Programme: UFO Innovation boosted by small Flying Objects
Project full name: **5 DIMENSIONS ARCHITECTURAL AIR DOCUMENTATION**
Project acronym: **5D ARCH AID**

<table>
<tr><td colspan="2" align="center">Deliverable report
D4.1 Capacity-building Workshop in Syros Island
D4.2 Workshop results web publication</td></tr>
<tr><td>Deliverable name:</td><td>**D4.1 and D4.2**</td></tr>
<tr><td>Work Package:</td><td>WP4: Exploitation and Dissemination.</td></tr>
<tr><td>Submission Date:</td><td>25/06/2022</td></tr>
<tr><td>Task Leader:</td><td>Asociatia MONUMENTUM (AM) & HERMeS</td></tr>
<tr><td>Contributing partners:</td><td>ALL</td></tr>
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Partners

	GEOSPATIAL ENABLING TECHNOLOGIES (GET)
	JGC S.A. (JGC)
	Heritage Management e-Society (HERMeS)
	Asociatia MONUMENTUM (AM)

Contents

1. Introduction

The three-day educational seminar called **"5D Architectural Air Documentation"** that took place in Hermoupolis, Syros, within the framework of the 5D-ARCH-AID project, was an opportunity for all interested parties to emerge inside the reconstructed environment of specific digital tools that initiated the conceptualization of the multilayered, interdisciplinary documentation regarding the traditional settlement of Ano Syros.

The workshop provided the participants a tactile form of interaction with the technological software, as well as the digital background generated during the digital imprinting of the Medieval site, under the guidance of the selected specialized moderators chosen to coordinate the three different thematic axes that framed the days of the workshop. The direction of the seminar was for architects, engineers, designers, historians, educators, archaeologists and people generally interested to become familiar with cutting-edge technologies that are not abundantly accessible, as well as their application on preservation and raising awareness for all aspects of tangible and intangible cultural heritage. It was based upon empirical, laboratory and research tests behind software that is related to digital documentation, 3D reconstruction, redesign and promotion, aiming to enrich the participants knowledge inside a hands–on, interactive course.

Figure 1: Cover Page of Booklet [Personal Archive, Greece]

Figure 2: Poster of Flash Talks Event [Personal Archive, Greece]

The first and third day of the workshop took place inside the space of Zisimatos Textile Factory in Hermoupolis, Syros. The events that accompanied the workshop, specifically the event of the Flash talks regarding good practices as well as the following networking event, were held respectively in the Cultural Center of the Municipality of Syros and Kois Mansion. On the third

day, after the designed morning session, the participants had the opportunity to visit the heritage site of Ano Syros through a coordinated tour, which focused on highlighting the historical and architectural physiognomy of the Medieval settlement.

The three-day workshop was also accompanied and completed in the Apoș region of Romania, where the digital recording of the project and its methodology was presented with the local partners to the interested participants who attended the one-day event. The morning part of the educational course engaged all trainees in hands-on practices that represent a part of the regional cultural heritage of the site, including historical guided tours through digitally documented, significant points of interest. The day came to a conclusion on the evening presentations on the results of the 5D-ARCH-AID project, the research and digital documentation using terrestrial LiDAR and SFO technologies, as well as the presentation on Craftsmanship and heritage, regarding traditional tilemaking in the vision of architects by key partners of the project.

2. Thematic entities

The three-day workshop was structured in three main thematic axes with relevant practical applications in the digital preservation of cultural heritage, with particular emphasis on the methodology produced on the project on 5D-Arch-Aid. The logic of the sequence of the axes aimed first for the trainees to become acquainted with the digital mapping tools and then to take the initiative of using the results produced by these tools inside practical scenarios on promoting and protecting cultural heritage.

A. 3D and Mobile scanning.
3-dimensional digitization of interior spaces with a high-resolution camera, as well as outdoor spaces using laser scanning and / or unmanned aerial vessels (drones). Recording and mapping with mobile technology (360) and self-propelled camera. Panoramic Image Collection System.

B. Sensitization of society to the loss of cultural heritage.
Design of applications through online educational programs to raise awareness of society, in relation to the local cultural heritage.

C. VR-AR Applications.
Design and development of simple Virtual and Augmented Reality applications for the research, elevation, and promotion of cultural heritage.

