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TECHNICAL ANNALS

SPECIAL ISSUE

Trandisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage

Second International Conference, TMM_CH 2021
Athens, Greece, December 13-15, 2021
Revised Selected Papers

Special Issue Editors

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Technical Annals

Journal of the Technical Chamber of Greece

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Inauguration of Technical Annals e-publishing

With particular joy, respect and commitment to the history of TEE, to the future of the scientific role of the Chamber and to the work of Greek Engineers as a whole, the Technical Chamber of Greece is proceeding with the publication of an international scientific journal. After several years without regular scientific publications, due to the special economic situation of the country, but having as a source of our history the TECHNICAL ANNALS, published by the TEE for decades, we undertake this role again to give another scientific podium to the Engineering community.

More specific, the Governing Committee of TEE, in accordance to Decisions No A14/Σ39/2021, A16/Σ7/2022 and A41/Σ16/2022, proceeded to publish of the Scientific Journal entitled «**Technical Annals**» **by the Technical Chamber of Greece (TEE)** concerned with **Advances in Engineering**, in English language. The content of the journal will be available electronically and via Open Access, through the e-Publishing service of the National Documentation Centre (EKT).

The scope of the journal will include all Fields of Engineering:
1. Civil Engineering
2. Architectural Engineering
3. Mechanical Engineering
4. Electrical & Computer Engineering
5. Rural and Surveying Engineering
6. Chemical Engineering
7. Mining and Metallurgical Engineering
8. Naval Engineering
9. Electronic Engineering
10. Engineering of Urban Planning & Regional Development
11. Environmental Engineering
12. Engineering of Mineral Resources
13. Engineering of Production & Management

Furthermore, it will be concerned with Interdisciplinary Thematic Areas, which are at the cutting edge of Research and Innovation, such as:

Agricultural Engineering and Food Processing, Artificial Intelligence, Aerodynamics, Bioengineering, Circular Economy, Climate Change, Cultural Heritage, Education and Learning Processes, Energy, Environment, Economy, Geoinformatics, Human Modelling, Industrial Symbiosis, Management and Quality Control, Material Science and Engineering, Naval Coastal and Maritime Design Engineering and Planning, Spatial Planning, Sustainable Development, Systems' and Processes Engineering, Technology, Transportation, Processes, among others, and the thematic areas will be dynamically adjusted and determined taking into account both the progress of Science and Engineering, as well as future trends and the trending concerns and needs of Society.

Moreover, conferences, in which TEE is either co-organizing or participating in their Organizing and Scientific Committee, will be able to submit a request to publish their Proceedings (in either Greek or English language) always through the "e-Publishing" mechanism, as long as the request has been submitted to TEE and has the approval of TEE's Governing Bodies, either six months before the conference date *(in cases where the proceedings are to be published prior to the conference initiation)*, or three months before the conference date *(in cases where the proceedings are to be issued after the Conference)*.

The Governing Committee of the TEE assigned the responsibility of the publication to the Editorial Board and the Scientific Board of the Journal; the list of members of each board is herein attached.

We inform all Greek Engineers, the Academic and Research Community that we are proceeding with this publication in order to give the floor for communication, publicity and recognition, by the International Community, of the Research and Innovation that Greek Engineers produce in practice, on construction sites, in urban space, in regional areas, in industry, in development, in environment, in energy, in the digital world, in universities, in research centers, in startups, in businesses, etc.

We aspire to attract your interest, find in you critical readers, feed your scientific work and publish the results of your research through the International Scientific Journal of TEE.

Looking forward to an important publication that we'd like to become everyone's business,

<div align="center">
The President
of the Technical Chamber of Greece

George N. Stasinos
</div>

Antonia Moropoulou · Haris Doukas · Charalambos Ioannidis ·
Sofia Avgerinou-Kolonia · Kyriakos Lampropoulos

SPECIAL ISSUE

Trandisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage

Editors

The Technical Chamber of Greece (T.C.G.) decided to republish in English a Scientific International Open Access e-Journal. The "Technical Annals" - a journal which was counting decades of life following T.C.G. activities – will be edited by the T.C.G. through e-Publishing Platform at the EKT (National Documentation Centre) and will concern all the advancements in Engineering:

Referring to the Engineering Disciplines :

- Civil Engineering
- Architect Engineering
- Mechanical Engineering
- Electrical & ComputerEngineering
- Rural and Surveying Engineering
- Chemical Engineering
- Mining and Metallurgical Engineering
- Naval Engineering
- Electronic Engineering
- Engineering of Urban Planning & Regional Development
- Environmental Engineering
- Engineering of Mineral Resources
- Engineering of Production & Management

Referring to interdisciplinary Thematic Areas at the forefront of Research and Innovation like:

Agricultural Engineering and Food Processing, Artificial Intelligence, Aerodynamics, Bioengineering, Circular Economy, Climate Change, Cultural Heritage, Education and Learning Processes, Energy, Environment, Economy, Geoinformatics, Human Modelling, Industrial Symbiosis, Management and Quality Control, Material Science and Engineering, Naval Coastal and Maritime Design Engineering and Planning, Spatial Planning, Sustainable Development, Systems' and Processes Engineering, Technology, Transportation, Processes, et al as dynamically will be defined by the progress of science and engineering, the future trends and social needs as well.

The TCG is aiming through this e publication, of at least 3 volumes per year to connect Greek Engineers with the International Community of Engineering Science and Innovation for the benefit of the public interest and for the promotion of science through research, development, innovation in compliance with its constitutional targets.

Technical Annals is a peer-reviewed journal.

Preface

Innovative scientific methodologies and challenging projects marking future trends in the protection of cultural heritage have initiated through a holistic approach, by merging competence from the scientific fields of architecture, civil engineering, surveying engineering, materials science and engineering, information technology, and archaeology, a universal conversation among scholars, heritage professionals on restoration and conservation, stakeholders, industry representatives, and policy makers. The combined utilization of digital documentation technologies with innovative analytical and non-destructive techniques; numerical, computational; and 3D techniques; and archaeometric and archaeogene methods supports the development of a transdisciplinary multispectral modeling methodology towards the sustainable preservation of cultural heritage. Innovation is enhancing and revealing a critical dimension of the preservation of cultural heritage along with social participation and communication.

The 2nd International Conference on "Transdisciplinary Multispectral Modeling and Cooperation for the Preservation of Cultural Heritage: Recapturing the World in Crisis through Culture" (TMM_CH 2021), has being held during December 13–15, 2021, at the Eugenides Foundation in Athens, Greece, and discussed modern trends in the original agora of our technological and democratic roots.

The conference was organized by the National Technical University of Athens (NTUA) in cooperation with the Technical Chamber of Greece, under the patronage of H.E. the President of the Hellenic Republic, Katerina Sakellaropoulou, inaugurated by H.E. the Vice President of the Government of the Hellenic Republic, Panagiotis Pikrammenos, with benedictions bestowed by His All Holiness, Ecumenical Patriarch, Bartholomew I of Constantinople and His Beatitude Archbishop Hieronymus II of Athens and All Greece.

Distinguished scientists and representatives of the National Geographic Society, the Cultural Heritage Finance Alliance (CHiFA), the International Council of Monuments and Sites (ICOMOS), the International Committee for Documentation of Cultural Heritage (CIPA), the Organization of World Heritage Cities (OWHC), the European Society for Engineering Education (SEFI), the European Construction Technology Platform (ECTP) and the Hellenic Construction Technology Platform (HCTP), the International Federation of Surveyors (FIG), the World Monuments Fund (WMF), AHEPA Hellas, the Grand Priory of Greece at the Sovereign Military Order of the Temple of Jerusalem, the UNESCO Chairs on "Digital Cultural Heritage" and "Culture, Tourism, Development", and other major international and European organizations, associations, networks, universities, and research centers in the field of cultural heritage preservation, vi Preface participated in the international Steering and Scientific Committees, and addressed the conference at the opening session.

At the 1st TMM_CH conference, which was held with great success in October 2018 at the Eugenides Foundation in Athens, with the attendance of 350 delegates from 22 countries, the emblematic rehabilitation of the Holy Aedicule of the Holy Sepulchre in Jerusalem was presented as an exemplary application, in the field of monuments' protection, of interdisciplinary and multispectral collaboration, as an outcome of innovation in both research and implementation, with emphasis on technological advancements, not only intersecting all the scientific fields of engineering and natural science but also initiating an ongoing dialogue with the humanities, such as archaeology, theology, sociology, diplomacy, and tourism.

The 2nd TMM_CH conference focused on the latest developments in research and innovation and the identification of novel trends to build an interdisciplinary approach to conservation and holistic digital documentation of cultural heritage. The utilization and reuse of monuments, historic cities, and sites forms the framework for the sustainable preservation of cultural heritage, in accordance with the principles of a circular economy, in terms of the respect and protection of values, materials, structures, architecture, and landscape, with an informed society able to participate effectively in the policies that will design and implement the new strategies required.

Innovative knowledge transfer through practice and education is continuing the venture for the rehabilitation projects in the Church of the Holy Sepulchre, joining the National Technical University of Athens and La Sapienza University of Rome with the Bezalel Academy of Science and Arts in Jerusalem, in cooperation with Israeli Antiquities Authority, the Hellenic Research Institute of Alexandrian Civilization, and PerpetielSI SRL, through the Erasmus+ Strategic Alliance EDICULA "Educational Digital Innovative Cultural Heritage related Learning Alliance".

The issues discussed within the 14 sessions and 14 panel discussions at TMM_CH 2021 were as follows:
1   The Holy Sepulchre rehabilitation project: an emblematic source of innovation;
2   Resilience to climate change, natural hazards, and pandemic risks - biosafety;
3   Novel educational approaches for the preservation of cultural heritage;
4   Preserving compatibility, the materiality and integrity of structures, and architectural authenticity;
5   Advanced nondestructive and structural techniques for diagnosis, redesign, and health monitoring;
6   Earthquake and structural rehabilitation;
7   Archaeology, archaeometry, and archaeogene;
8   Bridging heritage stakeholders, science, and industry;
9   Transdiciplinary dialogue for world heritage at risk: the exemplary Hagia Sophia;
10 Digital heritage: a holistic approach;
11 Green and blue deals for local and regional sustainable development: revealing and preserving cultural and natural assets for isolated areas development with social participation;
12 Green deal and blue deals for sustainable development of isolated areas: sustainable land management and rural and urban development through preserving, reusing, and revealing cultural heritage;
13 Historic cities and centers: new Reuse and preservation strategies applying a circular economy;
14 Recapturing the world in crisis through culture.

Sharing knowledge, experiences, and recommendations about sustainable cultural heritage approaches and practices, at a moment of great risk and a time of renewed possibilities, has reorientated conversation to explore the current conditions and contours of the world in crisis, recapturing itself through culture and relaunching development.

The TMM_CH 2021 conference was held at the Eugenides Foundation in a hybrid format. Due to the pandemic both onsite and online attendance was facilitated for oral presentations, in compliance with governmental directives against COVID-19. All sessions and panel discussions were accessible for the registered conference participants using the unique link in their personal conference ticket. The opening session and all panel discussions, as addressed to the general public, were livestreamed with free access via the conference's YouTube channel and website.

The 2nd TMM_CH Conference was highly anticipated, attracting researchers from all over the world. It was held with great success, despite the pandemic, with the physical presence of 150 delegates and online attendance of 500 delegates in real time.

Striving to ensure that the conference presentations and proceedings were of the highest quality possible, we only accepted papers that presented the results of various studies focused on the extraction of new scientific knowledge in the area of transdisciplinary multispectral modeling and cooperation for the preservation of cultural heritage.

In total, 310 contributions were submitted, and 124 papers were accepted for oral presentation and publication (representing the work of 377 authors from 33 countries) after peer review and consequent revision, with a rate of acceptance equivalent to 40%. A single-blind peer review process was employed with each paper receiving, on average, three reviews. Accepted papers were published in this volume of Technical Annals.

The interdisciplinarity in the preservation of cultural heritage requires holistic documentation with the fusion of the various disciplines' data on 3D models. Computer aided design and advanced computer science methodologies support an interdisciplinary synthesis of the preservation state assessment, i.e. the evaluation of the rehabilitation achieved in respect of the integrity of materials and structures, throughout the design of the restoration of authentic architecture. In parallel, new technologies can be used to enhance research and education and communicate the reuse and exploration of cultural and natural assets, providing, through tourism, external economies to sustain local and regional development in a circular way.

Hence, 24 papers presented at the 2nd TMM_CH conference, integrating all of the above aspects, are published in this volume as a special issue "Transdisciplinary Multispectral Modeling and Cooperation for the Preservation of Cultural Heritage". This is the first volume of the *Technical Annals – International Scientific Journal In Advances In Engineering* by the Technical Chamber of Greece (T.C.G.)

This edition would not have been possible without the commitment of the TMM-CH editors of this volume (Antonia Moropoulou, Haris Doukas, Charalambos Ioannidis, Sofia Avgerinou-Kolonia, Kyriakos Lampropoulos); as well as the valuable assistance of the editing team at *Technical Annals* (Fotini Kyritsi, Eleni Bairaktari, Evridiki Karathanasi, Panagiotis Vrelos, Maria Sinigalia, Manolis Erotokritos, Isabella Tsavari, Dimitris Psarris), to whom we are most grateful.

December 2022   Antonia Moropoulou

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Digital Heritage - Holistic Approach

Documentation of Historic Buildings For Their 3D Reconstruction In A Digital Cultural Heritage Management System.

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Abstract. Being at the crossway of trade routes, Ioannina, in northwestern Greece, has known overtime an economic and spiritual flourishment reflected in the city's urban web, which has, unfortunately, undergone major alterations.

Focusing on the city's Post-Byzantine period, starting in 1430, for tracing its pluralistic physiognomy, studying the osmosis of its three cultures, Christian, Jewish and Muslim, and figuring out the related cultural palimpsest, still surviv- ing in the collective memory of the city, has been the great challenge of *IASIS* Postdoctoral Research Project.[1]

Extensive documentation of various origin, dynamic and combined interpretation and processing of multiple data, cross-checking of the detected infor- mation, have formed the basic principles of *IASIS* project development.

The specific paper forms the first part of Hagia Paraskevi Christian Byzantine Monastery-Namaz Giyah Muslim Mosque-Perifereia Hellenic State Administrative Building cultural landmarks' integrated management, i.e., the part on the landmarks' integrated documentation in the framework of *IASIS* Postdoctoral Research Project. [35, 36]

Keywords: Cultural Heritage, Documentation, Digitization, GIS, Photogrammetry, 3-D Modelling, Open Sources, Ioannina.

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[1] Implemented by Athina Chroni, Dr. Archaeologist, supervised by Professor Andreas Georgopoulos, Laboratory of Photogrammetry-National Technical University of Athens

1   Introduction

The historian Prokopios, in his work On Buildings2 is the first one to report the "founding"3 3of Ioannina (under the name New Evria4) by the emperor Justinian i528 AD. [8] For the first time the city of the Castle is cited as Ioannina in the Proceedings of the Synod in Constantinople, of the year 879, Zacharias cited as the Bishop of Ioannina. [8] Until 1020 Ioannina is still a small diocese, under the Archdiocese of Ohrid. [28] The Fall of Constantinople in April 1204 by the Crusaders, decisively influenced the development of the city of Ioannina where Michael A΄ Komnenos Doukas giving shelter and organizing cores of resistance, reinhabits the city, radical- ly renovates its Castle and establishes the Despotate of Epirus. [1, 16, 20, 28] During the following period, Ioannina flourished, developed and in 1285 the Diocese of Io- annina was promoted to a Metropolis. [19, 28]5 Until 1430, the city of Ioannina has a strong aristocracy. [28]

On October 9, 1430, during the reign of Charles B΄ Tocco, the city of Ioannina was handed over to the Ottomans. [15] The terms of the surrender being determined by Sinan Pasha Decree, [2, 3] according to which the Ottomans were committed to respect certain privileges of the inhabitants, mainly property and religion, a fact having contributed to ensuring the development of Ioannina. After 1430, the merchants maintained a privileged position in the social web of the city and enjoyed the favor of the Ottoman ruling class, as they were the means of increasing its income. [13]

In 1611 a failed uprising of the Christians, will cause their violent expulsion from the Castle, the widespread destruction of Christian churches and monasteries and a general change of balance in the city. [13, 22, 28]

In 1913 the city was handed over to the Hellenic State.

2   Selection of Landmarks-Reasoning

In the framework of the specific paper, the following landmarks have been selected to be presented, as representative case study concerning IASIS Project:

➢ *Hagia Paraskevi* Byzantine Monastery. Status: destroyed.
➢ *Namaz Giyah* Muslim Mosque. Status: destroyed
➢ *Perifereia* [of Epirus]6 Hellenic State Administrative Building. Status: existing.

In the aforementioned landmarks' case study it is observed:

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2 *Περί Κτισμάτων.*
3 Rather "re-inhabiting", as Procopius' citation has not been confirmed, [16] given that, according to archaeological findings, the city already existed before the times of Justinian. [24]
4 *Νέα Εύροια.*
5 However, certain scholars consider the year 1318 or 1319 to be the most probable for the promotion of the Diocese of Ioannina to a Metropolis. [4, 16, 33] In the specific research project we will accept the data cited in the synodic act of 1345, i.e., the upgrading of the Di- ocese of Ioannina to a Metropolis in the year 1285.
6 "Perifereia" is the Greek word for "Region".

> ➢ Uninterrupted identical use of the same site as a religious one, until the end of the Post-Byzantine/Ottoman period of Ioannina.
> ➢ Successive construction of religious buildings of different religions, during the Post-Byzantine period of Ioannina.
> ➢ Construction of a state administrative building in modern times.
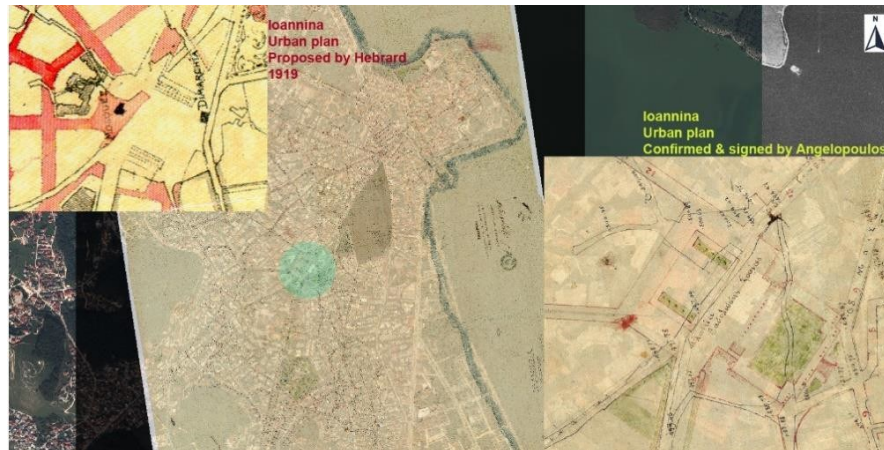
Fig. 1. Screenshot from GIS developed for IASIS project. Layering of the ortho imagery 2015 with the urban plan of Ioannina/1915/Approved and signed by Angelopooulos. The green coloured area indicating the site represented in detail images, as parts of the urban plan of Ioannina/1915/Approved and signed by Angelopooulos (bottom right corner) and the urban plan proposal of Ioannina/1919/Implemented by Hébrard (up left corner). [Imagery source: © 41, © 31, © 29] Digital processing by Athina Chroni.

All the buildings are located at the same site, [Fig. 1] outside the Castle of Ioannina, in the suburbs of the former Byzantine, later on Post-Byzantine city of Ioannina, nowadays the center of the modern town, forming a stratigraphic and cultural palimpsest, thus reflecting the respective political and social alterations, revealing the pluralistic physiognomy of the city.

The most challenging goals of the specific part of the research project have been:

> ➢ Figuring out Hagia Paraskevi Byzantine Monastery's dating, location and form, in relation to Namaz Giyah Muslim Mosque, as depicted, mainly, in Mellirrytos (& Christides) urban plan[7] of Ioannina, dated in 1916-1918, and to Perifereia Hellenic State Administrative Building, since only fragmentary bibliographic data have survived.
> ➢ Detailed documentation and 3D digital approach of Namaz Giyah mosque's prayer hall[8] and cemetery to the east.

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[7] Urban plan for "Διάγραμμα ρυμοτομίας" in Greek. [29]
[8] A building still being officially under "preservation status", although already destroyed.

3 Methodology

Perifereia State Administrative Building has been the starting point for the location of the two religious buildings and their respective cemeteries, the urban plan of Mellirrytos (& Christides), dated in 1916-1918, forming the link between Perifereia and Namaz Giyah buildings, since the mosque's plan view is depicted in the aforementioned cartographic datum, forming thus, chronologically, the mosque's last opti- cal, official, trace.

Furthermore, additional cartographic data and artistic depictions of the 19th c. and the beginning of the 20th c., postal cards and photographs of the first quarter of the 20th c. as well as an air photograph of the year 1944 and a color ortho photo of the year 2015, have furnished further data for crosschecking the research's results, thus support-ing the location of the Muslim mosque and the hypothetic location of the for- mer Byz-antine monastery's katholikon, as well as both of the religious buildings' respective cemeteries.

Moreover, the research study has been strengthened by making use the following documentation data:

➢ Historical data on the city of Ioannina, as shortly outlined in the specific pa-per's "Introduction" Paragraph.

➢ Bibliographic reports-testimonies-fragmentary archaeological findings.

➢ Typological data on Byzantine Christian monasteries' as well as on Muslim mosques' architecture.

4 Hagia Paraskevi Christian Monastery, Namaz Giyah Muslim Mosque and Perifereia State Administrative Building: Location and Dating

4.1 Location

Bibliographic references, archaeological findings and testimonies, under intensive cross-examined study, lead to the safe conclusion that:

The Byzantine monastery of Hagia Paraskevi, a nun's monastery [28], as derived from the memoire of 1584, [5, 28] situated outside the Castle, probably a construction of the Early Byzantine period, was still standing until 1431. [33] In the years 1431-1584 it had been transformed to a metzit9 according to the memoire of 1584 as cited by Athenagoras,10 [5, 28] and to the Holy Metropolis of Ioannina official citation. [33]

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[9] Fulfilling the need for a praying site for the conquerors.

[10] According to the *1584 memoire*, as cited by Athenagoras [5] the religious building of Hagia Paraskevi was not a church as cited by Aravantinos [3] but a monastery, from which the holy icon of Virgin Mary had been taken away to be saved, when the Monastery was occupied by the Ottomans. Nevertheless, it is not clear whether the nun *Parthenia*, commemorated in the *memoire* might be the one to have taken away the holy icon a few years before 1584 or the holy icon had already been saved long before Parthenia, who was, finally, the one to dedicate it to Saint Nicolas Christian monastery, located on the island of Ioannina Lake. We will make the

The replacement of Hagia Paraskevi Christian monastery by a Muslim metzit is confirmed by Aravantinos' citation. [3]

The former Christian religious building complex, later on a Muslim one, was located at the southwestern entrance-exit of Ioannina, at the highlands of the greater area of the city, as confirmed by Celebi's description of 1670 in Kokolakis, [14] the alti- tude map curves of Melirrytos (& Christides) urban plan of 1916-1918, and Smyris' citation of an altitude of 500 m for the specific hill, [26] thus providing a panoramic view over the greater area and fulfilling its role as a protective bastion.

Fig. 2. Screenshot from GIS developed for IASIS project. Layering of the map 1811- 1815/Implemented by Jean-Denis Barbié du Bocage with the urban plan of Ioannina/1916- 1918/Implemented by Melirrytos (& Christides)-Signed by Melirrytos. The green-coloured area indicating the site of Namaz Giyah mosque, former Hagia Paraskevi monastery, and the yel- lowcoloured area indicating the site of the two, out of three, respective cemeteries. [Imagery source: © 30, © 31] Digital processing by Athina Chroni.

Namaz Giyah Muslim mosque and the respective cemeteries' location apart from various bibliographic citations as by Celebi in Kokolakis, [14] Aravantinos, [3] Lambridis [19] and Athenagoras, [5] is also confirmed by:

➢ Artistic depictions of the mosque and its surrounding area, one of the three respective cemeteries to the east included, by C.R. Cockerell and J. Smith in 1820, Cockerell and T. Higham in 1832 and Edward Lear in 1849 clearly depicting the existence and form of the mosque. [11, 12, 23, 37]

➢ The photograph on the postal card Registration Number No. 255-Aspiotis Publications/year of publication 1913, depicting Namaz Giyah mosque from the north side, confirms its existence in the urban web of the city, its form and its condition with most of the damage at the minaret, from which the conical roof

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assumption that Hagia Paraskevi Christian monastery had been transformed to a metzit approximately in the year 1431, violating *Sinan Pasha decree*, dated in 1430, on the preservation and protection of Christian buildings.

6

> is absent. [42]
> ➢ More postal cards of unknown publisher and publication year, as well as photographs form private collection, further contribute in the documentation of the mosque. The only datum, detected so far, depicting the mosque mina- ret's conical roof is the photograph on the postal card of unknown date and publisher, as shown in Fig. 3 of the present paper.

Moreover, the mosque is further confirmed by cartographic data of the 19th and the 20th c., [Fig. 2] as following:

➢ Jean Denis Barbié Du Bocage's map[11] dated in 1811-1815, according to Kanetakis,[12] [13] dated in 1820, according to Bibliothèque Nationale de France, scaled 1:9000. [30]
➢ Italo Bernasconi's city plan, dated in 1895, scaled 1:2000, proposing a new city planning. The original map is lost: an exact copy of it dated in 1904,[13] in the Greek and the Ottoman language, had been confirmed as accurately depicting the current state of the city by the Municipal Committee of the Hellenic State in 1916. [29]
➢ A map by unknown author, dated in 1905-1908, scaled 1:2000, in the French language, based on the aforementioned Bernasconi map of the city. [29]
➢ Melirrytos (& Christides[14]) urban plan, dated in 1916-1918, scaled 1:1000, in the Greek language, based on the aforementioned Bernasconi map of the city. [31]
➢ Hébrard's draft map, dated in 1919, scaled 1:4000, in the French language, confirming the road network of the aforementioned Bernasconi map of the city. [29]

4.2   Dating

Concerning the dating of *Hagia Paraskevi* Byzantine monastery only assumptions should be made. Taking into account the historic framework of the city, there might be two options:

➢ The years between 528, when Justinian is supposed to "create"[15] the city of Ioannina, [8] and 1020, when Ioannina is cited as a small Diocese under the Archdiocese of Ohrid.
➢ The years following the conquest of Constantinople by the Crusaders, in 1204, when Ioannina's urban web in the Castle area is strengthened by Michael A΄ Komnenos Doukas. [6]

In both cases, the establishment of a monastery in the suburbs of the city, delimited at that time, by the Castle wall, is probably revealing an early tendency to expand the city beyond the Castle, in the context of meeting the need for new lands.

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[11] Bibliothèque Nationale de France (D.C.P.) Ge. F. 14472
[12] According to the Bibliothèque Nationale de France the map is dated in 1820. [30]
[13] According to an official note in the Ottoman language, certified with signatures and stamps.
[14] Christides D. cooperated in the first year of the urban plan's designing project, i.e., in 1916. Melirrytos P. was the one to fulfill the specific project for the Municipality of Ioannina. [29]
[15] Rather to **strengthen** the urban fabric, by reinhabitation of the existing city and renovation of its fortification.

An element that might contribute in reducing the aforementioned chronological limits is the citation by Lambridis that the Muslim mosque, successive to the Byzan- tine monastery, was decorated with four monolithic columns of mixed color, (white and green), about two meters high, of "Byzantine art". [19] It is likely that the four white and green monolithic columns [28] either come from Pantocrator Byzantine Cathedral16 located at the southeastern citadel of the Castle [6] or were originally built for Hagia Paraskevi monastery, if we take into account similar examples of other Christian buildings, where we find architectural elements of a similar typology, as is the case of Hagios Demetrius church, dated in 412-413 [10] and Acheropoiitos church, dated in 431-450, [10] both churches located in Thessaloniki, Greece.

If we accept that the four columns originate from Hagia Paraskevi's katholikon and that this monastery reproduces architectural prototypes, i.e., in terms of architectural elements, of the two aforementioned Christian religious buildings of Thessaloniki, then Hagia Paraskevi should be dated after the end of the 5th century, more specifical- ly in the years after 528, when Justinian is supposed to reinhabit the city of Ioannina, as cited by Procopius.

Concluding:

- ✓ Hagia Paraskevi had been transformed to a Muslim religious building complex[17] in the years 1431-1584, without leaving any optical traces, only bibliographic citations. [5, 19, 28, 33]
- ✓ *Namaz Giyah* Muslim Mosque, at the site where the former monastery, [5, 19, 28] a landmark completely destroyed approximately in 1930, [28] had successive construction phases as following:
  - ➢ 1431-1584[18]: Destruction or reconstruction of the existing Christian monastery, transforming its *katholikon*, first, to a Muslim *metzit*, i.e., a site for praying. [5, 19, 28, 33]
  - ➢ 1617: Reconstruction of the Muslim *metzit*, transforming it into a *mosque*, Mustafa Effendi Defterdar, Financial Supervisor from Constantinople, covering the expenses. [19]
  - ➢ 1715: A renovation of the mosque in the year 1715 confirms the constant interest of the sponsors. [26]
  - ➢ 1773: A second renovation is cited for the year 1773. [26]
  - ➢ Demolition of the mosque in the years 1928-1929, according to *Joseph and Esther Ganis* Foundation, [34] or in 1930,[19] according to Vranoussis' citation. [17, 28]

The case of Namaz Giyah mosque is characterized by the following paradox:

- ➢ The Greek Government Gazette No 152/A/16-6-1925 declares the mosque as

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[16] The second Cathedral of the city, in the Post-Byzantine period, after the destruction of Taxiarchis Archangel Michael Byzantine Cathedral. As estimated, Pantocrator had also been destroyed, approximately in 1612.

[17] Namaz Giyah mosque.

[18] The period 1431-1584 might be considered as the period of the transformation of Hagia Paraskevi monastery, considering as period limits the surrender of the city to the Ottomans in 1431 and the *memoire* of 1584. [5, 28]

[19] We will adopt the year 1930, as the mosque's demolition year.

> a *protected monument*, [40] thus, further confirming its existence for the year 1925.

- ➢ So far, no Greek Government Gazette has been found declassifying the mosque to a *non-protected monument*. The mosque, standing at a key point of the modern city's center, was in a constant state of risk, finally concedingits spacious open site to the new Hellenic State's Administrative Building and the city's central square, a plan already scheduled from the mid-1910s, as confirmed by the two urban plan proposals, in 1915, approved and signed by Angelopoulos, Deputy General Governor of Epirus [31] and in 1919, proposed by Ernest Hébrard, French architect, archaeologist and urban planner. [29]
- ➢ The relevant digital file of Namaz Giyah's Declaration as a *protected ar- chaeological and historical site*, is still posted on the official website of the National Press Office of the Hellenic State/*Permanent List of Declared Ar- chaeological Sites and Monuments*.[20] [39]
  - ✓ *Perifereia* Hellenic State Administrative Building, constructed in the years 1935-1970, in successive structural phases, a secular public building, a modern landmark of the contemporary city, built at the site where formerly Namaz Giyah mosque used to stand. Designed by the Ioannite woman architect Eriketi Ioannidou,[21] is one of the largest buildings of Ioannina, its construction having been adventurous: having been bombed in 1940, during WW II, it remained in ruins for many years after the war. Later on, it was rebuilt, but not completed until 1960. In 1970 a third floor was added. [38]

5   Data Processing

All of the geospatial data detected for the documentation of the two lost religious landmarks, as aforementioned, have formed the basic components for the development of a GIS. Their further study in a georeferenced geospatial digital environment, contributed creatively in their crosschecking, as well as in their interpretation, ending in conclusions derivation, by making use also of the related literary sources. The GIS implementation product has formed the basic element for the development of a web database.

Furthermore, composites of image products as derived from the GIS' multiple layers activation visibility,[22] have formed the background image for developing the re- spective landmark's 3D digital model. Each one of the 3D digital models has been chosen to be rendered in an abstractive way, focusing on its basic architectural ele- ments,

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[20] As it is derived from the aforementioned, Namaz Giyah mosque, although destroyed, still belongs to the category of monuments to be protected and preserved, according to the Greek Government Gazette No 152/A/16-6-1925. [40]

[21] Eriketi Ioannidou (1910-1984): in 1927 Eriketi Ioannidou graduated from the School of Architecture of the National Technical University of Athens. [21]

[22] Keeping always visible a layer representing the modern city, under the intention of rendering possible a continuous observation of the hypothetic interaction of the building's structure with the modern urban web

under the perspective of implying the building's form and not imposing the researcher's point of view. Figuring out the alterations of the urban fabric and awakening the city's collective memory as well, have formed the basic axis of the scientific procedure.

At a next stage of work, integrating the 3D digital models' .mp4s in an online virtual museum, as well as additional information, has been chosen as the most user-friendly medium to communicate the digital product to the public. Furthermore, QR codes set at the specific sites, where the landmark buildings used to stand and have been now 3D digitally developed, under the intention to achieve more interaction of the project with the local community, fulfill their role of active portals to *IASIS* virtual environment, as composed by the related website, the virtual museum and an online routes platform proposing cultural walks in the city.

Given that the number of digital images that are freely available online today has reached unprecedented levels, fruitfully making use of the specific data for developing 3D digital models through the implementation of significant breakthroughs such as the *Structure from Motion* algorithm which creates 3D models of objects using their 2D photographs [18] and "since the footprint of time sometimes imposes terri- ble consequences on cultural heritage, it often becomes necessary to not only recover the memory of original features of historical buildings, urban and landscape environ- ments, but also understand its likely evolution", [25] the 4D digital model develop- ment and, furthermore, upgrading the digital model by incorporating the description of additional semantic metadata information, thus rendering a 5D digital model [9] might form another *IASIS* project's milestone in the future.

6   Conclusion

All places have hidden secrets, revealed when the cultural palimpsest goes under a decomposition procedure by tracing and revealing its structural elements. Ioannina being a city with a long Byzantine past, should have the chance to reveal its hidden Byzantine secrets, given that "each place is a distinctive autonomous entity, as a unique idea, which has spiritual power and emotional content, expressed through the collective, overall and perpetual consciousness of its people." [7, 27]

Concerning cultural heritage, the year 1830 is a turning point. According to the Greek Law 3028/2002, Art. No 2: "(aa) As ancient monuments or ancient relics are considered all cultural goods belonging to Prehistoric, Ancient, Byzantine and Post-Byzantine times and are dated up to the year 1830, subject to the provisions of Article 20 … bb) As newer monuments are considered cultural goods that are dated later than the year 1830 and whose protection is imposed due to their historical, artistic or of scientific significance, under the regulations of Articles 6 and 20." [32]

The case of the successive destruction of a Christian monastery, initially, and a Muslim mosque later on, calls for an urgent plan, globally, for saving cultural heritage and strengthening collective memory. [Fig. 3]

Fig. 3. Namaz Giyah Muslim mosque. View from the northeast. The specific photograph constitutes the only datum, detected so far, depicting the mosque minaret's conical roof. Postal card of unknown date and publisher. [Imagery source: Private collection]

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Digital heritage consolidation and innovation, three case studies between documentation and divulgation aims

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Abstract. In recent years, the need to digitize and create digital twins of the architectural and artistic heritage has been confirmed and accelerated. In this context, the DIDA-LXR (Laboratory for eXtended Reality) of the DIDALABS system, has carried out a series of research on the use of Virtual and Augmented Reality solutions to create and support activities in digital surveying, workshops for architects, and the establishment of a common knowledge basin regarding the existing architectural heritage. In this paper, several experiences are presented, and their workflows and results are shared. The selection focuses on the virtual reconstruction of the Gothic apses in the Cathedral of Fabriano; the reconstruction of the frescoes in *Santa Maria dei Bianchi* in Gubbio and the virtual reconstruction of the *Horrea Agrippiana* at the Roman Forum in Rome. Despite these four case studies being different, they all aim at creating a series of products that document the state and possible aspects of the past of significant elements of the architectural heritage. In their own way, they fix the state of knowledge and condition of these complex artefacts, preserving their memory and creating a valuable basis for any further interventions. Simultaneously, the use of today's digital tools in structures geared towards both sharing in working groups and dissemination activities makes this content available for a wide variety of processing. The technologies for the visualisation of digital works are to be considered excellent tools for the use and enhancement of Cultural Heritage.

Keywords: Digital Survey, Virtual Reality, Augmented Reality.

1 Introduction

Digital tools for survey, documentation, presentation, creating multimedia content and sharing information offers interesting possibilities with great potential in the field of cultural heritage. The creation of a digital copy from the real object is an important

step in bringing architectures, artworks, and archaeologies of any size into the present, whenever this means bringing it in taking part of contemporary procedures of management, protection, and dissemination. From a single building to an entire museum to large excavation sites and a system of ruins over a large area. The tools for this transformation, thanks to their progressive dissemination over the last twenty years, are available to heritage managers, researchers and, progressively, to any visitor interested in the consistency of built heritage. From 3D laser scanners to modern photogrammetry and components built into personal devices, digital copies are being produced ever faster and in even better quality. The numerous experiences of recent years confirm the widespread use of digital innovations in the reality of individual buildings, architectural ruins, museums, and collections [4]. These changes and developments should be considered as part of the components at the base of Humanity 5.0, defined as a "society of intelligence" in which physical space and cyberspace are fully integrated [13]. The opportunity for a renewal of the logic and methodology of documenting and sharing information about architecture and art should be provided by digital innovations at all levels, starting with the tools that make it possible to move from the real to the digital with the digitisation of architectural space and to implement valuable content aimed at creating a constructive experience for the public, based on multimedia concepts and rich in qualities. The activities of the eXtended Realities laboratory, which is part of the Didalabs system at the University of Florence, aim to explore and research solutions for the use of rich content in the different situations that can occur in architecture, from design requirements to the presentation of architectural and cultural-historical themes. The strategy aims to create accurate documentation, establish a quality base, and enrich the resulting digital environment with elements of valuable interest. These solutions are designed to attract attention and convey the intrinsic values emanating from places and their history, helping scholars, students, and casual visitors to gain new information about a building's original appearance and its evolution over time. All this is done to communicate precisely, far from any desire to make the subjects spectacular and to follow a possible division of steps from the inventory to the study of the current state of the architecture to the ideas and derivations that lead to the final result. The level of accuracy of each reconstruction is always indicated, with the graphical solution used to represent the resulting model varies according to the wellconsolidated indications for the presentation and sharing of research results [1]. On the side of the tools, in all cases, the alchemy of digital surveying, mainly 3D laser scanning and photogrammetry, is used to produce correct documentation of the architecture "as is" and as a suitable basis for further studies. The 3D laser scanner units and the cameras are selected on the basis of the specific characteristics of the building, while photogrammetry is used and optimised on a case-by-case basis for interiors with frescoes and/or rich details and for objects that require a model with high accuracy. All 3D laser scanner data is processed using each unit's proprietary software, then mostly aligned, and refined in Autodesk Recap. Photogrammetry is done using Agisoft Metashape or Reality Capture, two well consolidated SfM/IM based software. The first can be considered a "classic" and reliable solution since the early days of the renewal in digital photogrammetry, while the second, developed by Capturing Reality, a company recently acquired by Epic Games, owner of Unreal Engine (a popular software for developing virtual reality

environments), offers superior speeds and interesting possible future developments. Both are used to process the collected data, and the choice depends on the specific characteristics of the available images. Both use Structure from Motion/Image Matching procedures (SfM/IM), a distance representation technique that, starting from points extrapolated from 2D images, allows the reconstruction of three-dimensional objects in the form of a textured mesh [7]. At the end of the process, the resulting polygonal mesh surface, together with its texture, provides a digital model that can be optimised for the following steps leading to the final virtual environment. The occasion of developing virtual contents with full quality and dedicating a proper time to research about virtual reconstruction and using the resulting models as a ground test about the realism of the hypothesis took place in more than one occasion across the last period, it took inspiration and reference from other researcher valuable experiences [2, 3, 10], and found the benefit of exploiting previous initial experiences from the DIDALXR laboratory [12] and then arriving to the case studies described in the following lines.

2 Case study one: Gubbio

2.1 The Church of Santa Maria dei Laici

Starting in July 2021, the complex of the crypt of Santa Maria dei Laici in Gubbio alongside the entire church were surveyed panoramically from the inside and outside photogrammetrically, with 3D laser scanning and VR. The survey formed the basis for the subsequent virtual reconstruction of the complex. The church of Santa Maria dei Laici, also known as the "Church of the Whites", is located opposite the Basilica of San Francesco and is situated between the piazza dei Quaranta Martiri and via Piccardi. There are two entrances, both from via Piccardi and from under the loggias. There are several important works in the church, but the most important is the cycle of 24 panels painted by Felice Damiani around 1607 on the theme "Life of the Virgin" [8]. The church is built on two levels, presumably due to a series of alterations and transformations. On the first level, there is a frescoed underground chapel and on the second level, the devotional space. An opening in the floor gives access to the crypt, through which one can glimpse the level below, where part of the frescoes depicting the "Passion of Jesus" can be seen. These frescoes have always been a cause for concern, as they are in a state of disrepair, mainly due to the dampness in the place. The chapel was flooded by the Camignano torrent in 1858 and 1862. The damage was considerable, as the basement has windows overlooking the torrent [5]. In the course of the last restoration works in 1963/64, the frescoes were taken down and moved to the former refectory of the monastery of San Francesco, but some were preserved as the degree of damage was considered too great to remove them from the walls. During 1973 they have been moved to the Cathedral Museum. In the church, an opening in the floor allows to see the level below, with parts of the walls from the previous structure, enriched by some remaining frescoes. The artworks remained in place, together with some traces and parts the past building of the former appearance of the church.

2.2 Digital survey campaign

The digital survey was considered the first fundamental step to allow the alignment and specific reading of all the remains. The photogrammetric surveys were carried out both in the church, inside the crypt and for a wooden Christ coming from the lower chapel and now repositioned in an altar, and in the Diocesan Museum, where the remaining frescoes are located. The photogrammetry for the crypt and the frescoes in the Diocesan Museum was operated using a Fujifilm Gfx50s, a 50MP digital medium format equipped with a Fujinon 32-64mm f4 lens, while a Nikon D850, a full-frame DSLR with a resolution of 47.3MP equipped with a Nikkor 16-35mm f4 lens. This second camera was used for the wall fragments emerging in the church, and for the statue of Christ. For this last specific survey, a total of 850 photos were taken and processed, the size of the statue was defined using some direct measurements taken at strategic points on the statue to determine the actual dimensions. Reality Capture was used to reconstruct the three-dimensional model of the statue, producing a polygonal surface of 267 million triangles. Additionally, a simplified version was made downsampling the model to nine million triangles with the application of the texture with two atlases of 16,000x16,000 pixels, this lighter model was then used for multimedia purposes, like its inclusion in the Sketchfab.com online archive. The 3D laser scanner survey of the whole church and of the rooms in the Diocesan Museum was carried out using the Z+F 5006h imager unit. This unit has a nominal maximum range of 80 metres and a minimum range of 0.4 metres, with a speed of max. 1.016 million points/sec. Nevertheless, this unit is not "that new" and has the disadvantage of weighing 14 kilograms, which thing requires some skill and planning to make some practical passes. Concurrently, the device is well suited for this type of use due to its excellent accuracy and high reliability.

2.3 Creation of the virtual tour

The structure of the virtual reconstruction assumes that the chapel was part of the original structure of the church, in time transformed into the present configuration and changed into a sort of crypt. The reconstruction process starts from the repositioning of the frescoes from the Diocesan Museum back into the chapel, recreating a new painted skin for the spoiled walls. Following the repositioning of the statue of Christ in its original configuration, laying, dead, on the plate inserted at the side of the main altar. The reconstructed system of the frescoes allows to have a new perception of this space, reading the relationship between the artworks and the people of that time entering this space surrounded by the histories of the Passion of Christ from the bible with an extreme description of details and the possibility of exploring them and getting notes about the main characters and events.

Fig. 1. The present state of the "Tomb of Christ" and its virtual reconstruction.

The whole reconstruction is available in the form of a virtual tour based on full panoramic images; a solution based on HTML language that allows a complete structure of the pages that remain independent from any proprietary software based on expensive subscriptions. The virtual tour is enriched by the possibility of passing continuously from the present state of the church to its virtual reconstruction with the insertion of virtual interactive models available for being inspected, like the statue of Christ and the schematic sequence of the evolution of the church.

3   Case study two: Fabriano

3.1   Digital survey campaign

This research was aimed to the reconstruction of the gothic apses of the St. Venanzio Cathedral, heavily transformed in time from a central space with radial chapels into a large central space hosting the main altar [De Marchi, 2017]. The study began with the use of a 3D laser scanner to digitally survey the apsidal area of the cathedral of St. Venanzio, followed by photogrammetric integration and final post-processing of the acquired data. Several processing steps were performed on the point clouds and the photographs taken during the survey to allow a complete interpretation of all the possible trace from the past aspect of this architecture. A first photogrammetric, 3D laser scanning and VR panoramic survey of the cathedral's apsidal complex was carried out in June 2020, then followed by a photogrammetry and panorama shooting campaign held in February 2021. The survey formed the basis for the subsequent virtual reconstruction of the complex as it presumably looked before the 15th and 16th-century alterations and putting back in evidence the frescoes by Allegretto Nuzi [9] and other painters from the XIVth century. The survey work was carried out with the Z+F 5016 3D laser scanner, the photogrammetric images with the Fujifilm GFX-50s medium format digital camera with 50 MP resolution. The panoramic images of the present state were taken using a Insta360 Pro2 camera.

After the individual scans were aligned using Autodesk Recap, the reference elements were extracted from the point cloud and used to adapt the photo coming from the first survey campaign. The post-processing began with geometric straightening of the photos in Autodesk Autocad using the Raster Design module and then pasting it into Adobe Photoshop for further steps. Thus, this method was not satisfactory as the particular morphology of some surfaces combined with the narrow working spaces re-

sulted in severe deformations in some photos that could not be properly corrected. So, a new photogrammetric session was planned in which the remains of the frescoes were entirely captured in high resolution. The photographs were processed in Reality Capture. In this way, high-resolution planar view of the frescoes was produced, and in a solution well compatible with the previous 3D laser scanning dataset. The photoplanes were mostly created with Reality Capture and, in some cases, with Agisoft Metashape. They were later post-processed using Autodesk Autocad Raster Design to refine the final geometry of these textures. The different photoplanes were connected to key points at their original position on the point cloud in Autodesk Autocad after proper colour and post-processing adjustments in Adobe Photoshop.

Each completed component was then shared with other members of the research team to reconstruct the missing parts of the frescoes and provide a basis for any ideas about the original architectural aspect of the building. The 3D model of the former St. Venanzio cathedral progressively took shape, constantly adjusting the structure of the frescoes, the traces left by the interventions in the masonry and some elements that can testify to the former configuration. The final 3D model, showing the articulated form based on a sequence of 6 chapels opening onto the central space of the apses, was later textured with the reconstructed frescoes, and used as the basis for creating panoramic images for the virtual tour.

3.2   Creation of the virtual tour

For the presentation of the reconstruction of the frescoes and the cathedral, the total online option for visualising and using the preserved research material was preferred among the various virtual options available. In order to put all the content in context, a virtual tour of the present cathedral was created using an Insta360 Pro2 camera providing panoramic images in 8K resolution. Everything was built around a virtual tour with a very intuitive and simple initial structure with a simple menu with basic instructions. Included in this virtual tour are panoramic views that offer the possibility to access various detailed information about the different structural and decorative elements; most of this additional information allows access to the virtual reconstruction of the cathedral "as it was". All the construction of the user interface and multimedia content was done using Garden Gnome Pano2Vr 6.1, and the final virtual tour was then exported in HTML format. In the end, the virtual tour was enriched with hotspots and clickable areas that allow access to enlargements, information panels, graphic diagrams, short videos, and other content that complement and enhance the quality of the experience. Thanks to automatic gyroscope detection, the orientation of the viewing angle can be changed in real time via smartphones and tablets. An additional button has also been added to switch to stereo 3D mode for VR headsets such as Oculus Rift S/Quest and HTC Vive Pro (or even simple smartphone-based adapters).
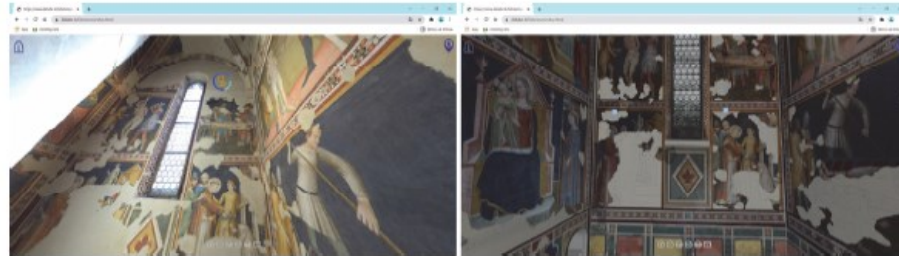
Fig. 2. The chapel of San Lorenzo by Allegretto Nuzi: present state and virtual reconstruction.

The virtual tour was presented on a dedicated website (available at www.didalxr.it/fabriano) that can be adapted and used on smartphones/tablets, notebooks, or other devices. The same virtual environment has also been optimised for use on a large touchscreen in the Fabriano Art Gallery, just in front of the cathedral of St. Venanzio. The touchscreen in the art gallery is an 86-inch Philips screen (Signage Solutions line, model 86BDL3012T) connected to PC and providing direct access to the online version of the virtual tour. The positioning of the screen has been optimised to make the touch function as easy and practical as possible for each user. The main menus have been positioned in the lower part of the screen and the height of the screen has been adjusted so that the centre of the screen is about 1.5 metres above the ground so that the virtual tour can be operated efficiently even by children or wheelchair users thanks to the size of the screen and the gesture functions.

