and postdoctoral researchers to technical staff and policy advisors. These materials were designed to facilitate both immediate learning during each event and continued professional development afterwards. The following subsections describe the structure, content, and usage of training materials across all four summer schools.

3.1 Types of Training Materials Produced

Across all summer schools, five core types of training materials were systematically developed:

- **Slide Decks and Presentations:** Each lecture or keynote was accompanied by detailed PowerPoint slides or PDF decks. These included visuals, simulation outputs, datasets, methodological workflows, and case study summaries. Many presentations were annotated to support asynchronous review.
- **Recorded Sessions:** For online and hybrid events, full-length video recordings were made of the keynote presentations, technical demonstrations, and panel discussions. These were uploaded to the internal YADES platform, with select content also shared on project communication channels (e.g., YouTube).
- **Reading Materials:** Participants were provided curated reading lists that included relevant academic articles, policy documents, book chapters, and project deliverables. These readings supported deeper exploration of session topics and encouraged interdisciplinary synthesis.
- **Workshop Manuals and Exercise Sheets:** Hands-on sessions were supported by detailed instructions, preconfigured datasets, and digital tools (e.g., QGIS layers, structural analysis inputs). Participants used these to perform guided tasks during the workshops and were encouraged to modify the inputs for experimentation.
- **Feedback and Evaluation Forms:** Each school concluded with the distribution of anonymous feedback forms that captured participants' assessment of content relevance, quality, delivery, and suggestions for improvement.

3.2 Customization per School Theme

The training materials were not generic. Instead, they were carefully adapted to reflect the thematic focus of each summer school:

- **Athens (2021):** Materials emphasized fundamentals of climate modelling, with introductory tutorials on tools such as WRF (Weather Research and Forecasting model), and OpenSees for structural analysis. Datasets related to the Delphi pilot site were used.

- **Milan I (2022):** Focused on participatory planning and risk communication. Materials included scenario cards, urban governance case studies, and templates for stakeholder mapping and co-design exercises.
- **Milan II (2023):** Included advanced technical toolkits such as Earth Observation data workflows, seismic hazard simulations, and integration with GIS platforms. Case study material from the Italian pilot cities was provided for exercises.
- **Pylos (2025):** Interdisciplinary modules blended field-based measurements with theoretical frameworks. Materials featured climate data logs from mobile meteorological units, 3D scanning models from GEOMATICS, and heritage site vulnerability assessment templates.

3.3 Access and Archiving

All materials from the summer schools were archived within the internal document repository of the YADES project. This repository is accessible to all consortium members via the project's collaborative platform. In addition:

- Public-facing materials (e.g., summary slides, edited video segments) were shared on the YADES social media accounts and official website.
- Specific datasets and software modules used in exercises were also made available through GitHub and other project-affiliated open repositories, with appropriate metadata and citation information.

3.4 Educational Impact and Legacy

Participant feedback highlighted the clarity, accessibility, and relevance of training content. Most participants reported that materials were not only useful during the events but continued to serve as references in their own research and teaching. Moreover, several institutions (e.g., NTUA, POLIMI) have integrated components of YADES training content into their ongoing curricula and professional training workshops.

The interdisciplinary and modular design of materials also ensures their reusability in future European projects, both as stand-alone teaching resources and as blueprints for new training curricula.

In summary, the training materials developed through the YADES summer schools reflect the project's commitment to high-impact knowledge transfer. They have contributed significantly to capacity building, fostered ongoing collaboration, and ensured that project outcomes continue to resonate beyond the lifecycle of the grant.

4. Conclusions

The YADES summer schools have been a cornerstone of the project's mission to promote interdisciplinary education, foster cross-border collaboration, and advance scientific understanding in the field of climate-resilient Cultural Heritage (CH) preservation. Spanning four years, these training events were strategically designed to evolve with the project's own progress—beginning with foundational technical themes and culminating in sophisticated, interdisciplinary integration.

Each school brought together a carefully curated mix of expertise, local context, and hands-on practice. The progression from Athens to Messinia reflected not just a geographical journey, but a pedagogical one: from theory and modelling fundamentals to real-world applications and multi-hazard planning. Participants were exposed to a comprehensive blend of scientific, technical, and socio-political insights, all aimed at equipping them with the tools and frameworks to tackle the complex challenges facing CH in the era of climate change.

One of the major achievements of the summer schools has been their ability to facilitate impactful knowledge transfer. Through workshops, lectures, field visits, and digital tools, participants engaged with a wide array of content tailored to their backgrounds and interests. Feedback consistently indicated that the events were highly valuable, both for professional development and for expanding networks of collaboration. Additionally, the modular and interdisciplinary nature of the training content means that the material will continue to have educational utility beyond the project's lifespan.

From a broader perspective, the YADES summer schools contributed to building a pan-European community of practice dedicated to the preservation of cultural assets in the face of increasing environmental risk. They served as platforms for aligning methodologies, sharing innovations, and harmonizing responses to shared challenges. In this way, the schools reinforced the project's objectives of creating long-term, sustainable impacts across multiple sectors, including research, policy, and civil society.

Finally, the successful execution of the four summer schools stands as evidence of the consortium's robust coordination and adaptive capacity, especially in response to external challenges such as the COVID-19 pandemic. The hybrid and virtual models developed in response to these constraints proved effective and inclusive, setting a precedent for future training events.

In conclusion, the YADES summer schools were more than educational events—they were transformative experiences that nurtured a generation of researchers and professionals committed to safeguarding our cultural legacy through innovation, science, and cooperation.