FRIDAY 20.05 | ZISIMATOS TEXTILE FACTORY| HERMOUPOLIS, GREECE |

-12:00 - 12:30: Introduction to the Workshop| P. Chatzigrigoriou

-12:30 - 13:00: **3D Scanning** | Moderators: Gr.Billiris, Ch. Kontostathis and
P. Chatzigrigoriou

-13:00 - 13:30: **Mobile Mapping** | Moderators: G.Mavrellis, Th. Vakkas

-13:30 - 14:00: Break

-14:00 - 16:00: **Interactive practices of three-dimensional digitization: Spatial 3D digitization, usage of high - resolution camera, laser scanning and/or unmanned aerial vehicle (drone)**

-16:00 - 18:00: **Interactive practices of Mobile Mapping: Panoramic Image Collection System**

SATURDAY 21.05 | CULTURAL CENTER | |KOIS MANSION| HERMOUPOLIS, GREECE |

-17:30 - 20:00: **Presentations of partners: GET, JGC, HERMeS, AoM**

-20:00 - 20:30: **Result presentation of the Project 5D - ARCH- AID**

-21:00 - 22:00: **Organized Buffet, with free discussion/networking**

TUESDAY 24.05 | ZISIMATOS TEXTILE FACTORY | HERMOUPOLIS, GREECE |

- 9:00 - 10:30: **VR–AR applications** | Moderator: Pr. Spyros Vosinakis

-10:30 - 11:00: Break

-11:00 - 13:30: **Design and development of simple Virtual Applications of Virtual & Augmented Reality** | Moderators: P.Chatzigrigoriou, P. Georgaki, V. Nikolakopoulou

-16:00 - 18:00: **Visit to Ano Syros** | Moderator: P.Chatzigrigoriou

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SATURDAY 11.06 | WORKSHOP IN APOŞ | ROMANIA

- Morning:

- **Presentation and tour of the traditional kiln in Apoş** | Moderator: E. Vaida

- **Introducing the traditional craft of ceramic tile making** | Moderator: E. Vaida

- **Inscribing tiles with the names of the over 1000 donors who contributed to saving the choir of the Fortified Church of Vermeş through the campaign Virtual & Augmented Reality**

- **Tour of the Fortified Evangelical Church of Apoş** | Moderator: I. Burnichioiu |

- Break

- Evening Presentations in the repurposed traditional barn of "Villa Abbatis":

- **On the results of 5D-ARCH-AID** | Moderator: P.Chatzigrigoriou, A.Chamalidou, V.Nikolakopoulou

- **The Fortified Evangelical Church of Ţapu: from Medieval Times to the XX-th Century**| Moderator: I. Burnichioiu

- **Digital documentation of the Fortified Evangelical Church of Ţapu using terrestrial LiDAR and SFO technologies** | Moderator: C. Şuteu

- **Craftsmanship and heritage. Traditional tilemaking in the vision of Architects**| Moderator: E. Vaida

3. Moderators

Day 1

Figure 3. JGC Geoinformatics Systems [Personal archive, Greece]

Figure 4: GET – Geospatial Enabling Technologies
[Personal Archive, Greece]

Figure 5: Pavlos Chatzigrigoriou
[Personal Archive, Greece]

JGC Geoinformatics Systems SA (Day 1 & 2)
Gr.Billiris, Ch. Kontostathis

JGC Geoinformatics Systems S.A. represents leading manufacturers of topographic instruments of wider construction and laboratory equipment in Greece, Cyprus and the wider Balkan region, providing innovative products and innovative solutions since 1999. JGC offers the most advanced instruments of Topography (GPS, Total Station), Hydrography (Multibeam, Echosounder), Three-dimensional documentation (Laser & Optical Scanners), Geophysics (Geo radar, Detectors), Thermography, Drones & UAVs, Security Equipment (antidrones, XRAY, OTS) and in general scientific equipment and software that opens new horizons in the applications of modern engineering with innovative technologies as well as techniques. In the context of continuous technological development and increased requirements, our company offers a series of integrated solutions that include hardware, software and configuration according to the needs of the customer with the sole aim of the uninterrupted use of the equipment and the reliability of the solution over time.

GET (GEOSPATIAL ENABLING TECHNOLOGIES) (Day 1 & 2)
G.Mavrellis, Th. Vakkas

Cultural heritage is a valuable and non-renewable asset and is now a recognised strategic resource for a sustainable Europe. Digital technology and the Internet are reshaping the monument's relationship with man and society. Technological development offers new possibilities for the preservation, archiving, promotion, exploitation and reuse of our cultural heritage, with the result that the use of digital technologies can significantly increase the public value of cultural heritage.

At GET we offer solutions for the recording and automated prioritization of interventions to save the cultural reserve through the creation of a modern cartographic 3D background and the creation of a three-dimensional digital twin pan-effigy (Digital Twin) which facilitates the perception of space and is the basis for decision-making in macro - medium and micro -scale.

GET, with modern digital technologies as an ally and through the implementation of similar projects, aims to bring monuments to the center of life, to reconnect them with society and the economy and to make them public domain of all as an essential means to improve competitiveness, human life and the natural environment.