4 Case study three: Horrea Agrippiana

4.1 Historical background

This research is based on virtual reconstruction and the possibilities it offers to all scholars in the field of archaeology and architecture. In recent years, technological developments, and the curiosity to investigate how certain sites or buildings might have looked in the past have led to an awareness of the importance of survey technologies, digital investigations and tools such as XR (augmented realities) for implementing the collected data.

A *Horreum* was a public storehouse where different types of supplies were stored during the Roman era, primarily of course those containing food and grain. At the end of the imperial era there were about 300 of them, but today the *Horrea Agrippiana* are the only ones in Rome whose remains can still be visited [11].

According to most researchers, the *Horrea Agrippiana* date from the time of *Marcus Vipsanius Agrippa* and are dated to between 20 and 10 BC. They are located to the northwest of the Roman Forum, between the church of Santa Maria Antiqua, the church of *San Teodoro* and the Domitian group, and bordered by the *Clivus Victoriae* and the *Vicus Tuscus*, the street that took its name from the Etruscan colony that came to Rome with Tarquinio the Superior.

The building was arranged around a large courtyard and surrounded by shops on the street. It presents itself as a huge two-storey building consisting of large square rooms made of tufa blocks, partly opening on to the courtyard with a porch and were later occupied by other smaller rooms made of bricks. This area was one of the most feverish for the economy.

4.2   Digital Survey

To reconstruct and virtualise the ruins, two types of surveys were carried out to obtain the material necessary to achieve this goal: a digital survey for photogrammetry and VR panoramic survey. A third survey was carried out onsite with a 3D laser scanner, an Imager 5016 Z+F. The photogrammetric survey was carried out in three distinct steps, comprising data acquisition, elaboration, and recovery, to get a comprehensive and detailed documentation based on the SfM/IM technique. The instrumentation used consists of a Nikon D850 camera with a Nikkor 16-35 mm F4 lens; the sensor, thanks to the intense summer light, was set at a low sensitivity, whit an ISO value of 64, reducing to the minimum any possible presence of noise. The full series of shot was finished counting a total of 1900 photographs.

For the VR panoramic survey, the aforementioned Insta360 Pro2 was used to capture spherical 360 HDR videos and images at 8k resolution. The surveyed area is very large and therefore the stations were planned to achieve the most complete result possible and avoid repeating data. After shooting, the data was imported into the special software Insta360Stitcher, which offers the possibility of setting useful parameters to enhance the quality of the stitching and image correction, creating high quality panoramic images rich of details and free from alignment defects.

4.3   Digital reconstruction and virtual environment

To achieve a high-quality result, the operations carried out in the reconstruction phase must be accurate and based on solid archaeological and historical research. The support by the archaeologists taking part to the research were fundamental in creating a specific reconstruction as well as their indications about other similar building from the Roman age, a fundamental match to allow a digital reconstruction.

To obtain a digital reconstruction of the anastyloses, the archaeological analyses formerly carried out was transferred into a 3D model. The model was created using Maxon Cinema4D software and later inserted into the context of the *Horrea Agrippiana* created by Reality Capture. Epic Megagames Unreal Engine 4 (UE4) was then used to create virtual content that can be used to design the environment in which the digital model can be visited and explored.

4.4   Virtual tours

The ultimate step of this research was to develop three different types of tours, depending on the distinct possibilities we wanted to achieve. The first tour is an interactive 360° tour that was created using CGI technology with UE4. The 360° images are then edited, exported, and imported into the Gnome Garden Pano2VR software to make the tour accessible to everyone, with interaction and historical knowledge.

(https://www.didalxr.it/2021FMHorrea).
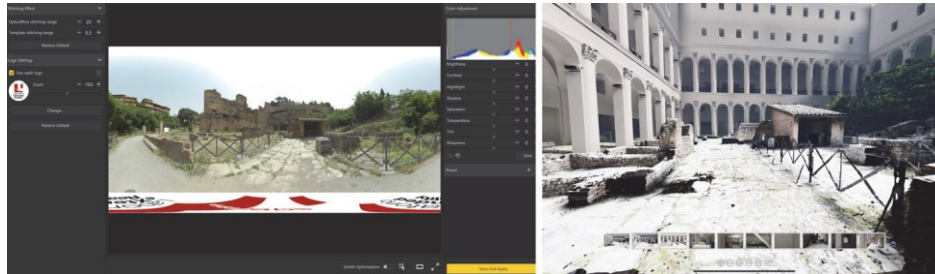
Fig. 3. The treatment of the panoramic image in the Insta360stitcher and a view from the virtual tour of the Horrea Agrippiana.

In the second type of tour, which always starts from the same environment created in UE4, an immersive virtual tour has been created that gives the user a fully experiential interaction with the virtual environment they are immersed in. Access is via the headset VR. Finally, a 360° tour with panoramic images of the insta360 pro2 was created, offering a picture of the current state of the archaeological site, in contrast to the previous tours that rather try to tell the story of the site in the past. The possibility of using these tools to verify the effectiveness of the results of research and studies in archaeological and architectural philology should be a starting point for a new approach to the study of the existing architectural heritage.

Conclusions

The experiences conducted in the past two years by the DIDALXR laboratory confirm how the digital reconstruction and be a way for learning and better understanding the built heritage values, with the production of valuable contents that can be shared with other users and visitors to allow them to make a step forward in the comprehension of a distant, but extremely fascinating past. Most of all, these experiences demonstrate that spectacularizing the virtual reconstruction is not the most preferable way to communicate Cultural Heritage values. The honest sharing of the reconstruction process and the right balance between each contribution in the research teams allow to build positive experiences that add qualities to the rich, but often misinterpreted, patrimony from archaeological and very old sites. The virtual reconstruction when presented in immersive solutions is capable of conquering a robust grip in the interest of visitors, but most of all it is a significant test ground for the quality of the contents and the reliability of the final result. The direct exploration from the virtual environment leaves no space to weakness or unsolved parts, it requires more completion than a single static image or a video sequence. The three experiences presented here are part of a patrimony that in the past suffered from abandon and neglection, before been recognized for their real value as important witness of a distant and fascinating past. The digital solutions allow to bring these architectures closer to a public interested in technologies and capable to appreciate the integration of digital solutions and artworks. A challenge that passes by

creating proper contents, enhancing the inner value of a patrimony characterized by an incredible beauty.

Acknowledgments

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Rebranding the World with SPHINX

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Abstract. This work presents a part of the researcher's postdoctoral work, which extends the results of the doctoral dissertation by creating a digital database (SPHINX). This database will function as a website showcasing (projecting) the existing tangible and intangible networks of the landscape so that the user understands and experiences it holistically. The adopted methodology will be implemented as a pilot in the area of Boeotia. The main purpose is to reconstitute and highlight the cultural identity of the field of application but also of any other area -various spatial/urban global scale- where the digital system SPHINX will be applied. In the case under study the adopted methodology aims to reveal the cultural identity of an area in Boeotia considering a field of research. The landscape, with any cultural production that emerges from it -as an element of its definition- constitutes an anthropological structure (anthropology of space). At the same time the landscape constitutes the expression of its inner meaning through a strong symbolic system.[23]

Key words: SPHINX, Palimpsest, Networks, Boeotia, Culture Heritage, Sustainability

1. Introduction

Examining the place one realizes its multilevel structure and composition, with other words the three levels of its existence (real, emotional, spiritual), while analyzing the landscape one is confronted with the result of the overall and collective perception of the physiognomy of a place. The place, after all, as an entity with special characteristics,

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[23] It is worth noting that in support of the author's doctoral dissertation, the seven-member examination committee considered the *sphinx system to be innovative*. In this article the term *innovative* will be adopted based on the critique of this committee

has Myth and Reason. Therefore, it becomes clear that the process of perception and assessment of the landscape is a particularly complex phenomenon. This is because it involves not only quantitative quantities but the combination of material resources, collective mental and ideological potential as well as the relationships between them (network). It is a fact that the approaches of the place so far through the landscape of the total and collective perception that it offers, have been limited to material elements and elements of lived experience (eg fragrant landscape). They contain or testify to the existence of inner wealth for a place, but without constituting wealth in itself.

This paper is framed by the conceptual version that the landscape as a total reference of place and culture, as a cultural landscape, is the overall receptor on which many individual cultural or cultural indications are projected. This is true both in terms of structured historical references and those of popular tradition. The latter is the one that, as a rule, strengthens and continues the evolution of the myth of the place, that is, the possibility of developing its emotional intelligence.

Under the framework of the Doctoral Thesis of Dr. Dimitra Paraskeva (National Technical University of Athens), attempted to create an innovative system of management of tangible and intangible culture with field of research the area of Boeotia, which bears the name SPHINX: System for the Protection of Heritage (Intangible and Natural resources) while X indicates the respective area/field of the implementation of the system (as a mathematical term).

The SPHINX system is a particularly valuable methodological project both for the field of proposed approach and for any other area where SPHINX will be implemented. Of course, the researcher's work revealed a very important aspect of the Boeotian land, its global uniqueness, and in particular its cultural elements. These elements are clearly incomparable in the world with a prominent element the Theban circle (or circle of Lavdakides), one of the two pillars of Greek Mythology and Drama.

In order to create the SPHINX system, **the map tool and the mapping process were chosen**. In particular, twenty-two (22) families of maps were constructed, out of a total of one hundred (100) maps-depicting the numerous qualities of the landscape- which act as capacitors of formations (thickenings, dilutions, vibrations, intensities). **The SPHINX system is based mainly on the interplay of maps and is a constant search for landscapes** (networks of landscapes, events, constantly changing, multiple networks/grids, communications and interfaces of all kinds). These landscapes, as dynamic and timeless fields of recording and manifestation of culture, seek their deepening and reading in the sphere of meanings and symbols. The process of map composition highlights, through the emerging concept of the palimpsest, the constantly pulsating images of the landscape -the Boeotian landscape in this case-. This happens through the complexes of multilevel topographic dynamic systems and networks inscribed on holographic surfaces. In this way he -farm- past functions as a pocket of condensed information, which emerges as a curvature of spacetime in the future.

2.   Proposal objectives and challenges

The reason for the elaboration of postdoctoral methodology was the successful elaboration of the doctoral dissertation of the researcher, as mentioned above. In this research was sought and created an system of management of the tangible and intangible cultural elements of an area with scope Boeotia.

The main purpose of the postdoctoral research is the highlighting the cultural identity of any area nationally and globally, where the SPHINX interinformational digital system will be implemented. This will be happen after the substantiated proposal of a method of reading the landscape with the application of the SPHINX system and the conclusions of the dissertation. More analytically, the use of this mechanism will give the guidelines **in order to highlight the cultural heritage and the natural landscape, the areas and landscapes of the continental and island area with natural, historical and cultural interest as well as to promote cultural tourism in conjunction with awareness of ecology, tourism and sustainable development**. In other words, the expected increase in cultural tourism can be achieved in stages over time, through strategic planning/programming. The estimated increase in cultural tourism will be 25% in the first 2 years of system implementation, 40% in the next two years and then rapid growth in the next three years to 100%.

In essence, **this is an project that aims to create appropriate mechanisms for the realization of the landscape** –ecological, cultural, social, political, economic-. Besides, the landscape is **a timeless receiver of concentrated meanings and symbols through its ontological requirements.** Furthermore, the aim of the adopted approach is **to highlight Boeotia (as a field of application) in an area of attraction of cultural tourism -nationally and globally-.** This can be happen not only because Boeotia has a rich, interesting natural landscape and anonymous architecture but mainly because it contains all those mythological and historical elements through which it tries to highlight its cultural version. It is a common place that her culture was decisive for the central composition of Western civilization, as mentioned above. Another **objective of postdoctoral work is the application of the promotion of the cultural identity of the landscape as a lever of sustainable development.** This practice presupposes scientifically substantiated development programs through the organization studies of the proposed uses. This will be prevent he destruction and annihilation of the landscape, after first sealing and stitching the gaps of the intense existing fragmentation, projected by the modern image of the landscape, such as that of Boeotia.

At this point, **the necessity and immediacy of the implementation** of the research proposal for the creation of such a system should be emphasized. The most important reason is the current complete lack of a mechanism, which manages the cultural elements of an area, is obvious and mainly harmful to the landscapes and the users in general. **Therefore, the urgent necessity and immediate implementation of the SPHINX system is understood in order not to completely destroy the witnesses - tangible and intangible- of the cultural heritage** (building stocks, archeological sites, oral testimonies, etc.). In other words, **there is a need to define a holistic management policy as the organization and promotion of an action plan**. This is called to reshape the existing -incomplete- framework, in which the existing "reality" - or the expected

"reality" - and the experience of the landscape by the residents/users are constantly recorded. Regarding the field of study, an insightful look at the area of Boeotia could reveal at present **the latent state of a palpable imprint of traces of tangible and intangible qualities**. In addition, it could be the trigger for the recognition of a world originality and uniqueness, which still contains archetypes, ideas-founders of European thought.

In general, the set of objectives to be achieved of the proposed approach project are: 1)to highlight the uniqueness of SPHINX as a capacitor of the tangible and intangible elements of an area as the respective field of research claims its own uniqueness, **2)**the drawing up of guidelines in order to highlight the cultural heritage, the natural landscape, the areas and landscapes of natural, historical, cultural interest and to promote cultural tourism in combination with the awareness of ecology, education, tourism, sustainable development, **3)**the definition of a -holistic- management policy for the remodeling of the existing incomplete framework, in which the existing "reality" and the experience of the landscape are continuously registered by the users, **4)**the strengthening of the universal use and cooperation of the competent Agencies, in order to achieve the wider impact of the work through the leading Humanistic Science of Architecture, which promotes and evolves Human, **5)**the highlight of the continuous and timeless process of recording the anthropogenic imprint in the space-time continuum as the expression and the spirit of the place (Genius Locci) as well as **6)**the promotion - through the implementation of the digital SPHINX system as a lever of development- of the development planning to ensure the prosperity and sustainability of the landscapes -at national/ global level- for an auspicious future.

2.1   State-of-the-art & Innovation

As for the state-of-the-art of the proposed methodology, it lies, as mentioned above, in the fact that there is no system in the scientific community that manages all the tangible and intangible cultural elements of a landscape. Therefore, the SPHINX system is exactly this one that will highlight the dynamics under area investigation. In particular, the research activities of **Dr. Dimitra Paraskeva will establish a digital database** (maintaining the name SPHINX) which will act as a receiver of information, data. This could be after the necessary their collection, documentation and evaluation. In particular, the database will receive the necessary information and through the process, which has been thoroughly analyzed in the researcher's doctorate, the multiple readings of the landscape will constantly occur.

A dominant innovative idea of the proposed methodology topic is to highlight the uniqueness of the system that will act as a capacitor of the tangible and intangible elements of an area. In this way it will be promoted and highlighted the area's cultural identity, as the respective field of the adopted methodology claims its own uniqueness. The SPHINX system will offer the possibility of complete promotion of each area -nationally and globally- with its immediate application and implementation. With the above adopted approach, a remarkable database will be created fully usable for any area (on a small or very large scale, at the level of City, Municipality, Region). On this database will be included all the tangible and intangible elements of a landscape (applicable even at country level). According to the above, the work

project is called to respond to the scientific/technological peak-with the support of technology- of the management of the cultural heritage of a landscape at national and global level.

2.2   Scientific and/or Social Impact

It becomes clear, then, that the research activities of Dr. Dimitra Paraskeva will be a great project with the main objective of extending the results of her doctoral dissertation. The theoretical background of the new database will be governed by the philosophy of the SPHINX system- **which approaches a variety of scientific fields with scientific and social impact.** More specifically, the adopted methodology will focus on the development of -disciplinary- areas. At the same time, it will contribute to the clarification of the work questions posed by the researcher and occupy the School of Architecture of the Technical University of Crete and the scientific community at large. Therefore, **the wider impact of the proposed approach at both scientific and sociopolitical-economic level** is considered to be particularly important as the scientific fields, related to the present research are multiple such as: architecture, spatial-urban-town planning, archeology, culture, arts, philosophy, history, sociology, development programs, tourism development, etc. In particular, the SPHINX interinformational digital model will enable the immediate and valid information, awareness and familiarization of potential users in general. Moreover, will be able to be updated the local community and the wider region (residents, students, scientists, interested, etc.) in its utilization use (educational- experiential- seminars, workshops, etc.). This could be happen because of **the mentality of transforming knowledge into innovation will be gradually cultivated.** As it is understood **this proposed work is particularly important for the scientific field where it will be applied that is, the leading Humanistic Science of Architecture, promoting and evolving Human.**

In addition, **in terms of impact on the career prospects,** it should be emphasized that this proposed methodology will enhance the potential and future career prospects of all members of the work team. In particular, the adopted methodology will give to the researcher a valuable opportunity: a) to develop the methodology of the SPHINX system, to implement a project of high scientific quality and excellence, b) to increase her mobility between different work units, c) to further expand her scientific interests, d) to create interesting interdisciplinary collaborations as well as to proceed/propose new innovative proposals as an extension of its scientific object. In addition, the technical/scientific staff will seek to deal with a highly interesting and innovative mechanism, that will be created from the bottom (custom made). This mechanism will be based on modern technology but at the same time will give the impetus for the creation of the SPHINX interinformational digital model. This will enhance the work team's potential and future career prospects.

3.   Methodology and Implementation

3.1   Research Methodology

Regarding the proposed research, it is pointed out that is framed by **the basic**

perspectives, perceptual concepts and conceptual approaches, related to the possibilities and conditions offered by spatial- urban planning. This aims both at stabilizing the development process and at ensuring the qualitative dimension of the landscape. The framework created by the spatial planning sector - an organic part of the respective development process - will give the guarantees for a strategic development planning, that aims at the expected, for each lamdscape, sustainability. Moreover, it is worth noting that the landscape itself -the landscape of Boeotia in this case- is offered for study, research and utilization through the analysis of conceptual approaches -physiognomy, identity, character, entity levels- of the landscapes.

According to the above, **the intention of the postdoctoral work is the search for a new methodology, that will be applied in other landscapes at different spatial/urban scales at national and global level.** The present proposed approach will be **prepared and implemented in a pilot in the area of Boeotia**, as well as in the doctoral dissertation of the researcher. This will give the opportunity to thoroughly investigate th data and the results that emerged in this area. In this way the new methodology will enrich the existing bibliography concerning the management of the - cultural/collective- identity of the landscape. She is also the one and that meets the requirements of spatial/urban planning while at the same time the new methodology must be governed by its conceptual framework. In other words, the methodology that will be sought will function as a cornerstone for the creation of the information database. This will happen with the possibility of direct and/or indirect correlation with the various infrastructures concerning the natural environment, education, the daily life of the Human etc.. Moreover, there will be a connection to the wide range of other -global- sources of information (Educational Institutions, Research Centers, Libraries, Museums, etc.), as will be analyzed below.

For the holistic approach of the landscape - with field of application Boeotia - should be followed, a speicific procedure· **the process through which is discovered, recorded, developed and organized a fully substantiated framework of conception of ideas and plans for the recomposition and promotion of cultural identity of the landscape.** In particular, through the holistic design, the necessary elements are determined, in order to display all the tangible and intangible dimensions of the landscape in order for the users to approach their landscape experientially. This, of course, presupposes a strict methodological framework, which will include: a) -investment- strategies in equipment (eg building infrastructure, drone, camera, tablet, mobile phones), b) frequent project promotion activities (eg organization of events, participation in conferences, publications in scientific journals and conference proceedings), c) in "orgware" (cooperative organizational structures), d) in virtual reality (eg websites, social networking, software, reality capture, symbolic actions), etc.

3.2   Implementation

In terms of the most practical part for the promotion of cultural identity, modern technology is one of the most important tools that can be used by most residents/users/stakeholders in the field of research. After all, **the tangible and intangible network of the area provides all the guarantees to convince people that the area**

has a rich cultural heritage at all levels, which they can experience using technology. More specifically, **the -existing and documented- networks of the SPHINX system will be connected to an intangible internet network, which will be activated throughout the individual's visit to the area.** Prerequisite for the operation is a) the existence of wireless networking technology (wireless fidelity or wi-fi or data use), b) the creation and use of a specific application / database (data base /mobile application or app) on the user's mobile phone and (possibly) and c) a laptop screen (tablet or tablet) for greater image clarity. **The most important condition, however, for the operation of the intangible internet network is the transfer of the mapping of the SPHINX system in electronic form. In this way it can be processed and managed at an intangible level.**

More specifically, a multi-level mechanism will be designed, which has as its ultimate objective the increase of traffic in the landscape -with field of application Boeotia- utilizing the elements of the SPHINX system. In other words, **the appropriate conditions should be created** in order for this mechanism to include: a) the creation and implementation of three-dimensional cultural routes, b) the promotion of building reserves-monuments, associated with routes (eg. old paths), c) revival of holidays (religious events, gastronomy events, tasting events, etc.) but also d) educational programs (participation of children inside or outside the school program, eg theatrical performances) with the dynamic participation of Agencies, Associations, Groups, schools and citizens. The three-dimensional paths-routes that come from the evaluation of the recorded data in the system, are to be highlighted, so that the visitor/user/resident/interested is able to holistically perceive the landscape-. The routes, after all, contain all those tangible and intangible elements of the landscape and their promotion is considered necessary. Thus, the individual user/visitor will be able to choose any route in the field of research/exploration and by using the application on his mobile phone he will be able to experience the landscape in all its dimensions -tangible and intangible-. More practically, the user will be able to select a specific route and receive the corresponding information. This will happen with the help of his mobile phone (smart phones or smartphones) or special projection glasses to select any point, landscape, area - either tangible or intangible element-. The process will be achieved by using an application (mobile app) based on virtual and augmented reality. The application will be connected to the SPHINX digital database enriched with documented information (mythological, historical data, images, videos, narratives), which will be provided through multimedia material. After all, this technique of interaction and visualization in augmented spatial reality is the most modern technological means. This one allows the user to interact with the object of exploration projecting at the same time their three-dimensional and embossed illustration. These objects will be building stocks, sanctuaries, theaters, citadels / forts / palaces, frying pans, churches / monasteries, paths, feasts, songs, flavors, etheric triangles, constellations etc.. Of course, the application (mobile app) will be based on the innovative database (mapping) of the SPHINX system. The main goal is to provide all the networks (at all levels) while the on-site navigation will be carried out by ensuring the geographical location of the user through the global Global Positioning System (GPS).

In addition, another interesting element of the navigation will be **the possibility to**

select the time period, which the user wishes to be informed, as if he were in a time machine. At the same time all the information will be visible on a screen of either the mobile phone or the tablet computer. Moreover, the individual user/visitor of the area will be able to connect electronically with libraries, Universities, Research Centers, Art Galleries, Museums, Collections. In this way he could to receive the corresponding information for any point of his route from anywhere in the world in real time. The traveler, visiting the area, will be able a) to locate, for example, a sanctuary - in three-dimensional illustration – b) to perceive its environment (the specific time period), c) at the same time to process the network (in relief form) in which belongs (correlation with other sanctuaries, near or far) and d) associate it with other networks (in relief/three-dimensional form even the local etheric triangles or constellations). He will also be able to receive information about the sanctuary at the same time from multiple points / sources of information in the world. The mechanism, which has just been analyzed, may be available even to users who are remote from the area under investigation in order to receive all of its cultural heritage (eg. researchers from abroad).

Also, **the SPHINX system can provide unlimited possibilities for its use by the Public** (GNTO, Ministries, Regions, Municipalities, Ephorates of Antiquities, and Modern Monuments). Also, it can be used **by private Institutions as it is a tool to promote one area and a model for application in other areas, which aims to increase cultural tourism, sustainability and ultimately the prosperity of each area.** The Public Agencies of the individual areas will be able to continuously supervise all the important -e.g. archeological- sites (pathology and decay of monuments, visitation of monuments/sites/landscapes). In addition, they will be able to take actions to create an integrated social, economic, cultural network between the Institutions, aiming at a) the exchange of know-how and good practices, b) the organization of joint activities and events and c) the best political planning of actions (need for introduction of new use or ban of uses, need for -spatial/urban planning, etc.) in order to have **a practice of cooperation between the Agencies.** Besides, SPHINX provides the possibility to be applied in any region, a fact that allows -finally- the universal application under the partnership, participation and cooperation of more Municipalities and/or Regions.

Therefore, in any case the real-experiential path of the individual can be enriched with all those elements/networks -tangible and intangible-. Moreover, the individual is given the opportunity to experience the landscape holistically, at all levels of its entity. At the same time the Agencies of the respective landscape will have the possibility of total supervision of their area of jurisdiction.

4.   Results - Cultural heritage

The proposed approach, as it is understood, focuses on the search for ways of deeper and more efficient extraction and transmission of all those intangible elements, which through the material bodies will function in such a way that the contact of people with the place is transformed from simple acquaintance and relationship into an experience as intense and conscious as possible. It is therefore easy to conclude that the results of the use of the SPHINX system (and in general the positions of the researcher's

dissertation) can be fully utilized. At the same time, it is imperative to integrate its objectives into a fully organized political management system with a final in order to highlight the cultural identity of the field of application (Boeotia) and not only. It is also worth noting that the SPHINX system is an innovative tactic and strategy for exploring, reconstructing and promoting -political- identity of the place.

It is thus understood that the SPHINX system is the way of managing material and intangible culture, which is formed through the process of evaluation and synthesis of fragmented and scattered information. The maps capture the ever-pulsating image of the qualities of the landscape, in other words the maps function as information carriers of the signifiers and signifiers of the place, as palimpsests. Therefore, applying the SPHINX system in any area (spatial scale) achieves an innovative management of its material and intangible culture, highlighting its qualities. Therefore, with the proposed system, the subject is given the opportunity to face a different view of space/place/landscape, overcoming the simple and abstract accumulation of knowledge, which corresponds to the existing situation.

5.   Thoughts for Discussion

The understanding of space as a generator structure raises important questions, which are answered in the present dissertation. These questions are related a) with the current situation, b) with what the inhabitants of the area have perceived today, c) what one expects from the implementation of the SPHINX system, d) what is offered in the landscape with the present research, e) how one approaches a landscape and f) what a landscape has to do with the place and its deeper content (the Myth and the Word).

It is generally accepted that the process of perceiving and estimating the landscape is a particularly complex phenomenon. This is because it involves not only quantitative quantities, as mentioned above, but a combination of material shells, collective mental and ideological potential as well as interrelationships (network). Regarding the area of modern Boeotia, it is pointed out that its landscapes are characterized by their strong dependence on the socio-economic conditions of the local rural population. At the same time, any deviations in anthropogenic effects on them can be potentially disastrous for the sustainability of these landscapes, jeopardizing the prosperity and sustainability of the region.

Examining in depth all the above -regarding the positions of the dissertation- concludes the possibility of a holistic approach to the landscape of Boeotia through the management of its rich cultural heritage and the implementation of the SPHINX system. The main purpose is to strengthen the dignity of the inhabitants and self of the specific area and the Greek area as a whole.

Moreover, it becomes clear that the problem, which arises in relation to the proposed approach, concerns the possibility of a people-centered development policy/promotion of landscapes. Therefore the Competent Bodies should be strongly support the landscapes for the holistic promotion of both the Greek space and and any other site globally where the SPHINX system will be implemented.

The intention to use the SPHINX system is based on the statement that the subject

matter is historically, culturally and politically unique. This happens because it deals with an area that at the level of cultural, cultural and political evaluation is central to the formation of the western - and global - world. This intention refers to terms of cultural and political identity as opposed to the market term place branding, which manages the values of the landscape as a marketable species. After all, this term (place branding) ignores the cultural and political value that it has for both the residents themselves and the incoming ones. At the same time, it fails to replace the current term tourism with the term tour, which can describe a centrally cultural and political treaty. At this point it is worth emphasizing that in the context of the researcher's work, the deepest and most cultural significance of the -patented- term branding is activated. This proposed approach aims at a more substantial cultural and political purpose and "abolishing" its simplistic appearance. Is place branding misunderstood?

6. Epilogue

Summarizing the above, it is considered that through **the research activities of Dr. Dimitra Paraskeva will emerge the continuous and timeless process of recording the anthropogenic imprint in the continuous space-time as the expression and the spirit of the landscape (Genius Locci). At the same time, the central issue that arises is the correct implementation of the Interinformational digital model of highlighting the tangible and intangible cultural elements of the landscapes. The point is to act as a lever of development both for the field (prefecture of Boeotia) as well as for any -different scale- area.** The material and intangible capacitors of the meanings and meanings of the place reproduce, translate, transform and evolve the memories and space-time continuations of the landscape. The natural environment, as a total recipient of culture, is in a constant and active dialectic with the material and intangible cultural expression of the Human but also his action. At the same time, it composes the whole under the influence, which transforms space and time into a place with Myth and Speech, with signs and symbols, with ideas and values and therefore with culture. After all, it is a common place that without the natural environment which is the local background for all -tangible and intangible- "events" and actions, the term culture and human activity could not exist. However, despite the importance and dynamics of ancient Greek models, modern society has taken a stand of complete indifference and cognitive paraphrase. This results in the incessant decline of modern Greek morals and the modern Greek state in relation to the management of its historical depth. and in the area of Boeotia.

After all, the implementation of the SPHINX system will enable each landscape to be projected in the present through development planning, in order to achieve the prosperity and sustainability of landscapes -nationally and globally- for an auspicious future.

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Non-destructive 3D reconstruction of an Hagia Sophia clone mosaic utilizing ultrasonography combined with an accurate motion planning [24]

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Abstract. In the current work the endoscopy and retrieval of mortar covered mosaic patterns, such as the Hagia Sophia ones, is presented. In particular, an appropriate instrumentation is developed combining ultrasonic tomography and an accurate motion planning. The acquisition of high-response tomographic images is performed utilizing transducers in a linear array through the efficient control of their phase characteristics both in transmit and receive modes. Moreover, an accurate mechanical adaptation is designed in order to move the ultrasonic probe with a constant velocity. Then, a sequence of tomographic images is recorded and the 3D endoscopic characteristics of the measured object are extracted via the effective reconstruction of the 3D volume. This device is used on a realistic Hagia Sophia mosaic replica that is covered by a thick mortar layer. The evaluated results indicate a complete 3D reconstruction of the hidden mosaic in micrometric resolution, while the inner details of individual tesserae are, also, recovered.

Keywords: beam forming mosaic tessera tomography.

1 Introduction

During the recent history of cultural heritage science, various techniques from physics, chemistry and engineering have been utilized for the identification of the material and structural composition of an artwork [3]. A notable example is the utilization of

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ultrasound tomography for surface mapping and stratigraphy extraction of an object that is under investigation [2]. Specifically, ultrasonic transducers in a linear array are able to support the high-response tomographic image reconstruction through the efficient manipulation of their phase-shift both in transmit and receive mode. However, single tomographic images are not adequate to reveal the complete structure of the examined object, thus a 3D approach is required. Such a case is the Hagia Sophia mosaics that are covered with a thick mortar layer and the reconstruction of their pattern, in a non-destructive manner, is required to unveil iconic Byzantine art aspects

In this paper, we present an integrated platform that combines ultrasonic tomography with accurate mechanical adaptations for the non-destructive 3D endoscopy of Hagia Sophia clone mortar-covered mosaics in order to retrieve their pattern. Initially, a functional, versatile and multi-degree of freedom linear array of ultrasonic transducers is examined in terms of the required phase-shift to achieve the high-response single tomographic imaging. Then, the appropriate mechanical adaptations are designed for the accurate motion of the ultrasonic probe via constant velocity. The sequence of the tomographic images is recorded throughout the entire motion of the probe, while the 3D image reconstruction is achieved considering the ratio of the constant velocity to the image resolution. The proposed instrumentation is, then, used on a realistic Hagia Sophia mosaic replica, covered by a thick mortar layer. The ultrasonic tomography acquisition and the subsequent 3D reconstruction reveals a high fidelity hidden mosaic pattern with an image resolution that is in a micrometric order.

2 Instrumentation

2.1 Phased array for tomographic image acquisition

Principle of operation The phased array probe consists of N small ultrasonic transducers, each of which can be pulsed independently. By varying the timing, for instance by making the pulse from each transducer progressively delayed going up the line, a pattern of constructive interference is set up that results in radiating a quasi-plane ultrasonic beam at a set angle depending on the progressive time delay. In other words, by changing the progressive time delay the beam can be steered electronically. It can be swept like a search-light through the tissue or object being examined, and the data from multiple beams are put together to make a visual image showing a slice through the object. Moreover, focusing of the transmitted beam can be accomplished by combining a parabolic timing relationship with a linear one to produce a beam which is focused at a given range and propagated at a specific angle. The following generalized focusing formula is derived to compute the required time delays

$$t_n = \frac{F}{c}\left[\sqrt{1+\left(\frac{\tilde{N}d}{F}\right)^2+\frac{2\tilde{N}d}{F}\sin\theta} - \sqrt{1+\left(\frac{(n-\tilde{N})d}{F}\right)^2-\frac{2(n-\tilde{N})d}{F}\sin\theta}\right] \quad (1)$$

where t_n is the required time delay for element $n = 0,\ldots,N-1$, $\tilde{N}=(N-1)/2$, d is the center-to-center spacing between elements, F is the focal length from the center of the

array, ϑ is the steering angle from the center of array and c the speed of sound. This generalized focusing time delay formula is valid for any number of array elements (even or odd), while by eliminating the constant t_0, the formula guarantees positive time delays which do not have to be larger than necessary
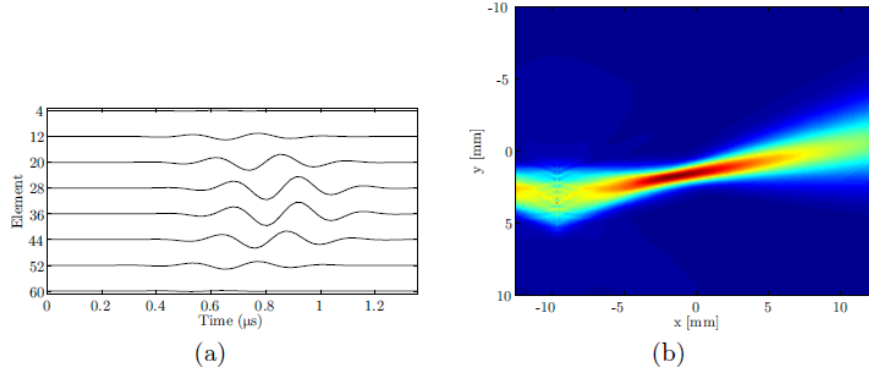
Fig. 1. (a) Stimulation signals and (b) amplitude of pressure of a linear phased array achieving a beam that is directed towards 10° and focused at 10 mm applying a Hann weighting function for apodization.

One major problem of phased array excitation is the "sidelobes" that can appear to be false echoes of the beam profile region. For this reason, apodization techniques are utilized by weighting the amplitude of the normal velocity across the array. Specifically, it is accomplished by simply exciting individual elements in the array with different voltage amplitudes, defined by popular weighting functions such as Hann

$$w_h[n] = \sin^2\left(\frac{\pi n}{N}\right), \qquad 0 \leqslant n \leqslant N, \tag{2}$$

or gaussian

$$w_g[n] = e^{\frac{(n - \bar{N})^2}{2\alpha^2}}, \tag{3}$$

where α a properly defined constant. A simple scenario of a phased array transducer is numerically investigated [8], where 64 piezoelectric elements are utilized and stimulated so that the beam is directed towards 10° and focused at 10 mm from the phased array center, while a Hann weighting function is used for apodization. Some selected signals are sketched in Fig. 1 and the extracted pressure amplitude in Fig. 1 proves the successful implementation of the desired characteristics.

Multi-line acquisition beam forming An interesting observation is that the beam does not need to be the same in the transmit and receive phase and this is certainly the case with multiline acquisition beam forming. The basic idea behind this approach is to transmit a wide beam, so that a large area is insonificated, and then make use in receive of multiple, narrower beams, in order to form several A-scans along different directions for each transmission event. In this way, multiple lines are formed in parallel, thus increasing the frame rate and improving the temporal resolution. The receive phase is in fact defined by how the different signals received by all of the array elements are

combined to form a line of the image

Therefore, it is possible to apply different phase sets and apodization masks to the signals received after a single transmission event, thus allowing the formation of multiple lines in parallel at varying focusing points. The combination through image fusion of the multiple images is able to enhance significantly the quality of the final tomographic image. It is evident that a wider beam can be achieved by using, without focusing, a small subaperture at the center of the array during transmission [5–7, 9].

The multiline acquisition method can be applied efficiently to achieve a gain in the frame rate, it can also be applied to improve the signal-to-noise ratio and contrast by simply averaging consecutive images obtained at a higher temporal resolution than with standard beam forming (i.e., techniques where only one line is generated per transmission event). Moreover, it can also be used to image a larger field of view. In this case, the gain in acquisition rate is used to widen the area covered by the imaging system. To summarize, image lines could be formed in parallel, meaning that

- – the temporal resolution can be improved,
- – consecutive images can be fused to enhance the quality,
- – a larger field of view can be established,
- – a combination of these gains could be achieved by spending the higher data acquisition rate in the most desirable way (e.g., fusion of less consecutive images and thus improving the signal-to-noise ratio while still improving also the frame rate).

2.2 Mechanical adaptations for volume acquisition

As it is described in the previous section, a linear phased array is capable of acquiring tomographic images at high data rate. It is evident that a possible combination of consecutive images at slightly different positions, as depicted in Fig. 2
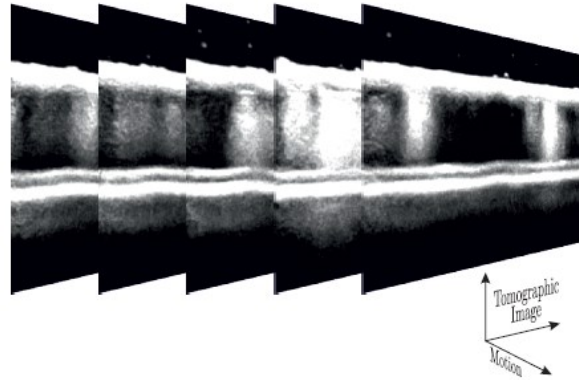
Fig. 2. Acquisition of consecutive tomographic images via the controlled motion of the linear phased array

can provide a measurement of an entire 3D region of interest. This is achieved using a precise mechanical adaptation for the motion of the phased array parallel to the tomographic image normal vector with a constant velocity v [mm/sec]. Furthermore,

considering a constant frame rate f_r [frames/sec] of tomographic image acquisition, the number of frames per distance is straight- forwardly calculated

$$\frac{\text{frames}}{\text{mm}} = \frac{f_r}{v}. \tag{4}$$

Now, this value must be connected to the resolution [pixel/mm] of any single tomo- graphic image (that is defined straightforwardly via the ultrasonic measure- ment) by enforcing

$$\frac{\text{pixels}}{\text{mm}} \equiv \frac{\text{frames}}{\text{mm}}. \tag{5}$$

Obviously, these values may not be identical and consequently the initial tomo- graphic images are resized by the factor

$$\alpha = \frac{f_r}{v \frac{\text{pixels}}{\text{mm}}}. \tag{6}$$

Finally, the images are combined into a single file that is fully compatible to the DI-COM format, following the DICONDE standard [1] and extending its proper- ties by inserting modality-specific information, when necessary. The DICONDE standard was developed by the Non-Destructive Testing/Evaluation (NDT or NDE) community to reduce the cost of storage, making it easy to share and compare imaging information and enabling quantitative analysis. This way, the produced volumes can be loaded into third-party processing, medical and NDT software platforms with ease, such as 3D-SLICER [4], MITK [10] and MatlabTM for postprocessing and visualization purposes.

3   Operational Analysis

3.1   Test-case description

The operational status of the proposed instrumentation is examined and validated using a specific test case scenario including a mosaic pattern that is covered by thick mortar, as demonstrated in Fig.3. Initially, a preparation layer is placed and the mosaic, that simulates realistically the technique of the ones in Hagia Sophia, Constantinople, is designed over it. The utilized tesserae are, also, formed to approximate the real ones, in terms of their dimensions and structure. Finally, a 1 cm thick mortar is placed to cover entirely the designed mosaic.

3.2   Non-destructive acquisition of 3D sub-surface details

The structure of the clone mosaic is measured using the proposed methodology. A SuperSonic Imagine Aixplorer ultrasonic system is employed with a probe of central frequency at 15 MHz. Moreover, the motion system is composed of Aerotech devices

of 0.5 μm step accuracy.

(a)   (b)
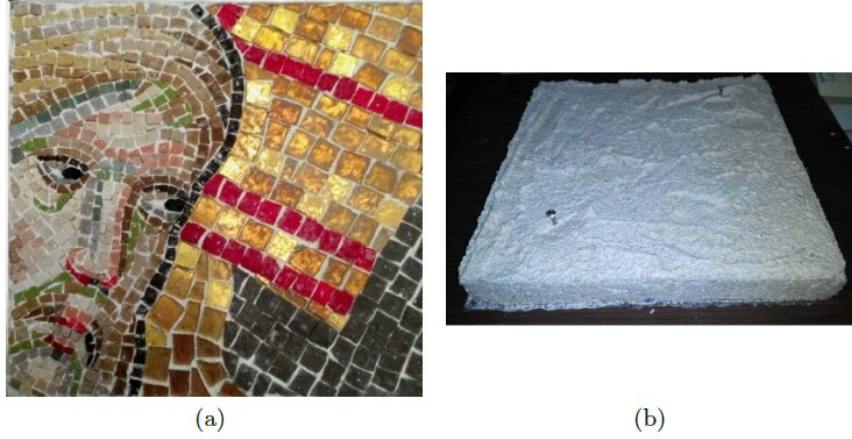
Fig. 3. Clone mosaic icon that simulates the technique of the ones in Hagia Sophia, Constanti-
nople. (a) The hidden mosaic pattern under (b) thick mortar covering.

An initial tomographic image of the clone mosaic is depicted in Fig.4. It is evident
that the acoustic waves are able to penetrate the thick mortar and provide high fidelity
information of the underneath tesserae. Specifically, the mortar is appearing as the high
intensity upper layer due to its scattering, while the thickness seems decreased due to
the high acoustic velocity. On the other hand, tesserae are appearing as separated ele-
ments of varying intensity
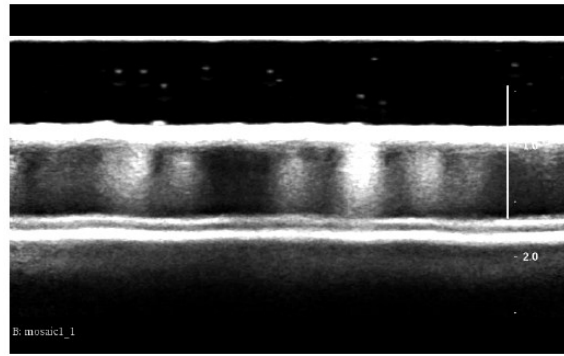
Fig. 4. A tomographic image of the clone mosaic acquired using ultrasonic phased array system
at 20 MHz.

The 3D image reconstruction from the tomographic sequence of constant velocity
motion of the ultrasonic probe is, then, extracted considering our proposed methodol-
ogy. The outcome is demonstrated in Fig. 5 using the flexible 3D-SLICER software.
Here, the image is displayed in two phases, namely the upper mortar part in Fig. 5a and
the inner mosaic one in Fig.5b. The former is an impressively detailed illustration of
the mortar surface, where even the roughness of this layer can be evaluated.
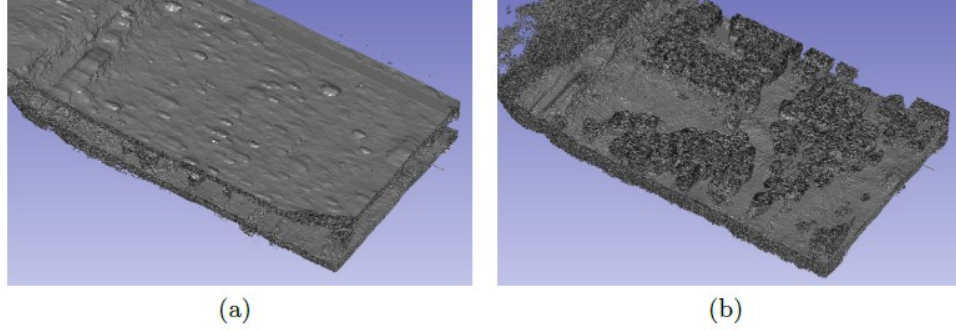
Fig. 5. (a) Detail of the clone mosaic at the region of interest and (b) an horizontal slice of the acquired measurement at the same region

However, the most interesting results are revealed through the mosaic region that is optically hidden under the mortar. It is observable that the tesserae shape is reconstructed successfully, while the detailed pattern of the mosaic is, also, evaluated. The last remark is validated in Fig. 6, where a horizontal slice of the 3D image at the tesserae region is extracted and compared to the original mosaic of Fig. 3a. Here, one can note that the reconstructed mosaic pattern is identical to the original, thus proving the potential of the proposed instrumentation and the subsequent processing methodology.
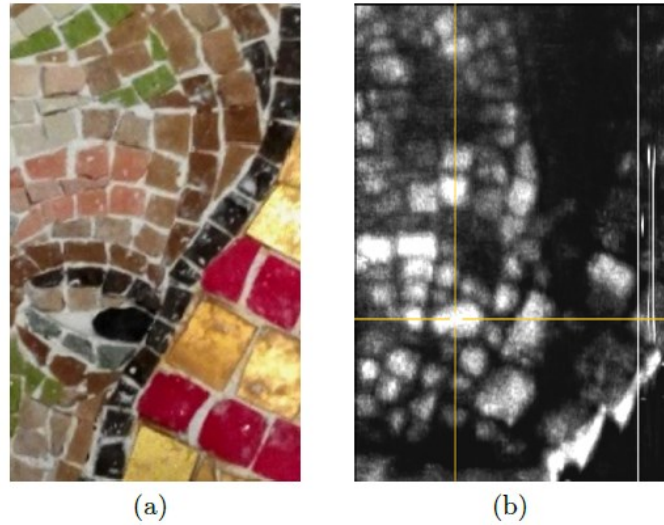
Fig. 6. (a) Detail of the clone mosaic at the region of interest and (b) an horizontal slice of the acquired measurement at the same region

3.3 Vertical resolution

The final step of our analysis is the investigation of the ultrasonic vertical resolution, since the horizontal one depends on the motion plan of Section 2.2. It is well-known that the vertical resolution is influenced mainly by the frequency, but the phased array setup and the multi-line acquisition beam forming scheme are able to improve the outcome.

To this end, the inner details of a tessera is examined in Fig. 7, revealing the structure scratches due to its preparation method. This interesting result is compared to a single tessera analysis of Fig. 7a that is measured using an ultrasonic probe at 175MHz. The reconstructed image from this measurement is depicted in Fig. 7b, where corresponding structure scratches are observed. Consequently, despite the decreased frequency of the phased array probe, significant vertical details of the inner structure can be evaluated.
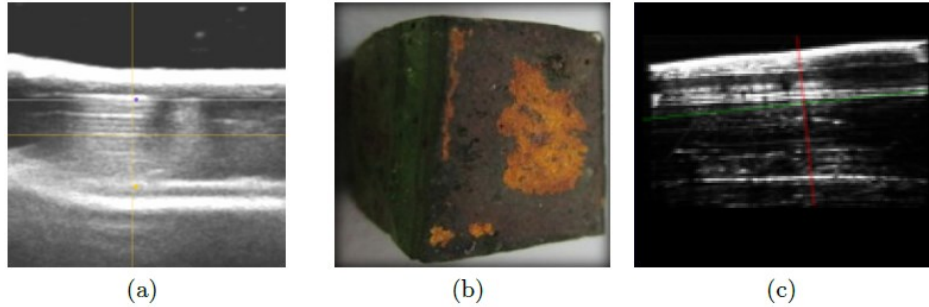
Fig. 7. (a) Details of a tessera inside the clone mosaic acquired using ultrasonic phased array system at 20MHz. (b) A single tessera from the archaeological site of Ancient Messene and (c) tomography of its inner structure using acoustic microscopy with transducer at 175 MHz.

4 Conclusion

The instrumentation and the subsequent processing methodology for the non- destructive 3D tomographic reconstruction of iconic cultural heritage assets has been proposed in this work. The basic parts of the instrumentation include an ultrasonic phased array system and appropriate mechanical adaptations for its motion planning towards the object that is under investigation. Then, powerful methods, such as the multi-line acquisition beam forming, are applied to extract the 3D inner reconstruction of the object. The utilization of the proposed methodology on a clone mosaic that is hidden under thick mortar, verified the successful implementation indicating the method's potential.

Acknowledgment

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The 'Kalamata 1821: Roads of Freedom' Project: Technological and Management Advances for Cultural Heritage

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Abstract. The purpose of this paper is to offer an overview of the Cultural Heritage Enhancement project "Kalamata 1821: Roads of Freedom" after its completion. "Kalamata 1821: Roads of Freedom" has been a co-financed by Greece and the European Union project which was placed under the wider scheme "Research, Creation and Innovation" NSRF (ESPA) 2014-2020. The project was implemented during the 2018-2021 period, i.e. by taking advantage of the celebration of the landmark of two centuries (1821-2021) since the uprising which led to the establishment of the Greek State. It was executed via a tripartite research association which consisted of the University of the Peloponnese, which assumed the role of the coordinator, the Community Enterprise of the Municipality of Kalamata (ΦΑΡΙΣ) and the film production company View Master Films. The project's aim has been to augment the footprint of Kalamata's unique modern heritage and make it known and accessible to wider and diversified audiences. The paper outlines the historical background and the conjuncture that inspired the project and thereafter traces the course of its deliverables, namely the production of the feature-length film "Wind of Freedom 1821", the "Kalamata 1821 Digital Museum", and the "Kalamata 1821" brand. It discusses how the pandemic affected the filming of the movie but despite the imposed delay it was fulfilled and screened in Kalamata's Dance Hall in July 2021. It shows how the "Kalamata 1821 Digital Museum" set an example for raising the awareness of a city's heritage via the employment of new technologies. It presents how the "Kalamata 1821" brand attempts to set in motion the various cultural currents of the city in order to blend the historical tradition with the contemporary creativity. Additionally, it showcases the most successful aspect of the "Kalamata 1821" brand, i.e. the "Flavours of '21" and it discusses the digital applications that were developed but eventually were not used due to the ramification of the pandemic-related restrictions.

1 Introduction

"Kalamata 1821: Roads of Freedom" has been a co-financed by Greece and the European Union project which was placed under the wider scheme "Research, Creation and Innovation" NSRF (ESPA) 2014-2020. The project was put under the auspices of His Excellency the former President of the Hellenic Democracy Prokopios Pavlopoulos (Eleftheriaonline.gr, September 6, 2018). The project was implemented by a research association whose three distinct operators were the University of the Peloponnese which among others has been assigned with the role of the coordinator, the Community Enterprise of the Municipality of Kalamata (ΦΑΡΙΣ) and the film production company View Master Films. The major drive behind the project was the conjuncture of the bicentenary celebrations of the Greek revolution of 1821; the struggle which led to the establishment of the modern Greek state and which was actually launched in Kalamata. In this regard, the project's main aim was to identify, highlight and ultimately re-introduce to the wider public all the interconnections between the 1821 era at the level of the city of Kalamata and its adjacent regions, and the present. More specifically, the project tried, and to a great degree achieved, to showcase the links between the past and the present through roads of history, culture and trade. To this end, and by making use of an array of sophisticated digital tools, the project's research association organized, undertook and oversaw the implementation of three major deliverables which could, and in some cases did, give space to initiatives that deserved special merit and account. On the other hand, the unforeseeable COVID-19 pandemic with its multifaceted impact could not but have a serious effect on the open social events that the project had prepared for the celebrations of March 2020 and March 2021 respectively. To be sure, a number of conferences, public lectures, presentations, happenings and activities had to be cancelled or, wherever that was feasible, transferred on an online virtual platform. The pivotal deliverable of the "Kalamata 1821: Roads of Freedom" project was the production of an original film that touched upon the 1821 uprising and the role of Kalamata in its success. The film production company View Master Films undertook the task and with the guidance of academic experts brought about the script of the "Wind of Freedom 1821" which was largely filmed in historic sites of Messenia. The movie, which reflects on the events and causes that led to the successful outbreak of the 1821 Greek revolution in Kalamata, was the only major film production that coincided with the bicentenary celebrations. Moreover, its inaugural premiere took place in Kalamata in July 2021. The second deliverable of the project pertains to "Kalamata 1821 Digital Museum" which since October 2020 functions in a room on the ground floor of Kalamata's Old City Hall. The museum was destined to become, and to a great degree is, a multimedia applications room where the visitor can extract information related to the events of March 1821 and their connection with iconic sites and buildings of the modern city. Therefore, the very concept of the establishing of a digital museum encouraged the research on how digital applications could be used so as to enhance and ease the connection of Kalamata's residents and visitors with the city's glorious past, and to do

so in a creative and educative way. In this respect, various ideas were brought to the fore like employing augmented reality schemes. In view of the pandemic and the numerous restrictions it came along, these plans did not materialize but exist as a legacy and thus could and should inspire future projects in the field of Cultural Heritage Enhancement. The third main deliverable of the "Kalamata 1821: Roads of Freedom" project was the introduction of a special brand. The idea was to engineer the palpable involvement of the local business community in the landmark celebrations through the trade of products bearing the brand "Kalamata 1821". The aforementioned products hold a distinct connection with the 1821 era and subsequently their distribution and circulation would raise the collective awareness germane to the unique events that took place in the region of Kalamata in 1821. Again the pandemic created seemingly insurmountable obstacles. Nevertheless, many initiatives went forward and one of them, the "Flavours of '21" was as widespread and successful as to resemble a distinct deliverable. In short, the "Flavours of '21" was the coupling of 1821 with the present through food. Academic research identified certain dishes and delicacies that were popular in the early 19th century in Messenia and encouraged local catering businesses to create dishes inspired by them. The subsequent introduction of tourists and residents to the selected dishes could not but widen the bridges between contemporary Messenia and that of the 1821 era.

From the meeting of the Research Association, March 2018
Source: https://kalamatadromoieleftherias.gr/wp-content/uploads/2021/01 φωτο-kick- off-meeting-Μάρτιος-28-2018-scaled.jpg

The Historical Background and Conjuncture as an Opportunity for Cultural Heritage Enhancement

The Messenia region in general and the city of Kalamata in particular enjoy a unique heritage with regard to the 1821 revolution that paved the way for the founding of the modern Greek state. Messenia is the part of the Peloponnese, which itself has been rather restless since the failed 1770 Orlov revolt, where one of the most significant Greek chieftains, Theodoros Kolokotronis, found sanctuary prior to the revolution. To

be precise, Kolokotronis in January 1821 found shelter in the tower of Mourtzinos (Troupakis) family in Kardamili (Christou, 2013). Since early February Archimandrite Grigorios Dikaios, aka Papaflessas, is spotted in the Northern Peloponnese and then heads towards Messenia where he awaits the arrival of a crucial ammunition shipment. The cargo reaches its destination safely in mid-March which is no other than the bay of Almyros, an anchorage just a few kilometers east of Kalamata. Papaflessas arranges the transport of the gunpowder with his associates Nikitas Stamatelopoulos, aka Nikitaras, and Christos Papageorgiou, aka Anagnostaras, to Mardaki Monastery outside the Taygetos Mountain village of Megoloanastasova, modern Nedousa, and from there they distribute it to various monasteries overlooking Kalamata. From those spots armed clans headed to Kalamata on March 23, 1821. They were joined by the forces of Petrobey Mavromichalis, the ruler of Mani. The revolutionaries hand an ultimatum to the local Ottoman ruler, Voevoda Souleiman Agas Arnaoutoglou. The latter, having full knowledge of his precarious position, agrees to surrender the city which was therefore liberated without any bloodletting on March 23, 1821. As a result, Kalamata becomes the first major urban center that falls into the grip of the revolutionaries. Kalamata will stay in Greek hands for the most part of the revolution. Moreover, it was another place of the region of Messenia, the port of Navarino, modern Pylos, which became the theatre of the crucial namesake naval battle that tipped the scales of the confrontation in favour of the Greeks thereby paving the road to the official establishment of the independent Greek state. This unique heritage is celebrated in various ways and arguably the most prestigious relevant tradition is the ritual of the 'Reenactment' of Kalamata's liberation every year on March 23.

With that being said it is obvious that the "Kalamata 1821: Roads of Freedom" project sought to honour a very real and outstanding heritage by amplifying the mechanisms and the rituals that connect the present with the past. It did not seek to replace or abolish any established ritual and activity. On the contrary it proposed alternative innovative ways that would breathe new life into the existing traditions by raising the awareness of the local heritage and its means of celebration. Indicatively, a visual exhibition in "Kalamata 1821 Digital Museum" is exclusively dedicated to the ritual or the 'Reenactment' and its journey through time, that is to say since the ritual was first incepted and performed in 1952 (Eleftheriaonline.gr, March 23, 2021).

Furthermore, it was the conjuncture of the bicentenary celebrations that inspired the overall project which was put on track in June 2018. In other words, it was also the simple belief that something special should happen on the occasion that would mark the passing of two centuries since the moment which the revolutionary fire was kindled in Kalamata in 1821. That is to say, a series of initiatives, events assisted by the new technologies with the aim of highlighting Kalamata's unique role in the making of modern Greece. Thus, by enhancing its cultural heritage Kalamata would inevitably heighten its reputation and attract more visitors. Needless to say, by the time the project was making its first steps, nobody could have predicted the advent of the pandemic and the restrictions which it brought along. Yet, despite the difficulties "Kalamata 1821: Roads of Freedom" adjusted to the new conditions, went forth and brought about the scheduled deliverables.

The "Wind of Freedom 1821" Film

The first and arguably most prestigious deliverable of "Kalamata 1821: Roads of Freedom" project was the production of a dramatized documentary by the film production company View Master Films; one of the three branches of the project's research association. The audiovisual material would reflect on the events that led to the liberation of Kalamata in March 23, 1821. Everything would be based on the relevant historical research. As the preparations progressed the idea of a feature-length film gained ground and it was decided that an original movie with an original script would be filmed. Instead of simply narrating the facts via a dramatized documentary it was agreed that there would be a film that would follow the activity of Ioannis Filon, a fictitious senior member of the 'Filiki Eteria' (Society of Friends), in the pre-revolution Peloponnese and specifically in the regions of Messenia and Mani. Through the story of Filon, who travels and roams around under the cloak of a merchant, and his activity as a 'Filiki Eteria' cadre, one develops his/her nderstanding regarding the early 19th century society's economy, daily life, dominant ideas and trends, and ultimately the conflicts of the era; all products of a relevant thorough historical research. The script not only is largely based on historical facts, but also is to a great extent inspired by the activity of Christophoros Perraivos, a prominent 'Filiki Eteria' member who travelled to the Peloponnese before the revolution with the aim of reconciling the powerful clans of Mani thereby sowing the seeds for the emancipation of the Greek nation.

The film was named "Wind of Freedom 1821" and apart from filling a notable gap in the existing 1821-related filmography, due to the manifold effects of the pandemic, it happened to be the only major Greek original production which referred to 1821 and was filmed on the eve of the bicentenary celebrations. Needless to say the pandemic imposed serious impediments on the production of "Wind of Freedom 1821" as well. Not only the initial rounds of filming were postponed due to the general lockdown, but also View Master Films' colleague and renowned costume designer professor Ioulia Stavridou passed away prematurely in September 2020 after being infected with COVID-19 (Tovima.gr, September 9, 2020). Eventually the filming started in the fall of 2020 and for its purposes emblematic landmarks were selected and exploited by holding necessary permits granted by the Ministry of Culture. To be precise, scenes were filmed in Ancient Messini, Andromonastiro, Velanidia Monastery, Methoni Castle, Mourtzinos-Troupaki Tower in Kardamili and the historical church of Aghioi Apostoloi (Saint Apostles) of Kalamata.

As far as the casting is concerned, alongside the professional actors a number of auxiliary amateurs volunteered to embody the passerby crowds in the various scenes of the film. Many of those who hastened to participate happen to be members of folklore groups that have a role in the March 23 'Reenactment'. More importantly the project sought and guaranteed the participation of the main characters of the annal ritual. In other words, those who each year pose as the major Greek chieftains who entered the city, namely Kolokotronis, Papaflessas, Mavromichalis, Nikitaras, Anagnostaras answered the call with enthusiasm. This very collaboration underlines the intention of the project not to sideline or undermine the established norms that honour Kalamata's unique heritage, but to operate with and alongside them by incorporating its

protagonists to additional schemes that reach out to wider and different audiences so as to get closer to the aim of Cultural Heritage Enhancement.

The initial plan for the film was to reach the cinema theatres in early 2021 and to have a panegyric screening in Kalamata in March 2021. Again as a result of the pandemic which not only imposed delays in the actual filming, but also forbid cinema theatres from operating, the plan had to be revisited. Therefore, the movie "Wind of Freedom 1821" had its premiere in July 2021 in Kalamata's Dance Hall (Ertnews.gr, July 29, 2021). A large number of dignitaries and local officials were present in the screening and hailed the result of the effort of "Kalamata 1821: Roads of Freedom" project.

From the filming of "Wind of Freedom 1821" in Andromonastiro, December 2020
Source: https://kalamatadromoieleftherias.gr/wp-content/uploads/2021/01/4545.jpg.

Kalamata 1821 Digital Museum

The second main deliverable of the "Kalamata 1821: Roads of Freedom" project was the creation of a permanent exhibition that would employ the new technologies in order to introduce its visitors to the city's landmarks and highlight their connection with the 1821 era. Since October 30, 2020, and in accordance with the pandemic-related restrictions, this exhibition exists and functions in a room on the ground floor of Kalamata's Old City Hall (Eleftheriaonline.gr, October 31, 2020). This multimedia applications room constitutes a sheer novelty for the city and sets the example for similar efforts in the field of Cultural Heritage Enhancement. The main feature of the digital museum are two touch screens, one of them accessible to people with special needs, through which the visitor can explore buildings and sites of the city that although are heavily linked to the events of the March 23, 1821, the connection in question does not show and thus escapes the passerby's eye. In this regard, through the touch screens the visitor can access visual material and text that raises his/her understanding of Kalamata's distinct heritage in a creative, entertaining, and educative manner. Moreover, he/she is informed about certain routes that he/she could follow within the city and thus to an extent live the experience and feel the spirit of 1821. Alongside the touch screens there are two TV sets playing with English and Greek subtitles material related to

Kalamata's role in the outbreak and first steps of the revolution. Again he/she can watch the main characters of the 'Reenactment' outlining how the Voevoda Arnaoutoglou was forced to surrender the city without a fight to the rebels on March 23, 1821. There is also a screen where, among others, one can study the famous "Warning towards the European Courts", the first ever diplomatic document issued by a Greek authority. Besides the screens, on the very walls of the room the visitor can study digital prints of famous paintings by the renowned painter Evangelos Drakos. The later lived most of his life in Kalamata and his work has been inspired by the city's celebrated liberation. The digital prints displayed on the walls of the room reconstruct the collective memory of the crucial moments before and after the city's liberation. There is also a digital print of the "Warning towards the European Courts". Finally, the set is complemented by a number of authentic artefacts like a firearm and a sword which are carefully showcased.
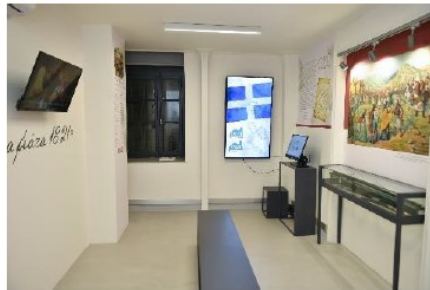
From the opening of "Kalamata 1821 Digital Museum", October 2020
Source: https://kalamatadromoieleftherias.gr/wp-content/uploads/2021/01/Museum-05-768x512.jpg

From the opening of "Kalamata 1821 Digital Museum", October 2020
Source: https://kalamatadromoieleftherias.gr/wp-content/uploads/2021/01/NIK_374-768x512.jpg

Information Technology, Smart Devices and Augmented Reality Applications for Cultural Heritage Enhancement

The most conspicuous repercussion of the pandemic on the "Kalamata 1821: Roads of Freedom" project was undoubtedly the cancelling of a series of events and happenings that were scheduled for March 2020 and March 2021 respectively. This unprecedented situation resulted in the shelving of an innovative tool that aimed at assisting the public to follow the various events. The latter pertains to the use of Augmented Reality (AR) technologies with the scope of enhancing the dissemination of the scheduled events. The term AR refers to technologies that digitally reproduce three-dimension (3D) objects in the natural environment in real time. AR has been applied in numerous and various fields like games, medicine and in military applications (Azuma 1997). AR differs from Virtual Reality (VR) because in the case of VR the user immerses into a holistic digital experience that does not allow him/her to see the real world. On the contrary the AR user is allowed to move and interact with the real world which is enriched with digital virtual objects (Milgram & Kishino 1994). AR has also been employed in the field of culture with various museums using it to promote the interaction

with certain artefacts (Sylaiou et al 2004).

The "Kalamata 1821: Roads of Freedom" project aimed to use AR technologies on the "Kalamata March 2020 Poster" (Zacharias and Panagiotidis, 2019). The poster was designed to interact with a smartphone application that could be downloaded with the mere reading of a Quick Response (QR) code. Thereafter, the user could use this application in order to interact with certain features of the poster. Consequently, the camera of his/her smartphone would recognize and activate material that would then appear on the smartphone's screen. The idea was that the visitor would watch brief videos related to the events that the poster would advertise with the aim of making a strong impression to him/her, thereby increasing the possibility of convincing him/her to be part of the audience. Additional features in the poster would present the project itself and its deliverables. In this regard, the interaction of a certain element on the poster would trigger the reproduction of the "Wind of Freedom 1821" trailer. The fact that the pandemic-related restrictions did not allow the March events to take place deprived the city's public to interact with a rather innovative tool. Yet, the work on the "Kalamata March 2020 Poster" could and should be deemed as part of the project's overall legacy that is destined to be applied on similar Cultural Heritage Enhancement projects.

The logo of the Project seen as a 3D element through AR
Source: Zacharias N., & Panagiotidis V. (2013). Innovative Technological Application in the Project 'Kalamata 1821: Roads of Freedom': The Augmented Reality Poster (in Greek), Presented in the 3rd Panhellenic Conference of Digitised Cultural Heritage – EuroMed 2019, Conference Annals p. 328.

The "Kalamata 1821" Brand

The third deliverable of the "Kalamata 1821: Roads of Freedom" project was the creation and promotion of a distinct brand. Based on the notion that cultural growth cannot occur in the absence of the community that is the bearer of the concerned heritage, the project sought to interact and work together with the local productive and entrepreneurial enterprises. To this end the project, from its earliest phases, organized seminars and workshops so as to get into touch with representatives from the tourist sector, the catering business, dancing schools and produces of traditional local products. The project's scope and ambition had from the outset been to go beyond the necessary anniversary celebrations. In this regard, it aspired to amplify the footprint of the local heritage by contributing to the ever-developing exposure of the city and the region of

Messenia in general. In other words, by introducing the "Kalamata 1821" brand to se-
lected products and services with a distinct connection with the 1821 era, it would for-
tify and expand the collective memory of the events of March 1821 thereby prompting
more people to rediscover them and concomitantly giving a notable boost to the eco-
nomic activity in general, and the tourist industry in particular. All these were being
discussed and organized before the advent of the pandemic which changed everything
with regard to travelling and catering. To be sure, as the economy came to a halt, the
effort to promote the "Kalamata 1821" brand was met with serious impediments yet it
settled some note- worthy scores. Indicatively, local producers were convinced to grow
again the traditional 'rovitsa', a green mung bean in the size of the lentil
(Eleftheriaonline, October 23, 2020). 'Rovitsa' was quite popular in the Peloponnese
in the early 19th century but its crop has been abandoned for decades. The revival of
'rovitsa' was boosted by the will of certain local restaurant owners to introduce dishes
with the "Kalamata 1821" brand. The dishes in concern were inspired by the culinary
habits of the 1821 era that the research of the "Kalamata 1821: Roads of Freedom"
project brought to the fore.

From the presentation at the Peloponnese EXPO, December 2019
*Source: https://kalamatadromoieleftherias.gr/wp-content/up-
loads/2021/01/Gal-4-01.jpg*

Flavours of '21

One of the success stories of the "Kalamata 1821" brand is the "Flavours of '21"
scheme. The above resulted from the tremendously rich material of the historical study
on the period of the Greek Revolution in the Messenia region. The memoirs of 1821
heroes and the written narrations of European travelers demonstrate that the period of
the War for Greek Independence was featured by flavours and products which are still
in use and production, with recipes many times either identical or slightly modified
with necessary drops of creative imagination. To be precise, the research identified
basic elements of the era's food and delicacies which we still cook and thus recognise

as traditional Messenian dishes. That being said, the "Flavours of '21" constitute an inspiration guide for the making of dishes that correspond to the diet of the early 19th century Messenia residents. The "Kalamata 1821: Roads of Freedom" project worked to bring back those flavours to limelight and, in this regard, to motivate both locals and tourists to look for and subsequently taste them as part of their tasting peregrination. To this end, it first reached out to local restaurants and caterings business with many of the latter answering to the call with little, if any, reluctance.

The "Flavours of '21" are also connected with producers of local traditional products. The recipes of dishes drawing their inspiration from the era of the revolution are based, as it was after all expected, on products thriving across the Messinian land. Products like figs, olives, raisins, 'pastelia' (sesame seed candies), 'lalaghia' (local pancakes) cheeses, and wines. Unsurprisingly their producers occupy a prominent place on the manufacturing chain of these special dishes and therefore are expected to be benefitted by their appeal to the public. In this context, the "Kalamata 1821: Roads of Freedom" project, as it should, made an effort, in many respects successful, to facilitate a constructive collaboration between producers and entrepreneurs in the field of catering business.

In the view of the need to make the scheme known to the wider public which by default would boost the chances of success of the entrepreneurs who decided to get involved, the "Kalamata 1821: Roads of Freedom" research association organized two events before the advent of the pandemic. Specifically, in February 2020 and early March 2020 local chefs and associations exhibited their 1821-inspired dishes at the premises of 'Ek- paideftiria Bouga' (Eleftheriaonline, February 14, 2020) and the city's central market (Tharrosnews, March 6, 2020) respectively. Moreover, the project collaborated with Tharros (Θάρρος) one of Kalamata's prominent and traditional local newspaper so as to dedicate its annual edition of Gastroploia (Γαστροπλοΐα) to the "Flavours of '21". The special edition was circulated on the last day of 2020 (Tharrosnews, December 30, 2020) and in its coloured illustrated pages one could read about the dishes bearing the "Kalamata 1821" brand and in which places he/she could find them.

From the presentation of "Flavours of '21" at 'Ekpaideftiria Mpouga', February 2020
Source: https://kalamatadromoieleftherias.gr/wp-content/uploads/slider3/Gal2-06.jpeg

In addition an online educational game «Invitation to a dinner with the heroes of the Revolution» was developed, addressed to the younger visitors of the project's website, providing in an entertaining and fun way, information about everyday dietary, available food ingredients, cooking habits, all these connected with historic places around the city of Kalamata and in Mani and the heroic protagonists of the War of Independence, Kolokotronis, Nikitaras, Papaflessas and Petrobeis Mavromichalis, well known from the liberation of the city of Kalamata on March 23, 1821.

Our approach to presenting nutrition habits of the area of Kalamata and Messenia through this online game comprises a variety of history sections alongside with food ingredients, such as objects, views of costumes and the everyday life, connected with the events that took place for the liberation of the city of Kalamata, on March 23, 1821. Through this concept young learners gain a complete view of the era, expand their knowledge and connect with their past.
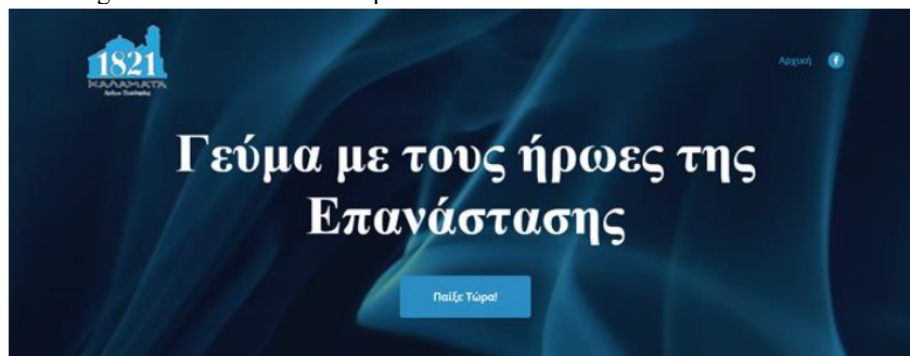
Screen presenting the initial page of the online game

2   Future Aims

Presented above is the overview of the "Kalamata 1821: Roads of Freedom" project and its course of implementation since its launch in June 2018. The project could and should be seen as an exemplary case study in the field of Cultural Heritage Enhancement. It took a city with high cultural added value and significant conjuncture, and sought via a series of distinct deliverables to raise the awareness of the city's heritage to broader audiences. To this end it used innovative technologies so as to bridge the past with the present in a creative, entertaining, and educative manner. Moreover, as the project was faced with the impediments of the COVID-19 pandemic, it had to adjust and revisit its methods and objectives. Consequently, and although most of the goals that the "Kalamata 1821: Roads of Freedom" project had set were eventually achieved, a part of the initial planning failed to materialize. Indicatively, the use of AR in the effort to disseminate public events which the pandemic did not permit to take place. Moreover, the interaction between entrepreneurs, authorities and institutions like the university with the aim of enhancing the cultural heritage of the region should deepen and undoubtedly this is the bet for the future. In the same vein, initiatives like the "Digital Museum Kalamata 1821" should be supported with the enrichment of its content and the upgrading of its applications. The collective experience and accumulated knowledge from the implementation course of the project constitutes a priceless legacy that will prove useful in future schemes of Cultural Heritage Enhancement.

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Community Archive as a Platform for Development and Preservation of Intangible Heritage—the Community Archives Project

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Abstract. BG archives have initiated the Community Archive Project, the objective being to create communal archives that will prepare the material for researching Israeli development towns and Bedouin communities from the bottom – up, fully digital and accessible online. Bedouin towns and development towns are home to thousands of Israelis, and their role in the historical development of the state of Israel is clear. That said, their particular stories have yet to be told, mainly due to the absence of accessible documentation. This ―silence of the archive‖, as it is called in archival studies, inhibits the development of effective research and creates the false impression that ―what you see is what you have‖. Because of the ―silence of the archives,‖ these communities have been portrayed in a similarly passive fashion in public discourse and scholarly research. Their natural growth and development, propelled by internal dynamics as organic communities with ―bottom up‖ growth, has, until now, received little attention from researchers. This project aims to address this gap and to enrich the historical record by including the archival collections of the development towns themselves. The project leans on the theoretical framework and moral motivation of the Canadian concept of Community Archive. We acknowledge that the fundamental challenge for this project is to create authentic archives that will reconstruct the silence of the archive. This paper discusses the meaning of this core challenge, the solutions we formulated and the significant impact this project is expected to have on the thriving field of Israel studies.

Keywords: Digital Archives · Community Archives · Intangible Heritage · Periphery

1. Development Towns in the Israeli Legacy—The Public Image

Immediately after it was established, the fledgling State of Israel opened its gates to Jewish immigrants from all over. In the country's first decade, most of them were Jewish refugees from Europe and the Islamic lands. Of all the mighty challenges that Israel faced at this time, absorbing mass immigration on a scale that tripled its population was the hardest. Most of the newly arrived had left their property behind and had not brought

wealth with them, leaving thestate to shoulder the burden of their integration. The main question was: Where should they be housed?

As it managed the integration project, the Israeli establishment directed the immigrants, sometimes coercively, toareas far from the center of the country—Galilee and the Negev—in order to disperse the population and create an infrastructure for the country's socioeconomic development. The establishment then took responsibility for developing the immigrant townships, henceforth known as development towns.

Over the years, the inhabitants of the development towns contended with problems typical of geographic and social peripheries—distance from centers of social, economic, and political influence and inferior opportunities for personal, economic, and professional advancement. This remoteness and its resulting disparities created social stratification that became permanent in the domains of the Israeli legacy. Namely, the Israeli archetype was identifiedwith the decision-makers: members of the Labor Movement, mostly of European origin, well-schooled, secular, middle-class, and civically active. Contrastingly, those residing in the development towns were identified with remoteness from decision-making, Mizrahi origin in most cases, staunch allegiance to the Jewish religious tradition, lower- class socioeconomic status, and civic passivity.

2.   The Problem—Lack of Resources of the Community Itself

As Israeli society evolved, the development-town communities became marginalized along with Bedouin society, a nomadic society far from Israel's constitutive Zionist ethos. In the 1980s and 1990s, Israel initiated the establishment of Bedouin townships in the Negev in order to draw Bedouin society closer to Israeli society by organizing it—an attempt that, however, enjoyed only partial success. Thus, the development towns and the Bedouin townships remained on the fringes of Israel's society and history. In the past two decades, the communities have achieved demographic growth and economic improvement for reasons including developments in national transport infrastructure. Also, during that time, studies have been written and films made about these towns. Their passive and marginal image, however, persists.

The perceived passivity of the development-town and Bedouin-township communities is hard to correct because the communities have no historical documentation. Hardships of daily life, social heterogeneity, lack of organization, and additional factors have obscured the need for historical documentation that belongs to the communities themselves. The absence of documentation in the development towns is felt all the more in view of the meticulous—if not obsessive—documentation that organizations and communities associated with the Israel Labor Movement went out of their way to produce. Thus, the social gap originally created by historical circumstances is being perpetuated by lack of documentation.

Those who wished to acquaint themselves with the past of these communities via archive documentation found some in the Israel State Archives. Mainly, however, what they found there were references to the development towns in administrative archive material at the state level. Since this material reflects the state's official relationship with the towns' municipal authorities, it is typified by a top-down perspective. One who

studies the state-level administrativedocumentation sees the communities en passant and on a small scale, if at all, and encounters nothing of the communities' independence and dynamism. Due to its administrative nature and its top-down point of view, this material does not— cannot—allow the communities' voices to be heard. In other words, although there is archive material about these towns, there is none *of* them.

The detriment occasioned by the lack of documentation is not confined to the community of researchers and other interested parties. It also, and mainly, affects the communities themselves. The lack of community archives in the Israeli periphery has shunted the community legacy to the fringes of the Israeli story and left it at an oral parochial level. The rich community heritage, one that combines partnership in fate, a shared past, surmounting of obstacles, andmanagement of processes has a definitive role to play in the coalescence and cohesiveness of the community and the forging of community resilience. In its absence, the community loses.

3.   The Solution—Community Archives

It is this double necessity—that of the community and that of research—that gave rise to the community archives project. It is a joint project of the Ben-Gurion Research Institute for the Study of Israel and Zionism and the communities that populate Israel's periphery. Within this joint structure, the communities gather historical materials from their own settings and arrange it in the order of their choosing, whereas the Ben-Gurion Institute redacts the collection to meet archive standards, scans it, and makes it accessible online as a self-standing database atop the digital-management system of the Ben-Gurion Archives[25].

4.   Constructing the Project Framework

At the very beginning of the work, many questions that threatened the project arose. First, what is the conceptual space of the community? A community is a voluntary entity; its conceptual demarcation is vague. This awareness brought up additional questions: Is the municipal authority part of the community or is it the long arm of the state? What about public or semi-public entities such as the community center? — are they part of the community that cannot make its voice heard, or do they belong to the central establishment, whose voice is heard loud and clear? What municipal documents should be included in the community archive? Do engineering-department files, town building plans, and building authorizations tell a community's story? What about private individuals—how far should the archives go in reaching out for residents' personal collections? Such collections are indeed very important, but the collection should not be made overly eclectic. What we considered clear and well defined at the outset turned into something like mercury beads scattering across a floor.

To demarcate and model the project, we strongly availed ourselves of the Canadian

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[25] The Community Archives website. http://www.infocenters.co.il/amc

community-archive model. The idea of the community archive began to blossom in Canada in the protest era of the 1960s. At that time of flourishing social-history and protest movements, the community archive jelled as a contrast to mainstream archives [7]. As awareness of the power of an archive to create a shared social memory grew, so was the Canadian administration increasingly inclined to establish archives by promoting community awareness and collecting materialsof national historical value to ethno-cultural communities [5]. In the Canadian context, the communities at issue were ‒other‖—neither British nor French. However, archives such as the Canadian National Ethnic Archive (NEA), established for this purpose in 1972, evolved differently from community archives such as those of the Canadian LGBTQ community, established a year later. While the former came about as a top-down legacy institution that had thegoal of collecting material of national value, the latter rose from the grassroots due to community members‘ growing awareness of their community affiliation. Much time passed, however, until the community-archive idea would jell intoa model [4].

Andrew Flinn [3, 4] associated a community archive with three elements acting in concert: autonomy, independence, and authenticity—autonomy because the archive is created for the purpose of promoting shared community goals and not national or governmental aims; independent because it is managed independently of theestablishment; and authentic in the sense that it revolves on the axis of community events and ideas.

Following Flinn‘s [4] model, we adopted these three elements—authenticity,autonomy, and independence—as fundamentals of the project. We implemented two of them, authenticity and autonomy, at once.

5.   Authenticity

We vacillated about including municipal authorities‘ administrative archives in the community archive. In Israel, municipal authorities are closely tethered to central government and sometimes appear to be long arms of the state. However, municipal authorities have salient characteristics of leadership, not only because they were democraticallyelected. Municipal politics is typified by an intimacy that evolves from close circles of acquaintance within the community. It emanates from the mayor‘s office to the town square, the street, and the local café. The mayor and his or her staff are highly accessible to the public. The time that passes between an authority‘s action and its outcome, although relatively short, is long enough to allow public debate to take place. Plainly, a municipal authority is above all a local leadership that grows from the grassroots together with the community. For this reason, we decided to include municipal-authority materials in the archive. Like the municipal authority, public and semi-public companies that operate in the community typically have local-leadership characteristics and we included them, too, in the community archive. We found reinforcement for our decision in the commonality of this model in municipal or local archives abroad, which acquire archive material of importance to the community that traces its origin to the domain of municipalgovernment [3].

We also wrestled with the question of what administrative-archive documents to incorporate into the community archive. We decided first to deal with files of historical

and social value for the history of the community. By and large,community affairs and energies are channeled to the mayor's bureau, the municipal council, and the education, culture, and welfare departments. Consequently, these are our top-priority blocs. Turning to internal prioritization within each bloc, we also sought the community imprint that was created in the records. Therefore, we chose to prioritize the following: minutes, correspondence, financial statements, photographs, audio and video clips, and, finally, press clippings and official publications. We did not gather materials from engineering and revenue departments even thoughthey are of much interest. Engineering departments retell the story of a town's physical development; obviously, a community archive is interested in their files. In practice, however, collecting them is problematic due to their enormous quantity. Given the time and budget limitations of the project, we cannot deal with recording, describing, andscanning such voluminous records. Due to the painstaking management of engineering-department records, however, anyone who is interested in these materials can access them on their own, with no need for the mediation of the community-archive project. Thus, due to a technical constraint but one that has a worthy explanation, we decided to forgo the treatment of engineering-department files [8].

Irrespective of what one might think, revenue-department files contain fascinating data for an understanding ofcommunity dynamics. For example, the community's payment ethic can signal times of plenitude or distress, community awareness or its absence; it can also serve as an excellent overall metric for community resilience. From theresearch standpoint, however, such materials should be approached by distant reading and statistical data processing. To deal with these materials, one needs to access the body of documents itself by means of optical character recognition (OCR) decoding. Here again, time and money constraints forced us to do without these materials for thetime being.

The third question was how to deal with residents' and organizations' private collections. The main problem that we faced was eclecticism. We were concerned that the materials to be gathered into the archive would reflect the extent of motivation of those submitting them and not their degree of importance. We also feared that some important materials would be collected but others, no matter how important, would elude us totally. As a result, the community tapestry would be missing some of its fibers. For example, if the Smiths and the Joneses submitted their collections and the various John Does did not, the community's features would be illuminated only in the light of the two families that submitted their materials; the roles of all the others would not come through at all. In other words, the problem traces not only to the materials submitted but also to those not submitted.

We found it better, however, to start gathering some private collections and work our way up than to collect none. Thus, we opened a door through which others would come forth and donate their collections. Our guiding rule was to collect materials that pertain to the community—photographic and written local documentation and personal interviews.

6. Autonomy

How should a community act when it initiates the establishment of a community archive? The participants in the project should act as members of the community and not as representatives of the establishment in order to retain the diverse social dimension. As Howard Zinn says, the archive should reflect the ordinary people—the peasant, farmer, artisan, and midwife [7]. The community as a group has much power, immeasurably more so than an individual, in making order out of a voluminous archive. Thus, the evaluation, organization, and description of the archive material should accord with community traditions and agenda [7]. For this purpose, each community appointed a steering committee for its archive. This committee determines the archive's priorities—which materials to collect first, which later on, and which not all; it also determines the structure of the archive and the activity by which it reaches out to thepublic and collects its materials.

As we worked on the community archive in Hura, a Bedouin township, we found an epitomic example of the autonomy of an archive, one that illustrates well how much autonomous management creates an authentic archive. In one of the working meetings where the hierarchical structure of the archive in Hura was to be determined, we suggested an internal division that had been established for a community center in another development town where we were active subdivisions for sports, culture, and advertisements. The coordinator, a member of the Hura community, proposed an additional subdivision: women, divided internally into sports and culture. Here is a good illustration of the importance of an internal order that reflects community traditions and agenda: In a traditional religious society such as that of the Bedouin in Hura, integrating women into culture and sports activity is so important as to deserve separate expression. What was right for the community in Mitzpe Ramon, for example, is not right in Hura. Therefore, to allow the archive to reflect the Hura community's singularity and authenticity, we went out of our way to hire a local coordinator to build the archive and appoint a steering committee that would help to determine its structure and priorities. The steering committee was composed of representatives of the community's sundry groups in order to fullyreflect the diversity of the community mosaic.

In sum, unlike a municipal authority or an organization that has a clear organizational structure derived from legislative provisions, a community has no clear contours. Over the years, it waxes and wanes as a living organism andleaves the imprint of the changes that it undergoes in its history. Its image takes on and sheds form; there is no similarity between its image at one point on the community timeline and at another. Therefore, when we wish to createan archive that will reflect the community over the years, we must first define what the community is in order to specify the nature and type of materials that should be incorporated into the archive. To model the project and limit it so that we do not scatter it in all directions, we avail ourselves of the Canadian community-archive model and the anchors that Andrew Flinn [3, 4] set forth. As we have seen, two of Flinn's anchors serve well in sketching the demarcation lines of the communities in our project: authenticity and autonomy.

7.   Future Possibilities

The Community Archives project is still in its infancy. Four archives have been established thus far and another one is about to start up this year. The interest the project has aroused, however, illustrates its immense potential. The future possibilities of the project may be divided into two. The first is quantitative growth. In Israel, dozens of communities are situated in cities established by government decision and do not maintain archives. The Community Archives project, or parallel projects, may expand and grow in future years and enrich the reservoirs of historical information. The second possibility relates to technological development. The materials already being gathered for the project are analog—documents, photographs, and magnetic media—that were digitized and made accessible by the project's pool of information. The copious thus information gathered can and should be upgraded technologically. The use of OCR can allow photo files to be put to full-text computational uses. Town-building plans uploaded to GIS systems will become computational tools for studies in social geography. The digitization of local folklore— Bedouin dance, community memorial rituals, folk dance—by means of projects such as TERPSICHORE can provide a basis forcomputational use in the field of culture studies [1, 2, 6]. Thus, the Community Archives offers a huge number of possibilities.

8.   Conclusion

In one of the planning meetings for the establishment of the community archive in Ofakim, a participant from the community told a story that went more-or-less this way: ‒We have a legacy. It isn't written down. But if I go out on Friday afternoon into the neighborhoods of the city with a guest from elsewhere, I can tell him the history of each and every family by the aroma of the food they're cooking at home for the Sabbath.‖ Each community taking part in the project has a glorious legacy, a vernacular legacy, an oral legacy that stayed within the community's boundaries and failed to enter the Israeli textbooks and the pastures of memory in Israeli time and space. As a result, it was doomed tooblivion and its bearers to marginalization in the country's narrative. In the community-archive project, we wish to gather up the written, photographic, and narrated testimonies and organize them into the template that the community established. The priorities and management of each and every archive are autonomous, flowing from the community itself; the university merely stewards them. Residents are mobilized largely to submit materials, and many gave their consent to be interviewed for the project. The authenticity of the archive is evident also in that the more involved archive managers are in the community, the more responsive are the community residents.

We hope and believe that the project will yield a harvest of documentation with which the community and researchers may tell the communities' story and heritage beyond their borders, empower the communities, and narrowtheir distance from the social periphery to the center.

How badly does the belated construction of documented legacy crowd out oral

legacy? How much does the eagerness to tell a community's story, in order to move the community from periphery to center, obscure the community's vernacular legacy? It is too early to tell. These and other questions will become clear in the course of comprehensive future research on the topic.

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Improved Resilience and Sustainable Reconstruction of Cultural Heritage Areas to cope with Climate Change and Other Hazards based on Innovative Algorithms and Modelling Tools

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Abstract. Our proposed framework aims to efficiently train a network of fellows on the field of the resilience of Cultural Heritage (CH) areas and historic cities against Climate Change (CC) and other types of hazards. Towards this direction, the proposed framework aims to introduce a research framework for downscaling the created climate and atmospheric composition as well as associated risk maps down to the 1x1 km (historic area) scale, and specific damage functions for CH materials. Applying atmospheric modelling for specific CC scenarios at such refined spatial and time scales allows for an accurate quantitative and qualitative impact assessment of the estimated micro-climatic and atmospheric stressors. Our proposed framework will perform combined structural/geotechnical analysis of the CH sites and damage assessment under normal and changed conditions, based on the climatic zone, the micro-climate conditions, the petrographic and textural features of building materials, historic data for the structures, the effect of previous restoration processes and the environmental/physical characteristics of the surrounding environment. The data coming from installed monitoring system will be coupled with simulated data and will be further analysed through our data management system, while supporting communities' participation and public awareness. The data from the monitoring system will feed the Decision- Support-System (DSS) so as to provide proper adaptation and mitigation strategies. The produced vulnerability map will be used by the local authorities to assess the threats of CC (and other natural hazards), visualize the built heritage and cultural landscape under future climate scenarios, model the effects of different adaptation

strategies, and ultimately prioritize any rehabilitation actions to best allocate funds in both pre- and post-event environments. To train the fellows, our approach will make use of extensive workshop and training sessions, as well organise summer schools.

Keywords. Cultural Heritage, Climate change, Hyperspectral data, Data Management System, Visualization, Monitoring

1. Introduction

Recent studies highlight the potential impact of Climate Change (CC) and geo-hazards (such as landslides and earthquakes) on historic areas hosting Cultural Heritage (CH) sites and monuments[1], which in turn yield significant adverse impacts on economies, politics and societies. The deterioration of CH sites is one of the biggest challenges in conservation; aspects such as building technologies/materials, preventive measures and restoration strategies, resilience and adaptation methodologies must be considered[2]. Up today there is no specific process towards understanding and quantifying CC effects on historic areas; combined with the limited strategies on CC-related issues, it becomes difficult to assess quantitatively and qualitatively the impact of various climatic and other parameters on the CH sites[3]. These issues form an integral part of the necessary support that should be provided to governmental bodies and cultural authorities to properly adapt their policies, in the short and long term, towards deploying sustainable mitigation plans and providing efficient reconstruction of the CH parts that have been damaged.Finally, the absence of communities' participatory approaches to the overall planning of the historic areas is a main challenge to tackle.

The proposed framework aims to efficiently train a network of fellows on the field of the resilience of CH areas and historic cities against CC and other types of hazards. The network aims to use proper modelling tools and methods, innovative technologies (terrestrial and satellite imaging for wide-area inspection, advanced machine learning techniques, etc.) to deliver an integrated platform for resilience assessment of CH areas, addressing multi-hazard risk understanding, better preparedness, faster, adapted and efficient response, and sustainable reconstruction of historic areas [4]. The proposed frame- work will take into account the local ecosystems in the areas of interest, mapping out their interactions and follow a truly sustainable reconstruction approach at technical, social, institutional, environmental and economic levels [5]. To this end, it will incorporate active communities participation, support new business models based on the concept of a "load-balancing" economy, (using an algorithm that acts like a "reverse proxy", distributing client traffic across different companies within the same sector) and offer financial risk-transfer tools (parametric insurance,Catastrophe-CAT-bonds) that can ensure the immediate funds' availability to fuel timely build-back-better efforts.

2. Related Work

Protection of the Cultural Heritage monuments from Climate Change and other types

of hazards, assessment of their condition and restoration actions are research areas of great interest. Moreover, their impact on social systems plays a significant role in sustaining the economy. At European level, there exists significant efforts in understanding and quantifying Climate Change effects on the built environment and on heritage assets in particular, introducing and utilizing a wide range of scientific techniques, analyses and assessment approaches [6 – 17].

A series of significant scientific challenges regards the effective assessment of the state of preservation of the cultural heritage assets, the diagnosis of their deterioration mechanisms and the prevailing environmental phenomena that cause damage to the surfaces and the structure of the heritage assets, as well as the evaluation of the detrimental effect of past inefficient protection or rehabilitation interventions [19]. The role of non- destructive testing in providing crucial information to address these challenges is becoming more valuable, especially as the technological advancements enable non-destructive data to be fully integrated in a 3D approach of understanding the structure and the impact of the environment on the asset [20], [21]. In [21], the authors exploited infrared thermography to diagnose materials decay taking into account different historical periods.This approach is used as a tool in the diagnostic level, for the detection of invisible superficial cracks or/and disparities, as well as the revelation of moisture presence within structures. In [22], the authors introduced a fuzzy clustering approach for extracting the local variance feature from an image. This method applied to define the transitional features implementing hybrid segmentation. In [17], the authors proposed a framework to boost the development of efficient Climate Services in Europe, by supporting research for developing better tools, methods and standards on how to produce, transfer, communicate and use reliable climate information to cope with current and future climate variability. In [18], the authors develop regional networks that will connect actors of the wood mobilization value-chain from forest owners to relevant regional authorities but also forestry industry to cover and find answers to the main challenges in the field, especially the sustainability of the wood mobilization. In [11], the authors presented the total reported economic losses caused by weather and climate-related extremes over the period 1980-2017 amounted to approximately EUR 453 billion (in 2017 Euro values).

There are also ongoing similar projects for the resilience of cultural heritage areas against climate change. In [14], the team applied the circular economy principles to cultural heritage adaptive reuse for achieving environmentally, socially, culturally and economically sustainable urban/territorial development. In [15], the team's mission was to create an ecosystem of Citizen Observatories to help move citizen science into the mainstream and demonstrate COs as a valuable component of managing environmental challenges and empowering resilient communities. Therefore, several key instruments applied to target, connect and coordinate relevant stakeholders: fostering communities of practice to strengthen and consolidate the current knowledge base of COs and expand the geographical reach to different target groups via several toolkits. In [23], the team will develop a disaster risk management framework for assessing and improving the resilience of historic areas to climate change and natural hazards. Tools and methodologies will be designed, in collaboration with the four European municipalities (Bratislava, Camerino, Hamburg, and València), for local authorities and practitioners, the urban

population, and national and international expert communities. In [24], the project will provide the tools needed to understand the effects of climate change, extreme weather conditions, the ravages of time and intense geological phenomena on cultural heritage monuments in Greece, Italy, Norway and Spain (representing different climatic zones).

3. Our proposed approach

Our proposed framework will coordinate the existing expertise and research efforts into a collaborative plan to offer a comprehensive Transfer of Knowledge (ToK). The multi- scale approach to ToK, teaching, research and skill share will be able to encompass the full range of methodological advancements that are otherwise only available at high- class individual research centres across Europe. In our proposed

Table 1. Research projects, milestones and mitigation plans

Climate Change approaches	Year
FP7-ERA-NET - Cofund network: ERA4CS- European Research Area for Climate Services [17]	2016-2021
JPI Climate - Joint Programming Initiative Connecting Climate Knowledge for Europe Strategic Research and Innovation Agenda [16]	2016-2025
DG ECHO - Overview of natural and man-made disaster risks the European Union may face [6]	2017
European Environment Agency (EEA) - Economic Losses from Climate-Related Extremes [11]	2017
CLIC - Circular models Leveraging Investments in Cultural heritage adaptive reuse [14]	2017-2020
WeObserve - An Ecosystem of Citizen Observatories for Environmental Monitoring [15]	2017-2020
ROSEWOOD - European Network of Regions On SustainablE WOOD mobilisation [18]	2018-2020
SINCERE - Strengthening INternational Cooperation on climatE change Research [13]	2018-2022

framework, we have adopted for each research pillar an iterative research methodology, in a way to minimize all the possible risks (training management) and guarantee a smooth running of the framework.The research methodology is divided into four main phases, based upon the PDCA Model (Plan-Do-Check-Act).

Phase 1: Definition-and Analysis of Requirements. This will take place at the beginning of each research step. Requirements will be defined in respect to the resilience and risk assessment of CH areas and historic areas against CC and other hazards, and in close collaboration with the well-known members of the project
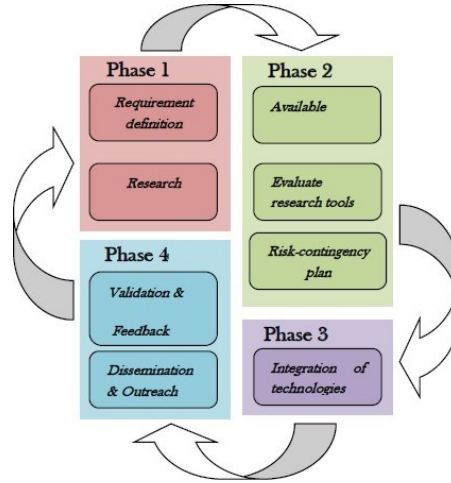
Figure 1. Iterative Research Methodology For Each Research Step

Phase 2: Research. It is responsible for introducing the main research components of each WP. More specifically, it includes identification and exploitation of best available technologies, anticipating a risk and contingency plan in case that the designed or adopted technology is not able to fulfill requirements of Phase 1 and introduce objective benchmarking tools the for evaluation of the research tools.

Phase 3: Implementation. It regards implementation aspects and system integration issues. During this phase collective intelligent framework able to integrate the entire distinct component together in a common final integrated platform will be established. All previous results are interlinked together. On one hand previous phases' and research steps' outcomes are integrated, and on the other hand platform's architecture and research shortcomings are detected and surpassed, to stay aligned with our approach's objectives and timeline.

Phase 4: Validation, Dissemination, Outreach and Feedback. Validation will be accomplished using the benchmarking metrics derived from the research phase and the recommendations as well as consultations of the end-users. Dissemination and outreach activities are designed in a way to ensure maximal impact and contribute to the relevant CH policies, by covering the full chain, ranging from research, academia, industry, policy makers and CH stakeholders to general public (including pupils). Throughout the different tasks in each segment of this approach, there are inter-relations between different phases, to guarantee that the main research objectives will be addressed and realized to the maximum extend.

3.1. Strategic Objectives

Our approach deals with 8 Scientific and Technical Objectives (STOs). The first STO refers to reliable quantification of climatic, hydrological and atmospheric stressors. Our proposed framework will propose existing numerical modelling tools in the

targeted historic areas in order to cover interactions from short to the longterm. This data will estimate indicators for the potential impacts of CC on historic areas at a local level, in- cluding aspects created by their longterm exposure on air pollution and micro-climatic conditions. Lastly, a Land Surface model will be proposed to account the impact of climate and atmospheric composition on soil surface parameters. As a result the model will quantify the structural and thermophysical impacts on the structural elements.