PAVLOS CHATZIGRIGORIOU (Day 1, 2 & 3)

Pavlos Chatzigrigoriou is a Civil Engineer with a Master's degree in Protection, Conservation and Restoration, a Master's degree in Environmental Urban Planning and a PhD in Architecture (Digital Cultural Heritage).

In 2015, his research (HERMeS) led him to the European Union Cultural Heritage Award "Europa Nostra", among 269 proposals. HERMeS is now part of the "Best Practices for the 2021 Strategy" set up by the Council of Europe and currently extending to many historic cities. He attended as a guest speaker among others: the "Cultural Forum", the "Best in Heritage", the "Best practices in public administration" (Luxembourg), the "Digital Heritage", the "2021 Strategy" and many more. He was a postdoctoral fellow in "Marie Curie" at the Cyprus University of Technology.

Today he is a researcher at the University of the Aegean, at the Interactive Systems Design Lab, president of the jury of the European Culture Awards - Europa Nostra in the category "Citizens' actions and awareness of society", co-founder of the non-profit NGO "Heritage Management e-Society" for the digital management of heritage and chairman of the Board of directors of the "Syros Institute".

Day Two

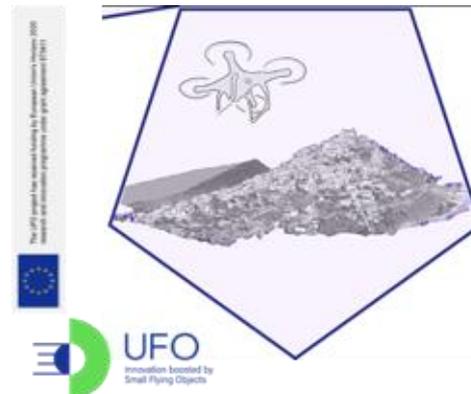*Figure 6: Ambulance For Monuments [Personal Archive of AfM, Romania]*

Figure 7: 5D-ARCH-AID Project [Personal Archive, Greece]

AMBULANCE FOR MONUMENTS – VERONICA VAIDA

The "Ambulances for Monuments" project, launched in 2016, aims to preserve the architectural heritage. Responding to a clear need to restructure national heritage policy, the project operates in a variety of axes: it has an educational character by offering the opportunity to volunteer students to participate in rescue interventions, uses traditional conservation techniques ensuring their preservation and dissemination, sensitizes and includes the local community in the process of protecting the heritage, and inspires local philanthropy.

Thanks to the actions of the project, there are often changes in the attitude of the local administration and society to the rescue of a monument: independent initiatives are developed to care for the monument, rescue interventions continue, and the local community unites around a symbol and a purpose.

In addition, awareness of environmentally friendly building practices is achieved using local materials and traditional techniques.

5D – ARCH - AID : GET - JGC - HERMeS – AfM

In this project, we approach the traditional settlement of Ano Syros in research, applying a series of state-of-the-art technological tools to digital cultural heritage, with the aim of arriving at an innovative methodology for the digital management and protection of traditional settlements. Specifically, based on the "HERMeS" recording methodology applied in Hermoupolis, we are exploring new technologies with a combination of drones, ground-based special cameras, and digital scanners. We check the data in terms of accuracy and automation of recording with emphasis on the pathology (problems) of buildings. We are aiming for a new methodology for rapidly assessing the situation of traditional settlements which will be particularly valuable as the socio-economic conditions combined with climate change lead historical buildings to abandonment or collapse.

Day Three

Figure 8: Interactive Systems Design Lab [Personal Archive, Greece]

Figure 9: Jenny Giorgaki [Personal Archive of G. Giorgaki, Greece]

Figure 10: Vasiliki Nikolakopoulou [Personal Archive, Greece]

INTERACTIVE SYSTEMS DESIGN LAB (ISD) - SPYROS VOSINAKIS

Interactive Systems Design Lab – ISD) of the University of the Aegean aims at the research, development and support of courses in the wider areas of Human-Computer Communication and New Media Design. It is housed in the historic former A' High School of Arena of Syros, in Ermoupolis and has rich and specialized equipment that includes indicatively: motion capture studios, virtual and augmented reality material, advanced systems and sensors of physical interaction, drones, scanning devices, digital manufacturing and prototyping technologies.

In recent years, a large number of research and development projects have been implemented in the laboratory in areas of application such as: interactive applications for museums and places of cultural interest, personalized tourist routes, digital systems to enhance experience tourism, digitization of buildings and artifacts with the aim of saving or highlighting their special characteristics, digitizing traditional dances and clothing and promoting them in virtual environments, Etc.

JENNY GEORGAKI

Jenny Georgaki studied History and Archaeology at the Aristotle University of Thessaloniki and then received a master's degree in The Restoration of Monuments of Culture at the Faculty

of Engineering of the Aristotle University of Thessaloniki, where she was awarded a doctorate. She has worked as an archaeologist at the Ministry of Culture and Sports, in a number of excavation programs as well as in the design of museum programs of the public. She is a visiting professor at the Aristotle University of Thessaloniki and teaches History of Art and Greek Culture in adult education structures.

VASILIKI NIKOLAKOPOULOU

Vassiliki Nikolakopoulou holds a bachelor's degree in Mathematics from the National and Kapodistrian University of Athens and a master's degree from the Department of Design Engineering of the University of the Aegean, where in the same department she carries out her PhD focusing on methods of evaluating the user experience in interactive mixed reality systems in museums and exhibitions related to cultural heritage.

She was a Marie Curie researcher in Cyprus and Austria at the first European Initial Traning Network dedicated to digital cultural heritage. At the same time, she has participated in domestic and European projects on science education and communication. The interdisciplinarity of her fields of activity has led to research interests covering areas from Human-Computer Interaction, participatory, conceptual, and digital design, to cultural heritage management.

Day in Apoș, Romania

Figure 11: Eugen Vaida [Personal Archive of E.Vaida, Romania]

Figure 12: Călin Şuteu [Personal Archive, Romania]

Figure 13: Ileana Burnichioiu [Personal Archive of Ambulance for Monuments, Romania]

EUGEN VAIDA

Eugen Vaida (M) is an architect with a rich architectural design activity in the rural area of Transylvania. In the field of heritage, he initiated and developed through Monumentum Association a series of applied conservation and educational programs in close cooperation with local communities. He owns a vast ethnographic collection, being the founder and the president of The Network of Private Rural Ethnographic Museums and Collections from Romania (RECOMESPAR). In 2017 he was appointed the president of The Federation of Transylvanian Heritage – TransylvaNet. His concern is to rise the quality of architecture in rural areas by instructing architects and students architects who are exploring traditional techniques and local materials with solutions that meet the current living comfort. As a member of the Rural Working Group of the Romanian Order of Architects he initiated and supported the development of a series of architectural guidebooks for contextual planning in most of the ethnographic areas of Romania, and currently coordinates the project "Mapping of craftsmen and their traditional products in the construction sector in Romania". Eugen Vaida is a member of several advisory committees for approval of interventions in historical areas and leads a series of summer schools for young architects and students. During 2017 he participated at the elaboration of a report on heritage and traditional crafts for the European Commission called Skills, training and knowledge transfer: traditional and emerging heritage which should be implemented in the public and private policies of each of the member states, which he struggles to do nowadays. Through his research and education programs he has an important role in the preservation of the historical roof landscape in Transylvania. He coordinates the "Ambulance for Monuments" project in Southern Transylvania and the capacity building of the project through other NGOs all over Romania.

CĂLIN ȘUTEU

Călin Șuteu is an archaeologist and heritagedigitization specialist based in the heart of Transylvania, at Alba Iulia, with a passion for caving and kayaking. A keen interest in archaeometry as a student and a passion for photography further developed into a PhD study

aimed at developing the cultural heritage 2D and 3D digitization methodology for Romania, applying some of the most advanced techniques in the field, like SfM photogrammetry, both aerial and close range, metrological grade 3D laser scanning, gigapixel imaging, H-RTI and other scientific photography techniques. As a volunteer/ scientific partner has participated in numerous national and international projects, both in Romania and abroad and also teaches photogrammetry for cultural heritage to MA students at his alma mater, the 1 Decembrie 1918 University of Alba Iulia. Besides helping the team at the Ambulance for Monuments in documenting the interventions he is dreaming of a long-term monitoring project for the amazing cultural landscapes and monuments of Romania, using modern techniques and interdisciplinary, international teams.

ALICE CHAMALIDOU
Aliki Chamalidou is an Architectural Engineer of Aristotle University of Thessaloniki and is currently finishing her Master's degree at the Department of Product and Systems Design Engineering of the University of the Aegean. She has completed the photography training program at Stereosis School of Photography, and has voluntarily participated in organizations such as Monumenta, 100 Resilient Cities: Thessaloniki and Thessaloniki International Film Festival. She has previously worked as an architect and has simultaneously taken over the set-design department on the production of short films. She currently works at the non-profit NGO "Heritage Management e-Society" for the digital management of cultural heritage.

4. Workshop: Day 1

The first day of the workshop, which was held inside the Zisimatos Textile Factory, focused on the gradual acquainting of the participants with all available digital tools that were unfamiliar to a measurable number out of the 35 people who attended. The trainees were introduced to the evolution of unconventional applications of technology into capturing the spectrum of cultural heritage.