Second STO refers to multi-Hazard modelling which will cover single, cotemporaneous and cascading hazards. Moreover, inundation maps will be provided for specific catchments by using hydrological modelling for various precipitation capacities. As for seismic hazards, they will be quantified based on their seismic intensity levels and their spatial/temporal distribution for the historic areas, via stochastic modelling approaches. Our approach aims to provide input for the relevant regulatory framework, on the load models for climatic actions.

The third STO includes the estimation of Structural and Geotechnical (SG) safety risk of the surveyed structures. This estimation will be achieved via Simulators that exploit monitoring data from various sensors.Besides our partners expertise on SG engineering and on materials' deterioration, the consortium will also assess the current con- dition of structural, non-structural and content components of all buildings in the historic area. These models will validate simplified numerical or reduced-order physical models in order to achieve more accurate assessment of the impact of the climate pressure and geo-hazards. These models will also define related damage/vulnerability functions and capacity thresholds of the aging structure, optimise any reconstruction or retrofitting actions and finally evaluate the response of the structure in the future, for a large number of hazards scenarios with/without the proposed adaptation and mitigation measures.

The fourth STO refer to the environmental and material monitoring including state identification and damage diagnosis. In particular, Computer Vision (CV) and Machine Learning (ML) algorithms will be proposed to exploit sensors some of which mounted on vehicles and drones to get a precise inspection of the selected CH sites. Some of the expected outcomes will be 3D images of the wide area, damage assessment and structure deformation maps, surface material classification and degradation analysis and contour diagrams for the temperature profile. Additionally, spatial-temporal 4D (3D plus time) maps will assess the temporal damages of sites and the impact of the climate on its conditions. Moreover, ML-based algorithms will be used for the assessment of land cover changes in the broader area, and overall estimation of the environmental condition of the CH site. Lastly, each site will obtain integrated conventional sensors (e.g., environmental and structural) and low-cost microclimate-stations.

The fifth STO includes the design of a Cultural Heritage Resilience Assessment Platform and a Decision- Support-System (DSS), enabling communities' participation. This platform will support the implementation of various analysis, modelling tools and damage/vulnerability functions, while obtaining information from various sources (literature, surveys, satellite, etc.) with different levels of granularity (building/block/regional level) together with the associated uncertainties. These tools will be desingned on a Geographic Information System (GIS), based on the interface of an existing open-

source hazard assessment software (e.g., OpenQuake) and network simulators (e.g., EPANET, traffic simulators), and using socioeconomic impact analysis tools to produce both quantitative and qualitative loss estimations (e.g. financial loss estimation, reputation impact, morale impact etc.) As a result the platform will enable the simulation of different scenarios offering total risk and impact assessment of hazards on the structural/non-structural components, testing of various risk management approaches, plans, strategies, counter- measures and adaptations for the selected structures, understanding the sensitivity of system assets, structures, and services to various hazards and interdependency due to cascading events.The platform will also help the development risk-based response strategies adapted to specific scenarios and defining efficient standard response procedures. Lastly, this platform will assess and quantify the overall resilience of the CH area with a holistic quantitative approach.

The sixth STO proposes the development of an initial research and training net- work which will support the development, effective integration and increased utilisation of existing and the proposed framework's innovative technologies and techniques. Our approach will encourage researchers and professionals to go beyond the current state-of-the-art in the relevant application domain, through a multidisciplinary and international approach based on a wide spectrum of technological tools and methods that can contribute to a more effective CH resilience and conservation policy.

The seventh STO includes the provision of a Handbook that presents: a) technical information on sustainable reconstruction of historic areas, b) proper adaptive response strategies for CC and other hazards scenarios, c) post-disaster reconstruction examples, d) practical checklists and references to assist practitioners, field-workers, cities and cultural authorities, etc. in better decision making, e) recovery requirements for various sectors, f) information on financial tools to mitigate risk, including a novel set of CH-area-specific insurance-linked securities (e.g., CAT-bonds) designed to cover different degreesof extreme CC and non-CC event severity and g) guidelines and techniques to encourage, facilitate, and develop bespoke reciprocal agreements between same type of businesses for timely service recovery. Last STO refers to build up specific complementary and market-oriented skills to allow the European researchers and professionals to face the new challenge in terms of technology development and future services.

4.   Impact of our proposed approach

The main impact of this approach is to form an international and inter-sectorial network of organizations working on a joint research programme in the field of Resilience of CH focused on market needs. The participants will exchange skill and knowledge, which will allow them to progress towards key advances in different techniques, and have a better understanding of the research culture in different countries and sectors.Technically, our proposed framework is expected to have a significant impact on a variety of technological aspects (tools and algorithms) related to the capturing, visual computing, animation, interaction, collaboration, visualization, and interoperable metadata description, all in the context of European framework of Copernicus, Galileo, CH, etc. The expected technological impact is of paramount importance given that our approach will

address a series of previously unexplored beyond the state-of-the-art areas that however have recently emerged as high value scientific objectives in research frameworks outside Europe. Moreover, the proposed framework promotes a unique think tank in the field of CH eliminating the cultural, political, linguistic but more importantly the geographic boundaries that sometime delay the materialization of new ideas into practical applications. The focus however of this pioneering think-tank is to execute in an intra-disciplinary fashion so that geographic and other boundaries reverse into advantages of new "added value" pan-European co-laboratories.

4.1. Research Collaborations

There are two categories of research collaborations during our approach. The first category aims to achieve transfer of knowledge between research institutions and to improve research and innovation potential at the European and global levels. In particular, the high quality of this approach will allow researchers to fully explore such high-end technology capabilities and better comprehend the benefits of their use. This will allow individuals from different scientific and technical fields to integrate their knowledge and practical expertise for the benefit of the end-users.

Our approach is designed to (i) make research careers more attractive to the new generations; (ii) make early stage researchers more attractive candidates for their future employment positions by creating very specific skills requested by the market and (iii) improve the skill and technical background expertise of staff engineers already employed in the industry. This approach will hence ensure significant impact on the key skills, career prospects and employability of all its candidates. Each individual researcher will gain immediate and longer-term benefits of the proposed research and training programme in terms of enhancing skills in technology and interpretation methods. The programme is envisaged in a multi-disciplinary framework that will allow researchers to foster their creativity. Through the mobility actions, our approach will provide exceptional opportunities to have a complete and in-depth hands-on experience on scientific instruments and software required for monitoring the major risk affecting the CH and historic areas. A well-structured work plan makes an effective connection between academia and the private sector with actions such as training seminars (complementary skills) that will be organised and implemented by SMEs. Network-wide events and individual projects will broaden the researcher's background knowledge in similar research areas. Researchers will become familiar with a wide range of research methods related to this subject. The network-wide events will also encourage researchers to develop or strengthen other complementary fields of expertise such as management skills, writing projects proposal, team working and leadership skills. Researchers will be actively involved in the integration of new and traditional techniques of archaeological sites monitoring mapping in different environments, thereby broadening the traditional academic research training setting and eliminating cultural and other barriers to mobility.

The second category refers to research collaborations resulting from the intersectoral and/or international secondments and the networking activities implemented. Firstly our approach aims to foster already existing collaborations within consortium. In particular, the members of the Knowledge Alliance have participated in several joint experi-

mental research efforts in the field of ICT-aided protection of CH assets. This approach forms the most suitable framework for amplifying on-going collaborations between its consortium members. Moreover, the commitment and the expertise of the consortium as well as the proposed research training, guarantee sustainable use of the results and future successful cooperation.Secondly, our approach plans to create and maintain long-lasting collaboration between the participants. Generally, the knowledge and skills acquired during this approach will contribute to significant collaborations between enterprises and academic/research institutes which will last long after the end of this approach. All the participants have strategic interest into collaborative efforts towards improved resilience of CH and historic areas. On the one hand, the enterprises are seeking for new technological toolkits arising from the fields of CC and hazards modelling and tools, innovative CV/ML techniques and tools, digitization and visualization. Additionally, the academic institutions anticipate to enormously benefit from their interaction with the private sector in terms of optimizing RD and aligning it to real-world needs.

Last but not least the project intends to strengthen the competitiveness of the participating enterprises and institutes. The economic value of CH has been studied on the national, regional and local levels. National studies often contain comparisons with other countries. There are also studies providing data by sector, such as museums, and studies of the economic impact on a micro level, providing assessment on the level of separate heritage institutions, such as museums, libraries, archives or sites. The literature review has identified that the economic value of CH is currently assessed using conventional and well-known economic impact models. Among other subsectors within the cultural industry sector, CH is not assessed as an explicit subsector or branch but, rather, as a cross-cutting prerequisite for economic development, particularly for the tourism industry and job creation. Such evidence based on the interconnection between CH and the emerging research of the creative industries sector is a recent phenomenon. The consortium aims to conduct a specialized business analysis to predict potential revenues on different types of target users (CH researchers, visitors of the historic areas and the wider public of the areas)

4.2. Improvement Of The Research And Innovation Potential

4.2.1. Regional CC maps

The proposed framework will advance the partners capacity for reliable downscaling of climate simulations and extraction of robust climate indicators in the local- to site-scale. By enabling access to an extensive database of high-resolution (12km) RCM simulations as driving climatology, a set of novel approaches for the assessment of climate and micro-climatic effects in very small scales will be evaluated and validated. In the framework of the assessment of climatic stresses on CH sites, the relevance and representability of primary climate parameters (time-series) and compound indicators for local-scale applications will be evaluated. The assessment framework will integrate a two- way (meso/micro-scale) coupling scheme in a completely new area of application, namely the determination of flow fields in these scales related to the CH sites, as well as the transport and deposition of air pollutants under specific, realistic scenarios of climatic stress.

4.2.2. **Hyper/Multi-Spectral Imaging**

The proposed framework innovates on integrating ground multi/hyper-spectral imaging analysis techniques on automating the diagnosis of the current assessment status of a CH monument/historic area site. This exploits the concept that different materials and/or decay phenomena are depicted on spectral bands using different signatures and thus allowing discriminant analysis. During this approach, the multi/hypespectral imaging analysis is carried out at different temporal instances to get results about degradation rates and potential acceleration phenomena that are caused due to CC and environmental impacts.

4.2.3. **Data Management Systems (DMS)**

Having already gained a significant experience in the data management and big data technologies, the consortium aims to build upon these and expand this knowledge to another application domain that is the preservation of CH. Our approach aims to increase the odds of developing a novel DMS that will enter the relevant market and enhance our service portfolio.

4.2.4. **Visualization Systems**

The proposed framework will advance products to support enhanced 3D geospatial datasets, which will make them unique for this application. This new kind of knowledge will benefit to the large community of its product users, in different domains ranging from crisis management, civil security, to the general industry, to better understand and exploit the dynamic dimension, as well as other degrees of freedom, of geographic sites. It will also enable the community of developers to create new applications supporting massive dynamic geospatial datasets.

Acknowledgement

5.   Conclusion

This work provided a short introduction of our approach which propose a framework for the field of the resilience of Cultural Heritage (CH) areas and historic cities against Climate Change (CC) and other types of hazards. Such techniques has the potential to encourage governmental bodies and cultural authorities to deploy sustainable mitigation plans and provide efficient reconstruction of the CH parts that have been damaged. The proposed framework is expected to improve people's knowledge, providing them with training sessions and summer schools and allowing them to fully explore high-end tech- nology capabilities and better comprehend the benefits of their use.

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New methods for the drawing of the *Archaeological Forma Urbis*: Bohob's research in Catania

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Abstract. Nowadays, in the centre of Catania, the several visible archaeologies seem more irrelevant objects than ancient treasures. This is due to fact they are fenced in scattered holes without any common idea. "Bohob", the group of architects we belong to, is conducting a research in order to address this burning problem by means of a two-pronged approach.On one hand, by the Drawing of the City, a large plan of Catania including all the archaeological ruins representing their integral role in the building of the city and in forcing the shape of the modern town; on the other hand, by the Minimum Projects, consisting of shrines on a citywide scale in which the ruins are enclosed as well as appearing as gems and not as temporary objects in the urban pattern. The core essence of the research is studying the relationship between the archaeology and the city via an interdisciplinary method based on the brand-new digital forms of representation; starting from considering the ancient as "active part" in the construction of the town and its little fragments as gems mounted in the urban pattern.

Keywords: City, Architecture, Archaeology.

1   Background

In Catania, a submerged city shows episodically itself to the emerged city through its ruins fenced in "holes" scattered in the city centre. The authorities' action does not take into account the extraordinary condition in which two cities overlap each other. Hence, the archaeological areas are the dramatic expression of the lack of any point of view on what these remains and these places can be for the city.

The steps followed by the authorities could be summarized as follows: Choosing a place, defining a measure, fencing in the perimeter. Those who have to found a city are faced with the same successive steps, with an abysmal difference, however, contained

entirely in the purpose of those gestures: the city is founded to *include* life into it, the archaeological area to *exclude* it. In the name of protection *tout court*, the inhabitants lose part of the vital space that until recently belonged to them. Nevertheless, the worst aspect of this appropriation of space is precisely the lack of a subject driven by the need to occupy: i.e. the absence of an "enemy" who reasonably wants to snatch part of their space from the inhabitants.

Furthermore, in the intentions of these subjects, we do not believe lays a clear desire for forced appropriation of space, if only because it would be in clear contradiction with the one principle that seems to guide their actions from time to time: *neutrality*. From the most clamorous action (such as the location of an area to be excavated) to the smallest (the assembling of fences), neutrality is the only minimum common denominator. Other aspects, such as the temporariness and reversibility of the intervention, are linked to neutrality as the only drive qualifying the choices. They tend to start from the idea that any transformation involving archaeology must be temporary. In fact, it is precisely because of this way of proceeding that the ruins in the city are isolated presences in scattered holes (*objets trouvés*). The lack of serious vision generates a relationship of indifference between the inhabitants and the ruins, in which the one is alienated from the other. The extraordinary preciousness of the archaeologies is degraded to the point of being unwanted.

Actually, looking at an excavation is highly unlikely to recognize a project (intended as a transformation sustained by an idea), but instead only interventions: The intervention is a *fact*, the project an *idea*. The project should be based on an assumption, on a precise point of view on the world and for this reason it is always "partisan", each time compromising. A project always chooses sides, and we believe that this is what frightens who do not have an idea about the ruins. The project must necessarily be a vital aspiration towards the possibility of a place for people.

Moreover, a choice that turns out to be wrong in time is still far better than not deciding. A wrong project, if it is really the expression of an idea, will really condition the lives of the inhabitants, not establishing a relationship of indifference with them but rather one of confrontation. "*Polis*" is the root of "polemic", a city without struggle is a dead city. The citizenship renews its identity above all in the face of an "enemy", in the face of what it recognizes as in contrast with all its values. However, a contrast requires at least two opposing visions. In the face of neutral intervention designed to affirm nothing, the clash is denied, here reigns misunderstanding and indifference, serious dangers for the health of a city. The lack of choice behind archaeological enclosures produces not only spaces that are not frequented by people, but real *voids of meaning* for the city. Truly, the authorities' blindness causes serious damage to the quality of the relationships of the people. The paradox is therefore to recognize in those interventions guided by neutrality some drastic and harmful choices precisely because they are not controlled and never reasoned. For instance, the "choice" of focusing only on the ruin itself, the "choice" of making it totally visible and on the other hand the "choice" of keeping it closed to human presence, the "choice" of making the hierarchies of a place incomprehensible and destroying its spatiality. We can rightly be convinced that none of these decisions has ever been the object of conscious reflection on the authorities involved in the protection of the archaeological areas. Nonetheless, these are precisely the

consequences that affect the city making archaeological excavations similar to military areas, restricted areas for people.

All things considered, only the project can continue the construction of the city because it aims to enter decisively into its structure by re-establishing new relationships. Moreover, we do not believe that it is possible to design by looking at the archaeological area as itself and not as part of the city. This sectorial and watertight compartmentalized approach deprives the city of its vital space. The archaeological area is nothing more than *another city* that has emerged for some reason and with which we can attempt to establish a credible and plausible relationship with the *current city*, reaffirming that the city makes sense if it is a space for relationships.

2   The "Drawing of the City of Catania"

All these considerations about the nature of a city and the geographical space to this city have no meaning if not expressed through drawing. Representation is capable of saying all this with force and clarity.

2.1   The Plan by Sebastiano Ittar

In Catania, there is already a drawing of the city that is undoubtedly the most remarkable work ever been done: "La Pianta Topografica della Città di Catania" by Sebastiano Ittar. It is the most important work on the shape of the city of Catania because the plan has been able to produce two notable shifts inherent in its representation.

The first gap consists in the fact that the Plan is the first scientific drawing of Catania: Ittar manages to complete in about 25 years a huge effort to restore the measure of the city. The Plan is the first orthogonal projection of Catania; no one had ever seen the city in its entirety and in its exact dimensional relations. In this sense, it is clearly an invention: for the first time the shape of the city appears, is revealed in a drawing.

The second deviation made by Ittar lies in his idea of the city. The orthogonal projection of the city would have been sufficient to produce in any case something new and powerful, but Ittar goes further by representing his idea of the city: the close relationship between the contemporary city and its scenery.

He accurately draws the archaeologies buried under the city. He is not at all driven by "antiquarian" reasons but rather by constructive ones, which are perfectly within the discipline he deals with: architecture[26]. Rather than isolated archaeologies, the ones he draws seem more like fragments of a whole that from "below" undermines the shape of what is "above": there is another invisible city that constrains the development of the visible one. This makes still more species if we consider that Ittar designs a young city, with little more than a century of age, almost integrally reconstructed following the earthquake of the Val di Noto of 1693. Therefore, from the Plan, it emerges a city of the XVIII century that only superficially appears totally brand-new but that deeply sinks the own roots in the fragments of other cities by now become foundations.

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[26] This may seem superfluous, but it is necessary to clear up any misunderstanding from the outset: the drawing of a city is always a matter of architecture and never of town planning.

The Plan of Ittar was printed in 1832 and appeared to be a work of the nineteenth century, not only for its obvious chronology, but above all for its intellectual position.

The city of Ittar is articulated through the juxtaposition of the blocks that compose it: the scale of representation adopted, the technical means at its disposal, the new ideas in the field of urban analysis, all converge towards a typological representation of the city. A way of representing placed within a period in which, for the first time, a systematic approach to the form of the city was felt, up to that moment only punctually faced by experiences sometimes extraordinary but not related to the same direction of research.

Our Drawing wants to be the 1832 Plan in the present day, not meaning a mere technical update but a shift of meaning with reference to Ittar itself.

2.2   The Drawing of the City of Catania: idea

To take the model means to betray the model. Going beyond the issues, raised by the reference from which we start, is a duty and the only way to add a necessary piece to the discussion in which we want to act. In our case, we attempt to go beyond Ittar's work.

The limit of the Drawing that the Bohob laboratory is carrying out is the eighteenth-century city of the post-earthquake reconstruction of 1693. Because it is this measure of city[27] that determines the shape of Catania today. Our drawing shows the same city staged by Ittar in his Plan. However, what does it mean to make that drawing today? Clearly if we really want to make that drawing, it is necessary to make a different one. Faithful to the principles and not to the form, Bohob's Drawing wants to collect Ittar's idea of city and make a drawing even more pushed towards the physical fact of the city: our Drawing aims to be a constructive representation of the city of Catania.

The instruments available today allow us in a credible way to make a leap towards the understanding of the truth underlying the city. Therefore, the scale of the Drawing is 1:500, a powerful scale of representation for a drawing of the city. However, the issue is not superficially an enlargement of Ittar, a way of adding detail that Ittar could not technically have detected. His Plan is powerful precisely because of the lack of many details that would have weakened the "typological" figure of his representation, thus precisely what Ittar chose to omit. Not an enlargement but a shift towards the constructive dimension of the city. With the Amphitheatre and the Ancient Theatre, Ittar violently[28] affirms that the city of "below" administers measure and form to that of "above", but the very scope and limitation of his Plan lies in doing so through the typological and not the constructive eye.

We choose the representation in a constructive sense of the city; this choice gives us the right to feel inside Ittar's reasoning more than he did. In this sense, the Plan becomes a controversial archaeological subject capable of providing more suggestions for the future than it did at the time it was conceived. Reversing the reasoning, we affirm that

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[27] One can rightly speak of several distinct cities in the case of Catania, since the numerous times it has been destroyed and rebuilt, discrete monolithic blocks somehow superimposed

[28] Even more so, if we consider that in its time the Amphitheatre was entirely buried by the city, unlike today where part of it has been made visible.

Bohob's Drawing is more coherent with the main ideas of the Ittar's Plan than the Plan itself.

2.3   The Drawing of the City of Catania: structure

The Drawing of Bohob is composed of three syntagma: the roofs, the public buildings, the archaeologies. Their relationship gives shape to our idea of the city.

It is not possible to say with absolute certainty which of the three is more decisive in the form of the city but, if we were ever forced to say one, we would undoubtedly say the roofs. Roofs build the brute mass of the city, its skeleton, and at the same time give other fundamental information about the city. While they draw the outline, they give an account of the density of the built-up area, of its internal tensions. In the passage from silhouette to density lies all the effort of a year that Bohob has carried out in the redesign of the roofs of Catania. The shape is a datum expressed both by the drawing of the block and by that of the roofs. Nevertheless, the block is not a constructive unit but a typological one, to be clear: unlike the roofs, the block is not an element of the construction. The roof is a requirement and as such is capable of expressing the reasons it contains. The shape of the block is the result of single constructive acts no longer recognizable in that form, the roof instead, in the extreme synthesis of its few lines, expresses all the complexity of the plan, alluding to an invisible but present richness.

The measure of the city passes through the measure of the roofs. The accurate, or rather exact[29], design of the single roof with respect to the whole design finds its place in the hierarchy of the city, accentuating an axis if it is a large roof or giving unity to a small agglomerate if it is a small roof. The drawing of the roofs is able to give back in a representative form the perception of the density felt in the streets, being inside the city. Walking in a part of the city marked by blocks with tiny buildings has nothing to do with the density perceived in another part where a building corresponds to an entire block.

Drawing roofs is a powerful way to bring out specific characters of the city and not only its overall structure. A particularly effective exemplum of these specific characters is the "unreasonable disproportion" between the Benedictine Monastery and the houses of the surrounding neighborhoods. The ratio between a house in the neighborhoods and the Monastery is 1:35; an impressive proportion if we consider that usually in a city the ratio between an ordinary and an extraordinary building range from 1:4 to 1:6. The Monastery on the city's hill is one of the largest monastic buildings in the world. This datum, however statistically remarkable, considered in itself is useless to us; it is just one those many suggestions that we must daily evade. The relative dimension makes the city and not the absolute one. Around the Complex, develop the most popular quarters of the city, marked by a measure of tiny housing[30]. Face to face, the smaller fabric

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[29] The difference between "accurate" and "exact" is fundamental. The former term may be at odds with the constructive idea of the object to which it refers, while the latter is not, because of its specific feature is to express an idea. A neutral relief is "accurate"; another that forces one aspect and conceals another in favour of a whole clarity is "exact".

[30] This was due to the political choice of the men in charge of guiding the post-earthquake recon struction to define a real clear demarcation line that established two different land costs in the city. The Benedictine Monastery occupies a large part of this area and its economic and polit- ical

of the city is compared with the beastly and completely outsized size of the Monastery. This contrast gives shape to one of the strongest pieces of the whole city that in the Drawings the roofs have the ability to render.

Some buildings more than others are able by form, size, settlement issues, to specify the nature of a city. These buildings are what we call public buildings. In the Drawing, they are represented in horizontal section and not in plan like the roofs. The choice of this type of representation can be explained by the fact that we intend the plan of the public buildings as a "future archaeological section", as if to anticipate a persistence in the future site of the city: representing just what will remain in a future in which they, too, will be archaeological[31]. The term "public" in this context should be meant not in its literal meaning but in its spatial meaning. For example, both churches and palaces of the nobility are drawn as public buildings, and it is clear that they are not literally public either. Rather, we define the latter as public in that they are capable of representing the city, buildings capable of carrying within them the reasons for the city and acting as ordering elements of space.

How an invisible city is able to give form to the one that has emerged?[32] The object of the Drawing is the form of the city and its aim is to represent its construction through the close relationship it has with its archaeological substrate. Having a clear sense of the research is fundamental in order to discern what is important to us from what is not. In the case of archaeology, our interest is directed towards those that, over the course of time, have been able to prefigure the form of the city: only those that therefore "belong" to the city since they have actively influenced its structure. In the Drawing, they are represented in horizontal section but, unlike the public buildings, a hatch spells out this time the section since these fragments are already archaeology.

It is good to specify that belonging to the city is not a datum that has to do with the visibility of the ruin in the urban space but with being present in a deeper sense. The Drawing takes the responsibility of drawing with the same weight both the visible archaeologies in the city and the submerged ones, if both have contributed to build the city. From the point of view of drawing only what gives shape to the city, the possible invisibility of the pre-existence is completely indifferent.

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power enabled it to acquire so much land that the less well-off were concentrated in neigh- bourhoods around the Monastery. This political choice is explained by the presence in this area of the Jewish ghetto, which became a huge empty area available after the expulsion of the Jews by the Spanish.

[31] [Alberti is interested above all in the city as it is, the city through time; he is interested in the city and its history, in what he can still touch with his hand, such as the ancient city that has come down to him, the city and its architecture, that city which, through the signs left by time on its form, allows him to distinguish what is durable from what is temporary, what is important and therefore permanent from what is eliminated by time.] (Grassi, G. 2002)

[32] As Heraclitus said «The hidden form is more powerful than the manifest form».

3 The "Minimum Projects"

Minimum Projects are the constructive manifestation of the idea of giving dignity and value to spaces that currently have none. Each project consists of a white stone shrine to house the ruins. Many white cases of various sizes scattered around the city will make the small ruins they contain read like fragments belonging to a unitary whole.

They are not specific responses to the needs and problems of one area with respect to another, but aim to be applications of the same architectural construct, variations on a theme, which according to the characteristics of the specific site always take on different forms and aspects. They therefore consist of a single wall unit, which, depending on the archaeological site, may become a pavement, a parapet, a staircase, a sloping plane, etc. Two examples easily illustrate the versatility of a precise construction idea: the Terme Achilleane and the Benedettini's Balneum. In the first, the project is a staircase with a parapet, in the second a paved floor and a volume (an archaeological room) with a considerable size. They are an expression of the same constructive idea.

3.1 Ethically "minimi"

Enough has already been said about the meaning of the word "project", but why "minimi"?

One of the pitfalls of being an architect is grasping the limits of our work, understanding the space of our field of action within which to propose a point of view on the world. You need to be credible by arguing within your discipline and its language if you want to make a truly useful contribution.

Therefore, they are "minimi" because we move within and through the tools of the discipline, hypothetically leaving decisions not related to our profession to others. The possibility of a different way of use, for example, is not the task of an architect, and certainly not of architects who, out of a pure ethical and civic spirit, have chosen to conduct research on this subject. The profound freedom of the Bohob Laboratory lies precisely in being able to allow itself to reflect on the nature of making architecture in an absolute sense, without any professional mandate. This is without prejudice to the extremely constructive nature of the projects carried out by the group: let us be clear, Minimum Projects are feasible and conceived as constructions, regardless of their actual implementation. This is always because it is part of being an architect thinking about transformations always connected to a clear constructive idea; otherwise, we would end up with meaningless speculation that has nothing to do with making architecture.

The projects are defined by the use of the discipline's own tools: geometry, measure, material. The geometry in each chosen site is attempted to be always clear; each time the design effort consists in defining an evident geometry that elevates that space with respect to the ordinary city around it. This is the essence of the city's public spaces, their being exceptions to the approximation of the surroundings as defined geometries "closed" within themselves. The measure of the project gives substance to the presence of "something" extraordinary. The projects always look at the ruin through the city and never in itself, which is why the extension of the project area concerns the closeness of

the ruin and never the ruin itself. The material gives part of the character of a place. In Catania the preciousness of a place, its being exceptional in the framework of urban space, has always been rendered with white stone in contrast to black lava stone. That is why Minimum Projects are made of marble.

3.2   Necessarily "minimi"

However, the word "minimi" contains another nuance, intimately linked to the relationship between archaeology and the city. We are well aware that archaeology is "lower" than the level we live on today; the level of ancient settlements must be sought by digging. The only archaeologies at the level of the city plan are in fact those that over time have never ceased to host life within them and perform a function. In this sense, they could not even be completely defined as "archaeologies", precisely because of the lack of a trauma, a cut-off, that determines a before and an after. The difference of levels in the elevations produces a jump and here, in this gap, is the fundamental problem of Minimum Projects. The nature of the problem we are talking about is substantial, that is, it must be sought in the profound sense of the relationship that the city has with its substrate (its scenery). The functional problems related to the resolution in terms of accessibility of this leap is not the object of Bohob's research. These are resolutions that would only come into play in the specific case of a project to be realized, but which are not exemplary for manifesting our idea of the city.

The resolution of the leap has to do with making it measurable, appreciable; as if to say: "this is not an accident like so many others, but a difference in level built by time that separates two precise worlds". Here too the theme is underlining, bringing out a condition that, though hidden, we feel exists. The white stone that follows the gap from the level of the city to the edge of the excavation is a powerful idea that alone gives the measure and weight of an invisible world that exists. Without the use of panels, totems, or any "educational indications", the extraordinary richness on which every inhabitant of Catania unknowingly walks every day would be made perceptible to everyday use.

Because the only means of restoring the richness and preciousness of a place are those of construction, thanks to which the life of the city could approach areas that are currently marginal and refractory to human presence.

Suddenly, around the ruins, life is given a chance to dwell.

3.3   The method: The Triptych

What is the drawing that can reveal the idea?

Not just communicating technical information but also conveying the sense of the whole work?

The drawing that can say all this is always one, rarely more. As strong as the idea is, as few papers is needed to render it. In our case, it is one drawing made up of three parts: a triptych. Architectural drawing has a mysterious nature whereby it is both a tool and an aim, something for knowing how to do and a complex representation of an idea.

The Triptych consists of large square panels. Each project, depending on the characteristics and dimensions of the specific site, will have its own configuration. Both the shape of the representative module (the drawing) and that of the architectural construct (the building) take on their final form according to the characteristics of the site. It

emerges that not only the "form is already given" but also an evident correspondence in the way the project is constructed and the way it is represented.

The Triptych holds three scales together in a single drawing: 1:200, 1:50, 1:10. The power of this representation also lies in the relationship between these scales, so that one is never an enlargement of the other. On the contrary, each scale is necessary to say something that the others cannot. This method of understanding the graphic scale leaves the practice of "territorial context" behind and moves towards a "form of drawing" that is the absolute bearer of an idea.

The plan on a scale of 1:200 shows the city to the extent that it shows the position of the project in relation to the urban space. This first part of the Triptych makes it clear that the project belongs to the city around it, remembering the great teaching that "the position is 70% of the success of a project".

The 1:50 scale plan brings to light the relationship between the project and archaeology. Unlike the first part of the Triptych, this is not an elevation from above but a horizontal section. The city around disappears to reveal the room, the size of the archaeological room, which, like a shrine, holds the ruins inside. The measure of the ancient and the contemporary measure coexist in a single representation because they are the same matter.

The 1:10 scale section gives body to the architectural construct, the constructive idea of the specific project and of every project. Of the three, it is the only vertical section precisely because it is the drawing in which the measure of the relationship between the two levels of the city emerges with greater resolution.

3.4 The representation: The View

In addition to the Triptych, however, another tool necessary for the representation of projects is the view. This image aims to narrate the project by placing a point of view in space (therefore a perspective representation as the centre of projection is at a finite distance). All the images are comparable, since the same three elements are always present in each one: the city, the intervention and the archaeology. What makes each image different from the others is the specific character of the piece of city in which the project is inserted, each time defined by different relationships between the city, the intervention and the archaeology.

The construction is to the city as the view is to our idea. Just as the construction is intended to underline the city, the view is intended to underline the idea at the basis of the projects. In fact, the perspective view adds almost nothing more than what is expressed in the Triptych, but it is equally necessary. The view underlines the sense of our work: to stand "on the edge" of the archaeological excavation, shaping the project on the gap between the height of the present city and the ancient one. That discontinuity between the excavation and the city, today apparently only accidental, becomes visible thanks to the project in its extraordinary nature: a temporal and not spatial gap that separates and unites two worlds.

The image is the vehicle that intrinsically lends itself best to revealing the idea of the projects, in particular because of its innate predisposition to "falsification". Unlike the Triptych, which is always more real and exact on the quantitative datum (measurement, proportions, distances, etc.); none of the views corresponds faithfully to the spatial pro-

portions detectable in the city. On the contrary, each of them is a "fake" that distorts the dimensions and alters the relationships from time to time, but never arbitrarily. What holds these choices together is the basic idea to which the representation must always be subordinate: formal inaccuracy is necessary to make the idea unequivocally clear. In contrast to renderings, the views of projects are not realistic but the result of a critical operation in which everything is on its own plane. For example, in every view, the context is always depicted with a strong abstraction in an approximate way, just enough to make the background of that particular project recognizable. In the graphic treatment of intervention, on the other hand, the technical possibilities of photorealism are pushed to their maximum potential, attempting to give substance to the vibrations of the material that constitutes the project. The realistic view of the project contrasting with the highly abstract context is another "gap", here however in representative terms, which makes clear the strong expression of detachment from the ruins and the context in general. That placing oneself "on the edge" is rendered through the view with this clear difference in the weight of representation, not at all realistic, in which two worlds appear powerfully facing each other, "head to head".

The view is therefore the ambition towards the representation of a gap not only in the interpretation of the minimal projects but also precisely in the representation: the possibility of making evident a gap in thought by a gap in representation.
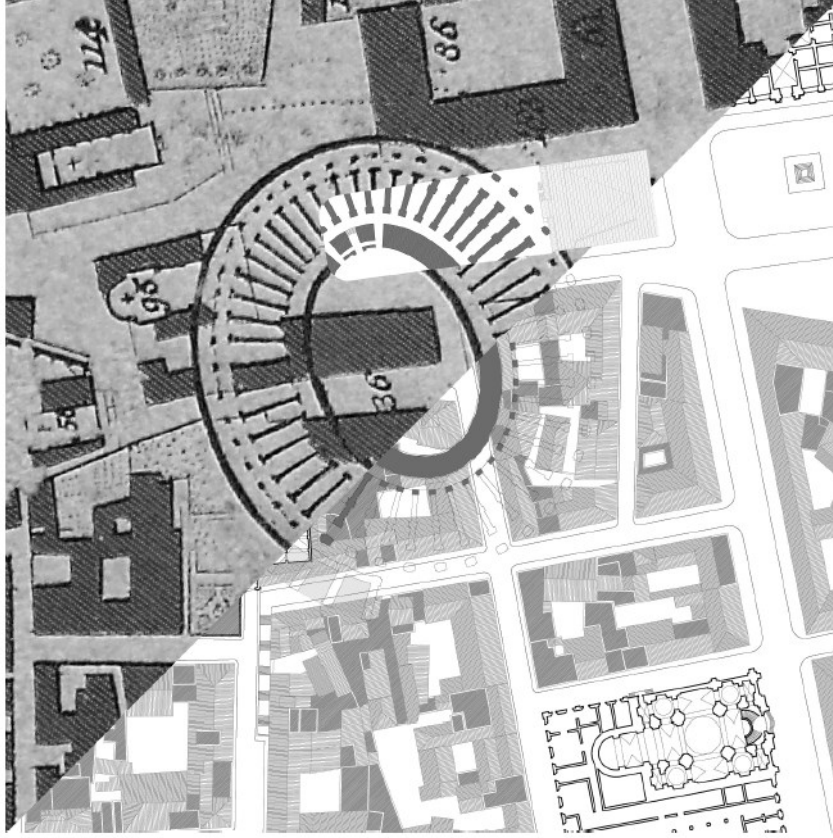
Fig. 1. Bohob's work in a picture: The Plan by Ittar, the Drawing by Bohob and the Minimum Project of the Amphitheatre.
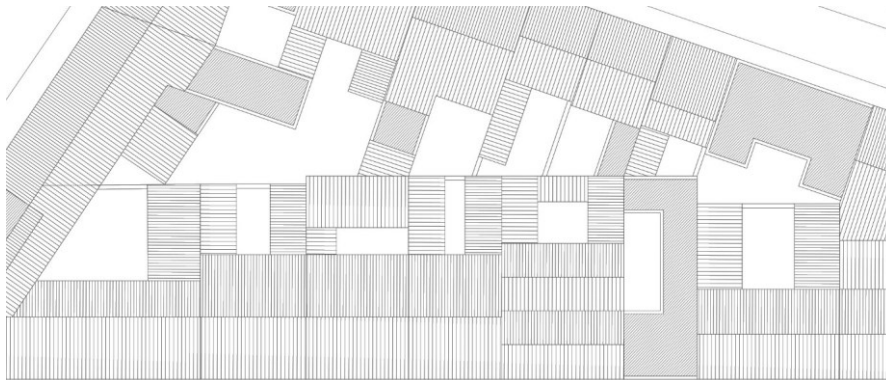
Fig. 2. 1st syntagma: the roofs. Excerpt scale 1:500.
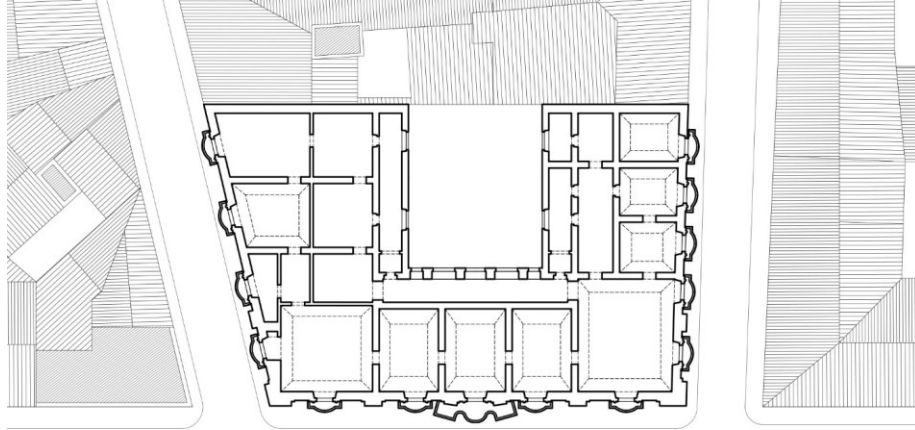
Fig. 3. 2nd syntagma: the public buildings. Excerpt scale 1:500.
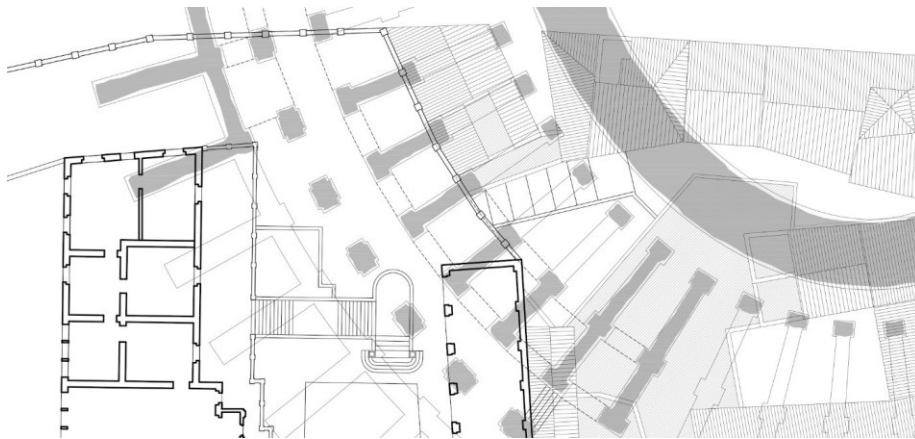
Fig. 4. 3rd syntagma: the archaeology. Excerpt scale 1:500.
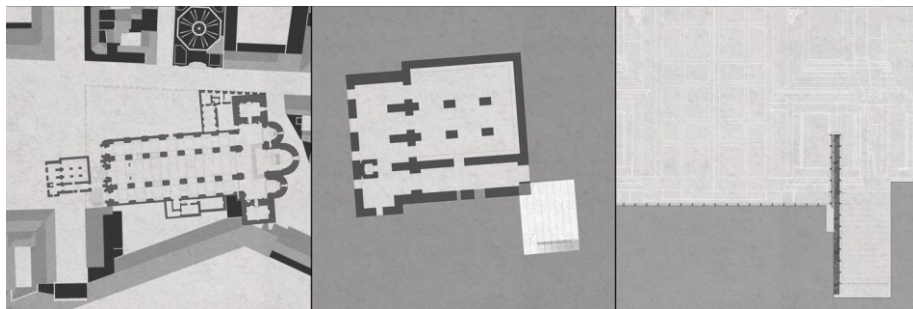
Fig. 5. The Triptych (Terme Achilleane).

Fig. 6. The View (Roman Amphitheatre).
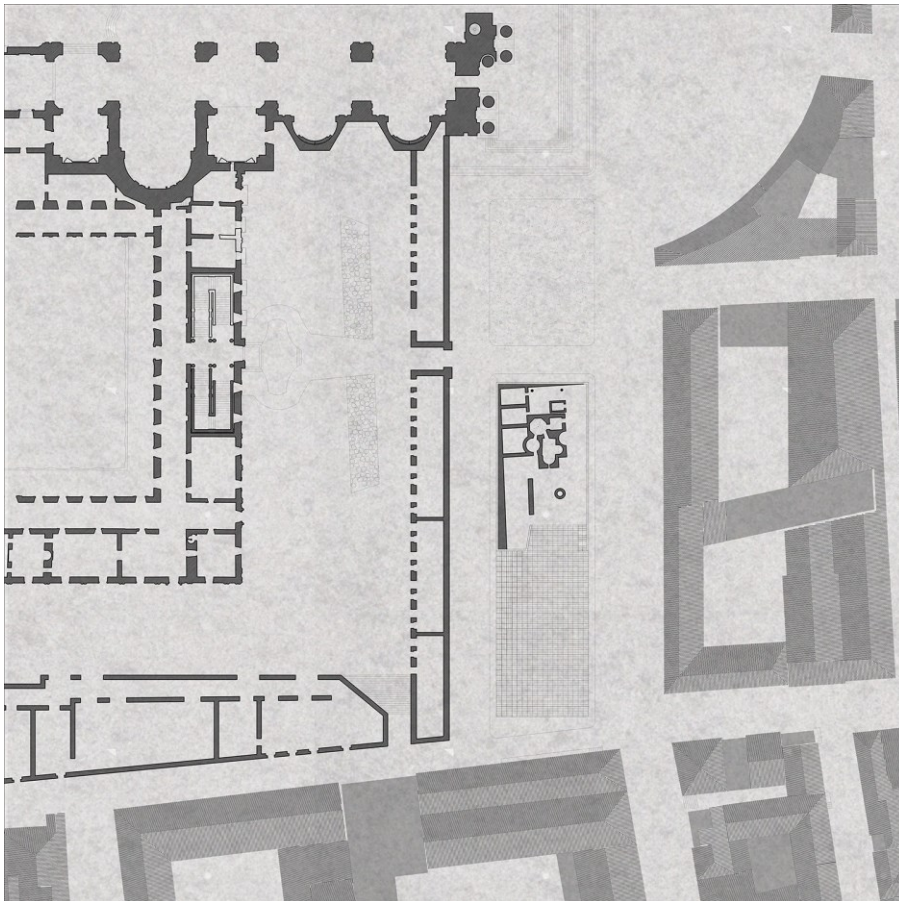
Fig. 7. The city, 1:200 (excerpt from the Triptych of Benedettini Balneum).
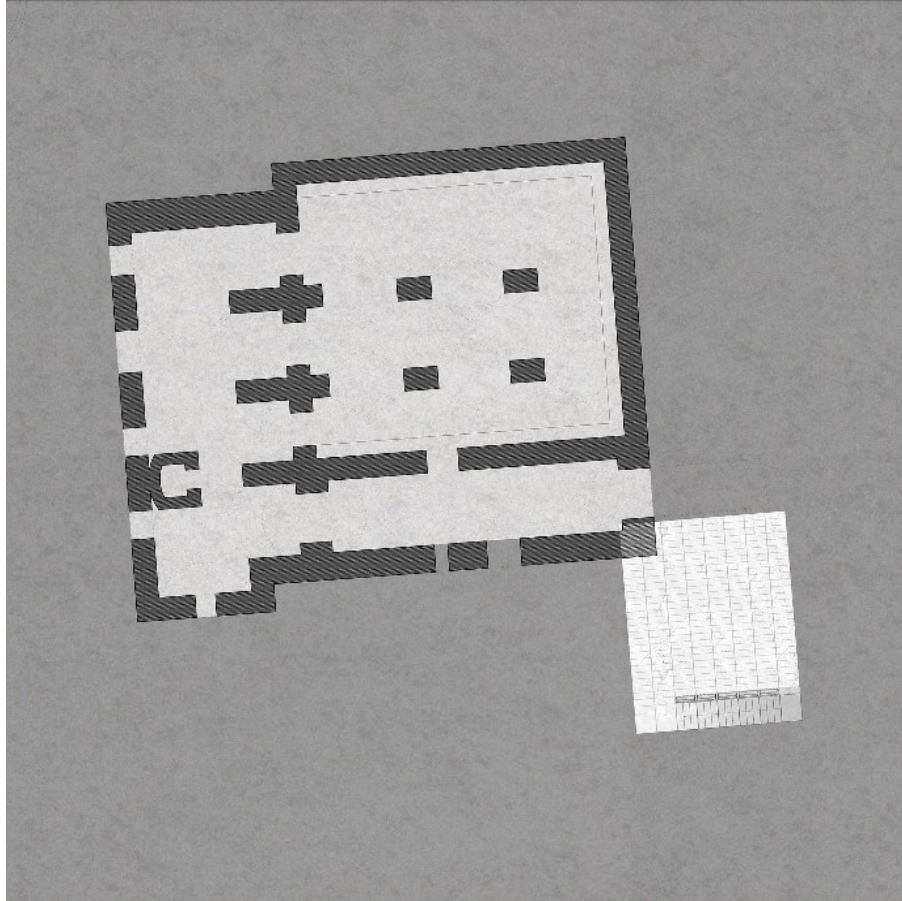
Fig. 8. The room, 1:50 (excerpt from the Triptych of Terme Achilleeane).
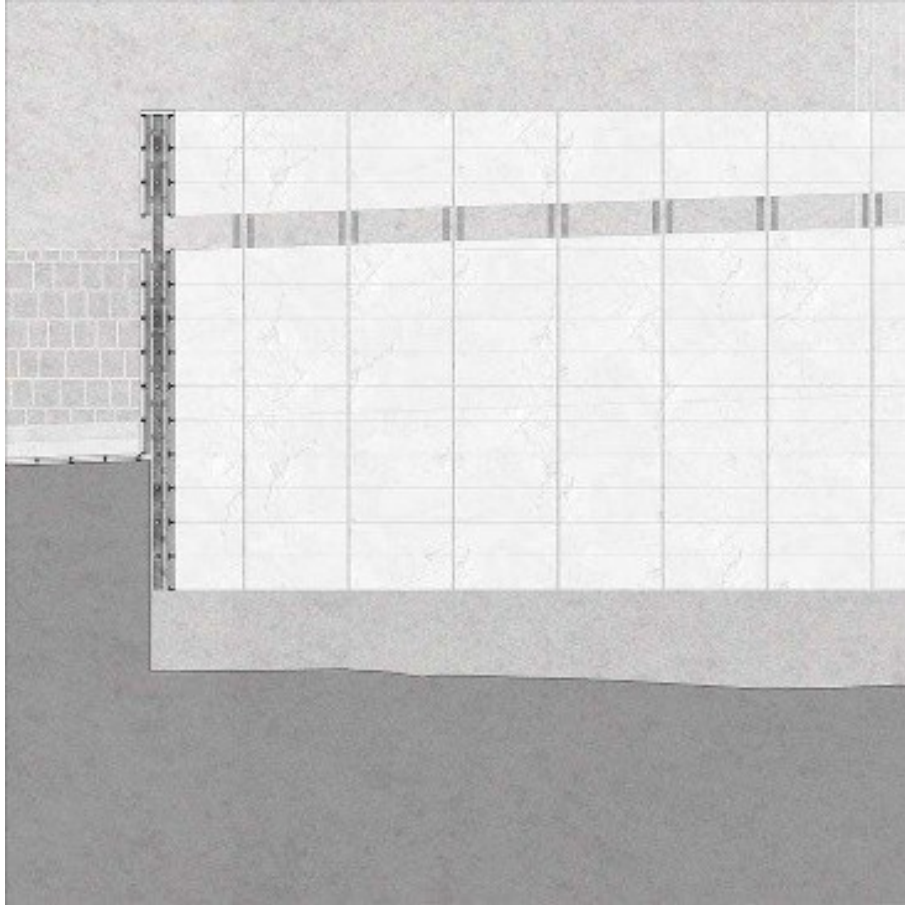
Fig. 9. The architectonical construct, 1:10 (excerpt from the Triptych of Benedettini Balneum).

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Early Hellenistic Marble Statue Found In Alexandria, Egypt

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Abstract. On 4th of May 2009, in Shallalat Gardens of Alexandria, a marble statue was found, during the excavations held by H.R.I.A.C. (Hellenic Research Institute of Alexandrian Civilization). The statue represents a standing naked man in a form of classical contraposto, with one foot raised, possibly bent to a support. Head and body are in a very good condition, but the part of the legs under the knees is missing. The features of the statue, the attributes and the stylistic analysis are connected with the portraiture of Alexander the Great.

Keywords: Hellenistic Marble Statue, Alexander the Great, Alexandria, Excavations

During April-May 2009, in Alexandria of Egypt, in Shallalat Gardens, an excavation was held by the Hellenic Research Institute of Alexandrian Civilization (H.R.I.A.C.).