The workflow of the day was molded into two main stages: initially an explanatory presentation by the selected coordinators on the thematic axis of the day, specifically in the section of 3D scanning and Mobile mapping. The experts visually regenerated the different processes used for the digital documentation of the settlement of Ano Syros, deconstructing the methodology behind a real scenario case, with its particular challenges.
As soon as an initial idea of the digital approach to the promotion of cultural heritage was shaped, the participants were divided into small groups and within a rotation system participated in short recordings of both outdoor and indoor space, using respectively mobile technology (360º 4K camera) and that of a self-propelled camera, as well as a high resolution Matterport camera, and a laser scanner (Faro Scanner).
Each group had to collectively complete a specific task in order to proceed to the next digital method. For instance, using Matterport Group A had to complete the entrance of the ground floor of the selected interior, while Group B had then o take over and scan the staircase that led to the second floor of the particular historical building. The alternate group of experts completed repetitively small demonstrations of scans to the interior, in the timeframe of 7 minutes per

scan, using the Faro Laser Technology. Finally, the last setup moved to the exterior space and focused on the available mapping techniques, as well as on the recording of a reconstructed environment with a self-propelled, high resolution camera.

Figure 14: 1st day of Workshop, Zisimatos Factory [Personal Archive, Greece]

Figure 15: 1st day of Workshop, Zisimatos Factory [Personal Archive, Greece]

Each participant had the chance to interact both with the digital equipment, as well as the professionals attending each day in order to get better acquainted with the possibilities as well as the limitations of each specific technology, such as weather conditions, intense lighting, project management and time efficiency. By the end of the day, the participants acquired a new understanding of the available practical applications of technologies at their disposal, getting ready to utilize the results of such technologies on the following days of the workshop.

Figure 16: Digital documentation, Matterport demonstration [Personal Archive, Greece]

Figure 17: Digital documentation, Faro Scanning [Personal Archive, Greece]

Figure 18: Digital documentation, Mobile Mapping [Personal Archive, Greece]

5. Workshop: Day 2

Following the previous day that focused on the initiation of the participants to the digital documentation technologies, an open call took place inside the Cultural Center of the Municipality of Hermoupolis, where experts on different fields of both digital documentation as well as practical applications on Cultural Heritage gave short presentations on their projects. For the closing of the flash Talks event, the contributors of the project 5D- ARCH-AID (GET - JGC - HERMeS - AfM) gave a summary presentation of the key conceptual strategies of the project. Each focused on their participation inside the project, regenerating the process that led to the final mosaic of the digital documentation model. The afternoon event was attended by all participants of the educational workshop, as well as a number of local engineers, teachers, professors and students of the Design Department of the Technical University of the Aegean, members of the municipality as well as residents of Syros sensitive to regional cultural heritage issues.

Figure 20: Flash Talk presentations, JGC – GET [Personal archive, Greece]

Figure 21: Flash Talk presentations [Personal archive, Greece]

After the completion of the presentations, the guests were led to the evening event and the tour inside Kois Mansion, one of the characteristic historical buildings on Syros that represents the neoclassical architectural identity of Hermoupolis. The purpose of the event was the interaction of the project's contributors, the acquaintance with the interested participants, as well as the social networking and discutsson.

Figure 22:, Kois Mansion event [Personal Archive, Greece]

Figure 23: Kois Mansion event [Kois Optics Archive, Greece]

6. Workshop: Day 3

The closing of the workshop came on May 24, returning to the Zisimatos Textile Factory. The theme of the axe of the workshop, focused on browsing through both Virtual and Augmented reality applications. The duration of the course followed the structure of the first day of the workshop, and was divided into the theoretical presentation part. As well as the hands - on part of the workshop. The invited experts who gave the opening demonstrative speeches, visualized narratively the effects of the experience of browsing within such a virtually constructed 3D environment, the challenges of the identification of the user who navigates within the corresponding environment, the possible feeling of uncanniness, as well as the deviations from the real space that is represented. Then the experts cited examples that they have personally taken on and were implemented within Greece, cases where this type of innovative technology was applied to projects of virtual museum exhibitions with the purpose of an unconventional, but effective promotion and assimilation regarding intangible cultural heritage.

The initial presentation followed by the interactive part of the workshop. Participants were able to experience the sense of a VR constructed environment with the use of Oculus Headset. They were then divided into two groups, depending on their engineering or educational/historical background of their specialty in order to proceeded in a task scenario using the tools produced by the 5D-ARCH_AID project.
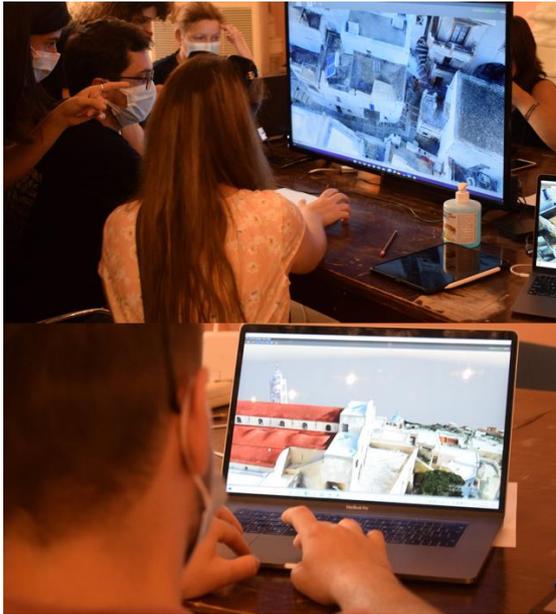
Figure 24: Digital Evaluation [Personal Archive, Greece]

Figure 25: Saint George historical task [Personal Archive, Greece]

Specifically, the participants who came from an engineering background utilized the available digital 3D constructed environment of Ano Syros, produced by the UAV Drone Technology, as well as the 360° spheres constructed environment that was uploaded on Mapillary's platform. The task that was given was the evaluation of the overall pathology of a selected number of buildings, with the completion of a google form questionnaire that accompanied the evaluation, recording the final results as well as factors regarding the level of difficulty of the evaluation, the confidence of the suggested estimate, the timeframe and user limitations.

The participants with an expert background on archeology, history and education accessed the produced 3D Model of the interior of Saint George, the Cathedral of the traditional Settlement that was documented using the high resolution Matterport camera. The task that was given to the attendees was to create a collective historical trail creating key points inside the 3D constructed model. The objective was to provide valuable information to the future digital explorer that will visually access Saint George.

The three-day workshop came to an end with the optional visitation to the Settlement of Ano Syros, where all participants as well as the moderators of the workshop had the chance to experience up-close the tangible and intangible aspects of the Medieval heritage site, to form a comparison with the digital environment that was initially provided to them.

Social Media Posts (indicative)

https://www.facebook.com/thinkhermes/posts/5042649672517824

https://www.facebook.com/thinkhermes/posts/5029099807206144

https://www.facebook.com/thinkhermes/posts/5027863817329743

https://www.facebook.com/thinkhermes/posts/5021704097945715

Figure 26: Visit to Ano Syros [Personal Archive, Greece]

Figure 27: Visit to Ano Syros [Personal Archive, Greece]

7. Workshop: Day in Apoș

The one-day workshop in Apoş, Sibiu county, Romania, brought together traditional and futuristic technologies. The event showcased and disseminated the results of the 5D-ARCH-AID project in an ambiance bridging the distant past and the nearby future in the present. 5D-ARCH-AID set out to employ cutting-edge technologies to devise effective tools and methodologies to address contemporary complex challenges endangering built historical heritage in Europe and worldwide. Apoş is a village in the southern Transylvanian countryside, a place where the perils of time and insufficient resources upon built heritage can be easily noticed. Sustainable heritage conservation and management demands material capabilities – financial resources, project managers, people, craftspeople, adequate construction materials – as well as epistemic facilities – easily accessible and comprehensive data about history, architecture, and traditional construction techniques, timely pathologies and vulnerabilities analyses, potential intervention plans adapted to the needs of the site etc. The workshop in Apoş mixed these crucial dimensions, presenting recent achievements which address both material and epistemic concerns which hinder material and immaterial heritage conservation initiatives. The morning session of the workshop consisted in field activities in the village of Apoş, at the traditional kiln and the Fortified Evangelical Church.

Figure 28: Workshop in Apos [Archive of AfM, Romania]

Figure 29: Traditional tile-making in Apos [Personal Archive, Romania]

The workshop took off with a tour of the traditional kiln in Apoș. Built by Monumnetum in 2013-5 with support from HRH Prince of Wales, the Anglo-Romanian Trust for Traditional Architecture, the Global Heritage Fund and the Mioritics Association, the kiln furnishes the needed stock of traditional ceramic tiles to heritage conservation and restoration initiatives in the region. Eugen Vaida (Monumentum) presented the facilities, detailed the workflow, emphasized the challenges, and told the history of one of the few traditional kilns where tiles are handcrafted following a fully traditional process. Besides providing the requisite building materials, the kiln serves to preserve the tile making craft by training fresh craftspeople and turning the craft into a sustainable business. Participants learned to mould the clay into shape – learning by themselves the joys and sorrows of tile making – while some inscribed freshly moulded tiles with the names of the thousand donors who contributed to saving the choir of the Fortified Church of Vermeș, Alba, through the campaign "Țiglă donează, acoperiș salvează" ("Donating tiles, saving roofs").

Figure 30: Visit to the Fortified Evangelical Church of Apoș [Archive of AfM, Romania]

The workshop continued with the tour and presentation of the Fortified Evangelical Church of Apoș, delivered by Ileana Burnichioiu ("1 December 1918" University). The A-listed monument dates back to the XV-th century and it is one of the many endangered edifices of its kind in Transylvania. Its walls and successive construction strata tell a rich history of social, economic, and political development in the region, and it would be one of the first beneficiaries of implementing the tools and methodologies developed within 5D-ARCH-AID.