The reason for selecting this site for archaeological research is its position in the topography of Ptolemaic Alexandria; it was a part of the royal quarter according to the ancient sources and especially Strabo (Geography, 17.8). At this time, this area is easy to be excavated compared to all other parts of Alexandria.

This project started on 2007 by conducting a geophysical survey in cooperation with the National Institute of Astronomy and Geophysics of Cairo (N.I.A.G). The results were the location of anomalies in the underground, in three (3) sites of the park. In the two sites, excavation was held during 2007 and 2008 but, although there were serious evidences of archaeological finds, the appearance of water table stopped the project.

On April 2009, the excavation started in the third site after operating a drilling with significant results. The samples were concrete pieces of white limestone. Due to the fact that this area has not any limestone layers, according to geological surveys till now, this wasan evidence of a human construction.

Due to the existence of tones of debris, loose soil and, the most important, the water-table that appeared again in a depth of 7,5 m, the project was progressing with difficulties. During the excavation, an architectural construction was found in a depth of 7

m,consisted of big stones of limestone, as well as a big quantity of roman and Hellen-istic pottery. In the west sidewall of the trench, there was a part of a floor which was difficult to be uncovered, due to the big quantity of soil upon it.

On 4th of May, in a depth of 8 m in the same west sidewall of the trench, and among hellenistic and early roman debris, a marble statue was found (FIG. 1). The height of the stat- ue has been measured 0,80 m. Head and body are in a very good condition, except a slight damage in the nose. From the legs, the part under the knees is missing.

There is a part of the right arm of 0,16 m before the elbow, while the left arm is missing completely. Under the right arm there is a hole, possibly for metallic connec-tion. In the left shoulder, there is an iron connection. In the back of the left shoulder, there is a small hole. The marble is Parian (Paros Island), according to the analysis of Democretus laboratory of Athens.

The statue represents a standing naked young man in a form of classical contraposto, with one foot raised, possibly bent to a support. The body is slightly turned to the right and there is a trace of a support in the right buttock. The left shoulder is raised as if it holds somethingand bents to it, possibly a spear. This is a hypothesis necessary for the symmetry of the pose.

Figure.1. Marble statue found in Shalalat Gardens (photo Limneos-Papakosta, 2009).
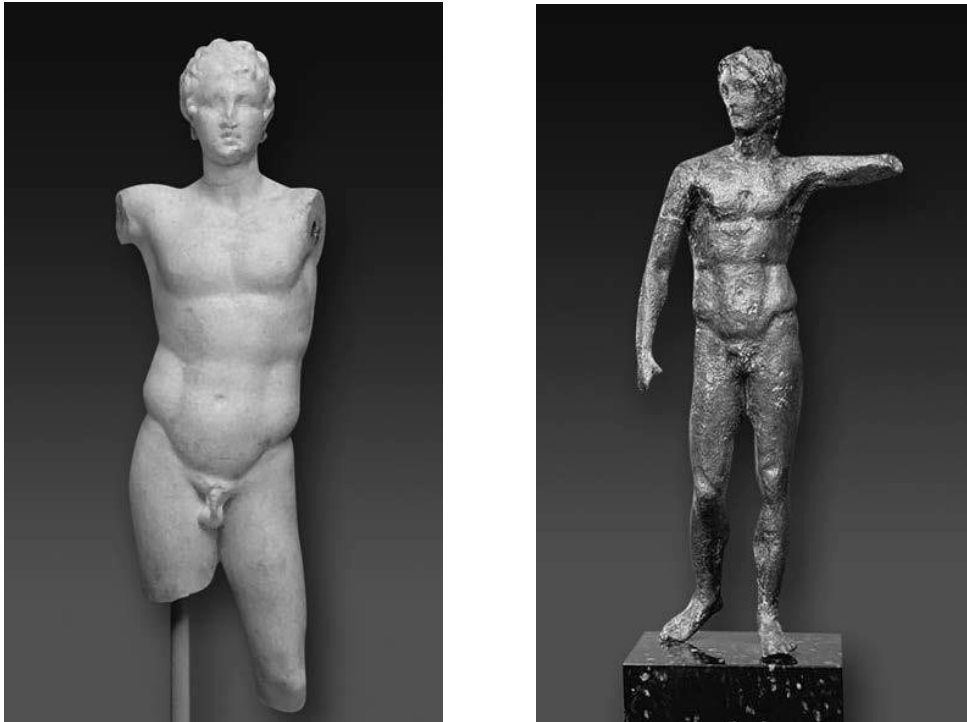
Figure.2. a. Malibu, Getty Museum AA17. Alexander with the Lance (FREL 1987, figs. 21-26); b. Paris, Louvre Museum 370. Alexander with the Lance (SMITH 1988, pl. 70, 3-4).

Smith[33] states, that standing naked figures were the most common type for royal statues. Although we don''t have any evidence to think that this type reminds one particular famous statue, some literary sources give us the information that it was used for Alexander the Great during his lifetime and after him.[34]

Comparing the statue with two of the most important statuettes, which reproduce possibly Lysippos'' „Alexander with the lance'', specifically a marble statuette in the Getty museum and a bronze one in Louvre, we notice that there are a lot of similarities (FIG. 2a, b).

The fact that the bronze one of Louvre was found in Egypt,[35] is a possibility that Lysippos has created the original one for the city of Alexandria.

As we know, besides standing naked king type there is another famous statue type, the 'Jason pose' or the „Sandal-loosening Hermes'' an attribution ascribed to the Lysippan School. It represents the King bending to the front, with one foot raised to a base. The most famous statue of this type is of course Alexander «Rondanini»[36] (FIG. 3).

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[33] SMITH 1988
[34] PlUT, *de Iside et Osiride* 24 (o.1481).
[35] SCHREIBER 1903, pl. vI L («ausUnteraegyp- ten»).
[36] Munich, Glyptothek (BIEBER 1964, pp. 25-26, figs. 6-8).

The statue has a unique, maybe, type; it has the right foot risen like the „Hermes" or 'Jason' type, but its torsion is standing, not bent. As it was mentioned before, there is a possibility of holding a spear. As a result, the statue has characteristics from both types of royal statues.

The statue has the following basic features that enable us to study, date and substantiate it (FIG. 4):

-      Poise of the neck to the left
-      Upward glance of the eyes
-      „Anastole" on the hair
-      Royal type diadem
-      „Dionysus" type diadem
-      Short hair
-      Sideburns
-      Proportions of the head & body
-      Pose and movement of the statue.
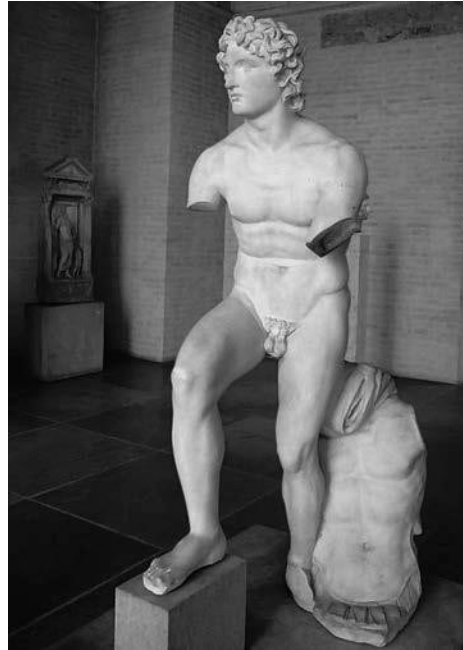
Figure.3. Munich, Glyptothek. Alexander«Rondanini» (BIEBER 1964, fig. 25, 6)
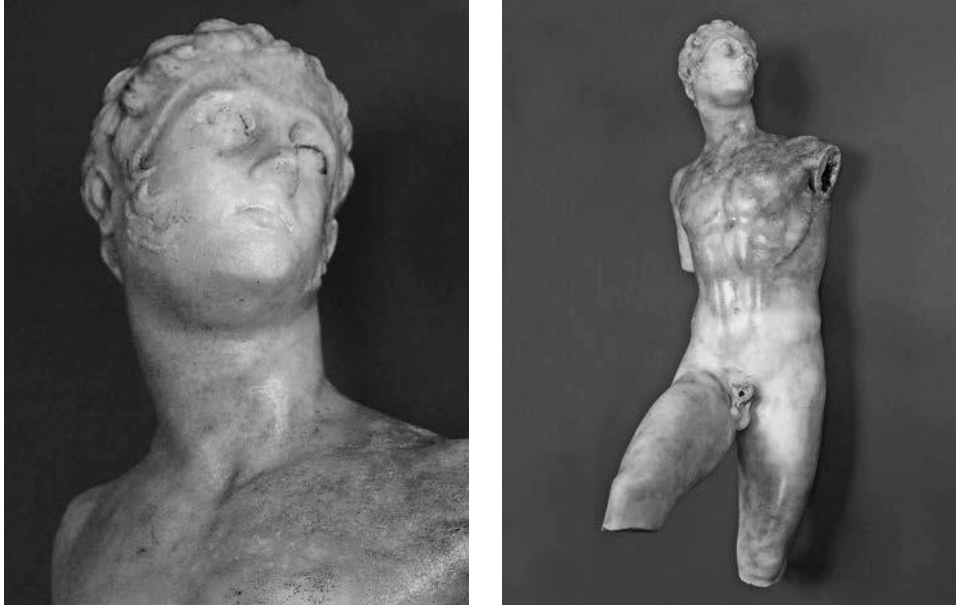
Figure.4. Head and body of the statue before restoration (photo Limneos-Papakosta, 2009).

The head has been measured 0,13 m and if we compare it with the total height of the statue (about 1,10 m), it is the 1/9. This analogy is typical of the Lysippan canon, and smaller than the previous canon of Polycleitos, which was 1/8. Pliny (nat., XXXIV, 65) states «Lysippos made the heads smaller than previous artists had done». The neck is turned to the left and the eyes look upward with an aspiring glance. Plutarch (Alexander, 4, 1), referring to Lysippos, comments: «For it was this artist who captured exactly those distinctive features, which many of Alexander‟s successors and friends later tried to imitate, namely the poise of the neck turned slightly to the left and the melting glance of the eyes». He also states that «When Lysippos first modeled a portrait of Alexander with his face turned upward towards the sky, just as Alexander himself was accustomed to gaze, turning his neck gently to one side, someone inscribed, not inappropriately the following epigram: I place the earth under my sway; you Oh Zeus keep Olympus» (PlUT., De Alexandri Magni Fortuna, 2, 2, 3)

These two characteristics (neck and eyes) are very intense in the statue and give the appearance of *pathos* to it.

Moreover, the ears and the lips are sculptured perfectly.

The hair of the statue is short, but very well defined, in contrast with later portraits of Alexander with long hair, especially Roman copies; but it is more difficult to decide how closely these later works are with the Lysippean type. On the other hand, the monuments which are contemporary to Alexander, such as the Alexander Sarcophagus from

Sidon (330- 310 BC)[37] and the Alexander Mosaic (copy of a painting of 330-300 BC)[38], show us that Alexander was represented with relatively short hair (FIG. 5a, b).

The same short hair we see in Alexander of the painting frieze of the Philip''s Tomb in Vergina[39]. Also in the famous „Lion Hunt'' mosaic from Pella, Alexander has short hair[40]. These representations, which refer to Alexander''s lifetime, give him shorter hair styles, while many posthumous portraits have longer hair that may have divinizing connotations (FIG. 6a, b)

It is a fact that the personality and the achievements of Alexander influenced and impressed so much the people of his time, as well as his successors and the Romans, and so, all of them, perpetuated his image, in many forms. But all of these were not contemporary portraits of him, so they can be idealized or divinized images. According to Ridgway[41], physiognomic studies have demonstrated that in both Greek and Roman times, certain features were associated with certain traits of character and were therefore selected to confer to the subject of the portrait the qualities implied by them, regardless of whether they were truly part of his appearance or not. This seems to have been the case with Alexander in particular, according to many anecdotes available about his depictions: the leonine "mane" of hair hinting at strength and valor…

We have to point out again that the four monuments, more or less contemporary of Alexander, represent him with short hair.

But the most important feature in the hairstyle of the statue is the *anastole*, not in the usual form, but for sure it is a distinctive arrangement of the hair over the forehead, a quaff of hair standing up with a slightly off-centre parting. *This anastole* of the hair, Plutarch records, was the distinctive feature of Alexander''s physiognomy (Pomp., 2, 1). It seems to be considered as Alexander''s personal attribute and it is generally not used by later kings. The sideburns on the face of the statue are a feature not very common in the portraiture of Alexander. The most important monument, original of which was contemporary of Alexander, was, as mentioned before, the Alexander Mosaic (FIG. 5).

Alexander is shown bareheaded and armored, fighting on horseback. This picture whether made in Alexander''s lifetime or not, at least, pretends to be a representation of him in his lifetime. He is shown with long sideburns. Besides, a lot of portraits of Alexander like Azara herm[42], Erbach[43], Dresden Alexander[44] and Capitoline head[45] have either sideburns or long hair in front of the ears (FIG. 7).

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[37] VoN GRAEVE 1970.
[38] ANDREAE 2003, pp. 62-77, fig. 67
[39] ANDRoNIkos 1984, p. 109.
[40] ANDREAE 2003, pp. 20-21, figs. 20-21; p. 22.
[41] RIDGWAY 2000.
[42] POLLITT 1986, p. 21, fig. 7.
[43] SMITH 1988, pl. 2.
[44] BIEBER 1964, pp. 7, 27, fig. 12.
[45] POLLITT 1986, p. 29, fig. 17.

Figure.5a. Istambul, Archaeological Museum, 72-74.
Alexander Sarcophagus from Sidon(voN GRAEVE 1970, p. 28);

Figure 5b. Napoli, Museo Archeologico Nazionale, inv. 10020.
Alexander Mosaic from Pompey, Casa del Fauno (COHEN 1997, pl. II).
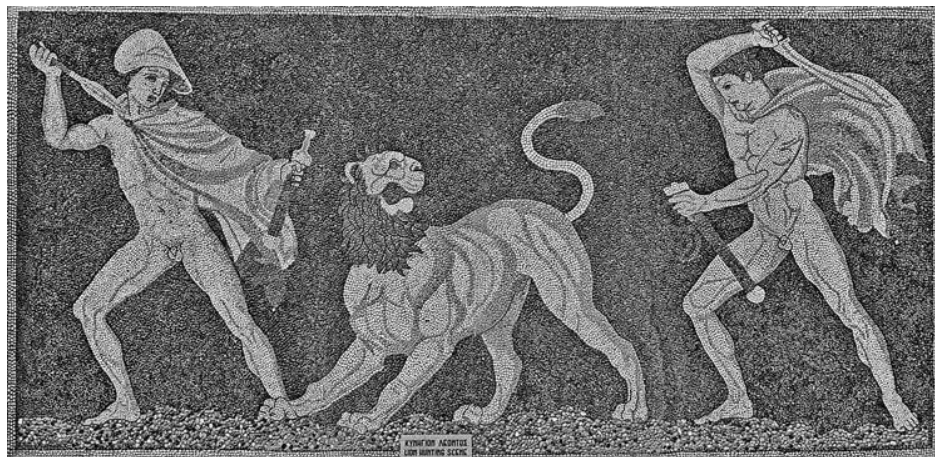
Figure.6a. Alexander of the painting frieze of the Philip"s Tomb in Vergina
(ANDRoNIKos 1984, pls. 65-66);
Figure 6b. Pella, Archaeological Museum. „Lion Hunt" (peble mosaic 4.90 × 3.20 m)
(ANDRoNIKos, ELLIS 1989, fig. 83).

Due to this feature, it was necessary to study carefully some images from the por-
traiture of the Ptolemies, especially Ptolemy II, III and IV, who are usually represented
(especially in coins - FIG. 8) with sideburns[46]. The criteria of their identification are
not the sideburns, but the form of round bulging eyes, as well as the puffy lips and the
full cheeks. These features do not exist in this statue.

The most important attribute of the statue is the two – not one – headbands (dia-
dems),one narrow band in the hair and another one in the forehead. In the beginning

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[46] BIEBER 1961, fig. 308; SMITH 1988, pl. 75.
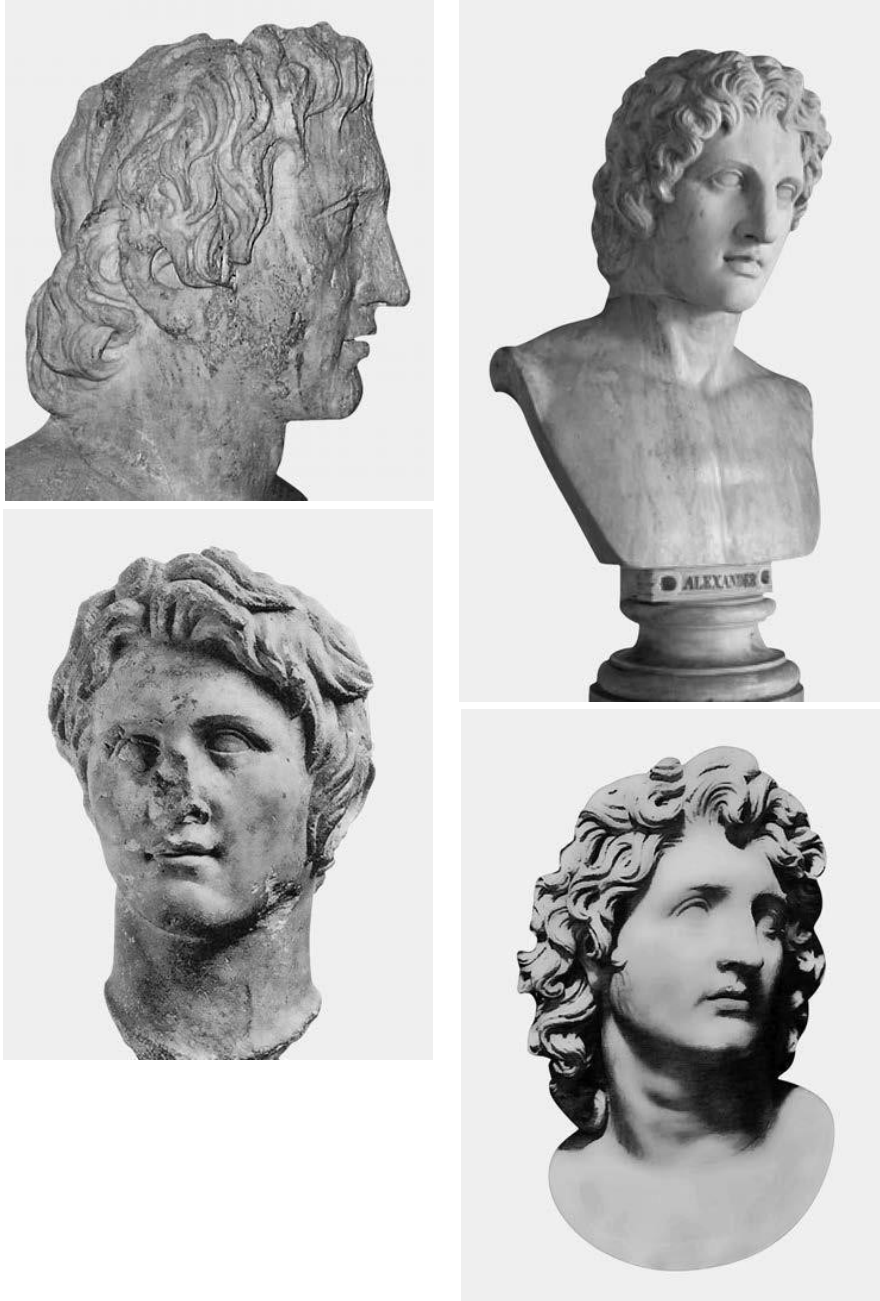
Figure.7a. Paris, Louvre MA 436. Azara Alexander (SMITH 1988, pl. I, figs. 1-6);
Figure 7b. Schloss Erbach, General Catalog no. 642. Erbach Alexander (SMITH 1988, pl. II, fig. 1-8);
Figure 7c. Dresden, Skulptureensammlung. Dresden Alexander (BIEBER 1964, p. 27, pl. 7, fig. 12);
Figure 7d. Rome, Capitoline Museum. Capitoline Alexander,Portrait of Alexander as Helios (Capitoline Museum, Alinari 5972).

Figure.8. Coin portraits Ptolemy II, III, IV
(Munich, Himer Fotoarchiv).

of our study, we thought that the band in the forehead was not really a band, but the evidence of a second use of the sculpture. But the perfectness of the form, the extremely high level of the art and the non-existence of any remains or defects in the face, obliged us to reject this idea. Furthermore, there were traces of color in the band and we think that this should give more notice to the attribute, instead of softening or hiding a defect. The sideburns and the hair next to the band are so fine that, according to our opinion, it is evidence that we have theoriginal face.

A lot of literary sources attest that the diadem (*diadema*) is the main royal symbol of Hellenistic kings and that it was a band of white cloth worn about the head[47]. Alexander was the first Macedonian king to wear it as an exclusive emblem of kingship. It became the symbol of his new status as „King of Asia".

Two sources, Diodorus Siculus (4, 4, 4) and Pliny the Elder (nat., VII, 191), say that the god Dionysus «discovered the diadem that he wore it to symbolize his conquests in

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[47] RITTeR 1965

the East and that Kings took it over from him».

However, the form of the royal diadem is not directly copied from that of Dionysus. The god wears his headband lowdown on his forehead, while the Kings wear it further back in the hair. For this association of the diadem, there is archaeological evidence. On Ptolemy''s posthumous Alexander coin portraits the king wears an elephant head dress and a flat diadem precisely as worn by Dionysus. Alexander''s and Dionysus'' headbands are here clearly associated (FIG. 9).
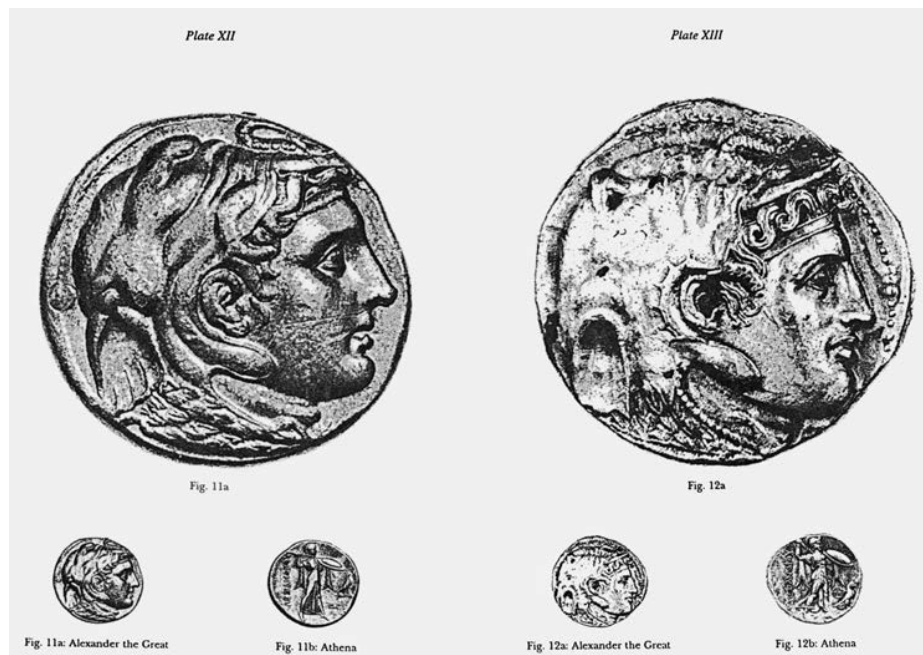
Figure. 9a. Alexander coin portraits (Munich, Himer Fotoarchiv).
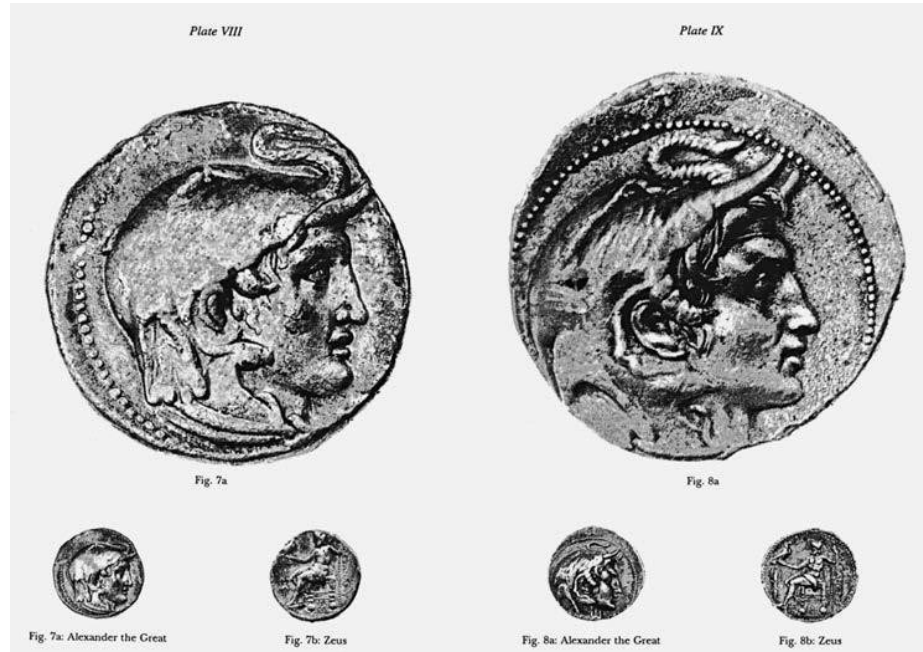
Figure. 9b. Alexander coin portraits (Munich, Himer Fotoarchiv).

Smith[48] states that, «Dionysus was important to Alexander and remained so, for the later kings. He was a conquering god and gave the divine model for the conquest of India and Asia. The similarity of the eastern conquest and of the headband''s form to those of Dionysus promoted the additional meaning of association with that god. Dionysus'' campaigns became a divine precedent and comparison for Alexander and this is thereason that he adopted the diadem as a royal symbol».

The body is slim, thus increasing the apparent height of the figure. The muscles are perfect and can be clearly seen; the backside is perfectly modelled as well as the side parts, so the statue can be seen by all sides. Thisissomething new that Lysippos first introduced in sculpture.Movement pervades the whole body and there is an obviousdepth. The knees are projecting out of the traditional closed squared canon and are intrud ing on the viewer''s space.

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[48] SMITH 1988, p. 37.

Figure.10. Alexandria, National Museum.
Hellenistic statue with characteristic of Alexander the Great
(photo Limneos-Papakosta, 2009).

All these features permit us to think the possibility of the connection of this statue with the portraiture of Alexander the Great.

The execution of the sculpture is of fine quality. There is a restrained realism and slight appearance of sfumato, combined with a post Praxitelean sensuousness. Besides, we notice the importance of proportion: more elongated with small head in relation to the body, as mentioned above.

The anatomy is less detailed but impressionistic and powerful. There is no exaggeration in the anatomical features, and this excludes the possibility to have a „baroque style". It combines the beauty of the sculpture of classical times and the passion of the Hellenistic statues. It captures also the personality of its subject.

Last but not least the statue was found and possibly was standing inside the royal

0palaces and for sure it could have not been sculptured by a simple sculptor. This fact in combination with its stylistic features that recalls the characteristics of the Lysippan School lead us to the possibility of having a work of this school, which was operating also in Alexandria. Our estimation for its dating is the early Hellenistic period. Seven years after the discovery of the statue, in 2016, its right hand appeared in front of us. It wasonly the palm holding a cylindrical part of an object, which will be our case of study (fig.11 & 12). This piece, made also by the same marble thestatue is made of, as well as the arm of the statue, have two connecting holes; one at the top and one at the bottom. This fact leads us to the conclusion that this object was extending up and down (Fig.13). Thus, the question is what did the statue hold?

As described above, the statue falls into the type of either the naked king or ruler. Therefore, from what we have learned so far from the statue"s study, it would make sense for the statue to be the king with the spear or sceptre. Although this type is not traced back to any famous statue, we do know from literary sources that it was used to depict Alexander duringhis lifetime and certainly after his death. (Plut. De Iside et Osiride 24-0.1481).

Figure 11 &12

Figure 13

In case the statue is holdinga spear, it is heldup by the right hand, rather thanthe left. But this fact does not occur for the first time. This detail can be also seen in the Bronze Spearbearer in Houston (fig.14). During the restoration and attachmentprocess of the hand of the statue, we had as a guide the engraving of an ancient Roman sculpture by the Italian sculptor and engraver Domenico de Rossi (1659-1730), which was depicting Alexander with Bucephalus (fig.15). We could assume that this picture has been inspired by the memory or tradition of an ancient statue.

On another note, the statue could be holding a sceptre instead. The sceptre and the diadem were constituting the main symbols of royalty.

The royal sceptre is not mentioned often in literature and appears only rarely on coins and gems(Theophrastus, On Royalty II). It is also an attribute of Zeus, in his "civic" role as the embodiment of supreme justice, connected of course, mainly with Alexander.

To continue, I believe that we should exclude the possibility of the statue holding a sword, due to the fact that the posture of the statue has noattacking tension at all.

I find it more probable that the statue applies to a "King with a lance", due to the construction of the marble piece, carrying the two holes that show an extension up and down, but also due to the similarities that this statue shares especially with the bronze statuettes of the Louvre and Getty Museums.
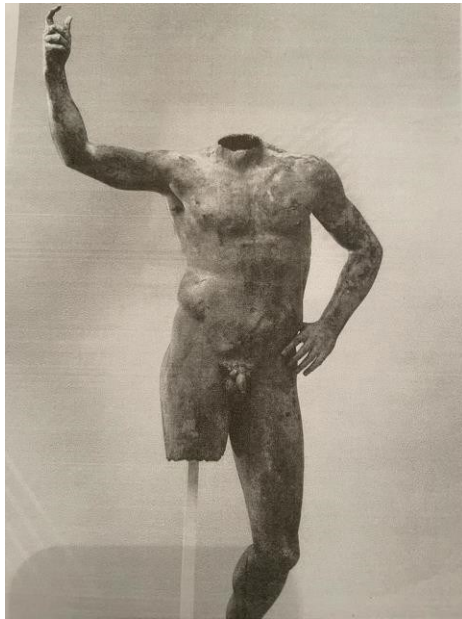
Figure 14 left (Bronze Spearbearer in Houston & Figure 15 right (Domenico de Rossi engraving)

It is essential to point out that the idea we have for the image of Alexander the Great, comes out from posthumous portraits of him made mainly by Greeks and Romans, who certainly had been influenced by his historical presence, his divinization and idealization. These works were notcontemporary and we must not insist that all of them are

copies of important prototypes, unless we seldom have some. So maybe, this excellent piece of art is closer to the „real face" of Alexander.

The continuation of the excavation will hopefully bring new evidence that will help to the completesubstantiation of this statue (FIG. 16).

3D model of the statue of Alexander the Great, found at Shallalat Gardens of Alexandria by HRIAC. Executed by Dr. Jay Silverstein and Mohamed Abdelaziz, sponsored by National Geographic Society

Figure 16

3D model of the statue of Alexander the Great, found at Shallalat Gardens of Alexandria by HRIAC.

Figure 17: Created by Prof. A. Georgopoulos. Images acquired via Android smartphone 20MP, 5mins. SfM-MVS processing (10mins), 1.75 million points, 118000 faces, 60000 vertices (April 2022)

Figure 18: Executed by Dr. Jay Silverstein and Mohamed Abdelaziz, sponsored by National Geographic Society, https://sketchfab.com/3d-models/alexander-statue-d07a827e363e40f69587875f631e34b2 (August 2022)

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Diverse Approaches to Negotiating and Transforming Industrial Architectural Heritage

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Abstract. The Industrial buildings of the 19th and 20th century on the outskirts of Athens, Piraeus, Chalkida, Xanthi, Karditsa – architectural tokens of a violent, sweeping deindustrialization – claim a new life and a new identity. The tobacco warehouse in Xanthi, the soap and pomace oil plant in Chalkida, the old warehouses of the railway station in Karditsa, the fertilizer plant in Drapetsona (Piraeus), the Votrys spirits and alcohol factory in Sepolia (Athens) – they are all being transformed and rearranged, acquiring a new form and structure, aspiring to be reintegrated into the urban reality and play a brand new active role in the socio-political scene.

This paper presents, through a series of research proposals, distinct ways to approach, manage and negotiate this ready-made and readily available architectural "raw material." It showcases ways to highlight and cross-pollinate past usage and historical memory with a process of reinterpretation, reframing and revitalization of industrial ruins. Understanding architecture as a complex and open activity allows for a degree of compromise and conciliation with the locus, the memory, the material imprints, the history of a city. When the anthropocentric focus takes precedence over practicality, commerciality, the ideology of pomposity and the culture of opulence and technocratic sensationalism; when synthetic gesture allows the integration of tangible and intangible traces of the past to produce new spaces that show care for the collective needs and sensibilities of the citizens and address demands and visions of the community; then the architectural conception is fulfilling its primary role: to be in the core of scientific processes that modify, revitalize and transform the existing urban matter.

Keywords: Industrial Architectural Heritage, Adaptive Reuse, Place Engagement, Urban Sites, Collective Memory.

1.   Introduction

"try to locate a kind of enjoyment of place ... is an aesthetics of
revelation,
a way of taking a piece of
the world and saying: I am appropriating it and
delivering it to the gaze in a different way."

[1]

The reasoning developed by architect Jean Nouvel and philosopher Jean Baudrillard, during their dialectic encounter in the context of a series of discussions between philosophers and architects (an initiative of the Maison des écrivains and Paris–La Villette School of Architecture, entitled 'Passerelles dans la ville'), contains the claim that architectural practice as an aesthetic approach and a social intervention may no longer – under the present circumstances – entail the conception of a world from scratch, but rather the processes of implementing intelligent interventions that transform and revitalize deprecated, deserted, discarded urban buildings [1]. Understanding architecture as a complex and open activity allows for a degree of compromise and conciliation with the locus, the memory, the material imprints, the history of a city. According to Elizabeth Grosz, the "*uncertain*" position of architecture somewhere between a scientific discipline, an art form and an aesthetic product, calls for openness to other scientific disciplines [2].

Lying at the heart of Baudrillard-Nouvel discourse, among other things, is the need for a successful adaptation of this readily available accumulated urban matter. Setting out from disparate starting points, both argue the position that architectural design as a subversive groundbreaking process in the context of a culture of economy and necessity will allow for the exploitation and exposition of the cultural building reserve, but will also lead to the production of new model ideas, studies and proposals. The Philosopher and the Architect both propose a radical management of this almost ready-made material through the interconnection of manual modes of conversion and intended uses, which will lead to envisioning new urban spaces with a social element that are distinct from both the public and the private sphere.

Hybrid, unexpected, fluid and uncharted spaces, which, in establishing alternative modes of integration and function in the contemporary postmodern metropolis, will constitute the nuclei of new creative encounters of resident collectives on urban territory, new practices of economic revitalization of a region, new forms of social life and habitation [3].

2   Material imprints on the body of the city and urban memory

The charming character of the multifocal, multifaceted and multivalent urbanscapes is due to the concentration of distinct elements, on the one hand, and, on the other hand, to the admixture and condensation of infrastructure and buildings, monuments and landmarks, micro-narratives and collective accounts, actions and sensory inputs; a heterogeneous collective and cultural material that highlights the historic trajectory of

cities and reveals their spatio-temporal depth [4]. The distinct idiosyncrasy of a city emerges from the confluence of reality and myth, present and past, memory and history [5]; of everything that reveals, not the "*literal technicality*" of form, syntactic structure and urban organization of a city, but the palimpsest of the lived experience; of everything that makes up, not the monologic linear narrative of constant progress and evolution of the urban condition and architectural practice as a functional machine, as a technological marvel, as representation of strength, progress and power, but the polyphonic non-linear narrative that traces discontinuities, discords and disruptions in the urban landscape, with the intention of highlighting contrasts and heterogeneities [6, 7]

The city is an encrypted text, a hermetic palimpsest of thoughts and acts that builds it, it is composed of all the streets, squares, houses, temples, ruins, public spaces and monuments, the "*emblematic scenes [that] are the sites of rhetorical meanings*" [8] that comprise it. Multiple layers of historical memory fragments and pieces of inactive and neglected topographies overlap, forming its unique collective and cultural physiognomy, its multimodal territorial and political reality, its syntactic structure and inscrutable social and material makeup [9].

Industrial buildings, once on the outer edges of the urban fabric, pulsating with activity and liveliness half a century ago, are now the dark spectral presences / absences in the life of the city. They are spatialized within the urban fabric in the form of attacks and agglomerates. Ghost-buildings of an era of rapid industrialization that is long gone, rendering obsolete production processes and products, stand idle and wounded by time and oblivion, currently suffocating surrounded by functions of habitation, entertainment, education. Industrial shelters of local, collective and cultural importance [10] are at the core of interventions for restoring their tangible and intangible values following diverse sets of adaptive reuse approaches [11].

The abandoned buildings disrupt the continuity of urban identity and enforces a feeling of placeness. Thus, the issue of integrating these decommissioned edifices by affording them new functions seems imperative. Alternation in the arrangement and multiplicity of spaces creates life [12], traces, history, revealing an alive, dynamic, inventive urbanscape, with its needs and luxuries, its realities and imaginations, its memories and cultural heritage [13]. Topological variety mobilizes vision, embodiment. The interaction between experiencing a place and the creation of meaning associated with that experience results towards place attachment [14].

Hence, architect Jean Nouvel and philosopher Jean Baudrillard [1] concur and describe architectural acts of redesigning and implementing innovative intelligent interventions in terms of multiplicity and enrichment of meaning on both the symbolic and actual level, in order to breathe new life into existing urban shells; so that what they once was, as form, structure and content, may be creatively and dynamically integrated into what they are going to be.

Memory is an active relationship with the past; a relationship in which the present is at stake, both as a field of action and as a field of bestowing meaning on the common references that characterize a group of people [15]. Thus, the shared identity is ascertained, confirmed or disputed, i.e. it "*occurs*" historically to the extent that a certain relationship with the past is ascertained, confirmed or disputed. Groups are formed to the extent that they share a "*common*" memory and the social bond connecting them is

based on such a form of acknowledgement. One way – perhaps the most definitive of ways – that societies use as a guarantee for capturing collective memory in repetitive rituals, in practices that consolidate a certain relationship with the past, is the dependence of this memory on the material environment [16]. Halbwachs states that every collective memory develops in a spatial context, and mental stability is based on the fact that the objects of our everyday life are barely changing [17]. Industrial shelters could have the power to cut up urban space to recompose a specific framework within which "*to enclose and retrieve its remembrances*" [17].

3 Approach Attempts: Interpretation, Appropriation, Adaptation

The country's industrialization during the 18th and 19th century and its gradual de-industrialization that followed during the 20th century, devaluing prosperous productive industry sectors and extensive economic activities, left a series of massive buildings of distinct architectural morphology on the outskirts of the cities, which were incorporated into the urban fabric after successive urban planning extensions. Thus, a series of industrial ruins, inextricably linked to the memory of the city and the productive life of its inhabitants, since in their heyday they played an important role in economic development by employing the city's workforce, are in search of a role and purpose [18].

Industrial architectural heritage is an integral part of cultural heritage, which in turn is the primary ingredient of society's sustainable development [19]. According to the Nizhny Tagil Charter for the Industrial Heritage [20] the remnants of industrial culture have significant historical, technological, social, architectural and scientific value, and include buildings machinery, processing and refining sites, as well as sites of social activities related to each respective industry [3, 19].

A pivotal issue for local communities trying to adapt industrial shelters is in which ways to simply to preserve but to mutate the existed edifices towards to enhanced the intangible experiences [21]. The following cases employ various design processes with a view to adaptive reuse, aiming at organically reintegrating industrial buildings in the life of the city, either through the adaptation of an existing building shell or through a selective reframing and the resignification of its remaining material traces.

Jean Nouvel in the example of a factory in Marseille (SEITA, France's largest tobacco factories) (Fig. 1) elaborates the terms of this modification. He explores the possibility of an intervention through "*an architecture of meaning and substance*", as he calls it, which does not have the character of restoration, remodeling in the classical sense or the preservation of some elements of the past. Therefore, the industrial edifice following his philosophy and in accordance with the adaptive reuse strategy it could be considered as a highly qualified cultural heritage infrastructure "*there were large rooms 15o meters long and 4o meters wide. It would be impossible to create a cultural space like that from scratch today. It would cost too much. We chose to consider this ulterior—exterior urban ensemble as a piece of the city.... we feel that the architectural act revolves around settling into a repurposed architecture.... this process of sedimentation is a form of creation and a complete qualification of the space. It's not only a*

modification; it's a mutation. The space is no longer experienced the same way, there are different things inside; we play with scale differently, change the meaning, and starting with what was a large, poorly defined, purely functional volume, we've gradually managed to produce a regenerative recreation that no one would have thought possible." [1].

Fig. 1. SEITA tobacco factory.

3.1   Receptor-space for cultural and artistic activities: Preservation of the ruin and the architectural mnemonic traces

Chalkida is a city with a rich industrial heritage since it is directly connected to the sea. Most of the city's facilities are located at the entrance to the city, in the southern port of the town of Agios Stefanos, an area that currently houses a plethora of industrial buildings, most of which remain unused.

One of these building is the 'V. Georgiadis Soap and Pomace Oil Factory', whose wings are built amphitheatrically in an area covering 16,000 square meters, a fact that renders it visible from many parts of the city. This industrial complex was built in 1921 to house a plant for the production of pomace oil and soap (Fig. 2). Vasilios Georgiadis from Kymi, Evia, was the founder of the company that, exploiting the vast square footage, housed a number of productive units, initially one of pomace oil production (1921), then soap production (new wing in 1927) and then an auxiliary unit of ice production (new wing in 1937-40). The plant could process 10,000 metric tons of pomace per year; the pomace oil produced was the primary raw material for the production of 30,000 okas (close to 40,000 kilograms) of green soap under the brand name 'Palirroia' (Tide). The firm grew exponentially, eventually also exporting its products; thus, it was one of the largest companies in Greece, supporting the country's economy at the time.

Fig. 2. Exterior views of the complex's current condition.

In the proposal [22], the site is not restored as a structure, except only selectively. It functions as an empty container that is ready to be filled, welcoming and incorporating various distinct activities – cultural events, trade expositions, art exhibitions and installations – in parallel with its permanently established functions (Fig. 3). Glass roofs and sides bring light into the space, reducing the sense of spatial boundaries, mitigating the additional material footprint, and leaving the gaze unobstructed to wander about the restored materiality of the ruins of the building, ultimately intensifying the impression of an intangible vacuum and effuse space (Fig. 4). In this architectural landscape, the same mission is fulfilled by the ramp traversing the space, guiding the routes and paths of workers and visitors alike, linking together the various different levels of the building's remains (Fig. 3). The ramp spirals around the emblematic chimney stack and the building which is being restored to house the permanent and auxiliary support functions, bestowing a quality of film direction to the human figures walking along it. In this way, the cost of repairs is reduced and the space is afforded a distinctly open, "anti-museum" form.
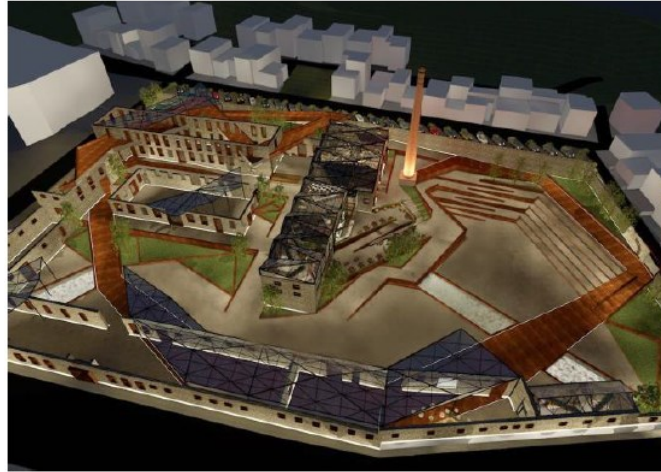
Fig. 3. Aerial night view of the center [22].
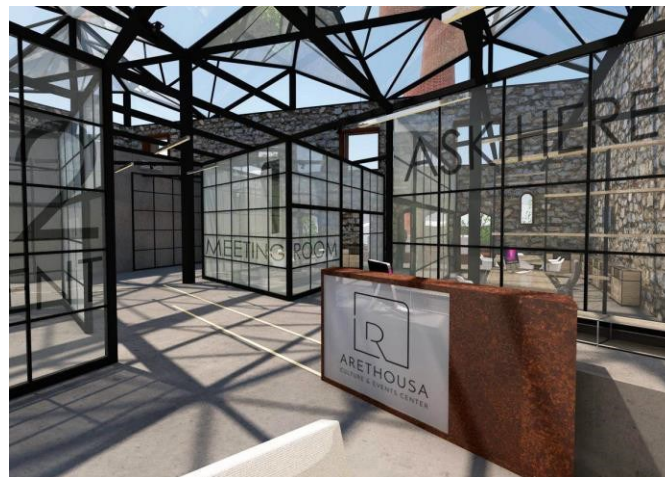
Fig. 4. Interior views with the solar protective glass [22].

3.2 Crossroads: Votrys winery and distillery building complex

The Votrys factory operated as a distillery from 1885 to 1986. It is one of the many wineries established in Greece after 1906 by the Hellenic Association of Wines and Spirits, which was engaged in trading all kinds of industrial products derived from grapes and raisins (currants). The deserted industrial complex (Fig. 5), consisting of eight buildings on a plot of 12,500 square meters. Sepolia, a district located northwest of the center of Athens, bordering with Thymarakia and the neighborhoods of Skouze Hill and Kolokynthou, traversed by the local road axes of Kifissos Avenue and the railway line, became an industrial center since the late 19th century, when secondary sector activities were concentrated around the end of Liosion and Lenorman Streets. The public Tobacco Factory, the Votrys and Atlas factories, the electric power plant on

Skouze Hill, the Lanaras textile factory in Kolokynthou – all employed a large number of workers, creating the conditions for the development of public housing.

Fig. 5. Exterior views of the complex's current condition.

The Votrys factory is one of many wineries founded since 1906 by the Hellenic Association of Wines and Spirits (E.E.O.O.) in various locations all over Greece: Athens Mills (modern-day Sepolia), Elefsina, Kalamata, Thessaloniki, Patra, Pyrgos, Achaia, Paros, Kymi, Velika, Gastouni, Vrachati, Lefkada, Samos, Aliveri. The 1905 "Currant Problem," i.e. the overproduction of Corinthian raisins (currants) – then the mainstay Greek national product – which were stacked in warehouses as their demand had fallen sharply and the market was absorbing very small quantities at very low prices, fostered the conditions for the formation of the only possible solution through the creation of E.E.O.O., a collaboration among the leading winemakers and distillers of the time (E. Charilaos, L. Oikonomidis, N. Kanellopoulos, A. Zannos, E. Ros, D. Galanopoulos). The period of prosperity for the Votrys factory was followed by a period of adventures that led to its abandonment and desolation. In 2004, by Ministerial Decree, the buildings of the industrial complex and the chimney stack were listed as industrial heritage monuments. At the same time, a building permit was issued for the demolition of all existing metal canopies and for fencing off the area.

The industrial complex is being transformed into a center for the study and promotion of modern Greek winemaking practices [23]. The alcohol processing facilities are transformed into places of historical reference to the industrial cultural heritage of wine and alcohol, but also into modern facilities for the provision of information and the promotion of wine production units (Fig. 6). The venture is complemented by projects of public nature, aiming at the building's reintegration into the urban fabric, since an indisputably decisive element of our industrial heritage is its ability to be an active part of the city and a pole of attraction for wider social strata. The reuse study aims at functionally linking the building complex with the community (Fig. 7). The path chosen is to transform it into a multifunctional space and integrate it into the life of the school community as a living memory cell.

Fig. 6. Interior views [23].

Fig. 7. Interior views [23].

The location of the Votrys plant is quite central, since it is located between Kifissos Avenue and Liosion Street, near the "Three Bridges" site, while the region is rich in school activities since there are four schools (2 primary schools, 1 middle school, and 1 high school) within walking distance from the factory. Thus, coupled with the fact that the specific area of the Municipality of Athens features no other such space, it is proposed that the site be used as a cultural center, but also as a plot of green, giving visitors and residents the opportunity to discover creative activities in a space that encourages its appropriation by various different groups of users, allowing intermingling and human exchange.

3.3 Spaces of Absence, Spectral Residues of a Different Urban Identity: Indoor Tobacco Warehouses

Built on the slopes of the Rhodope Mountains and well-known for its stately stone houses, Xanthi is a Thracian city with an age-long history that begins in the Bronze Age and spans uninterrupted to the present day. Xanthi is also marked by a high degree of diversity in its identity, a special blend of ethnic/tribal cultural elements, styles and traditions as, over the course of its history, the city was colonized by populations from Northern Thrace, Epirus, Macedonia and Crete, refugees from eastern Thrace, Pontus and Asia Minor, as well as Greeks from the former USSR. The city prospered during the 18th and 19th centuries, winning itself the nickname 'Little Paris', thanks to the high quality of tobacco that was produced and processed there.

The Sidiropoulos tobacco warehouses are a site comprising three detached stone buildings of folk neoclassical architecture (Fig. 8), featuring elements of eclecticism or German neoclassicism, very thick outer walls, wood-case windows with iron grates, heavy metal doors, rectangular or arched transoms and roofs with Byzantine or Roman-type tiles. Inside the buildings (Fig. 8), the large spaces without partitions feature wooden floors, props, beams and stairs.

Fig. 8. Exterior and interior views of current condition.

The proposed adaptation of the industrial complex [24] aims to revitalize these buildings, which were deserted and abandoned to oblivion after the tobacco processing activities were shut down. The conversion plan for the existing building complex focuses on the design of an organically interconnected tripartite space (Fig. 9), dotted with points of reference to its past syntactic structure and use (visually undivided spaces, ramps and bridges, wooden props, distribution of functions), featuring easy circular horizontal connection and vertical communication on all levels, which will constitute a hub of culture, artistic creation and getting together for the social groups of the city. From desolation and inertia, the space, preserving the imprints of memory, is reactivated and reintegrated into the life of the city.for the social groups of the city. From desolation and inertia, the space, preserving the imprints of memory, is reactivated and reintegrated into the life of the city.