After having lunch at the horse-riding center "Villa Abbatis" across the road from the church, the afternoon session comprised four talks relating the past with the future of heritage through the technological means of the present. Pavlos Chatzigrigoriou, Alice Chamalidou and Vasiliki Nikolakopoulou (HERMeS) presented the results of the 5D-ARCH-AID project to an audience of professionals in the fields of archeology, architecture, history, and heritage safeguarding and restoration. 5D-ARCH-AID combines the state-of-the-art heritage management system HeRMES with cutting-edge hardware and software technologies (aerial SFO technology, 360o

cameras, and optical range sensors) to build up a comprehensive and easily accessible tool designed to maximise the effectiveness of devising sustainable heritage conservation strategies. The tool increases the cost-effectiveness of heritage analysis and assessment, thus enhancing safeguarding and sustainable restoration initiatives. The HeRMES system provides a powerful methodology to evaluate, rank, and track the development of built heritage items. Modern technologies are employed to generate detailed 2D digital maps and 3D models of heritage items which, when integrated with related immaterial heritage items (4D), and data concerning pathologies, vulnerabilities and conservation needs (5D), result in a comprehensive database which enables effective and sustainable heritage management strategies. The tool was implemented on Ano Syros, Greece, for showcasing and optimisation purposes. The presentation emphasized both the virtues and the challenges of employing SFO and 360o technologies in documenting heritage sites: SFO is time-effective in yielding detailed 3D models, while it is limited due to image resolution, meteorological, and accessibility conditions, while 360o high-resolution hand cameras provide better texture, but are opaque to higher altitudes, being also more time- and effort-demanding.

The second and the third talks applied to the The Fortified Evangelical Church of Țapu, Sibiu county, another XV-th Century A-listed monument. Ileana Burnichiouiu presented the site from historical, architectural and archeological viewpoints, highlighting its successive construction layers and their correlations with social and political events of their times. She emphasized the challenges faced when trying to uncover previous configurations of the site: not long ago, uncovering these would have required invasive interventions altering the structure of the edifice. However, LiDAR technology provides a non-invasive and cost-effective approach to gather detailed data about the thickness of the church walls, which opens up new avenues to advance and test hypotheses related to the succession of architectural configurations. Călin Șuteu ("1 December 1918" University) went in depth about the process of 3D modelling the church and its precincts using SFO's and optical distance sensors (LiDAR), same in kind with the ones proposed by 5D-ARCH-AID. The presentation included a crash course in operating the two technologies, covering the requisite equipment, their use, the available modelling softwares, the challenges faced, and the virtues and shortcomings of each one of them.

Figure 31: 3D modeling with LiDAR technology [Archive of AfM, Romania]

Figure 32: 5D ARCH-AID presentation [Personal Archive, Romania]

Eugen Vaida (Monumentum) delivered the last presentation: "Craftsmanship and heritage. Traditional tile making in the vision of architects". Handcrafted ceramic tiles constitute the widest spread traditional covering material in the Transylvanian countryside, making up for the picturesque landscape which is a core part of the aesthetic and architectural identity of the region. However, due the penury of traditional craftspeople and tile making facilities, and the flood of modern day replacements, the countryside Transylvanian heritage landscape faces the danger of extinction. Architects need to understand and harness traditional tile coverings as a regional heritage identity motif, to use it in restoration initiatives, and to exploit its potential in original projects in the region. This is only possible, however, if the traditional tile making craft is kept alive and supported by a sustainable business model. Craftspeople and architects need to work together and support each other to secure a future for the Transylvanian heritage.

8. Lessons

Almost ten years ago Monumentum ran a project to record photographically over 150 the settlements from southern Transylvania (Hârtibaciu Valley). They systematically recorded heritage sites before the flux of modern materials and construction techniques fueled by a euphoric appetite for polished novelty could damage them beyond recollection. The resulting wealth of information is now a priceless source of data for the heritage preservation initiatives led by heritage management professionals in the region. This, however, proved a lengthy and costly process, highly ineffective given the resources available then, but also now. Modern-day technologies, tools, and methodologies of the kind employed and developed within 5D-ARCH-AID provide way more effective means to carry out such work, and to develop long-term sustainable conservation plans. Many young professionals taking part at the workshop in Apoș discovered the wealth of possibilities and the fruits of using such tools to address the needs of heritage conservation. The spectra of massive heritage loss due to rapid aging, disappearing crafts and the penury of craftspeople and facilities, and insufficient resources, is easily seen in the Transylvanian countryside; witness the heritage sites of the fortified churches of Apoș and Țapu. Building the requisite facilities and securing the continuity of traditional crafts is only one crucial step ahead towards successful heritage preservation: projects such as the traditional kiln in Apoș and the Ambulance for Monuments (Monumentum) are leading the way along this dimension. Using all the modern technological might to address complementary needs – crucially, heritage pathology analysis and developing effective and sustainable heritage management strategies – is yet another crucial step. The workshop showcased and promoted these technologies and the emerging tools developed within 5D-ARCH-AID to young professionals engaged in heritage management, and it achieved an understanding of the needs these tools aim to address, alongside their potential in addressing these needs. The workshop served as a bridge from the past, through the present, and into the future for the built historical heritage.