Fig. 9. Interior views [24].

Fig. 10. Interior views [24].

The intent of the design marks a 180-degree turn, both literally as it proposes the radical change of the building's mission (Fig. 10), use and content, and metaphorically, as the syntactic structure of the interior is inspired by the geometric relation among the buildings from the outside.

3.4 Railway Station Buildings in Karditsa

The presented case includes two buildings of the station complex, each with a dif-

ferent architectural morphology, as well as the surrounding space between them. The first building was constructed in parallel with the old building of the Karditsa railway station in 1885, by Italian engineer Evaristo de Chirico (Fig. 11). It was a commodities warehouse of the railway station and is now converted into a restaurant. The second building, constructed more recently, was a warehouse and is being reused as a covered municipal market for fresh produce. The idea of transforming part of the buildings of the Railway Station at Karditsa aims to activate some dormant building shells, so that the place acquires new uses of social content and distinct significations [25]. The design project (entitled Revival of the institution of the Municipal Market in a space of transitions: Reuse of the Karditsa Railway Station buildings) aims to create localized functions of high density and accessibility: a covered municipal market and a dining facility at a site of constant transitions.

Fig. 11. Exterior view of the building's current condition [25].

What prompted the idea of reusing the buildings was the fact that the southwestern part of Karditsa, where the buildings are located, began to expand enveloping the Station. Although Karditsa already has a covered municipal market in its city center, the proposal for a new one is based on the fact that the Municipal Market as an institution serves as a hub of socialization, highlighting and strengthening community culture, as a meeting place for the city's inhabitants and visitors from the surrounding areas, and a factor contributing to economic development as it supports local producers, giving them the opportunity to sell their products. Thus, the operation of a market next to the city's railway station will serve the residents of the surrounding areas, the passengers of the trains and visitors to the city, providing a powerful symbolism (Fig. 12).

Fig. 12. Interior views [25].

Fig. 13. Interior views [25].

The design is inspired by the fluidity of the masses of the Agrafa mountain range (Fig. 13). Hillsides and plateaus are captured in a three-dimensional model of the mountain range, which ties together the different buildings, affording the place a pulsating organic unity.

3.5 Drapetsona Glassworks building: open shell and lifting of interior-exterior boundaries

The factory of the Hellenic Chemical Products and Fertilizers Societe Anonyme (AEEHPL) is located in a seaside area, between the breakwater ('Krakari') and the bay of the Slaughterhouses ('Sfageia'), in the industrial zone of Drapetsona in Piraeus (Fig. 14).

Fig. 14. Aerial view of the building's current condition [26].

The Glassworks [26] forms the epicenter of a comprehensive design, which unfolds beyond the boundaries of the building. The respect for the memory of the place leads to a reversible intervention, which does not affect the existing situation. Thus, a metal frame is added inside the building, around the old equipment and without coming into contact with the building shell, which forms a pathway that traverses the building and unifies its various different levels. The Glassworks, which preserves the memory of its previous function as an integral part of a larger industrial complex that included a series of interconnected production processes, constitutes a hub and a station along a course that runs parallel through time and space (Fig. 15). The building as a landscape of continuous, permanent or ephemeral cultural activities does not claim autonomy as a structure and is not completed as a construction.
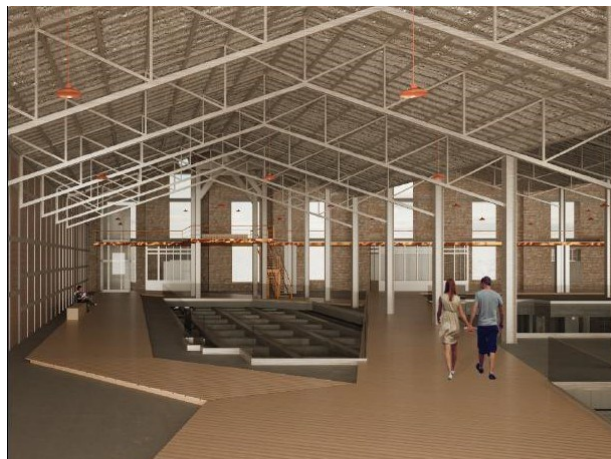
Fig. 15. Interior views of the main area [26].

Fig. 16. View of the interior colonnades [26].

It preserves the plasticity of an architectural assembly in progress, which retains the remaining traces of past industrial activity, while receiving and hosting the twists and turns of artistic events, participating in the creation of a new cultural signification (Fig.16). This is a dynamic transformation that encapsulates, contains and highlights the legacies of the past.

4   Epilogue

In dialoging with the "*geological layers*" of cities, these consecutive strata of architectural matter of collective memory and meaning, Jean Baudrillard [1] asserts that "*architecture can no longer have as its goal the transformation, the modification, of this accumulated material.*" In his line of thinking, the city resembles the overlapping layers of the earth, and a cross-section suffices to reveal the archeology of human intervention in space. In his discussion with Jean Nouvel, Baudrillard wonders whether, through interventions in this available raw material; through modifications in spaces; through actions that differentiate, modify, transform; through targeted transformative actions, voluntary and involuntary movements, a place may emerge not from scientific rationalization, but from the thick darkness of the senses. Like a sudden awareness, like a flash, like an island emerging from the sea.

The perpetuation through a dynamic repurposing and mutation of urbanscapes industrial memory, place attachment, psychological stability and collective continuity [3] could enable the emergence of novel forms of urban social and economic functioning.

The sense of place emerges from both the immediate experience and from knowledge [14]. Place attachment is a complex, multifaceted, and dynamic experience that is based on a place's complex processes [14]. Urban industrial sites are creators and carriers of conventional and unconventional cultural heritage chronotopes that have

been inscribed and can be traced in the city's tissue in the form of repurposed sites, edifices, squares, and streets. The bodily experience could define and construct directly spatiality as a result of motion and sensation [27, 28]. Tuan [29] argues that "*what be-gins as undifferentiated space becomes place as we get to know it better and endow it with value*" and that "*place is an organized world of meaning*".

With the phrase "*try to locate a kind of enjoyment of place*" [1] the aim of reasoning shifts from scientific rationalization to sensory apotheosis. It is the search of new tools to understand the complexity of the lived experience, aiming not only to draw an orig-inal architectural design or a new urban plan on paper, but to perform the convergence and fusion of the needs of various different groups of people, generations, races and social classes, collective and cultural memory [30]. Baudrillard points out: "*I think that through small movements we can achieve an ethics whereby the situation becomes slightly more positive every time we intervene.*" [1]. As architects and interior designers, we can try to design a kind of enjoyment of former industrial places by including tan-gible and intangible elements that weren't considered previously, industrial sites that of-ten belong to the order of chance; to invent adaptation strategies, those of bestowing value, the poetics of situations; to appreciate elements that are utterly incalculable*, "This is an aesthetics of revelation, a way of taking a piece of the world and saying, "I'm appropriating this, and I'm giving it back to you for your appreciation in a different way."* [1].

Industrial buildings exist idly as mutated trajectories within the fabric of cities, wait-ing for an architectural gesture that will breathe new life into them, afford them a new use and functionality. The simultaneous geography of trajectories activation with the aid of the perpetual mutation reflects de Certeau's model of place as a "*polyvalent unity of conflictual programs or contractual proximities*" [31]. The presented practices as multiple threads that layered one with and within the other could enable the emergence of alternative narratives that make livable the complexities and strangeness of our col-lective and aesthetic engagement with industrial architecture heritage in urbanscapes.

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Memories of the Orphanage - Prison of Aegina. Interpretation of a difficult heritage and proposals on its museology display

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Abstract. In recent decades, there has been a growing worldwide interest in those events that marked the course of world history and that create divisions within a society. In Greece, the 1940s and the threefold Occupation-Resistance- Civil War are such events that give rise to intense controversy. At the same time, the methods of repression that the political dissidents of that period suffered, which were basically persecutions, displacement to distant locations (exile) and internment to maximum-security prisons have been consigned to oblivion.

In Greece, dozens of islands were turned into places of exile and "disciplinary camps", whilst many prisons were created for the state "enemies". In their majority, these sites of memory in Greece have been consigned to oblivion since there is no state support for their promotion.

One of the most typical examples is the Prison of Aegina, which is also known as Kapodistrian Orphanage. The building was constructed by order of Ioannis Kapodistrias to house the orphans of the Revolution of 1821. In 1880, it was inaugurated as a prison for criminal inmates at first, while in 1920 it received the first political prisoners. The building operated as a prison for political prisoners up until 1974, during which time the Left was restored to legality in the country and hence, the persecutions ceased.

In this article, we will study the term "difficult cultural heritage" together with the promotion and conversion of sites of memory to museums. The building of the Aegina Prison will be examined as a case study for its significance and historical importance, but also its emblematic architecture.

Keywords: Difficult cultural heritage, Museum, Prison of Aegina, Political prisoners, museological proposal.

1 Introduction

1.1 Memory

Memory is not a static storage space from which we retrieve unaltered past experiences but an active process of constructing meanings [1]. Addressing traumatic and painful aspects of the past, especially recent ones, is a complex process determined by the politics of memory and oblivion [2]. After all, according to psychologists, "*the memory of traumatic events seems to be susceptible to oblivion*" [3]. In each site of memory, there is a multiplicity of interpretations, symbols, historical narratives, represented social and cultural practices (Karagiannidis, 2014). The role of the museum as an institution and a place of collective memory that is directly related to national history and politics is the cause for intense debates and political interventions [4].

It is a given that the different social groups living within the borders of a nation identify with the centre of government and must show obedience to it, whatever its form. This results in a national identity that is in fact imposed by the power of the state [5]. In post-war Europe, collective oblivion was a cornerstone of the structure of stability, especially in the West. In 1989, the overthrow of the socialist system in the USSR had multiple consequences, especially through the crisis of political consciousness; depoliticization and subjectivity prevailed in the interpretation of historical events. For many years, the sites of memory were sites of oblivion.

Based on the events of the last century, Europe could be considered a Memory Land and we are called upon to understand it as such. Every geographical point has its own story to tell. That story is not a result of materials that testify to facts, but oral testimonies that compose the history of the past, that compose identities. Within the context of the aforementioned events, new definitions have been devised, such as fever memory, mania memory, crazy for memory, etc. [6].

Only specific historical projects have been considered sites of memory; mainly those that transform memory in some fundamental way or provide repetition for educational purposes. Memory lands are created by the marriage of history and memory and their goals are many: to stop time, prevent oblivion, represent the intangible and give substance to what belongs to the past [7].

Nora (1989) was the first to introduce the term "sites of memory" (lieux de mémoire) and established the study of these sites in the context of examining collective memory [8]. Memory sites, according to Nora, are by nature "outward" and defined areas that were once considered "inward", whilst today they compose collective memory [9].

The last two decades have been marked by an explosion of interest in modern history not only in Greece but in Europe and other continents as well. It seems that the citizens are trying to learn about those events that for so many years have been forgotten or hidden in secret historical records, wanting to understand and create their own identity. Especially in Europe, because of its heavy heritage, there is a strong interest in the historical events of World War II since many citizens believe that they do not know enough about that period, due to ignorance or concealment of important events that determined the course of the War. This interest is expressed in various ways, such as the study of relevant publications, watching documentaries, films, etc. [4]. This search,

however, hides inside intense controversies, as the rival memories of the different camps of the War come into conflict.

What do we do when the dark traces of the past cannot be buried within a national negotiation but rather constitute an element of forming the world-historical memory? What do we do when the unwanted material presence of the unwanted past is of such a scale that it can be neither ignored nor silenced? [10,11].

1.2   Recounting history

Disputes over history cannot be understood without taking into account the specific conditions under which they take place, i.e. without examining their political and social context [12]. Depending on the era and the socioeconomic conditions, the ways in which we perceive the past and transform it into history change. Thus, under the influence of the major political overthrows that took place in the last century, in certain cases, the formation of contemporary identities requires a rupture with the dark contemporary past [10,11].

All around the world, historical issues and sites still creating division within society are part of difficult cultural heritage, and from time to time they have been addressed differently for being factors conveying specific impressions and emotions, but also ideological messages. Thus, various measures have been taken in order to diffuse a situation or form the desired consciousness, such as the partial or complete destruction of buildings, the attempt to neutralize others by dismantling Nazi symbols, the demythification of a location by integrating daily activities and the museumification of some parts of it [10,11].

1.3   Worldwide interest in the difficult cultural heritage

From the late 20th century to the early 21st century, there is a growing trend around the world to publicly display those stories and cultural heritage that are difficult and potentially capable of causing ruptures in the established contemporary identities and social relations. During the 1990s – a milestone in the revision of history – a fruitful debate began around the difficult cultural heritage and the historical events that it subsumes. That shift could not have left unaffected the museums and the way they used to address the difficult cultural heritage until then [13].

A museum is linked to the society of which it forms part and operates by promoting its cultural heritage. These sites can play a key role in the cultural life of a place through the activities they offer. The role of a museum should not be limited to collecting, preserving, studying and displaying the material evidence of the cultural heritage of a place with the sole purpose of promoting scientific research. Museums are organizations that preserve and present the objects of cultural heritage from one generation to another whilst teaching, educating, and entertaining their audience [14].

Museums are organizations that need to decide which notions of the past, the present and perhaps the future deserve public space [15]. Museums engaging with the topics of difficult cultural heritage and controversial stories often raise important and, at the sametime, unpleasant questions about the role they play. "*Should museums deal with controversial stories? Could they do so without entering into troubled, contemporary*

social and political relations? Could they do so without taking the side of one or the other? And how appropriate is the museum as a means of dealing with a dispute, raising or addressing questions?"[13].

2   The sites of memory in Greece

In Greece, modern history had not been a subject of a museum narrative for a long time. History museums and especially the difficult cultural heritage of contemporary historical events have not been the focus of systematic research and evaluation by historians and museologists. However, there is a shift towards new quests, a shift in the "classic" History Museum [16]. Undoubtedly, the events of the 1940s, and especially of the Greek Civil War, are part of the country's difficult cultural heritage, the study of which was avoided for decades or only certain fragmentary events of that period were showed, the most glorious and less *shameful* ones. Those are events that do not cause ruptures in the cohesion of society.

A case in point is that the first Conference exclusively dedicated to the Civil War was held in Copenhagen in 1984, with the programmatic statement being that the historical analysis of the Civil War could contribute to the reconciliation that was attempted at that decade in Greece [17]. However, it would take more than ten years to include the issue of the Civil War in a conference in Greece; the year was 1995 [12]. Therefore, it took about half a century after the end of the Civil War to open the case...

The first attempt was the Conference "Greece 1936-1949, '30 - Occupation - Civil War: Continuities and Discontinuities", which was held in Athens, in 1995 [12]. Whilst the first Law "On the recognition of the National Resistance of the Greek people against the troops of the Occupation 1941-1944" was passed in 1982, marking a turning point for the social reality of that time. Seventeen years later, the Law on "Museum display and Archives of the National Resistance 1941-1944" was passed. That Law provided for the issuance of a Presidential Decree that would regulate everything related to the protection of this heritage. Ultimately, that Presidential Decree was never published despite the debate and intense interest from all sides.

In view of that debate on the Occupation, Resistance, Civil War and exiles, a discussion opened up in the country regarding the role of museums and their dynamic in a society that was experiencing rapid changes. *Museums* and *memory* are some of the topics that sparked discussions amongst specialists, and which continue to this day [16]. In recent years in our country, important steps have been taken not only for the study and protection of the traumatic past but also for its promotion since the need for its *management* coincides with the ever-increasing interest of the public, and the flourishing of a new type of tourism from 1990 onwards, the so-called *dark tourism*[49][6].

2.1   Where to focus

This article will present a proposal for the reform and promotion, through a museological proposal, of one of the most emblematic places of detention of political

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[49] *Dark tourism* is defined as visiting sites of historical tragedy or violence and oppression, such as prisons, concentration camps, battlefields and settings of executions

prisoners, the Prison of Aegina. In recent years, the reuse of old monuments in Greece is frequent to the extent that one considers it as a natural and self-evident act without the need for particular concern [18]. The Aegina Prison is a special case since it was built under the rule of Ioannis Kapodistrias to house the orphans of the Revolution and do a virtuous and charitable deed. But very soon these plans were overturned, the uses of the building were many and different in terms of their content. But the one having a profound effect on that memory site was its use as a Prison.

The Aegina Prison operated as a repressive measure mostly against political and secondarily criminal prisoners for over a century! Dozens of souls were detained, tortured and executed in this total institution. Its purpose was to ideologically reform those who were *dangerous* to the proper functioning of the state.

In this article, an attempt will be made to examine this palimpsest of positive and negative memories and multiple uses of the building that compose the history of the Prison of Aegina. Our museological proposal does not seek to eliminate any of the pre-existing uses of the building; on the contrary, it will equally highlight every aspect of its history. It is worth mentioning that even though the memory lands seem still and observable, each era presents them in a different light depending on the respective purpose [4].

The reason why we chose the specific site and the theme of the proposed Museum is, on the one hand, the historical importance of this memory site, and that, on the other hand, after thorough research on the museum mapping of the country, it was found that there is neither a museum focusing on the threefold Occupation-Resistance-Civil War nor a museum housed in former prisons for political prisoners. An important incentive has been the growing research interest recorded in recent years in sites of detention and exile, in repressive policies but also social and ethnic conflicts [19].

The institution of displacement and internment based on the political beliefs of the citizens was a difficult subject to investigate. Until recently, in Greece, the only ones who dared to address it were the exiles themselves and their remaining associations creating some small thematic museums. However, there is a recent dimension to the studies regarding the prisoners and exiles. These studies in the new context of internationalized research have highlighted privileged areas for discussion, such as confinement, discipline, the techniques of subjection and the reaction to them [20].

2.2   The protection of residential complexes and buildings

Regarding the city of Aegina and its protection it was declared a site that needs special protection by the Ministry of Culture, in 1965. In 1977, a Presidential Decree determines special building codes and restrictions and recognizes the traditional way of settlement. This Decree is considered sufficient in terms of quality. However, it does not take into account some peculiarities of the architecture of the settlement, whilst the plot ratio is considered particularly high.

Thus, the city of Aegina is declared a traditional settlement under the new Constitution, in 1978. The decree includes building codes and restrictions but also some general construction principles for these settlements [21].

3   Kapodistrias and the Orphanage

Shortly after the arrival of Ioannis Kapodistrias on Aegina, the first capital of the free Greek state, the so-called "*Kapodistrian*" buildings were constructed. One of them was intended to house Greek orphans. Its construction began in October 1828 and was completed in June 1829. That was the first modern Greek public building to be constructed on the island shortly after his arrival because the war had left many children orphaned and unprotected and the Government considered it its duty to take care of, protect and educate them.

The boarders in addition to housing, food and clothing learned reading and writ- ing, music and practical arts, during which lesson students were trained in various tech- nical professions. Thus, apart from the first school, also the first Technical School in Greece operated in the Orphanage. The Orphanage building also included an Experi- mental School, from which teachers would graduate for mutual instruction (monitorial sys- tem). At that time, one would encounter the following [22]:

- Mutual instruction school
- Workshops for the orphanages (vocational workshops)
- The first National Library
- The first Archaeological Museum
- The first Minerals and Geological Collection
- The first National Printing House
- School of Byzantine and European Music

It is worth commenting on the founding of the first Archaeological Museum in the country. The new state, recognizing from its first steps the importance of saving ancient heritage, creates the first museum of the Greek state, in 1829, in the Orphanage of Ae- gina. The Museum is co-located with the Central School, the Library and the Na- tional Printing House [23], which means that the Orphanage, in view of the parallel actions that were held in its premises, became the first cultural centre in Greece.

After the assassination of Kapodistrias, the institution followed a decline and when the capital was transferred to Athens, it was deserted. After 1834, the building was consecutively used to cover various ad hoc needs. So, during that time, we can find the "*Evelpidon*" Military Academy, a quarantine hospital and a mental asylum (Fig. 1).

More specifically [24]:

- 1834 - Evelpidon Military Academy
- 1841 - Quarantine Hospital
- 1854 - 1860 the building was left to go to ruin until it reopened
- 1860 - Mental Asylum
- It was then abandoned to its fate until the end of the 19th century when it was repaired and transformed into a Prison.
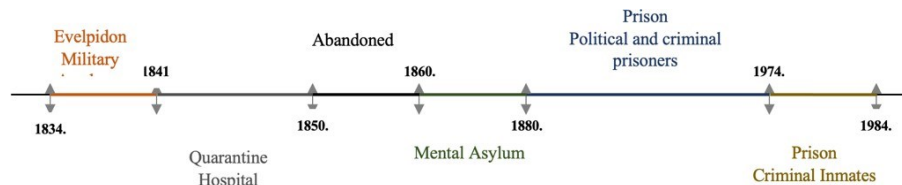
Fig. 1. Chronological use of Kapodistrias' building. Author.

The establishment of the Prison marks a structured organized state; there is now a power of reform. From 1880 until 1984, it operated as a Prison.[50] Whilst since 1974 the prison was used only for criminal inmates. That change is not coincidental since, in the same year, we have the first Government of the Metapolitefsi, i.e., Regime Change, the legalization of the Left, and consequently the cessation of persecutions [22].

3.1 The architecture of the building

The Orphanage was a huge structure compared to the respective buildings of that time. It was a vast rectangular building with a paved courtyard in the middle. Its construction provided jobs for many deprived people on the island and refugees. Much of the building material came from the foundations of the temple of Aphrodite, at the site of Kolona, an act of which Kapodistrias was later strongly accused.

The Orphanage was designed by Theodoros Vallianos. The building was described for its time as a "*brilliant construction*". Even though it was named *Orphanage* and remained with that name, the building was not used exclusively to house the war orphans [25,26].

Unfortunately, there are not many surviving plans of the building from its various phases, but neither are descriptions of architectural content through which we could assume its original form nor plans of the Prison with the necessary additions made. The additions were made gradually, without any complete proposal to convert the building from one use to another. Because of its structure, it was suitable for a prison. Without the need for additional renovation costs, insofar as the inmates should not have had increased needs [27].

At first sight, though, what impresses most is the size of the building. Its façade is one hundred and thirty-four meters, while the side wings are eighty-two meters long. The main gate is located in the middle of the façade and leads to the courtyard. Most of the windows have been bottom-half bricked up to serve the needs of the Prison.

Entering from the main gate we are in a corridor amongst newer structures. There the Prison Administration, the kitchen and other services were. The Prison courtyard was divided into five rays with autonomous yards, either by walls or buildings. The cells were located mainly in the wards of the original building, while inside there were services, auxiliary spaces but also some cells. All cells gave onto the courtyard but they did not communicate with each other. Finally, in the axis of the main gate, there is the

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[50] The first twelve prisoners arrived in 1880 and the last one hundred and eighty left in 1985.

church, which was part of the original complex [25].

3.2 The dispute over the interventions in the Orphanage-Prison & The Diachronic Museum

In 1985, the Maximum-Security Prison of Aegina closed down. In the same year, the Ministry of Culture declared the building of the Orphanage a protected monument, but only the Kapodistrian building in the part of the large rectangular building and the temple, while the declaration did not include the later buildings of the Prison. Eleven years later, in 1996, the building programme for the creation of a *Diachronic Museum* in the existing building was submitted to the Central Archaeological Council (KAS). The programme provided a study for the restoration and use of the complex as a *Diachronic Museum*, which proposed the elimination of the Prison building [28].

During the museum preparatory study, all preliminary steps were taken to ensure the right choices for the extent and the way of intervention in the building and the way of integrating the museum uses in it. In addition to the building survey, test sections were made to assess the condition of the structures that were under preservation. So, after the abovementioned actions, it was found that the subsequent transverse section was in a very bad building condition, therefore it could not accommodate the exhibits of the temple of Aphaia, as was originally planned.

Hence, it was deemed necessary to disassemble the entire subsequent structure, to build a new one in its place with an addition in order for the sculptures of the temple of Aphaia to be housed there. At the same time, in that way, certain elements from the time of the Prison would be highlighted, such as solitary confinement cells, wall sections, outdoor basins, outposts, etc. However, when that preliminary study was brought to the attention of the KAS in September 1996, disagreements arose and shifts in opinion took place amongst the members of the Council who expressed completely opposite views.

Some members argued that the proposals of the preliminary study degrade the building as a monument since its value was due to its typology, which was based on standards of the 15th century, quarantine hospitals or orphanages. Moreover, they considered that all subsequent structures should be removed from the inner courtyard and for its typology to be preserved and restored, i.e. not only the shell but also the interior layout, even if that meant that the building could not be used as a museum. A second group of members disagreed arguing that the historical phases of the building should be mentioned equally. Finally, a third group was in favour of the preliminary study, i.e. it focused on serving the museum uses. In the end, the first view prevailed by a majority, i.e. to highlight the first phase of the building, the Kapodistrian phase [22].

The protest storm in almost the entire press: "*They tear down the prison of Aris*" (*Eleftherotopia* newspaper, 05/09/96), "*They tear down 150 years of memories*" (*Ethnos tis Kiriakis* newspaper, 29/06/96), "*Demolition of history*" (*Avgi* newspaper, 06/09/96) titles of fiery articles that strongly expressed the view of public opinion against the consultation of the KAS. Thus, the demolition of the building complex was avoided mainly thanks to the reactions of the militants who had suffered internment in the purgatory of Aegina.

When the situation was diffused, an attempt was made to find a mutually ac- ceptable

solution. In January 1997, the Directorate of Conduction of Technical Works in Museums of the Ministry of Culture submitted a second study, in which the history of the Prison was further examined and it was concluded that the programme of the Diachronic Museum should include an annexe dedicated to the Prison. Within this framework, it was proposed to preserve the main architectural relics of that period, such as the "Pitharhio" (*Guardhouse*) as a place of torture of prisoners; the "Golgothas" (*Calvary*) as a place where those condemned to death were kept before execution; the "Episkeptirio" (*Visitation Room*) where methods of humiliation were implemented to the detainees in front of relatives and friends; the "kelia Apomonosis" (*Solitary Con- finement cells*); the "kelifos tou Anarotiriou" (*Infirmary Shell)* with the original inscrip- tion; part of the prison for political prisoners; the metal entrance control cage and the metal doors. The same applies to the dividing wall of the Rays D' and E', which forms the corridor between the Rays and the shell of the transverse building that is part of them, where it is planned to house the rooms of the Archaeological and Byzantine Mu- seum. From the structures that will be disassembled, the traces from the wall bases are to be preserved, as well as the floors as elements of memory, whilst some interior build- ings, such as the kitchen and the laundry rooms were demolished [28]. These areas were selected with the input of testimonies by people who were incarcerated in the Prison as political prisoners.

The new proposal, in the form of a preliminary museological study, was approved by the KAS in January 1997 by a majority of eight to five and was welcomed by the whole press.

As a diachronic museum, it was envisaged to include the following areas:

- Exhibition sites
- Refreshment room
- Cultural events venue
- Temporary exhibitions hall
- Archaeological conservation laboratory for findings, etc.

For several years now, the works have been stopped under the pretext of the lack of funding of the Ministry of Culture. The sad thing is that the building is not guarded by any government agency, resulting in the entry of passers-by since the violation of the site is feasible.

Moreover, in addition to the significant restoration work, there was also the preservation of the Prison relics. During the conservation work by the Directorate of Conservation of Ancient and Modern Monuments (DCAMM), carvings were found by groping around this so recent history point by point! That first conservation work took place in Solitary Confinement [29]. In two layers dozens of carvings and graffiti, often whole stories, written with charcoal on the wall, a collage with photos, two pigeons, a clock, a diary, a hammer and sickle, all with signatures and dates. Despair on the Confinement walls but also hope: "this too shall pass". The exact same carved inscription was revealed by the team of the Directorate of Conservation at the Gestapo detention centre on Korai Street, in Athens. The rooms are narrow and dark, except for one, which is exactly twice the size. In that room, they tore down the middle wall when they transported A. Panagoulis there in order to look less like a hell to the journalists who asked to see him [28].

The conservators gradually revealed the inscriptions and then fastened them for

posterity since the Solitary Confinement will be maintained as it is, and will be accessible to visitors. According to the study, for the protection of all these findings, the entrance of the visitors should be done with a controlled flow. In the buildings that will be preserved for the exhibition, the works to uncover the older layers on the walls were carried out in the same way. The findings were captured, photographed and taken from the wall for display in the Prison Museum. Today, because of the pause in restoration works, the walled sections that were removed are stacked under unsuitable conditions in the main building of the Directorate of Conservation of Ancient and Modern Monuments.

4   The Museological Proposal

Monuments and museums have always had a special connection; either because museums have long been housed in monuments or because the housing of a museum often led to the construction of monumental structures. The cases arising from the reuse of a museum in a historic building are the following: I) the repository and the contents are not related at all, ii) the shell and the exhibit have some potential to correlate and coexist, iii) the museums belong to this case based on which the housed exhibition is in a way a natural development of the initial use of the building [18,30].

The Aegina Orphanage-Prison is part of a network of historical sites that today remain unused and almost destroyed due to state indifference. It is not only the palimpsest of the memories of the building but also the palimpsest of the structures that compose it, the additions and the demolitions it suffered during the different phases of its history that require its conversion into a museum. The memory lands need to be restored to life in order for a living relationship to be built with historical memory. With the museumification of this place, we aim at the activation of memory and its integration in our daily life.

Within the framework of this authenticity of both the building and the history of its contents, we decided to highlight all the historical phases of the building, respecting the decision of the Central Archaeological Council and focusing on the Prison. This choice is not coincidental since the use of the building as a Prison was the longest one. The basic aim of the museological proposal is the conversion of the Aegina Orphanage-Prison into an accessible site of memory, education and culture that will express respect for the historical memory of the people who experienced internment on the sole occasion of their political beliefs. Our proposal does not seek to obscure any historical phase or degrade any other; the purpose of the Museum is to highlight all those memories that compose the palimpsest of memories and of the building. Our museological proposal does not seek to erase memories, alternate the country's history or romanticize tragic historical events.

The aim of the proposed Museum is to protect and preserve the objects of its collections, conduct scientific research and develop educational programmes. The Museum will be involved in a wide range of activities. Primarily to obtain, study, preserve and protect the objects of its collection and the building, as well as to provide access to archives, books and other material evidence of historical value. Authentic Prison

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Documents – testimonies of survivors, trial documents, microfilms, photographs, photo negatives, studies, dissertations, works of art – creations of the detainees during their incarceration and material from inside the prison such as newspapers.

The potential benefits of information in digital form (access, flexibility, enhanced capabilities for analysis and manipulation) are profound. Nevertheless, selection for digitization is a complicated process integrated with the work of librarians and curators. Nowadays, numerous software is available for easy scanning, correcting and ameliorating of museology exhibits.

Expanding the frontiers of digitization, new GIS services can be used as to obtain interactive 3D objects. A multi-orientated camera could depict even the most discrete points on semisphere bounds. The camera speed is adjusted on the calculated path considering the projected complexity of the texture of the exhibit, by giving to the user the required time to observe the scene. Nowadays, ameliorated algorithms have been developed, that can automatically calculate the optimal camera trajectory around an 3D model, by considering both its semantic and geometric features (REF). Thus, a real time virtual tour into a three-dimensional scene could take place, offering a more enjoyable experience. Furthermore, via such programs, objects can be projected onto 2D scenes, enhancing a visitor's exploration and offering the chance of integrating learning components [31].

It is of interest to understand what does experience exactly means for the public. The emotions that one is filled with during a visit and the gains that one is finally ac- quiring when leaving the Museum. To understand how a museum exhibition is inter- preted [32]. An effort will be made for the museological proposal to meet all those criteria that define a modern museum of our time.

The element that will differentiate this specific exhibition from the usual historical exhibitions is the lack of a permanent collection. In the Orphanage-Prison there is no warehouse of objects, there is no collection. However, within the framework of creating a modern Museum and research centre of that period, objects of former detainees of the Prison or of their relatives should be collected, something that will be done gradually.

To conclude, the proposal will include mild interventions in the site that will not alter it but will make clear its operation and its role as purgatory during the years of the Occupation, Resistance and Civil War. It will include signposting and organization of educational visits, raising awareness to the Greek and foreign public and of course introduction to the site. Certainly, it should be noted that the primary action is to conclude the preservation and restoration work of the building of the Aegina Orphanage-Prison.

4.1 Route

The aim of the study should be the organization of the exhibition sites in order for the incoming visitor to detach themselves from the modern environment of the island and to travel through time, experiencing the flow of events from the Occupation to the culmination of the Civil War. In an effort to connect the past with the present, the principle of memory activation will play a key role based on which the visitor will experience the place and the memories linked to it in a decisive way through the very experience of the visit.

Respecting the KAS decision, we would like to propose the Museum to be named as

follows: *Diachronic Museum* since the building will house other museums as well, such as the Archaeological and the Folklore Museums. Then, the main memory route will be proposed which will journey through all areas of the Prison. Finally, we decided for the route to consist of five thematic axes. These thematic sections will high- light the palimpsest of the building, starting the narrative from the first operation of the building as an Orphanage and ending with the period of the Metapolitefsi and the conversion of the building into a Maximum-Security Prison for criminal inmates.

The sections of the Museum, as distributed in the halls of the building, are summa- rized as follows:

- The glorious period - The Kapodistrian Orphanage
- The decade of the 1940s - From Occupation to Civil War
- The institution of displacement in Greece
- Persecutions & internment - Martial Courts - Prisons - Exile
- A history of bloodshed - Aegina Prison

Below follows a plan with the exhibition sections and the site layout. Moreover, the areas of the shop and the refreshment room are proposed, as well as the areas of the Archaeological and Folklore Museums, thus imple- menting the decision of both the KAS and the permanent residents of the region (Fig. 2).
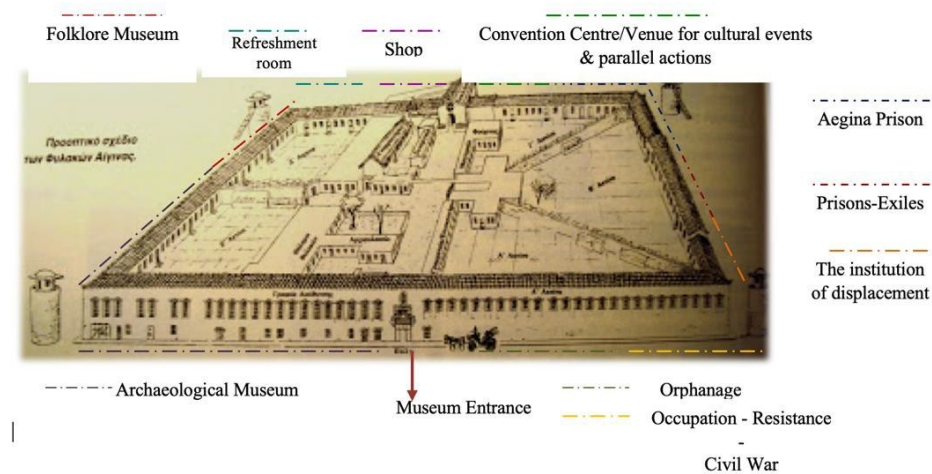
Fig. 2. Museological route of Aegina prisons.

The following is a detailed illustration of the proposed route of the abovemen- tioned sections (Fig. 3):
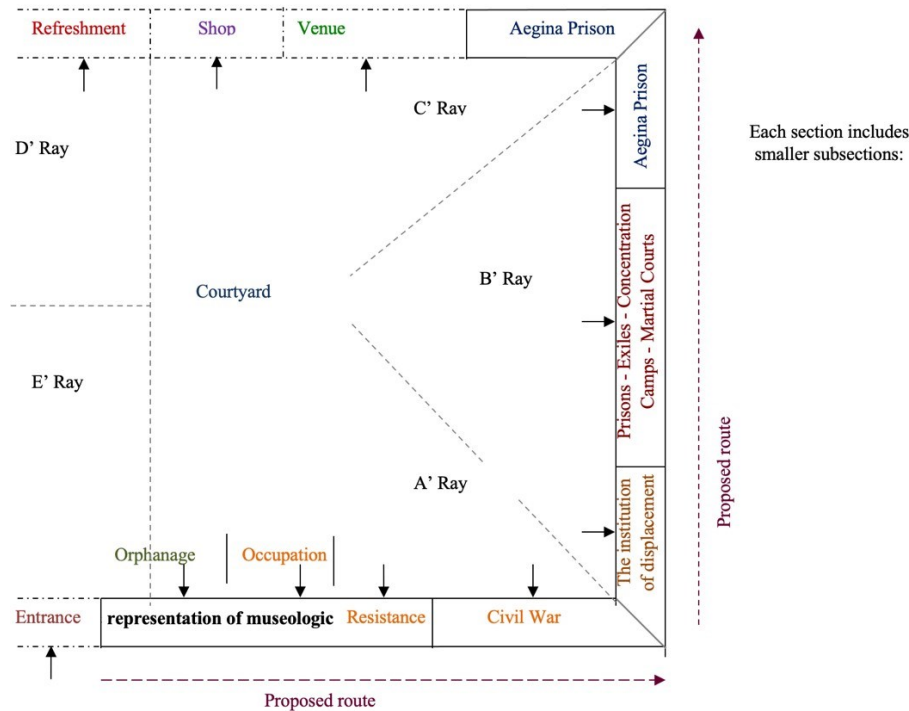
Fig. 3. Plan of the Museological route of Aegina prisons

1ˢᵗ Thematic Section: The glorious period - The Kapodistrian Orphanage

This section will be dedicated to the Orphanage of Ioannis Kapodistrias. Initially, general information will be given regarding the establishment of the new state, the time when Aegina became the county's capital and the arrival of Ioannis Kapodistrias on the island. Then, there will be information about the initiatives of Kapodistrias and the construction of the so-called Kapodistrian buildings of the island, influenced by the architectural trends of that time in Europe. In addition, there will be texts dedicated exclusively to the Orphanage informing the public about when exactly it was built, who its architects were and the reason why it was created – protection of the orphans of those fighting in the 1821 Revolution. There will be an extensive report of all the activities that took place in the Orphanage. Moreover, other innovative operations of the building will be mentioned, such as the first National Library, the first Archaeological Museum, the first Minerals and Geological Collection, the first National Printing House, the first National Conservatory with byzantine and European Music. At the end of this section, the date of the inglorious closure of the institution will be mentioned, as well as the subsequent temporary operations that took place in the Orphanage of Kapodistrias (Evelpidon Military Academy, Quarantine Hospital, Mental Asylum).

2st Thematic Section: The decade of the 1940s - From Occupation to Civil War

This section will be dedicated to the modern history of Greece and more specifically to the 1940s. The narrative of the events will start a little earlier than the dictatorship of August 4 as a simple reference so that the visitor can better understand the development of the subsequent events. This will be followed by the German Occupation and a reference on the resistance organizations that operated during that time. In the period after the liberation, there will be a detailed section dedicated to the December events. Then there will be a text that will analyze the period of White Terror and the origin of its name, whilst a mention will be made to the violence, persecutions and executions against militants that had taken part in the Resistance and had joined Resistance Organizations by state and parastatal mechanisms. A reference will be made to the Civil War, from its beginning to its end. Hidden aspects of the War will be revealed in an attempt to cast light on those dark parts that have faded into oblivion for decades. There will be an attempt to tear down those stereotypes that have been created for that period and the distorted perceptions that have been well-established over the years. At the end of this section, there will be a special mention to women and the struggles they have conducted during that period. The struggle of women will be specially promoted since the stance they held was impressive. We are talking about a time when women in their majority had not become independent yet, did not leave their homes and were either engaged in agricultural work and livestock farming or were running the household. Nevertheless, some women found the courage to fight in the mountains, defying danger and resisting the occupier; they stood trial, were imprisoned, exiled raising their children whilst displaced, and executed [33].

3rd Thematic Section: The institution of displacement in Greece

This section will be short and will present the most notable Legislation and Decrees that enacted the displacement or internment of those deemed "*dangerous*" to the state. These references will be combined with the chronological periods of the previous section for the visitor to combine each Law with the corresponding period and to understand for what it was intended. Finally, there will be the general numbers of the people that were displaced, interned, persecuted and executed, and the number of the people that died as a result of hardship and diseases in the prisons and exiles.

4st Thematic Section: Persecutions & internment - Prisons - Exile

This section will present the most emblematic sites of exile and internment[51] as well as the disciplinary camps that were established at the beginning of the Civil War. The portrayed sites will be connected with the historical events of that time for the public to understand the reasons why the sites of displacement were gradually increased. Moreover, a reference will be made to the Martial Courts of that period, which determined the lives of thousands of militants and fighters (the court in Thessaly, in Tripoli, etc.). Here, the public will be informed about the conditions of detention and living, the physical and psychological torture that took place in these places, the rampant diseases that afflicted the prisoners. On the other hand, a special mention will be made to the

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[51] Akronafplia, Corfu, Yedi Kule, Chaidari, Trikeri, Makronisos, Ai Stratis, Chios, etc.

camaraderie and solidarity that the prisoners showed for to be perceived how that respect and mutual support had many times played a crucial role in the *unwavering stance* of the detainees. The relations between the prisoners and the resident population will be mentioned but also the relations between the political and the criminal prisoners, revealing the state expediencies to enmesh them in the same places of detention. Moreover, the visitors will be informed about the "Omades Diaviosis" (*Groups on the Living Conditions*) and how they contributed to the organization of the daily life of the prisoners. There will be also a reference to the repressive measures on the part of the state in the places of exile and imprisonment and of course the measure of the *declaration of repentance* and how they extracted it. Finally, the visitors will be also informed about the bright side of those sites and the measures adopted by the prisoners for their ideological and political education, the fight against illiteracy and the organization of higher education lessons (foreign languages, accounting, mathematics, literature, etc.). At the same time, they will learn about the cultural events that were held (choirs, theatrical pieces, poetry and literature evenings, etc.). The message that should permeate the visitor is that those people, even under those circumstances, found the strength to look for a way out to culture, they were experimenting, they were creating. The bright side of the displacement will end with the illegal press in the exile by portraying the most remarkable examples, the main topics presented and sketches.

5st Thematic Section: A history of bloodshed - Aegina Prison

In this section, we will examine the case of the Aegina Prison starting from its opening and the first detainees – marking an organized state – until its permanent closure. Here, the narrative permeates all previous sections but this time focusing exclusively on the environment of the Aegina Prison. A reference will be made to the most important personalities per period who were interned in the Prison cells, and their *crime* (Antipas, Ambatielos, Velouchiotis, Mpelogiannis, Sarafis, Glezos, Panagoulis et al.). In addition, a special mention will be made to the mass executions of the political prisoners and the way with which their transfer was taken place to other parts of the island but also Athens. In view of the executions, there will be a link to Aghia Irini and Tourlos, places of execution on the island. In addition, a specific date should be set to hold a ceremony to those sites and to render honour to the executed detainees of the Prison. Moreover, a monument to the fallen, in addition to a votive tablet, is considered necessary to be placed on site.[52] The votive tablet will state the names of the prisoners that were executed or that died of natural causes in the Aegina Prison, their date of death, their age and their place of origin. It would be reasonable to connect the site with other martyred places, to transform it into a research centre of that period. Returning to the Prison site, it is proposed to highlight the buildings that were preserved by the KAS decision with the corresponding information signboards and markings, as well as those that were demolished so that the visitor can recreate a complete picture of the Prison. Moreover, the cell of Al. Panagoulis should be highlighted, which by decision was

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[52] In the summer of 2003, in the cemetery of Aegina, the unveiling of a monument took place, which included the names of the executed fighters of the National Resistance engraved on four plaques. In the same monument, a sculpture by the artist Giannis Klinakis, assistant and collaborator of Christos Kapralos, symbolizes two bereaved mothers.

deemed preservable and was conserved by the DCAMM. In that cell, it is proposed to add again into the wall the fragments of the graffiti with the prisoners' messages that had been taken off. Lastly, this section will close with the presentation of the subsequent history of the Prison in the years of the Metapolitefsi, the legalization of the Left and the end of persecutions based on political beliefs, and its conversion into Maximum-Security Prison for criminal prisoners. The messages of the political prisoners that were revealed and then destroyed or covered up again during the restoration can also be reproduced in this section.

In all thematic sections, there will be entrances/exits so that each visitor can go to the section they desire or even go to the shop or the refreshment room of the Museum. These entrances/exits will lead to the courtyard of the Museum, the old courtyard of the Prison. Each entrance will have a respective sign informing about its content. It is suggested that each section is designated by a different colour, e.g. in the texts or the entrance/exit signs so that each one is distinct and can be perceived by the public. Moreover, information signboards will be placed on every entrance notifying about the use of each building section during the period that was operating as a Prison.

The last hall, at the end of the section *Aegina Prison* needs to remain a site of historical memory. There, the right combination of aesthetic interventions and exhibits will offer the visitor an emotionally charged experience. The hall will be divided into two sections: a) the screening area, where a newsreel will be shown and b) the memory area, where there will be an exhibition of archival material, lists of those executed in the Aegina Prison, parts of the Prison Archive with the names of political prisoners per period, photos from the turbulent 1940s and especially from places of exile and prisons, etc. Thus, an astounding mosaic will be created that will recreate and personify that period.

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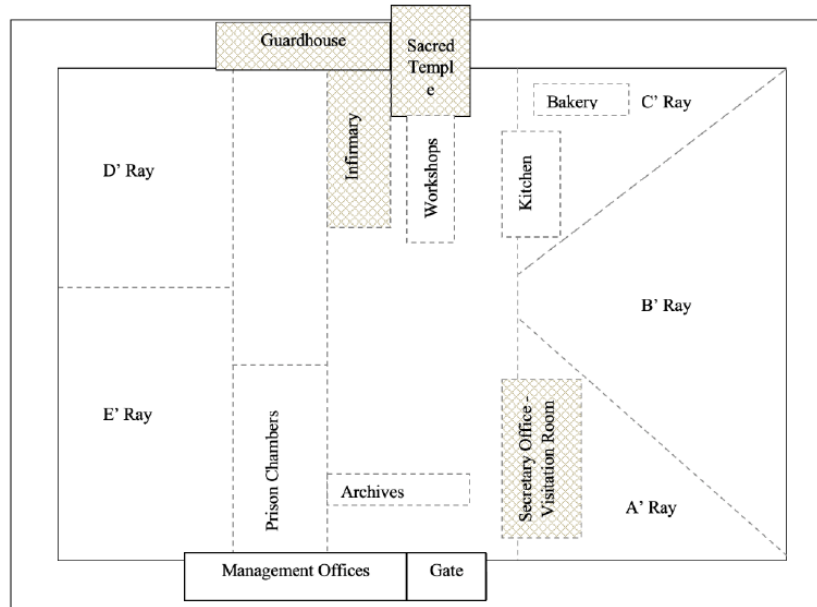
Fig 4: The Ground Plan of the Prison - The areas with section lining have been kept intact following the KAS decision.

5   Conclusion

The Diachronic Museum of Aegina as a case study was an interesting choice. Although the Museum appertains to a difficult period of the modern history of Greece, it will contribute to the materialization of something that would otherwise be a controversial view! The aim of the proposed Museum is to study objectively a period of the modern history of Greece, the 1940s, which still divides society since it is not a distant past and the memories are still fresh.

Our vision is an outward institution that will examine the events in an objective and lucid manner and will be based on both the personal testimonies of the people that experienced internment and the material evidence. A model institution, which in the future will become a modern centre for the study of issues on the difficult heritage of the country for Greek and foreign researchers. A cultural centre at the heart of Aegina, with a variety of actions and activities that will attract the permanent residents and the visitors of the island.

6   Acknowledgments

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Inspecting the healing process in an artificial stone used for repair works containing crystallines

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Abstract. Stone has been a basic building material of different monuments and structural components such as foundations and masonry. At the same time, different types of stones have been used for decorative architectural elements, such as cornices, reliefs, colonnettes, and corbels. The maintenance of stone ele- ments is essential for the continuity of these structures. Many studies have been performed to produce stones with artificial materials. This study aims to present a new approach to artificial stone with self-healing capability. Crystallines have been implied in two different dosages: 0.8 and 1.6% w./w, to achieve this goal. The addition of the crystalline admixtures affected the physical properties, decreasing the porosity and the capillary absorption, proving the sealing properties of the admixtures. The self-healing efficiency has been tested with the sorption test, recovery of compressive strength, and 3D acoustic microscopy. The crystalline admixtures accelerate the self-healing, increasing the sealing efficiency by 20% and recovering compressive strength by 15%. The analysis by 3D tomography provided results that confirm the healing of the crack hasn't occurred only on the surface but extended to a certain depth.

Keywords: Artificial stone, Healing, Mechanical Properties, Physical Properties, 3D acoustic tomography.

1   Introduction

Various types of stones have been employed in constructing monuments and historic buildings based on their significance and structural requirements as well as the availability of raw materials. Nowadays, many difficulties arise during restoration works when filling missing parts or replacing stone elements is required. These are mainly

attributed to the availability of specific stone types, the high cost of quarrying and transportation, and the high environmental impact. Artificial stone is an environmentally friendly alternate solution designed using guidelines and criteria based on the recorded properties of the authentic stones [1]. The term "artificial stone" has been specified in the Encyclopedic Dictionary of Polymers as [2]: "Special concretes and tiles, artificially colored to simulate natural stone, obtained by mixing stone dust aggregate and chips with Portland cement". The ability to produce a durable material of high-strength and resistance, which at the same time could be aesthetically elegant, imitating natural stones, is nowadays an extensive research field [3]. Today, the ad- vantages of artificial stone compared to natural stone are very much in line with sus- tainability principles in construction, associated with reducing raw materials and the consumption of energy resources [4]. However, this research field is becoming even more interesting as the designed materials can heal their flaws. The concept of self- healing is directly related to the concept of resilience. Cracks generally increase the material's porosity and allow water, salts, and other harmful substances to enter the mass and damage the material. The leading causes of cracking are low resistance to tensile, thermal shrinkage, autogenous shrinkage, and drying shrinkage. Different design measures can restrict the shrinkage phenomena. Nevertheless, it seems that early cracking is unavoidable for materials exposed to the environment. The capacity of a material to heal the early formed cracks is a broad research topic and approached in different ways, one of which is crystallines in the mixture [5-6]. Crystallines, what- ever their chemical composition, are hydrophilic substances. The presence of water is necessary to activate their action. If it is available, the crystalline admixtures (CA) react with it and cement to produce a new material that fills the cracks [7-8]. The use of artificial stone with healing capacities in heritage structures, poses several benefits, including the following options:

- Design a material of similar physical (porosity, texture, color hue, apparent specific gravity, etc.), mechanical properties, and microstructures with the original stone in the light of compatibility.
- Determine specific properties of the final product according to the specific needs of the monument and the broader environmental aspects (water retentivity, frost action, durability).
- Offer flexibility in the manufacture, application, and reproduction process.
- Cost-effectiveness and preservation of raw materials resources, under the prism of sustainability.
- Revival of a diachronic constructional technique that prevailed in constructions from the Neolithic period until the 20th century.
- Produce a material with self-healing capacities that increases its durability and reduces its preservation cost

The healing efficiency achieved in the materials tested is checked through different techniques such as strength recovery, sorption and porosity measurements. Additionally, a novel technique of acoustic microscopy that has been used in this study for the evaluation of healing is based on emitting and receiving high frequency (>10MHz) ultrasonic waves, i.e., shorttime pulses [9]. The received wave consists of the backscattered reflections, or echoes, of the emitted wave which results from the micro structures on and under the surface of an object. The received signal consists of a few time-

delayed pulses whose delay, or also called the time-of-flight, is associated with the distance the pulse traveled after it reflected from a microstructure. This signal is commonly called either the echograph or the amplitude scan (A-scan), while merging adjacent signals results in cross-sectional tomographic images, B-scans, or even pla- nar representations of the inner structure, namely C-scans. It is worth mentioning that a proper excitation frequency must be selected since the trade-off between the resolu- tion with the penetration depth should be considered.

The present study focuses on designing, manufacturing, and applying a series of tests on an artificial stone composition that imitates marble and can heal its weakness- es. The biggest challenge was to design an efficient artificial stone mixture for replac- ing or filling deteriorated marbles by maintaining the physic-mechanical properties of the authentic stones and enhancing their resilience under the current environmental- conditions. The artificial stone was created with inorganic binders such as white ce- ment and natural pozzolan, natural aggregates of different gradations, and additives.

2   Experimental program and methodology

2.1   Experimental program

In this work, the effect of CAs has been investigated. The analysis was divided into two stages. In the initial stage, all compositions have been evaluated through com- pressive and flexural strength, porosity and capillary absorption. The second stage was estimating the healing efficiency, the crack closure, and the recovery of compres- sive strength. Additionally, a 3D acoustic tomography test has been depicted the depth of the healed crack.

2.2   Materials

In this study, Natural Pozzolan and Portland CEMI52.5 were used, classified by the EN 206-1:2000. The water to binder ratio was kept constant (0.45). The reference composition has further been modified by adding two different dosages equal to 0.8 and 1.6% w./w. of the binder. These percentages were chosen to test the limits and effectiveness of additives applied to concrete, as the manufacturer's proposal is somewhere between the two. Table 1 shows the mix designs of the investigated com- positions. It is worth mention that the CA were added to the mixture without changing the other quantities.

Table 1. Mix designs of the investigated concretes.

Compositions	M	M0.8Cr	M1.6Cr
CEMI52.5	0.6	0.6	0.6
Natural Pozzolan	0.4	0.4	0.4
w/b	0.45	0.45	0.45
Limestone sand (0-4 mm)	1.5	1.5	1.5
Limestone aggregate (4-8 mm)	0.5	0.5	0.5
Crystallines **(CA)** (% w./w.)*	-	0.8	1.6
Superplasticizer (% w./w.)*	0.2	0.2	0.2
PP Fibers (% v./v.)	0.5	0.5	0.5
Consistence of fresh mortar (cm)	**14.5**	**15.5**	**15**

*the weight of the binder.

The superplasticizer addition (Rheobuild600) was added to maintain workability to the same level. Workability was measured for all compositions according to slump tests EN1015-3. Beam specimens, $40\times40\times160$ mm^3, and cubic specimens $50\times50\times50$ mm^3 were prepared. Compressive and flexural strength, porosity, capillary absorption, and ultrasonic pulse velocity were tested at 7, 28, and 90 days, according to EN196- 1:1995, RILEM CPC 11.3, BA EN1015-15:2002 and EN12504-4:2004, respectively.

2.3 Evaluation of self-healing

The capillary water absorption (sorption) has been tested according to EN 13057:2002 standard but with pre-cracked specimens. Water absorption tests were performed after 7, 14, and 28 days of healing. The parameters for the water absorption test remain the same as the standard. The healing effect was estimated by calculating the Sealing Ration parameter as follows, Eq. (1):

$$SE = \frac{SC_{unhealed} - SC_{healed_{(\Delta t)}}}{SC_{unhealed} - SC_{uncracked}} * 100, \qquad (1)$$

where: SE = Sealing Efficiency
$SC_{unhealed}$ = Sorption Coefficient for unhealed specimen (g/cm^2/t$^{1/2}$)
$SC_{healed\ (\Delta t)}$ = Sorption Coefficient after t days of healing (g/cm^2/t$^{1/2}$)
$SC_{uncracked}$ = Sorption Coefficient for the uncracked specimen (g/cm^2/t$^{1/2}$)

Similarly to the healing ratio, a crack closure ratio parameter was calculated based on equation (2):

$$Crack\_closure = \frac{CW_{initial_{(t_0)}} - CW_{healed_{(\Delta t)}}}{CW_{initial_{(t_0)}}} * 100, \qquad (2)$$

where: $CW_{initial\ (t0)}$ = Crack Width after pre-crack.
$CW_{healed\ (\Delta t)}$ = Crack width after t days of healing.

Also, cubic specimens ($50\times50\times50$ mm^3) were pre-damaged at 28 days up to failure. Then the samples were cured for one month, immersed to tap water, and re-tested until failure again. The recovery of compressive strength (RCS), as a parameter, is set as follows, Eq. (3):

$$RCS = \frac{P_{healed\,(t=30\,days)}}{P_{undamaged\,(t=0)}} * 100, \tag{3}$$

where: $P_{healed\,(t=30\,days)}$ = Compressive strength of healed material after 30 days of healing (MPa)

$P_{undamaged(t=0)}$ = Compressive strength of undamaged specimen before the pre-damage (MPa)

Also, for this study a 3D acoustic tomography has analyze the healing depth, short wavelength pulses are utilized. In particular, a 75 MHz ultrasonic transducer is utilized to satisfy a fine spatial and vertical resolution (micrometric order), allowing a millimetric order penetration depth. Moreover, a powerful A/D converter is attached, namely 1 GSample/s, to enable the accurate surface characterization of the cracking

3 Results

3.1 Physic-mechanical properties

The physic-mechanical properties of all the compositions were tested at 7, 28, and 90 days of curing. The specimens were cured in a humid chamber with 99% HR and 25±2°C.
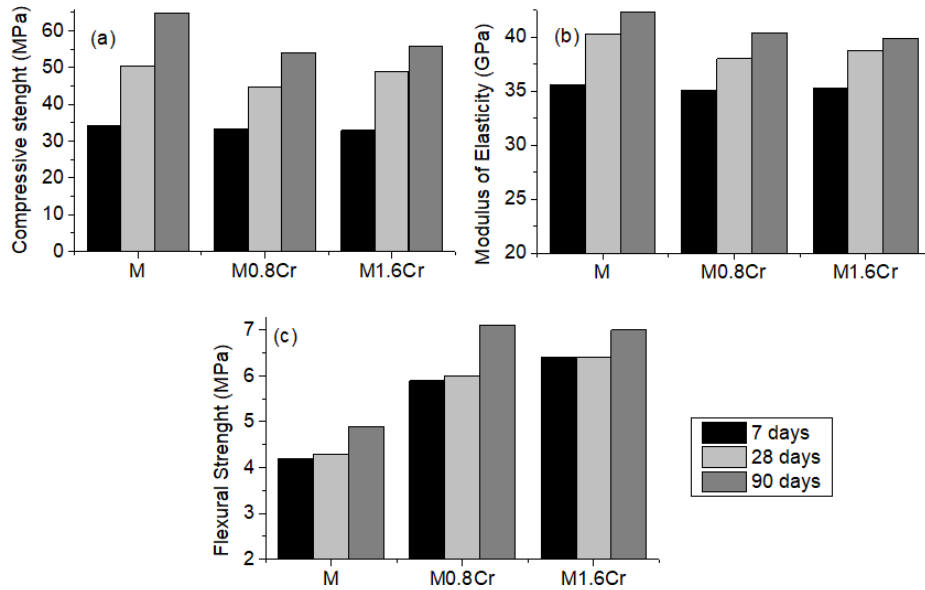
Fig. 1. Mechanical properties of the compositions, (a) compressive strength, (b) modulus of elasticity, (c) flexural strength after 7, 28, and 90 days of curing.

In figure 1(a), the compressive strength (CS) of all the compositions revealed that the addition of CAs seems to reduce it, especially after 90 days of hydration. Specifically, the addition of CA shows a reduction of CS at all ages. The CS of M0.8Cr composition compared to the reference sample decreased by 2.4%, 11.5%, and 16.7% at 7, 28, and 90 days. Additionally, the reduction of M1.6Cr was 3.8%, 3.1%, and 14.2% at

7, 28, and 90 days. Even though the reduction seems sugnificant, the final strength values meet the design criteria. According to figure 1(b), the modulus of elasticity seems to follow the same rate with the compressive strength, although the final reduction was 5.0% for the M0.8Cr, and 6% for the M1.6Cr.

In terms of flexural strength (FS), the CA seems to work favourably by increasing it (Fig. 1(c)). Specifically, the FS of M0.8Cr composition compared to the reference sample increased by 41.3%, 40.4%, and 44% at 7, 28, and 90 days, respectively. Furthermore, the increase of M1.6Cr was 51.4%, 47,7%, and 41.4% at 7, 28, and 90 days, respectively. These results show that CA eliminated the weak points by filling them and limited the discontinuities that can cause fracture due to tension.
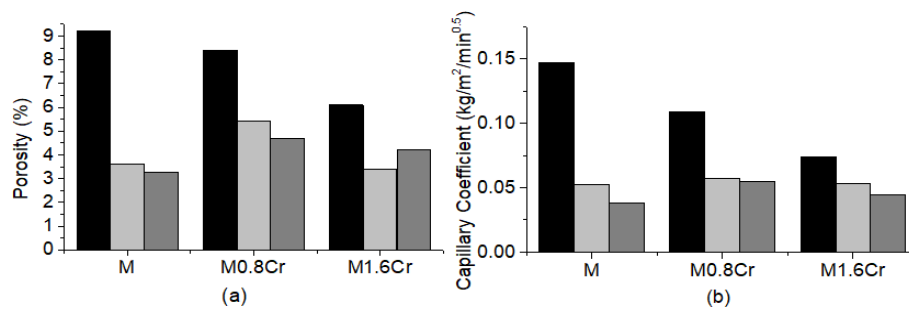
Fig. 2. Physical properties of the compositions, (a) porosity, (b) capillary coefficient after 7, 28, and 90 days of hydration.

The porosity test, time-related (Figure 2(a)), showed higher porosity at 7 days for the reference composition, indicating the crystalline effects at an early age. Although the M0.8Cr and M1.6Cr compositions' porosity at 90 days, compared to the reference, increased 43% and 28%, respectively. The same behavior was observed in figure 2(b) from the capillary coefficient, presenting a much lower absorption at seven days. Then, the reduction rate was lower than the reference sample. This reduction was may due to the hydrophilic nature of the crystallines.

3.2 Sorption coefficient test

The results of the water absorption test described in Section 2.3 are shown in Figures 3, and 4. Figure 3 depicts the relation of the level of damage of the cracked speci- mens, the initial crack measured with Dino-Lite microscope, and the initial slope of the water absorption. The level of damage has been measured with ultrasonic pulse velocity method, according to EN 12504-4:2004, before and after the pre-crack. The graph shows that the initial crack, although it was in the same range for all samples from 122 to 145 μm, does not play a primary role in the final absorption value.
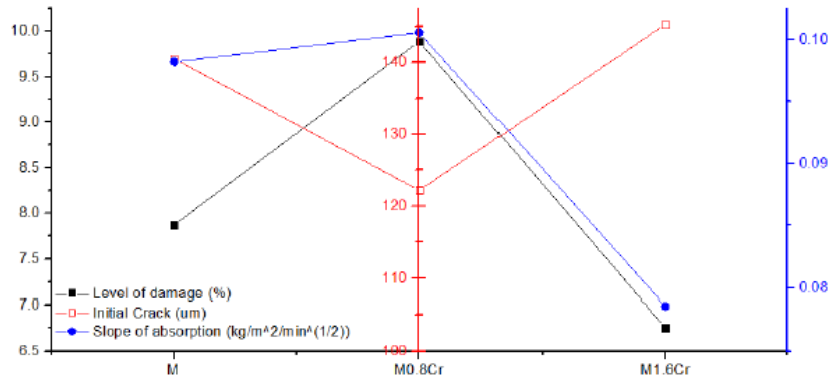
Fig. 3. Correlation between the level of damage, the initial crack, and the slope of absorption.

However, it is observed that the level of damage has a greater correlation with the final absorption. This fact showed that even the crack has been isolated for the sorption test, the sample's microstructure still plays a crucial role. Consequently, the initial and after healing slope can be used to evaluate the connectivity of the pore network. Figure 4 illustrates the difference in slope of absorption between the cracked and uncracked specimens. The porous media absorbs the water rapidly initially, and then the rate of absorption slows down. The water absorption rate of the cracked speci- mens increased, compared to the uncracked samples, due to the capillary tubes of the crack surface. In the reference sample, the slope of absorption of the uncracked and cracked specimens was 0.0334 $kg/m^2/min^{1/2}$ and 0.0982 $kg/m^2/min^{1/2}$, respectively. The slope of absorption of the uncracked specimens increased by approximately 194%. The slope of absorption of M0.8Cr was 0.0460 $kg/m^2/min^{1/2}$ and 0.1005 $kg/m^2/min^{1/2}$ for uncracked and cracked specimens, respectively, and the slope of water absorption of cracked specimens was 119%. Additionally, the slope of water absorption of the M1.6Cr cracked specimens fails to 76%, compared to the uncracked. The use of CA has increased the water absorption of the uncracked specimens due to the admixtures' hydrophilic nature and presented pretty similar results. Although in the case of the cracked specimens, the initial water absorption of the composition with 1.6% CA seems to decrease the capillary absorption already, even though the crack is wider.

The self-healing of cracked surfaces through further hydration of cementitious materials has two stages. The initial stage is the 'surface control' stage, in which unhydrated particles at the entrance of the crack react fast with the passing through water. Cause precipitation of hydrates on the surface, though further hydration. This mecha- nism plays a vital role in autogenous healing and provides most of the healing agents. The secondary-later stage is the 'diffusion control' stage. The ions inside the cement matrix diffuse and move to the cracked surface through capillary pores, generating additional self-healing products. Ca^{2+} ions with high concentrations exist in the capil- lary pores and in the cement matrix. When a crack occurs, the concentration differ- ence between the crack and the inside of the matrix causes the Ca^{2+} ions to move to the crack. When the Ca^{2+} ions moving into the crack react with dissolved CO_2, $CaCO_3$ is generated.

Thus, $CaCO_3$ generated usually has very low solubility (insoluble prop- erty) and fills the cracks. As the second stage has a much lower crack self-healing performance than the further hydration of the first stage, crack healing occurs quickly at early age and is mitigated later.
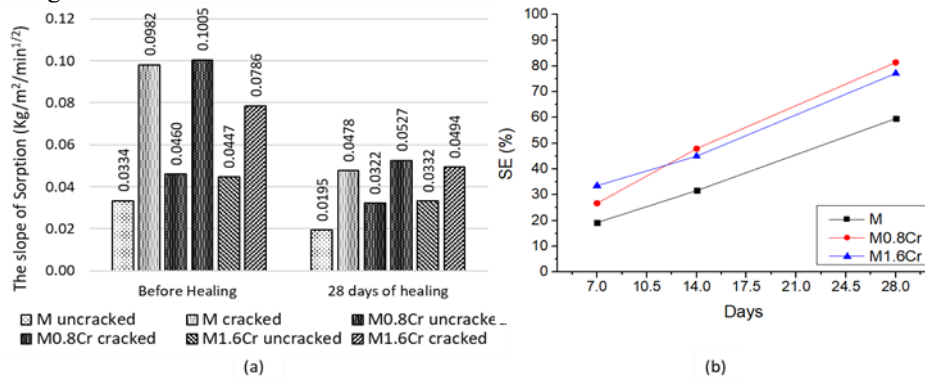
Fig. 4. (a) The slope of sorption before and after the healing period of 28 days, (b) and the Sealing Efficiency of all the compositions, after 7, 14, and 28 days

To exclude the microstructure factor, the healing efficiency was calculated based on equation 1. Figure 4(b) depicts the SE of the compositions' SE after 7, 14, and 28 days of healing. According to that, at all ages, the healing rate was higher than the plain composition. Specifically, at 7 days, the SE of M, M0.8Cr, and M1.6Cr was 19%, 27%, and 34%, respectively. The increased crystalline content seems to accelerate the initial reaction to the surface, especially with 1.6%. Subsequently, at 14 and 28 days, the SE seems to have the same trend presenting even greater SE. Finally, after 28 days, the SE of M, M0.8Cr, and M1.6Cr was 60%, 81%, and 77%, respectively.
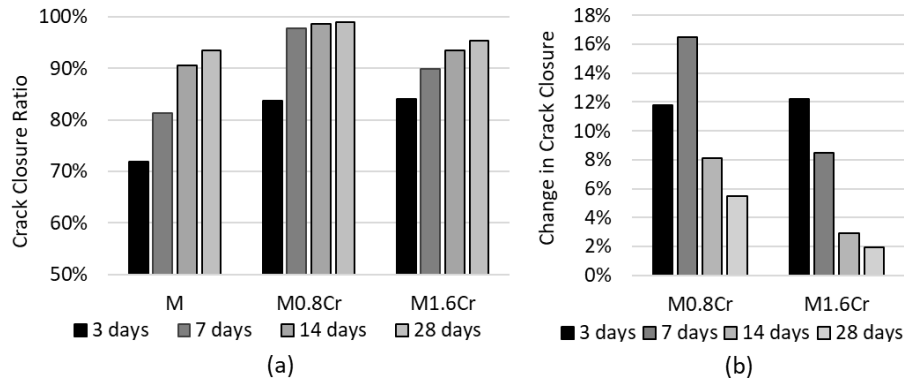
Fig. 5. (a) Crack closure of all compositions, and (b) Change in the Crack closure comperared to the reference sample, after 3, 7, 14, and 28 days.

Similar to SE, the crack closure ratio (CCR) has been calculated based on equation 2. Figure 5 depicts the CCR of all compositions after 3, 7, 14, and 28 days of healing. According to that, the composition with CAs seems to improve the crack's surface healing after 3 and 7 days of hydration. After 14 days of healing, the CCR was above 90%

for all compositions, with M0.8Cr exhibit the most remarkable results, reaching almost 100% of healing after 28 days. The results are in line with the SE results, proving that even the mere counting of the surface crack undermines the healing ability and that the crystallites favored healing.

3.3 Recovery of compressive strength

Figure 6 shows the healing rate of the pre-damaged cubes after one month of healing. The recovery of compressive strength, according to equation 3 evaluated based on the level of damage caused in each sample. The level of damage has been estimated based on the ultrasonic pulse velocity before and after the pre-damage. According to fig. 6(a). the level of damage was similar for reference and M1.6Cr, with an average damage of 26.1% and 27.1%, respectively. Although in the case of M0.8Cr, the level of damage rises to 38.5%. The fig. 6(b) shows that the RCS of the reference sample was 76% of the initial compressive strength. On the other hand, the recovery index of compositions with CA was 92.5%, 92.9% for M0.8Cr, and M1.6Cr, respectively. Those rates prove the very important contribution of the CAs that superficially close the crack and increase their strength. This increase was due to the ability to heal the cracks inside the structure and increase the strength of the healing agents.
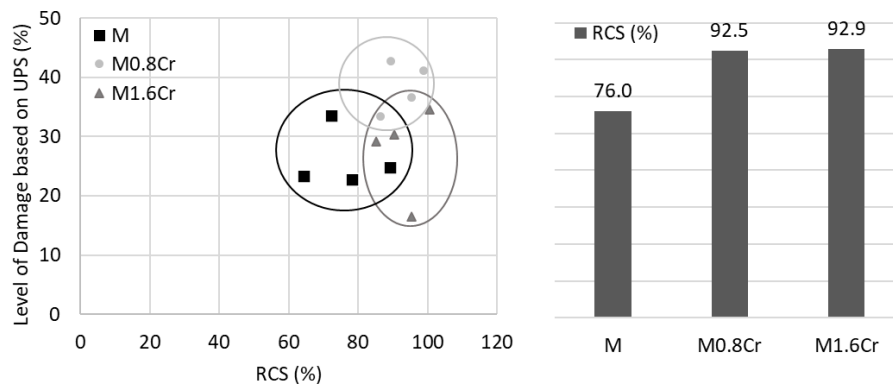
Fig. 6. The Recovery of Compressive Strength (RCS) to the level of damage based on UPS (%), (b) The average RCS(%) of all compositions after one month of healing.

3.4 3D acoustic Tomography

The M0.8Cr composition was measured via the acoustic microscopy setup, an unhealed specimen with visible cracking, and its healed counterpart. The tomographic image of the former, depicted in Fig. 7(a), clearly indicates the propagation of the cracking through. Moreover, a C-scan image is evaluated in Fig. 7(c) for this sample at 2 mm depth from the concrete surface, revealing the inner cracking profile. Finally, the tomographic image of the healed counterpart is illustrated in Fig. 7(b), proving the almost perfect healing due to a cracking absence.
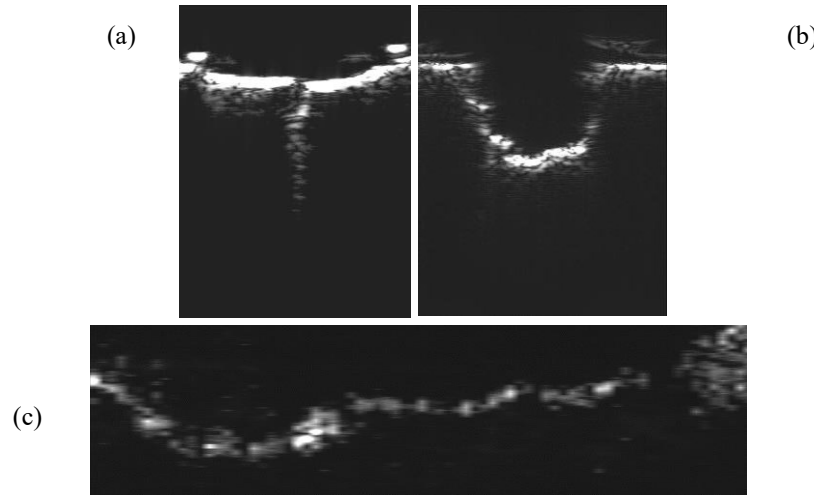
Fig. 7. Tomographic images, ac-quired via a 75 MHz acoustic microscope of (a) a concrete sample with cracking and (b) its healed counterpart. (c) The cracking profile of the first concrete sample at 2 mm depth.

4 Conclusions

This study investigates the self-healing performance and physic-mechanical properties of artificial stone. The effect of CAs on the mechanical properties was evident, as the compressive strength and the modulus of elasticity reduced, indicating the impact on the microstructure of the composition. Although the ability of CAs to heal and feel the gaps was profound to the flexural analysis, achieving a 50% strength rise in both compositions. Additionally, the porosity and capillary test have been significantly reduced at early-age for compositions with CAs. While the hydrophilic nature of the CAs prevents the same rate from continuing after 28 days.

For the self-healing evaluation, the pre-cracking samples on the sorption had a greater correlation with the level of damage than the initial crack width. This fact showed that even the crack had been isolated, the microstructure still plays a crucial role. Despite this fact, the healing rate of the composition with CAs has increased approximately by 20%. Additionally, the recovery of the compressive strength of cubes that have been pre-damaged to failure proved that the CAs react in the surface and also in the 'diffusion control' stage. In this stage, healing occurs inside the cracks, and healing agents with increased strength have been created, leading to 20% increased recovery. The composition with better healing efficiency, M0.8Cr, was analysed through 3D acoustic tomography. The outcome of this test showed that it was not possible to detect the crack with the resolution of 20μm. This fact proved that the healing had been achieved to such an extent that it will not be able to detect.

The results of the healing efficiency were quite interesting and constant. The CAs have established their beneficial role. The increased CAs seemed to play a minor role

in the healing properties, proving that 0.8% was the ideal portion.

Acknowledgments

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A stochastic approach for upgrading Cultural Heritage framed concrete buildings by cable-ties to prevent progressive collapse under seismic sequences

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Abstract. Old industrial reinforced concrete (RC) structures included to built Cultural Heritage are subjected sometimes to obligatory removal of some structural element-members, e.g. columns. In such cases, a modification of the structural response and a redistribution of internal actions can result to a requirement for upgrading the remaining structure after the removal of the degraded elements in order to avoid a progressive collapse. The present study deals with such a case, which concerns the stochastic computational analysis of historic framed RC structures under the removal of some columns and the so- induced requirement of a strengthening by ties (tension only elements). The unilateral behaviour of these cable-ties, which can undertake only tension, is strictly considered. The response under seismic sequences of the remaining historic RC structure strengthened by ties is computed considering uncertain-but- bounded input parameters.

Keywords: Historic industrial RC Structures, Progressive Collapse, Upgrading by Cable-ties, Input Parameters Uncertainty, Seismic Sequences.

1   Introduction

The recent built Cultural Heritage (CH) includes, besides the usual historic monumental structures (churches, monasteries, old masonry buildings etc.), also existing old

industrial buildings of reinforced concrete (RC), e.g. old factory premises framed structures. Such historic RC structures are subjected to various environmental actions, e.g. corrosion, earthquakes etc., which can often cause significant damages. A main such defect is the strength degradation, resulting into a reduction of the loads bearing capacity of some structural elements. For some of such degraded elements is sometimes obligatory to be removed, and so a further reduction of the whole structure capacity is caused, which can lead to a progressive collapse [1,2].

To avoid such a collapse, a suitable upgrading and strengthening must be performed. Moreover, concerning their global seismic behavior, it often arises the need for their seismic upgrading. Certainly this upgrading must be realized by using materials and methods in the context of the Sustainable Construction and in the frame of the current Civil Engineering praxis [3,4]. Especially for RC structures which belong to recent built Cultural Heritage, some traditional methods for their seismic upgrading (e.g. RC mantles) are available, see [4,5].

Recently, the use of cable-like members (tension-only ties) has been considered as an alternative strengthening method [6,7,16,31-34]. As well-known, ties have been used effectively in monastery buildings and churches arches. The ties-strengthening approach has the advantages of "cleaner" and "more lenient" operation, avoiding as much as possible the unmaking, the digging, the extensive concreting and "nuisance" functionality of the existing building. These benefits hold also for Cultural Heritage RC structures. It is emphasized that the ties can undertake tension but buckle and become slack and structurally ineffective when subjected to a sufficiently large compressive force. Thus the governing conditions take equality as well as an inequality form and the problem becomes a highly nonlinear one [6-10].

For the numerical analysis of such old RC structures, many uncertainties for input parameters must be taking into account. These mainly concern the holding properties of the old materials that had been used for the building of such structures, e.g. the remaining strength of the concrete and steel, as well as the cracking effects etc. Therefore, an appropriate estimation of the input parameters and use of probabilistic methods must be performed. For the quantification of such uncertainties, probabilistic methods have been proposed [11-16].

Moreover, as concerns the seismic upgrading of existing RC structures, modern seismic design codes adopt exclusively the use of the isolated and rare 'design earthquake', whereas the influence of repeated earthquake phenomena is ignored. But as the results of recent research have shown [17, 18], seismic sequences generally require increased ductility design demands in comparison with single isolated seismic events. Especially for the seismic damage due to multiple earthquakes and to pounding [17-19], this is accumulated and so it is higher than that for single seismic events.

The present research treats with a computational probabilistic approach for the seismic analysis of Cultural Heritage existing industrial RC framed-buildings, which are subjected to removal of some structural elements and are under seismic sequences. These structures are to be strengthened by cable-ties elements in order a progressive collapse to be prevented. Special attention is given for the estimation of the uncertainties concerning structural input parameters. So uncertain-but-bounded input parameters [20] are considered and treated by using Monte Carlo techniques [12-15,21- 23,35-37].

Damage indices are computed for the seismic assessment of such historic and industrial RC structures [24,25]. Finally, an application is presented for a simple typical example of an industrial RC frame strengthened by bracing ties in order to prevent progressive collapse under seismic sequences.

2   The Stochastic Computational Approach

The stochastic seismic analysis of Cultural Heritage existing RC framed-buildings is obtained herein through Monte Carlo simulations. As well-known, see e.g. [21-23], Monte Carlo simulation is simply a repeated process of generating deterministic solutions to a given problem. Each solution corresponds to a set of deterministic input values of the underlying random variables. A statistical analysis of the so obtained simulated solutions is then performed. Thus the computational methodology consists of solving first the deterministic problem any times for each set of the random input variables and finally realizing a statistical analysis. Details of the methodology are described in [16] and are given briefly in the next sections.

2.1   Numerical Treatment of the Deterministic Problem

The mathematical formulation and solution of the deterministic problem concerning the seismic analysis of Cultural Heritage existing RC frame-buildings strengthened by ties has been recently developed in [6, 7, 16]. Briefly, a double discretization, in space and time, is used. So, first, the structural system is discretized in space by using frame finite elements. Non-linear behavior is considered as lumped at the two ends of the RC frame elements, where plastic hinges can be developed. Pin-jointed bar elements are used for the cable-elements. The unilateral behavior of these tie-elements and the non-linear behavior of the RC structural elements can include loosening, elastoplastic or/and elastoplastic-softening-fracturing and unloading - reloading effects. All these non-linear characteristics, concerning the ends of frame elements and the cable constitutive law, can be expressed mathematically by the subdifferential relation [8,9]:

$$ -s_i(t) \in \partial S_i(d_i(t)) \tag{1} $$

Here s_i and d_i are generalized stress and deformation quantities. For the case of tie-elements, these quantities are the tensile force (in [kN]) and the elongation (in [m]), respectively, of the i-th cable element. ∂ is the generalized gradient and S_i is the superpotential function, see Panagiotopoulos [8] and [9,10].

For the numerical treatment of the problem, the cable-elements are taken into account and the dynamic equilibrium for the structural system is written in incremental matrix notation::

$$ \mathbf{M}\Delta\ddot{\mathbf{u}} + \mathbf{C}(\Delta\dot{\mathbf{u}}) + \mathbf{K}(\Delta\mathbf{u}) = \Delta\mathbf{p} + \mathbf{A}\Delta\mathbf{s} \tag{2} $$

Here $\mathbf{u}$ and $\mathbf{p}$ are the displacement and the load time dependent vectors, respectively, and $\mathbf{s}$ is the cable stress vector. $\mathbf{M}$ is the mass matrix and $\mathbf{A}$ is a transformation matrix. The damping and stiffness terms, $\mathbf{C}(\dot{\mathbf{u}})$ and $\mathbf{K}(\mathbf{u})$, respectively, concern the general non-linear case. Dots over symbols denote derivatives with respect to time.

The above relations (1)-(2), combined with the initial conditions, consist the problem

formulation, where, for given p, the vectors **u** and **s** have to be computed. From the strict mathematical point of view, using (l) and (2), we can formulate the problem as a dynamic hemivariational inequality one by following [8,9] and investigate it.

For the computational treatment of the problem, the structural analysis software Ruaumoko [26] is applied hereafter as described in [16]. The decision about a possible strengthening for an existing RC structure, damaged by a seismic event, can be taken after a relevant assessment. This can be obtained by using in situ structural identifications [13] and evaluating suitable damage indices. The focus herein is on the overall structural damage index DI_G after Park/Ang, as in details is described in [16,24,25].

The global damage assessment index is obtained as a weighted average of the local damage index at the section ends of each structural element or at each cable element. First the *local* damage index DI_L is computed by the following relation:

$$DI_L = \frac{\mu_m}{\mu_u} + \frac{\beta}{F_y d_u} E_T \tag{3}$$

where: μ_m is the maximum ductility attained during the load history, μ_u the ultimate ductility capacity of the section or element, β a strength degrading parameter, F_y the yield force of the section or element, E_T the dissipated hysteretic energy, and d_u the ultimate deformation.

Next, the dissipated energy E_T is chosen as the weighting function and the *global* damage index DI_G is computed by using the following relation:

$$DI_G = \frac{\sum\limits_{i=1}^{n} DI_{Li} E_i}{\sum\limits_{i=1}^{n} E_i} \tag{4}$$

where: DI_{Li} is the local damage index after Park/Ang at location i, E_i is the energy dissipated at location i and n is the number of locations at which the local damage is computed.

2.2 Numerical Treatment of the Probabilistic Problem

As mentioned, the Monte Carlo simulation is used [21-23] to calculate the random characteristics of the response of the considered cultural Heritage RC buildings. The·main element of a Monte Carlo simulation procedure is the generation of random numbers from a specified distribution. Systematic and efficient methods for generating such random numbers from several common probability distributions are available. The random variable simulation is implemented herein by using the technique of Latin Hypercube Sampling (LHS) [12-15,35-37]. The generated basic design variables are treated as a sample of experimental observations and used for the system deterministic analysis to obtain a simulated solution as in subsection 2.1. is described. As the generation of the basic design variables is repeated, more simulated solutions can be determined. Finally, a statistical analysis of the obtained simulated solutions is performed.

In more details, a set of values of the basic design input variables can be generated

according to their corresponding probability distributions by using statistical sampling techniques. As concerns the uncertain-but-bounded input parameters [20] for the stochastic analysis, these are estimated here by using available upper and lower bounds, denoted as U_B and L_B respectively. So, the mean values are estimated as $(U_B + L_B)/2$.

Such design variables for the herein considered RC buildings are the uncertain quantities describing the backbone diagrams of non-linear constitutive laws, e.g. plastic-hinges behavior, and the spatial variation of input parameters for old building materials. Concerning the plastic hinges in the end sections of the frame structural elements, a typical normalized moment- normalized rotation backbone is shown in Figure 1, see [14]. This backbone hardens after a yield moment M_y, having a non- negative slope of a_h up to a corner normalized rotation (or rotational ductility) μ_c where the negative stiffness segment starts. The drop, at a slope of a_c, is arrested by the residual plateau appearing at normalized height r that abruptly ends at the ultimate rotational ductility μ_u. The normalized rotation is the rotational ductility $\mu = \theta/\theta^{yield}$.
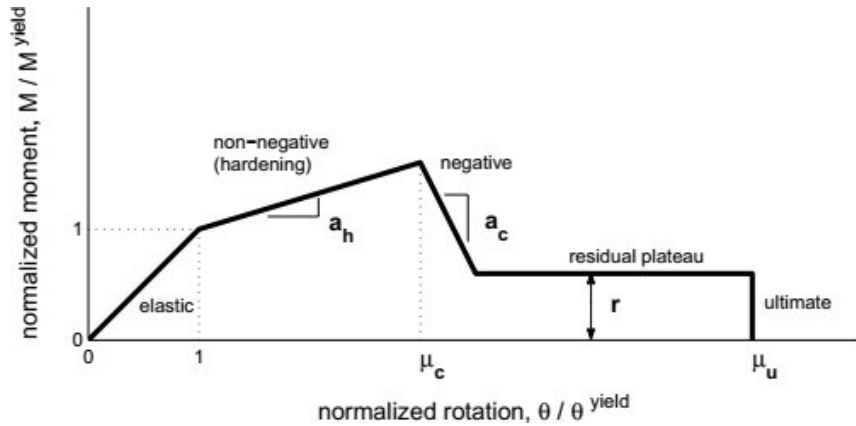
Fig. 1. Representative moment-rotation backbone diagramme for plastic hinges [14].

Table 1. Uncertain-but-bounded parameters for a typical plastic hinge

	Mean	COV	L_B (min)	U_B (max)	Distr. type
$a_{My,}$	1.0	20%	0.70	1.30	Normal-tr.
a_h	0.1	40%	0.04	0.16	Normal-tr.
μ_c	3.0	40%	1.20	4.80	Normal-tr.
a_c	-0.5	40%	-0.80	-0.20	Normal-tr.
r	0.5	40%	0.20	0.80	Normal-tr.
μ_u	6.0	40%	2.40	9.60	Normal-tr.

The above six backbone parameters in Fig. 1, namely a_h, a_c, μ_c, r, μ_u and $a_{My,} = M/M_y$ are assumed to vary independently from each other according to a truncated Normal distribution. Typical distribution properties for these uncertain-but-bounded parameters concerning plastic hinges according to [14] are given in Table 1. The table values concern the mean value, the coefficient of variation (COV) and the upper and lower bounds of the truncated Normal distribution.

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As regards the random variation of input parameters for the old materials, which had been used for the building of old RC structures, their input estimations concern mainly the remaining strength of the concrete and the steel and the elasticity modulus. According to JCSS (Joint Committee Structural Safety), see [11], concrete strength and elasticity modulus follow the Normal distribution, whereas the steel strength follows the Lognormal distribution.

3   Numerical Example

3.1   Description of the considered Cultural Heritage RC Structural System

The Cultural Heritage old industrial reinforced concrete frame F0 of Fig. 2 is considered to be upgraded by ties in order to avoid progressive collapse and will be subjected to a multiple ground seismic excitation. This system F0 had been designed and constructed according to old Greek building codes, having initially two more internal columns in the ground floor. These columns are shown as dashed lines and have been removed due to degradation caused by environmental actions. Following [1, 27], the axial loads, which were initially undertaken by these two columns, are now shown as the two applied vertical concentrated loads of 180 kN and 220 kN. The loading system shown in Fig.2 is the critical one taken into account the "equivalent static" loading according to Greek codes, see [28].
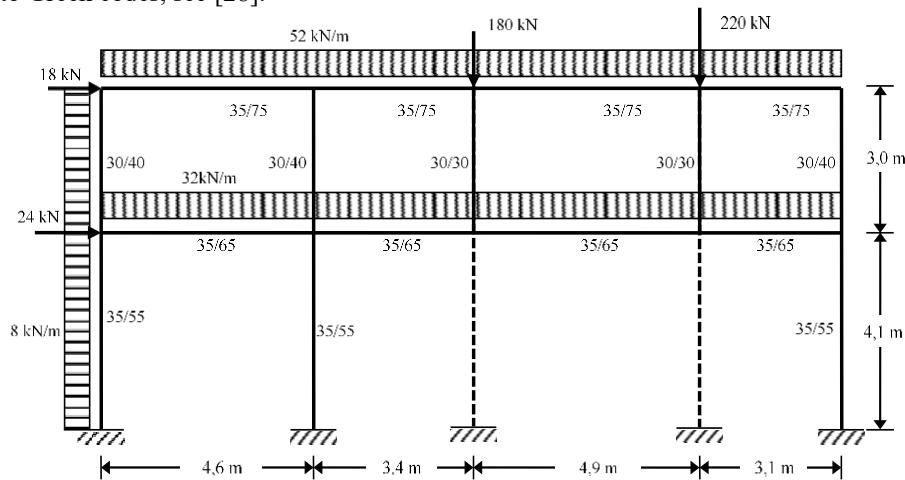
Fig. 2. System F0: The initial RC frame (without cables-strengthening).

Due to removal of the above two columns, the behavior of the horizontal beams connected with them changes drastically: These beams are not working further as "continuous beams", although they had been designed and constructed as such ones. So, after a structural assessment by a "push-over" methodology [4,5,13,15,26] and incremental dynamic analysis (IDA) procedures [14,33-37] of the system F0 under uncertainty and the shown critical loading system, it is concluded that the initial RC frame F0 of Fig. 2 is under a significant risk for a progressive collapse. Indeed, as concerns

the *global* damage index DI_G, a value greater than one is computed. This holds even more when seismic events and/or seismic sequences are activated.

In order to prevent such a progressive collapse, the initial RC frame F0 of Fig. 2 is strengthened by ten (10) steel cables (tension-only bracing elements) as shown in Fig.3. These strengthening cable members have a cross-sectional area $F_r = 20$ cm^2 and are of steel class S1400/1600 with elasticity modulus $E_s = 210$ GPa. The cable constitutive law concerning the unilateral (slackness), hysteretic, fracturing, unloading-reloading etc. behavior, has the diagram depicted in Fig. 4.
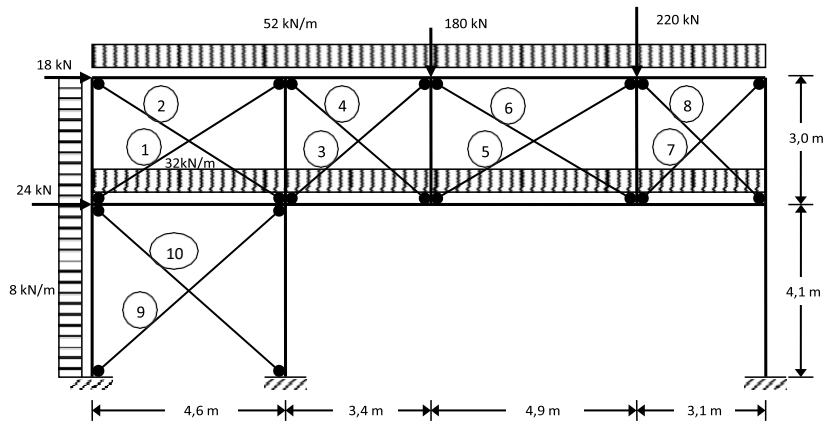
Fig. 3. System F10: The RC frame strengthened by 10 cables--strengthening.
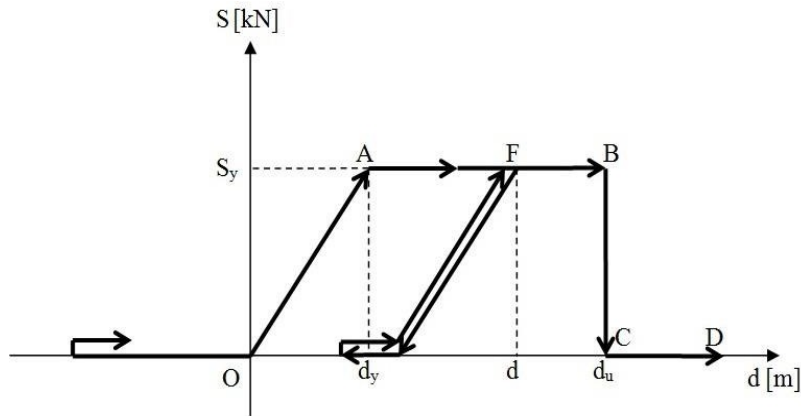
Fig. 4. The diagramme for the constitutive law of cable-elements.

Due to various extreme actions (seismic, environmental etc.), corrosion and cracking has been taken place, which has caused a strength and stiffness degradation estimated by insitu investigations. The effects of cracking on columns and beams are simulated by applying the guidelines of [28,29]. So, the stiffness reduction due to cracking results to effective stiffness with mean values of 0.60 I_g for the external columns, 0.80 I_g for the internal columns and 0.40 I_g for the beams, where I_g is the gross inertia moment of

their cross-section.

Using Ruaumoko software [26], the columns and the beams of the frame are modeled by prismatic frame RC elements. Nonlinearity at the two ends of the RC frame structural elements is idealized by using one-component plastic hinge models, following the Takeda hysteresis rule [26]. Interaction curves (M-N) for the critical cross-sections of the examined RC frame have been computed. The Ruaumoko Bi- linear with slackness hysteresis element is used for the simulation of the cable (tension- only) elements.

The concrete class of the initial old frame is estimated to be C12/15. According to JCSS (Joint Committee Structural Safety), see [11,35-37], concrete strength and elasticity modulus follow a Normal probability density distribution (pdf) and the steel strength follows the Lognormal distribution. So the statistical characteristics of the input random variables concerning the old building materials are estimated to be as shown in Table 2. By COV is denoted the coefficient of variation. The mean/median values of the random variables correspond to the best estimates employed in the deterministic model according to Greek codes, see KANEPE [28]. On the contrary, the input variables concerning the steel of the bracing ties (new material) are considered as deterministic ones.

Table 2. Statistical data for the old building materials treated as random variables

	Distribution	mean	COV
Compressive strength of concrete	Normal	12.0 MPa	15%
Yield strength of steel	Lognormal	191.3 MPa	10%
Initial elasticity modulus of concrete	Normal	26.0 GPA	8%
Initial elasticity modulus of steel	Normal	200 GPA	4%

3.2 Seismic Sequences Input and some Representative Probabilistic Results

In Table 3 three typical real seismic sequence are reported, which have been downloaded from the strong motion database of the Pacific Earthquake Engineering Research (PEER) Center [30], see also [17,18].

The system F10 with cable elements of Fig. 3 is considered to be subjected to the Coalinga seismic sequence of the Table 3. The application of the proposed numerical procedure by using 250 Monte Carlo samples gives the following representative results concerning some dynamic response characteristics:

In column (2) of the Table 4, the Event E_1 corresponds to Coalinga seismic event of 0.605g PGA, and Event E_2 to 0.733g PGA, (g=9.81m/sec^2). The sequence of events E_1 and E_2 is denoted as Event (E_1+ E_2). In the table column (3) the mean value and in column (4) the coefficient of variation COV of the Global Damage Indices DI_G. are given. Similarly, in the columns (5) and (6) the mean value and the coefficient of variation COV of the absolutely maximum vertical displacement U_{y220}, (under the concentrated load of 220 kN, see Fig. 2), respectively, are given.

Table 3. Multiple earthquakes data

No	Seismic sequence	Date (Time)	Magnitude (ML)	Recorded PGA(g)	Normalized PGA(g)
1	Coalinga	1983/07/22 (02:39)	6.0	0.605	0.165
		1983/07/25 (22:31)	5.3	0.733	0.200
2	Imperial Valley	1979/10/15 (23:16)	6.6	0.221	0.200
		1979/10/15 (23:19)	5.2	0.211	0.191
3	Whittier Narrows	1987/10/01 (14:42)	5.9	0.204	0.192
		1987/10/04 (10:59)	5.3	0.212	0.200

Table 4. Representative probabilistic dynamic response quantities for the system F10.

SYSTEM	EVENTS	DI_G		U_{y220} [cm]	
		Mean value	COV	Mean value	COV
(1)	(2)	(3)	(4)	(5)	(6)
F10	Event E_1	0.128	16.8%	-1.32	14.2%
	Event E_2	0.187	17.2%	-1.48	15.1%
	Event $(E_1 + E_2)$	0.248	18.4%	-1.73	16.8%

As the table values show, multiple earthquakes generally increase, in an accumulative way, the response quantities, e.g. critical vertical displacements and damage indices. On the other hand, the strengthening of the frame F0 by X-bracings (system Frame F10 of Fig. 3) improves the response behaviour against seismic sequences. So, the values of the Global Damage Indices DI_G show that the progressive collapse has been avoided.

Especially for the sequence of events E_1 and E_2, i.e. Event $(E_1 + E_2)$, the following mean-value results for the maximum response tension are computed concerning the critically active cable-elements of the stress vector $\underline{s}$, where: $\underline{s} = [S_1, S_2, \ldots, S_{10}]^T$:

$S_1 = 13.53$ kN, $S_4 = 698.24$ kN, $S_5 = 10.72$ kN, $S_7 = 607.84$ kN, $S_9 = 71.25$ kN.

The relevant mean coefficient of variation is COV=21.84%.

3.3 Some Comments concerning the Representative Results

Obviously, by a suitable parametric investigation concerning the increase of Monte Carlo samples number, a further improved study of the predicted behavior for the ties-strengthened system F10 can be obtained, because the values of the coefficients of

variations are reduced.

Similarly, by a suitable parametric investigation concerning the characteristics of the cable-elements, e.g. increase of sectional area F_r, etc., an improved upgrading of the initial structure F0 can be obtained and a further risk reduction of progressive collapse can be achieved for the system F10.

As reported in section 3.1, only the parameters concerning the old building materials, concrete and steel, in the existing RC frame F0 are considered as input random variables, which have a probability density function (pdf) with a symmetric statistic distribution. On the contrary, the input variables concerning the steel of the added bracing ties (new material) are considered as deterministic ones. So, the unilateral behavior of these tie-elements has no influence on the treatment of the probabilistic problem.

Moreover, as the above reported results for the maximum response tension of the activated cable-ties in the numerical example show, the numerical methodology presented herein in section 2.1 for the deterministic problem takes strictly into account the cable unilateral behavior. Thus, this methodology is an effective and reliable one. In the relevant earlier research studies [31,32] concerning strengthening by ties, the cable unilateral behavior is taken strictly into account only when the cable-ties can be placed in symmetric geometrical arrangements.

4 Concluding Remarks

The herein presented computational approach can be effectively used for the probabilistic numerical investigation of the seismic inelastic behaviour of Cultural Heritage old RC framed structures strengthened by cable elements in order to prevent progressive collapse. This is proven by the results of a typical numerical example concerning the seismic response of a system subjected to multiple earthquakes. The probabilistic treatment of the uncertain-but-bounded input parameters is effectively realized by using Monte Carlo simulation. Finally, the optimal cable-bracing scheme to avoid progressive collapse can be selected in a parametric way among investigated alternative ones by using computed damage indices.