9. Conclusions

The methodology previously applied by all responsible parties of the 5D-ARCH-AID project, in search of a sustainable form of systemic documentation of large – scale heritage sites, has

reached a solid level of sophistication in its entity. The interdisciplinary structure of the digital documentation presents possibilities to replace the convectional form of on-site recording, can simultaneously reduce physical and time limitations and enhance the effectiveness of produced conservation plans regarding any historic settlement. The resulting digital footprint of Ano Syros presents a visual of a multi-faceted integration of information that represents both tangible and intangible aspects of preserved cultural heritage. It serves as an insight on the past, a recording of the present and an estimate on possibilities regarding future preservation.

The purpose of this workshop was to supplement the never-ending dialogue among experts as well as citizens sensitive to heritage loss on ways technology can serve as a promoter of culture preservation. The hands-on practices using all available technology inside real scenarios reflect on the effort to influence people's perception on alternate paths on conceptualizing for heritage management.
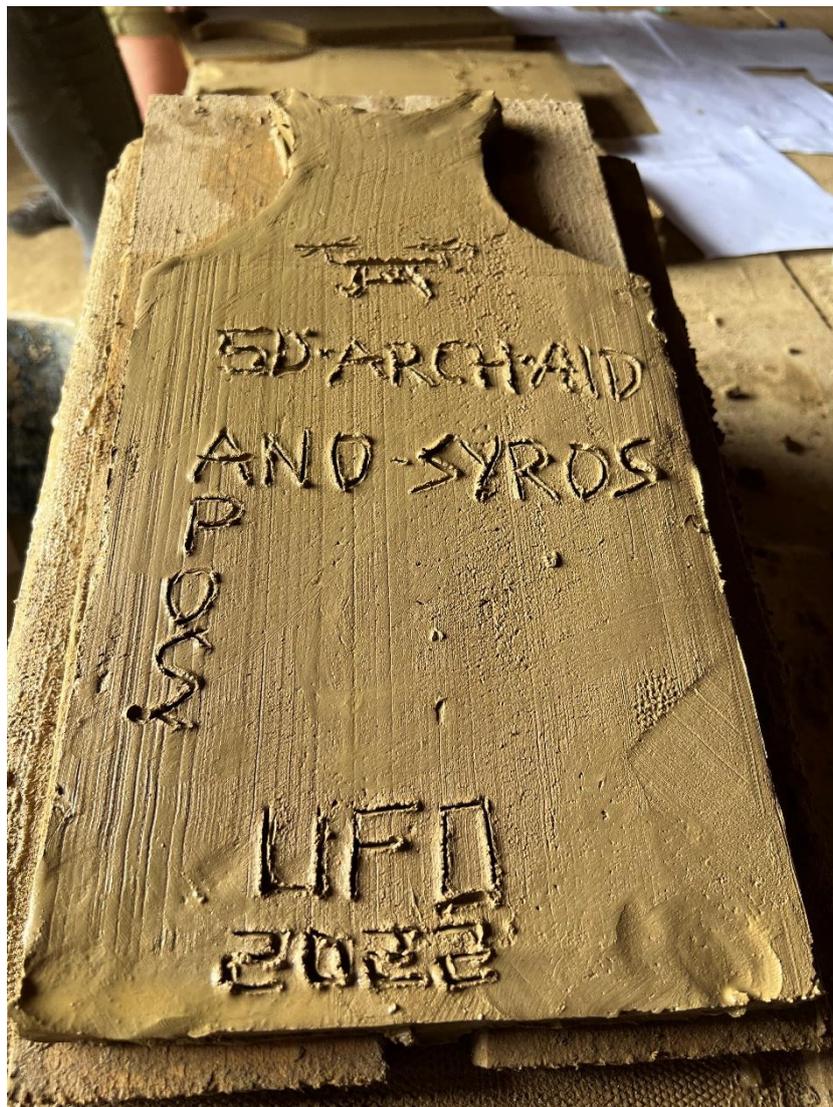

Figure 33 – As a memory of the project we created a "5D-ARCH-AID" hand-made traditional Tile that eventually will be part of the restoration of the fortified Church's roof in Apos Romania.