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A pointed falsework or a false decentering:
Restoration and consolidation of Tsipiani bridge

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Abstract. Tsipiani bridge (1875) is located at the East Zagori region in Epirus Greece, near the village of Miliotades. It is a peculiar single-arched bridge, the arch of which appears pointed, with an opening of 26 m. Traditional stone bridges have no wedge-shaped voussoirs, and the final round shape is formed by variable mortar amount amongst the flat sandstones of the area. The current stake is the salvation of the bridge. In the institutional framework of protection, the exact wording of the question is «whether or not» the study is approved. Bridges do not stand by democratic procedures but by the decisive intervention of the engineer corresponding to that of the master builder who in this case seems to have carried out a false decentering. In this case our proposal was the method of "stitching" which is used to reinforce existing structures made of stone or brick to increase the resistance of the masonry against compressive, shear and tensile forces and to connect loose parts in the body of the masonry.

Keywords: Stone Bridge, voussoir, decentering, stitching.

1 A pointed bridge

Tsipiani bridge (1875) is located at the East Zagori region in Epirus Greece, near the village of Miliotades. It is a peculiar single-arched bridge, the arch of which appears pointed, with an opening of 26 m and a height of intrados 12,20 m as can be shown in Fig.1 (a and b). Traditional stone bridges have no wedge-shaped elements, known as voussoirs, and the final round shape is formed by variable mortar amount between the flat sandstones of the area. The average thickness of mortar is 1 cm while the sandstones are 6 cm thin. According to a 90's approach of the civil engineer Stathis Papavranousis the pointed shape of the arch is due to the compression of the mortar of the central area during an early decentering and not at the intention of the master builder. The geometry

of the falsework is largely verified by the topographic measurement and the static contribution of the mortar has been largely discussed.

(a)

(b)
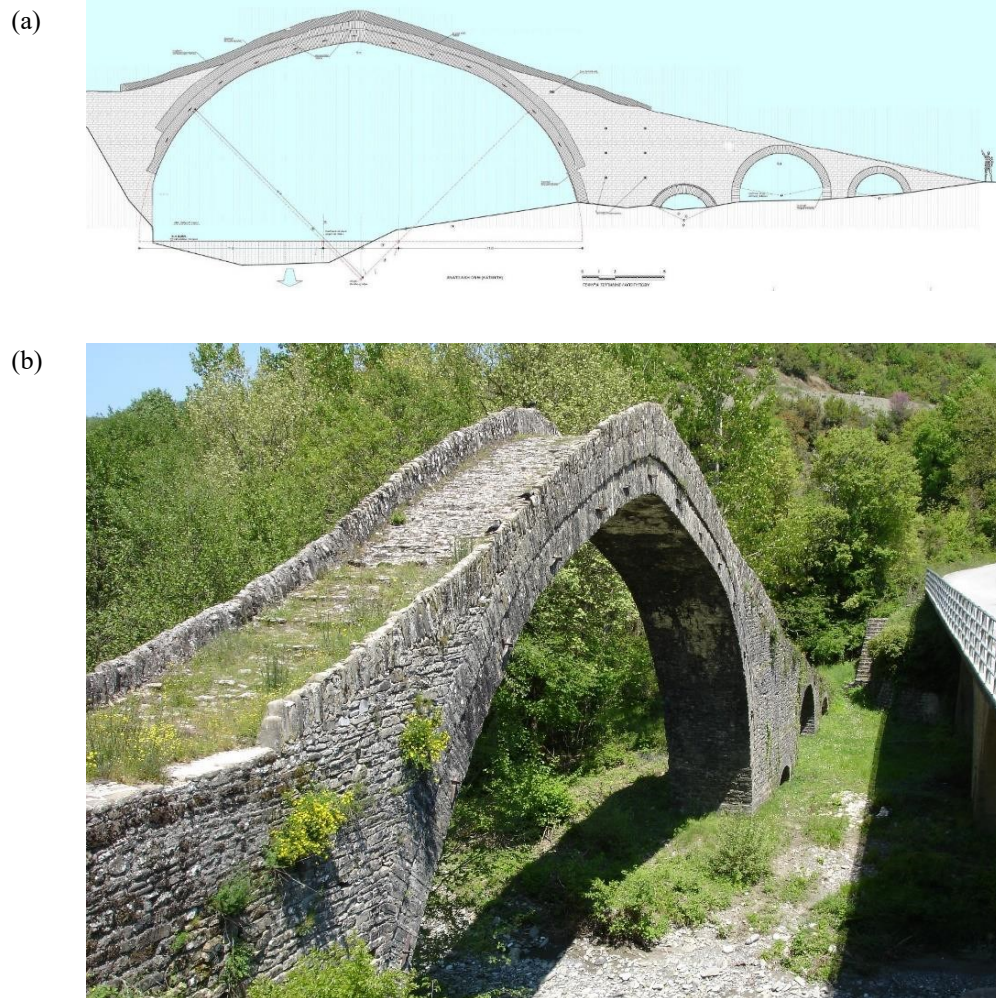
Fig. 1. Tsipiani bridge (a) Schematic representation, (b) side photo of the structure

2   Inspection

The average thickness of the rings is for the upper ring 41cm and for the lower ring 66cm. Metal keys are transversely placed on the body of the lower ring. Their purpose is to improve the compressive and shear strength of cross-sections through biaxial stress After a visual inspection that was done, four are the estimated and probable problems of stability, endurance, and static insufficiency that this bridge presents:

    i.   Extensive loss of sandstone bonding mortar all over the outer surface of the

bridge body, see (Fig.2)

Fig. 2. Extensive loss of sandstone bonding mortar

ii. The failure in the geometry of the arch in its upper left (downstream) part which occurred during its construction. The arch section tends towards its chord as can be seen in the (Fig.3).

Fig. 3. The arch section tends towards its chord

iii. The loss of contact between the two rings throughout the upper part of the arch due to the above-mentioned failure can be seen in (Fig. 4). The con-

sequence of this is that the loads of the deck are transferred exclusively from the upper ring, subjecting it to intensive sizes disproportionate to its geometry.

Fig. 4. Loss of contact between the two rings

iv. The revelation of the foundation to the right (downstream) of the bridge body with the simultaneous revelation of the rock on which it is founded can also be seen in (Fig. 5).

Fig. 5. Revelation of the foundation

Due to (i) the initial mechanical operation of the "stone-mortar" system has been reduced to an unknown degree.

Because of (ii) and (iii), as shown by the static solutions, the eccentricity of the thrust line in the larger upper part of the arch exceeds in both rings ½ of their cross section. Specifically, for the upper ring we have a stability problem for the permanent actions (Same Weight) and for the design earthquake, while for the lower ring only for the design earthquake. The above results in the creation of internal joints [1], [2], [3], eventually turning the larger upper part of the arch into a mechanism.

The revelation of the foundation (iv) does not currently raise the issue of the stability of the bridge, without this ruling out a future problem due to its possible under excavation.

3   Solution

The proposed solution was chosen to be compatible with the architectural and traditional constraints while maintaining the shape of the bridge, which is part of the history of the area. The aim of the solution is to reduce as much as possible the problems of stability, endurance, and static insufficiency that it presents. The following are suggested:

(i) The replacement of the remaining and the lost external bonding mortar of the stones. The joints are expected to have a penetration depth in the body of the bridge 3-5cm. Of course, the final depth of the joints depends on the condition of the individual parts of the bridge body, but deep joints are not appropriate because they can lead to loosening of the coherence [2].

(ii) The connection of the two rings of the arch with reinforcing bars, which will have blades at their ends. The new agglomerate that will emerge aims to achieve the static function that a (single) ring 107cm thick (average thickness) would have. At the same time, the gap created between them will be filled with mortar.

(iii) It is recommended that the transversely placed metal keys on the body of the lower ring be temporarily not moved, due to the unpredictable behavior of the stone blocks by the disturbance. After successful rehabilitation, if their presence is deemed unnecessary, it is recommended their gradual removal while monitoring changes in the intensive condition (eg local cracks).

(iv) Construction of a stone wall around the revealed foundation if an excavation problem arises in the future. This wall, if the need for its construction is judged, will be founded at the level where the rocky ground will be found.

The above solutions concern the static image of adequacy presented by the Tsipiani bridge macroscopically (visual control) but also computationally (paragraph 8).

4   Computational model – Data

The simulation of the stone bridge was done with surface finite elements 2.85m thick (average bridge thickness) while the simulation of the rings in the length that have lost contact with each other was done with rods for the two different phases, before and

after the restoration of the arch.

For the prearch restoration phase, the upper ring was simulated with 34 0.41m (h) x2.85m (b) cross-section bars and the lower ring with 34 0.66m (h) x2.85m (b) cross-section bars. For the postarch restoration phase, the new single ring was simulated with 33 bars of cross section 1.07m (h) x2.85m (b).

The absence of laboratory data on the mechanical characteristics of our body forces us to refer to the international literature for their conservative determination. According to [4], [5], [6, [7], a measure of elasticity E = 3.00 GPa is chosen and a Poison ratio v = 0.20. The coefficient of seismic behavior was obtained equal to q = 1.00. The same weight was set g = 22 KN / m3 while the compressive strength of the carrier for the solution was considered infinite [8], [9], and for the control of the cross sections equal to 7.72MPa (Table 1). Finally, the institution was considered to be rooted in its foundation.

5   Justification of computer model – Comments

There are three proposed methods for solving such vectors [1]. Linear elastic analysis with finite elements, "limit block analysis" and non-linear analysis with finite elements. Static solution is done by linear elastic finite element analysis [7], [1]. The static "limit block analysis" according to [1], [2], [3], which is based exclusively on Heyman's theory [8] cannot be applied here because the bridge is not subject to any significant mobile load, while the solution with non-linear finite element analysis [6] would be accurate with the strict condition of the laboratory determination of the mechanical characteristics of the bridge but also the knowledge of the history of the plastic movements, otherwise the solution with estimates it is very likely to lead to erroneous results [10].

The results of the static solution will be interpreted based on the assumptions of the theory of Castigliano [9] and Heyman [8]. The assumption of infinite compressive strength of the carrier is necessary for the solution. Solving an estimate of a value for compressive strength turns the problem into a nonlinear one [1] and if the estimate is not correct, as mentioned above, it leads to erroneous results. The number of ring simulation bars, according to [11], is sufficient to simulate their behavior.

As can be seen from the static analysis of the model, the eccentricity of the thrust line at the critical cross-section of the arch is now less than ½ of the new cross-section and thus at least part of the surface of the critical cross-section of the arch is operated under compression [2]. This, in combination with the control that the compressive stresses do not exceed the value of 7.72 MPa, certify the adequate operation of the arch, as it emerged after the proposed interventions, but also of the body as a whole. A prerequisite, of course, is the successful application of the armatures connecting the rings together.

The construction was considered to be fixed at the level of the foundation. More precise solution using a model on elastic ground requires the determination of soil characteristics after geotechnical research.

6   Upper and lower ring connection armature

As mentioned above, the solution of connecting the rings with reinforcement rods was chosen, which will have anchor plates at their ends. The difficulty arises in determining their density (number of bars / m2) because it is a purely empirical method [2], [12].

In the upper part of the arch are placed bars generally 4Φ12 / m2, B500C [2], [3], which at each end have blades measuring 100x100x20mm. In the rest of the arch where it is not possible to place blades on both sides, 4Φ12 / m2 bars, S500s with a length of 2.30m are placed, on which a dimension blade is placed at their free end.

According to [12], if the operation of the arch after the installation of the rods is not sufficient (eg unacceptable deformations, cracks, etc.) additional rods must be added.

The holes that will be drilled for the placement of the reinforcements will have a diameter of 20mm. The mortar pressed into the hole will be pure cement mortar with a watercement ratio of 1.0: 1.5. [2]

7   Compressive strength of load-bearing masonry - Selection of mortar for grouting

Table 1 below is from [5] and has been derived from the application of his semi-empirical equations [13] to determine the strength of load-bearing masonry if the compressive strength of stones and mortar is known. Here the calculations have been made for compressive strength (fb) of the stones from 15 to 22 MPa and quality mortars M1.2, M2.5 and M5 according to Eurocode 6.

Table 1. Compressive strength of load-bearing masonry for use of M1.2, M2.5, M5 cements and stones with fb = 15 to 22 MPa

Stones	Mortar		
f_{bk}	M1.2	M2.5	M5
15	5.45	6.08	7.30
16	5.78	6.40	7.62
17	6.10	6.73	7.95
18	6.42	7.06	8.27
19	6.75	7.38	8.60
20	7.07	7.71	8.92
21	7.40	8.03	9.25
22	7.72	8.35	9.57

The compressive strength of the stones, the compressive strength of the existing grout, the depth of grouting and the mechanical characteristics of the stone-mortar system, before and after grouting, are virtually unknown.

A schematic representation of Papavranousis 1996 [11] static model approach can be seen in (Fig. 6).
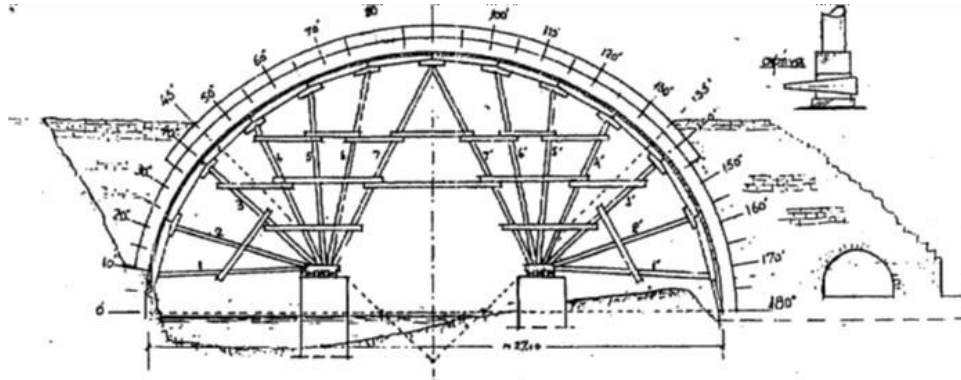
Fig. 6. A schematic representation of Papavranousis [13] approach

According to [11] the binder was created from river sand and lime in a large proportion. This allows us to estimate its relatively low strength. The following composition is proposed for the new mortar: 1 part Portland cement, 3 parts lime and 9 parts sand, ie M2.5 quality mortar ([2]).

The compressive strength of moderately strong unbreakable sandstone in uniaxial compression is less than 50 MPa [14]. Compressive strength is obtained for the stones of the 22 MPa system due to uncertainties about their condition.

From the above and from the results of Table 1 it is estimated that the compressive strength of the load-bearing masonry has as an estimated minimum the value of 7.72 MPa.

8 Calculations - Check at critical sections of the arch after restoration

The Position of checking points of critical sections of the arch after restoration can be seen in (Fig. 7).
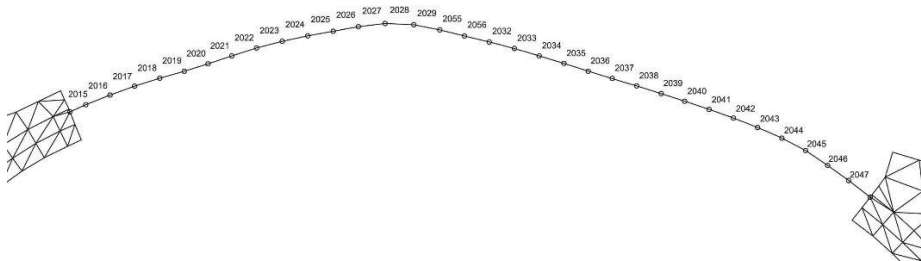
Fig. 7. Position of checking points of critical sections of the arch after restoration

Table Rod 2020 (Position of maximum positive torque against permanent actions for the left upper part of the arch).

Permanent Actions

Intensive design sizes: Msd = 111.32 KNm, Nsd = -1067.04 KN

Eccentricity: $\quad e = \dfrac{Msd}{Nsd} = \dfrac{111.32}{-1067.04} = 0.104 < \dfrac{b}{6} = \dfrac{1.07}{6} = 0.178$

The cross section is in complete compression.
Cross-sectional area = 1.07 * 2.85 = 3.05 m2
Compressive cross section voltages = 1067.04 / 3.05 = 350 KN / m2 = 0.35MPa
<7.72 MPa
The cross section is sufficient

Seismic Actions
Maximum torque within the level (M2max)
Intensive design sizes: M2sd = 269.30, M3sd = -101.90 KNm, Nsd = -878.46 KN

Eccentricities: $\quad e_{M2} = \dfrac{M2sd}{Nsd} = \dfrac{269.30}{878.46} = 0.307 < \dfrac{b}{2} = \dfrac{1.07}{2} = 0.535$

$\quad\quad\quad\quad\quad e_{M3} = \dfrac{M3sd}{Nsd} = \dfrac{101.90}{878.46} = 0.116 < \dfrac{b}{6} = \dfrac{2.85}{6} = 0.475$

The cross section is in partial compression.
Active cross-sectional area = (1.07-2 * 0.307) * (2.85-2 * 0.116) = 1.193 m2 Compressive stresses of active cross section = 878.46 / 1.193 = 736 KN / m2 = 0.74MPa
<7.72 MPa
The cross section is sufficient

Maximum off-level torque (M3max)
Intensive design sizes: M2sd = 167.34, M3sd = -416.86 KNm, Nsd = -1047.26 KN

Eccentricities: $\quad e_{M2} = \dfrac{M2sd}{Nsd} = \dfrac{167.34}{1047.26} = 0.160 < \dfrac{b}{6} = \dfrac{1.07}{6} = 0.178$

$\quad\quad\quad\quad\quad e_{M3} = \dfrac{M3sd}{Nsd} = \dfrac{416.86}{1047.26} = 0.398 < \dfrac{b}{6} = \dfrac{2.85}{6} = 0.475$

The cross section is in complete compression.
Cross-sectional area = 1.07 * 2.85 = 3.05 m2
Compressive cross section stresses = 1047.26 / 3.05 = 343 KN / m2 = 0.34MPa <7.72 MPa
The cross section is sufficient

Bar 2028 (Arch key - Position of maximum negative torque against permanent actions)
Permanent Actions
Intensive design sizes: Msd = -157.81 KNm, Nsd = -1017.83 KN

Eccentricity: $\quad e = \dfrac{Msd}{Nsd} = \dfrac{-157.81}{-1017.83} = 0.155 < \dfrac{b}{6} = \dfrac{1.07}{6} = 0.178$

The cross section is in complete compression.
Cross-sectional area = 1.07 * 2.85 = 3.05 m2
Compressive cross section stresses = 1017.83 / 3.05 = 334 KN / m2 = 0.33MPa <7.72 MPa
The cross section is sufficient

Seismic Actions
Maximum torque within the level (M2max)
Intensive design sizes: M2sd = -284.83, M3sd = 114.90 KNm, Nsd = -1244.85 KN

Eccentricities:

$$e_{M2}=\frac{M2sd}{Nsd}=\frac{284.83}{1244.85}=0.229<\frac{b}{2}=\frac{1.07}{2}=0.535$$

$$e_{M3}=\frac{M3sd}{Nsd}=\frac{114.90}{1244.85}=0.092<\frac{b}{6}=\frac{2.85}{6}=0.475$$

The cross section is in partial compression.
Active cross-sectional area = (1.07-2 * 0.229) * (2.85-2 * 0.092) = 1.632 m2 Compressive stresses of active cross section = 1244.85 / 1.632 = 762 KN / m2 = 0.76MPa <7.72 MPa
The cross section is sufficient

Maximum off-level torque (M3max)
Intensive design sizes: M2sd = -229.96, M3sd = -383.01 KNm, Nsd = -1119.31 KN

Eccentricities:

$$e_{M2}=\frac{M2sd}{Nsd}=\frac{229.96}{1119.31}=0.205<\frac{b}{2}=\frac{1.07}{2}=0.535$$

$$e_{M3}=\frac{M3sd}{Nsd}=\frac{383.01}{1119.31}=0.342<\frac{b}{6}=\frac{2.85}{6}=0.475$$

The cross section is in partial compression.
Active cross-sectional area = (1.07-2 * 0.205) * (2.85-2 * 0.342) = 1.43 m2
Compressive stresses of active cross section = 1119.31 / 1.430 = 782 KN / m2 = 0.78MPa <7.72 MPa
The cross section is sufficient

Bar 2037 (Position of maximum positive torque against permanent actions for the upper right part of the arch)
Permanent Actions
Intensive design sizes: Msd = 266.09 KNm, Nsd = -1067.37 KN

Eccentricity:

$$e=\frac{Msd}{Nsd}=\frac{266.09}{-1067.37}=0.249<\frac{b}{2}=\frac{1.07}{2}=0.535$$

The cross section is in partial compression.
Active cross-sectional area = (1.07-2 * 0.249) * 2.85 = 1,630 m2
Compressive stresses of active cross section = 1067.37 / 1.630 = 654 KN / m2 = 0.65MPa <7.72 MPa
The cross section is sufficient

Seismic Actions
Maximum torque within the level (M2max)
Intensive design sizes: M2sd = 481.95, M3sd = -86.79 KNm, Nsd = -944.19 KN
Eccentricities: eM2 = = = 0.510 <= = 0.535
eM3 = = = 0.092 <= = 0.475
The cross section is in partial compression.
Active cross-sectional area = (1.07-2 * 0.510) * (2.85-2 * 0.092) = 0.133 m2
Compressive stresses of active cross section = 944 / 0.133 = 7082 KN / m2 = 7.10MPa <7.72 MPa
The cross section is sufficient

Maximum off-level torque (M3max)
Intensive design sizes: M2sd = 307.67, M3sd = -289.32 KNm, Nsd = -961.70 KN

Eccentricities:

$$e_{M2}=\frac{M2sd}{Nsd}=\frac{307.67}{961.70}=0.320<\frac{b}{2}=\frac{1.07}{2}=0.535$$

$$e_{M3}=\frac{M3sd}{Nsd}=\frac{289.32}{961.70}=0.301<\frac{b}{6}=\frac{2.85}{6}=0.475$$

The cross section is in partial compression.
Active cross-sectional area = (1.07-2 * 0.320) * (2.85-2 * 0.301) = 0.966 m2
Compressive stresses of active cross section = 961.70 / 0.966 = 995 KN / m2 = 0.99
MPa <7.72 MPa
The cross section is sufficient

As revealed by the above calculations, the mean of the approximately straight section which resulted from the failure of the arch geometry (upper right section), is the most critical cross section.

9 Reinforcement procedure - Installation of reinforcement (root reinforcement)

9.1 General [2]

The method of root reinforcement (stitching) is used to reinforce existing structures made of stone or brick to increase the resistance of the masonry against compressive, shear and tensile forces and to connect loose parts in the body of the masonry. The technique was developed by the Italian Lizzi in 1952 to reinforce historic Italian structures that had been severely damaged during World War II.

It is a method of stabilizing the masonry by inserting steel reinforcing bars or anchors in a defined manner into the body of the masonry. The calculation of the strength of an element of masonry or brickwork to which the method of stitching has been applied is not practically possible as it depends on the existence of gaps, the variation of the strength of the mortar and the wall, the way of construction, etc., so the application stitching is more of an art than a science and the success of the method is based more on experience than on calculations.

Knowledge of the causes of wear, the general condition of the masonry and the permissible change in loads are some of the factors that determine the course of work for the application of the method while the absence of regulations makes it necessary to have experienced personnel about the method. The diameter of the holes that are drilled for the installation of the root equipment is of the order of 20 - 40mm, and their length varies depending on the thickness of the element and the nature of the construction problems, but must be sufficient to ensure the overlap of the reinforcement. , whose diameter ranges between 12-20 mm.

The number of holes or bars per unit area depends on the condition of the construction and the reason for the reinforcement. Approximately it is recommended to place 3 or 4 bars per m2, about three times the thickness of the masonry. Reinforced steel reinforcement ensures better cohesion and anchorage but in monuments and structures in wet environments it is recommended to use stainless steel.

The mortar pressed into the hole is usually pure cementitious with a watercement ratio of 1.0: 1.5. Mixing with sand is allowed only if there are large gaps in the body of the masonry. Epoxy or other polymeric resins can also be used if it is deemed necessary to use them for a large increase in the strength of the wall. However, their use is not recommended if the percentage of gaps in the masonry exceeds 3% -5% of its volume,

so it is necessary to use grout with properties more compatible with the masonry, ie cement mortar. The method of root equipment is successfully applied in constructions with masonry thickness of 0.5-2.0m and finds application in the stabilization of arches that have undergone deformations.

In vulnerable structures such as the arched part of the bridge, the holes are drilled using electric rotary drills with a diamond head and water inlet to cool the head and remove drilling materials. The use of drills of this type does not cause major damage. The direction of drilling the holes is from bottom to top, i.e. from the lower sole of the arch to the deck.

Medium-sized structures can be drilled using electric rotary-impact drills. Vibrations from the use of these drills are not capable of causing damage to most structures, but in cases of very weak masonry, special care must be taken to avoid minor damage.

The use of compressed air drills is only permitted in solid structures, especially if they are made of very hard stone masonry and long holes must be drilled.

The next step follows after making several holes in one surface. The reinforcement enters the holes and the process of inserting the grout is prepared. First water enters the hole to remove loose materials and then the injection of grout, which starts from the lowest points and proceeds upwards.

The equipment for the cement mortar consists of a mixer, a storage tank of the mixture and a pump which can be motorized or manual. In cases of fine-grained grouts, it is better to use a hand pump that allows better control of the impregnation process. The filling of the holes with grout is done under low pressure, usually 1-2 atm, but the pressure gauge that measures the operating pressure must be placed close to the nozzle to measure the actual pressure.

At the beginning of the impregnation the pressure is up to 0.30MPa and is kept constant until the grout is absorbed. It is then raised to 0.40MPa and held steady for 5-10 minutes until the mixture solidifies and the excess water is drained.

High pressure can create problems in low strength stone blocks, so the above sizes will be taken into account at work.

Anchor systems can be used in a housing containing a strong expandable mortar so that when the housing is broken the hole with the material is filled.

9.2   Holes & reinforcement grid

Holes with a diameter of 20mm are drilled for the installation of rod-shaped reinforce- ment Φ12 / B500C. The holes are in a grid by X (along the arch) per 1m (distance measured at the lower foot of the arch) and by Y (across the width of the arch) per 0.42 m (6 pieces by width per meter of lower foot length).

Thus 6 rows of rods were created. The directions of the rows alternately are + 45o & - 45o with respect to the lower foot of the arch. The same address is maintained for the entire series.

This grid was chosen so that, if necessary, there would be free space available to thicken the reinforcement. Details are presented in the Reinforcement Plan.

9.3   Supports [15]

The restoration process requires the support of the bridge arch. In general, any

damaged component must be secured immediately by supporting to discharge it. With the support, that is, an alternative way of charging and load relief of the damaged element is achieved.

The arch of said bridge even if we ignore its loading history (which is essentially unknown), due to 2 (ii) & 2 (iii), has at least two estimated plastic joints in the upper ring (upper arch tread) as can be seen in (Fig. 8), generative cause of which is the failure in geometry and the self-weight loading.
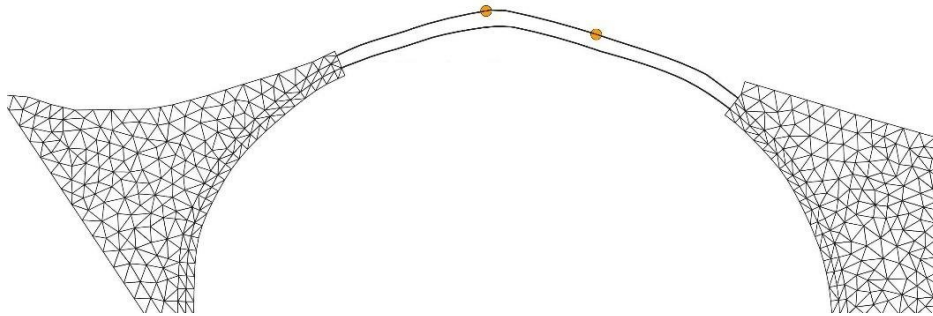
Fig. 8. The two estimated plastic joints in the upper ring

The two above joints have turned the upper foot into a mechanism and the fact that it does not collapse is due solely to the frictional forces acting between the stone blocks. Meanwhile, the distribution of the self weight principal tensile stresses σ_1 can be seen in the (Fig. 9).
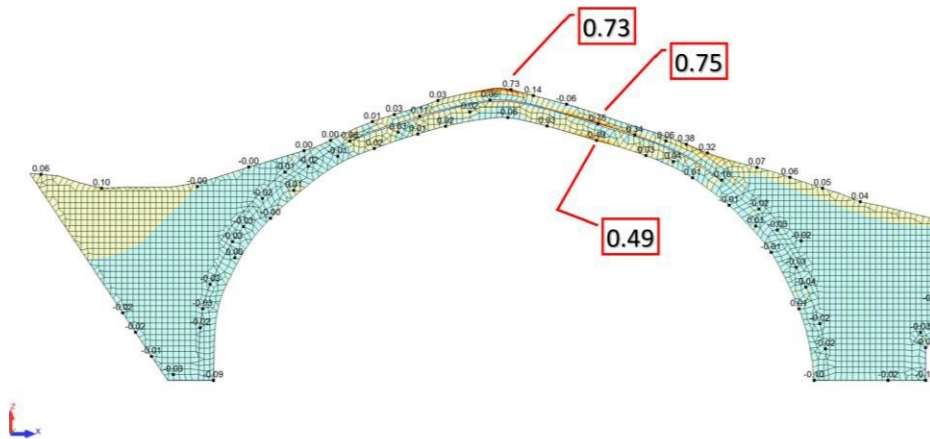
Fig. 9. Self-weight principal tensile stresses σ1 (MPa)

The role of support during the repair-reinforcement

. The support in principle ensures that the behavior of the lower arch will be the same as it would be if there was no failure in its geometry (ignoring other faults due to unknown charging history). During the restoration, both by drilling the holes and by pressurizing the grout to fill the hole, the possibility of disturbing the balance of the upper ring which would result in slipping cannot be ruled out. and consequently, the loading

of the lower ring with the loads of the stone blocks of the upper ring, thus subjecting the lower ring to additional loading with unknown consequences (e.g. possible collapse of the lower ring as well).

The role of support during the work is twofold.

. On the one hand to ensure the integrity of the lower ring from possible slipping of the upper ring on it during the work and on the other hand to protect the staff who will work under the arch to open or fill the holes. In short, during the repair-reinforcement works the role of the pillar is in principle passive (in business as usual conditions) with the possibility of turning it into an asset if specific failures occur.

The role of support after the work is completed

As mentioned, monitoring of the arch behavior (e.g. cracks due to sinking deformations) is required after the work is completed to determine if further reinforcement is required. In this case the role of the pillar is in principle passive (prevents the increase of deformations outside tolerable limits) with the possibility of turning it into an asset in the extreme scenario of failure of the restoration. In short, after the work is completed, the support is the only way to control and improve the proposed reinforcement.

10 Premeasurement of reinforcement bars and anchor blades

A side schematic representation of the reinforcement bars and anchor blades can be seen in (Fig. 10).
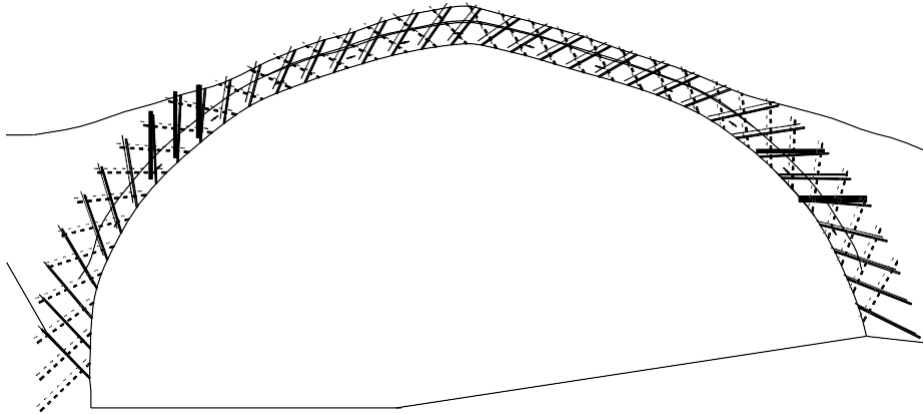
Fig. 10. A side schematic representation of the reinforcement

Metal rods Φ12 / B500C of different lengths and metal anchor blades
100x100x20mm
/ Fe 360 are installed.
Measurement of total length of metal bars
216 rods with an estimated total length of 420m
Total number of blades 100x100x20
327 pieces

11   Regulations

1. Regulation for Loading of Construction Works (ΒΔ 10-12-1945 Government Gazette 171 A / 1946)
2. Hellenic Earthquake Regulation 2000 (Government Gazette 2184 B / 20-12-99)
3. Amendments of EAK 2000: Government Gazette 781 B / 18-6-2003, 1154 B / 12-8- 2003, 447 B / 5-3-2004
4. Eurocode 6

12   Self-weight load - Comparative results of principal tensile stresses σ1

The results of principal tensile stresses σ1 due to Self-weight load before and after the application of reinforcement are shown in (Figures 11 and 12) respectively.
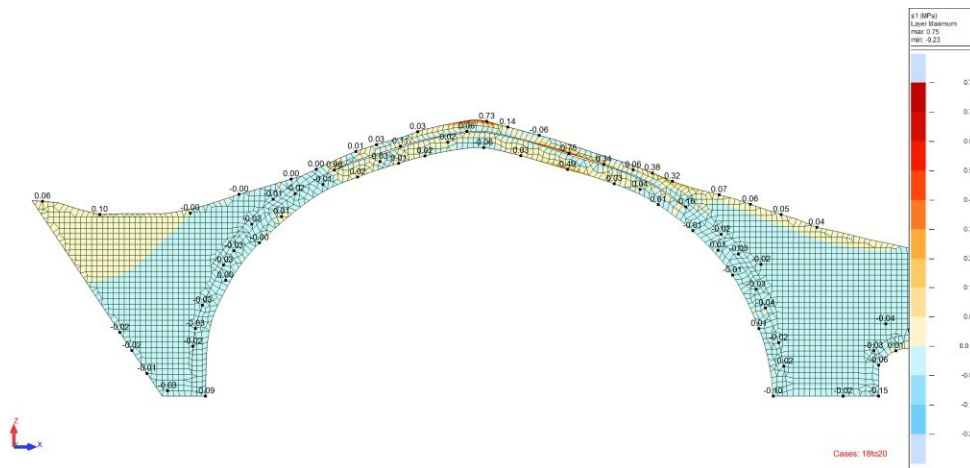
Fig. 11. Results before reinforcement: Self weight load. Principal tensile stresses σ1 (MPa)
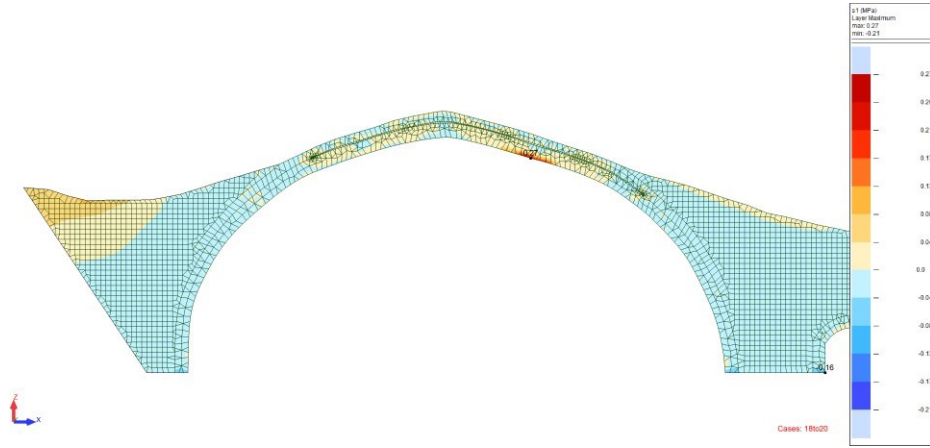
Fig. 12. Results after reinforcement: Self weight load. Principal tensile stresses σ1 (MPa)

13   Seismic design load - Comparative results of principal tensile stresses σ1

The results of principal tensile stresses σ1 due to Seismic design load before and after the application of reinforcement are shown in (Figures 13 and 14) respectively.
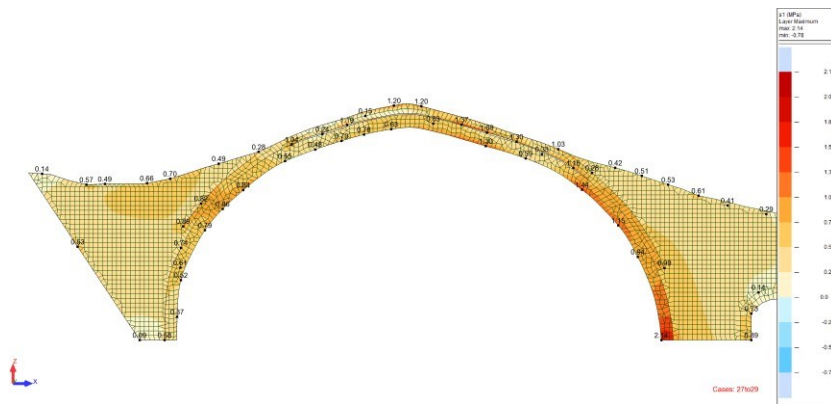
Fig. 13. Results before reinforcement: Seismic design load. Principal tensile stresses σ1 (MPa)
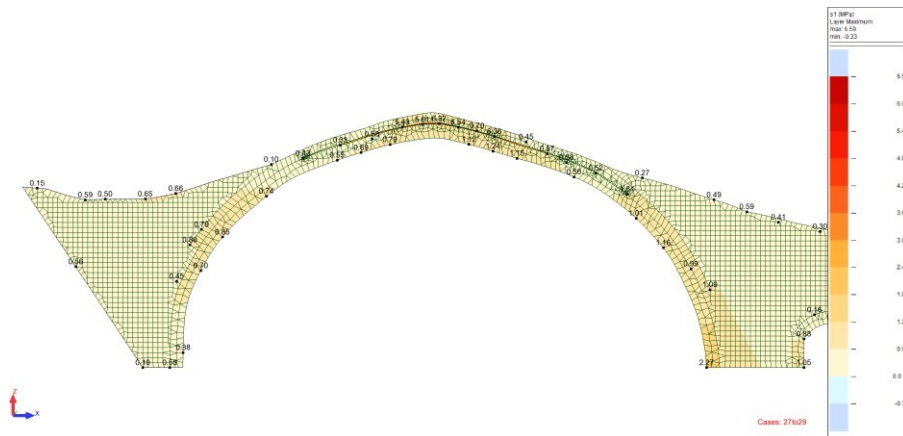
Fig. 14. Results after reinforcement: Seismic design load. Principal tensile stresses σ1 stresses σ1 (MPa)

14 The administrative adventure

The whole architectural and static study was first submitted to the Municipality of East Zagori in 2006. It was forwarded to the supervisor, then head of the Ephorate of Modern Epirus Monuments of the Ministry of Culture, who, according to the Ministry of Public Works [14], "omitted all his obligations". The result was the automatic receipt of the study.

Nevertheless, the study was re-examined by the Council of Modern Monuments and Technical Works of Epirus. In its opinion [15] it is stated that "the arch consists of wedge-shaped slates… The condition of the bridge is quite good and does not present static problems to date…" Concludes the approval of the study with the following, inter alia, remark: "To take care of the cleaning of the stone structures from the vegetation… and not to do any work for the joining of the rings, because this is a given situation from the construction of the bridge, has acquired its static balance… »

Respectively, the General Directorate for the Restoration, Museums and Technical Works of the Ministry of Culture [16], points out: "To analyze the current situation… to carry out laboratory research on the spot… to take into account the remarks of the Service of Modern Monuments and Technical Works of Epirus, with which we fully agree. In the summer of 2014, mortar studies were carried out which did not add key elements to the static approach.

The solution to the problem of the arc that became a string lies in the logic and sensitivity of the Central Council of Modern Monuments that will examine the issue, hopefully before the collapse of Tsipiani bridge.

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9. 9th Canadian Masonry Symposium, "Elastic no tensile resistant – Plastic analysis of masonry arch bridge as an extension of Castigliano's method"

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12. The minimum number of bars for successful simulation of ring behavior is 10 (based on Directive 16/93 of the British Department of Transportation) [3].

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Promotion and protection of cultural heritage through interdisciplinary approaches: The case of Souli

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Abstract. "Mapping" a place, through systematic recording, analysis, evaluation and interpretation of its characteristics, is a necessary condition and basic tool for its protection and promotion.

"Reading" a place through different scientific areas, includes perspectives and interpretations that converge and interact. These approaches highlight multiple issues for a place, contributing to its "recognition" through time as well as its promotion.

The paper focuses on the contribution and importance of the interdisciplinary approaches and cooperation in cultural heritage management issues, on the occasion of a research carried out for Souli, one of Greece's most important historical sites.

Emphasis is given on the issues of Geometric survey and documentation and the relation to the overall levels of recognition and interpretation of space, through the example of the historic site of Souli. The correlation of geometric to interpretive approaches, quantitative and "metric" recordings to qualitative and intangible characteristics, also the production of a "tool" that contains as much as quantitative as quality features, are basic concerns of this paper.

Keywords: Promotion, protection, interdisciplinarity, documentation, mapping, Cultural Heritage, Souli

1.   Introduction

This paper will discuss ideas of the contribution and importance of interdisciplinary approaches and cooperation in cultural heritage management issues. On the occasion of research carried out for Souli[153], one of Greece's most important

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[153] The data and results presented in this paper, regarding the case of Souli, are involved in the

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historical sites, the ways of "identify" a place will unveil, using interactive interdisciplinary processes and methods.

The paper will focus on the issues of geometric documentation and the relation to the overall levels of recognition and interpretation of space. "Reading" a place through different scientific areas includes perspectives and interpretations that converge and interact. These approaches highlight multiple issues for a place, contributing to its "recognition" through time as well as its protection, promotion, and management. In this context, key questions concern: The correlation of geometric to interpretive approaches, quantitative and "metric" recordings to qualitative and intangible characteristics.

2.   The concept of mapping

Discussing some important terms for this subject, appears that different disciplines (in this case the surveyor and the architect) give the terms multiple interpretations. For example, the concept of **"mapping".**

Concerning topography and Data acquisition, since its birth, the scientific area of Geodesy - Topography, has as its object the correct geometric representation of both the Earth Surface and the structures located on it. This mission is composed of the triptych, data collection, data processing, analog or digital display in two or three dimensions. Today, using modern techniques - data collection methods (using total stations, GNSS receivers and unmanned aerial vehicles (UAV) or remotely piloted systems (RPS), can ensure both geometric accuracy and uncertainty, which can reach up to a few mm. The derivatives of this process, in two or three dimensions, whether they concern the depiction of the Earth Surface or individual structures, can be used for the more general and correct mapping. They can be embedded in special tools (ArcGIS) creating an ideal platform for mapping qualitative and quantitative characteristics of the study area.

Concerning architecture, the issue of mapping is directly related to the identification of the place and the components of its physiognomy and can be explored in different ways and at many levels (Konstantinidou et al, 2017). Moreover, mapping a place, through systematic recording, analysis, evaluation, and interpretation of its characteristics, is a necessary condition and basic tool for its protection and promotion.

It is not just a descriptive and metrical act, but a tool for recording, recognition, understanding, reproduction, display, and visualization of objective reality. Research methodologies use the process of mapping to expose the complex and often invisible layers of information that exist (Hadjisoteriou et al. 2015).

In his article ″The Agency of mapping, Speculation, Critique & Invention″ (Corner, 1999), James Corner talks of the map as having the power to ″Reformulate what already exists″. Mapping is often understood as a technique for representing predetermined entities. This conception of mapping as a tool to visualize spatial concepts does not utilize the full potential that the map has to ″reveal″ the specific qualities of the site. In particular, mapping should serve as a process of identifying the elements that constitute the identity of a place, function eventually as a tool for its protection and promotion. Contemporary mapping research involves a process that is creative, evolving, and even interactive. Concerns not only tangible but also intangible elements of the place, and creates conditions of perception not only of its practical but also of its emotional and ideological image.

3.   The case of Souli

3.1 The place

Souli is one of the most important historical places in Greece, related to the struggles for liberation and the recent history of the country. The significance of the place goes back in time, to the mythical beginnings of Greek antiquity. Furthermore, the place is symbolically identified with the highest expression of people with a free spirit and the demand for independence, associated with the overall political background of modern Europe and the Western world.

The region of Souli is located in Epirus, the prefecture of Thesprotia, in the northwest part of the Country. The settlements are located a few hundred meters above the river Acheron, at the top of steep hills, in a naturally fortified position (fig. 1). Tetrachori (Tetra- is the Greek word for Four. Chori- is the Greek word for Village. Tetrachori means Four villages.) (Souli, Samoniva, Kiafa, and Avarikos) is the core of the historic site, while during the heyday of the settlements (late 18th - early 19th century), four other villages in the northwest, also known as "Eptachori", joined the coalition of communities of Souli.

Today, the four settlements of the core, which are developed in about eight square kilometers from north to south, are almost destroyed. The extensive ruined area seems to cover a long period from the 18th AD, until the mid-20th century. A very interesting element of Souli is the existence of different tribes, named after their leader, placed on distinctive locations. The social structure was based on a patriarchal hierarchy adopted, mainly, from the need to survive and be organized in terms of fighting. The local economy was mainly based on husbandry. However, their most well-established engagement was in guns and war.

Authentic ruined houses, relics of castles and other constructions, water wells, churches and mosques, paths and forts and also agricultural facilities, sheepfolds, corrals, ruined huts, are the architectural reserve of Tetrachori. The inhabitants are few; it is an aging community, while the local economy is based almost entirely on husbandry. The natural landscape, rough, "Doric" is imposing and submits the strong impression of the direct interdependence of the historical becoming and the natural environment. The area is a "historical place" and "cultural landscape" as it

has settlements that maintain distinct historical traces and historical fortifications.

Fig. 1. General view of the area of Tetrachori of Souli

3.2 The research programme

The research program on "HISTORICAL REGION OF SOULI: PROMOTION, PROTECTION, AND DEVELOPMENT OF ITS CULTURAL LANDSCAPE" aims to ″recognize″ Souli, one of the most important historical monuments in Greece, in order to formulate proposals for the protection, promotion, and development of the region and its activation on the occasion of the celebrations for the 200 years of the Greek Revolution.

An expanded team that composed of faculty members of NTUA, University of Ioannina (Department of Architecture) as well as Metsovion Interdisciplinary Research Center (MIRC). Also includes representatives of the Ministry of Culture and the Region of Epirus, worked for the project, with about 40 specialized members of various scientific specialties. For the recognition of the special identity and the current situation of the place, tools of primary and secondary research were used, conventional and modern digital media, and mainly field research and recording.

The research revealed a number of elements, historical, natural, social, spatial, aesthetic, quantitative but also qualitative, tangible, and intangible. The final proposals, as the culmination of the research, based on the grid of natural and historical-cultural elements constituting the place of Souli. Proposals related to issues of protection of the natural landscape, preservation, and promotion of the historical elements of the place and the historical memory, also with the intentions of enhancing the visitation and the creation of cultural actions and cultural routes.

The research was structured in three (3) stages: The first concerned the collection of data (bibliography, data, existing studies and research for the area). The second stage concerned the **Identification – recognition** of the study area, the recording, and interpretation of the components of the place. Finally, in stage 3, the proposals for protection and promotion were formulated, based on the data of the previous analysis.

4.   "Recognition" of the study area, interdisciplinary approaches

Interdisciplinary collaboration covered all phases of the research. This paper will focus on the 2nd stage, that of Identification of the study area, where the cooperation

between surveyor and architect was crucial. Identification of the study area concerns the mapping of the structural characteristics of the place and its critical coefficients of promotion. It was based on primary and secondary research and was carried out using conventional and contemporary digital media.

The most important tool to understand the place was the acquaintance - the experience of the site, based on the fieldwork which included from the scale of the whole to the individual building. Mapping also included the collection of data from existing relevant sources of information (e.g. cadastral data, statistical indicators), also on personal contacts, and interviews with competent authorities and stakeholders as well as with the local community.

In particular, the systematic recording, analysis, and interpretation of the characteristics of the place include issues related to the historical significance, the Natural and structured environment, the particular identity, and Physiognomy of the place. Also, the economic and social reality of the region as well as the Institutional Status of ownership and protection. The main characteristics of the settlements and the problems were identified, as well as the critical questions and concerns for the future of the place.

The first stage of the identification of the study area concerns the creation of the appropriate geometric backgrounds, the **Topographic mapping of Tetrachori**, with the application of contemporary topographic and geodetic methods. The outcome of the topographic survey is used as the basic background of the **interpretive analysis** that follows. And not only. *As we will see below, through specific examples, geometric and interpretive survey forms a dynamic interactive process.*

4.1 Built Environment

As already mentioned, today Tetrachori looks like an extensive ruin area. Kiafa and Avarikos are completely abandoned, while Souli and Samoniva have some newer constructions - houses and stable installations, corrals, and sheepfolds.

The condition of the place added a great deal of difficulty to the survey. In particular, the poor condition of the maintenance of the majority of buildings, roads, artificial configurations, accesses. In addition, the place access and the approaches to the buildings, both externally and internally, were difficult due to the vegetation, uncontrolled grazing, and use, but mainly due to the locally extensive collapse of the building stock. Soil erosion, the momentum of the streams that descend from the surrounding mountains, has altered the physical and technical passages. Many paths have been lost, while the existing ones are largely the result of intensive livestock activity. Thus, the space was not easy to perceive and capture, except in places where it was accessible.

4.1.1 Topographic mapping

Concerning topography, the research object is the surveying of the settlements of Tetrachori using contemporary geodetic methods and the representation in topographic diagrams. Thus, orthophoto maps and drawings of the three settlements were created, on a scale of 1: 1000 (fig.2, fig. 8), as well as drawings of parts of the settlements at a scale of 1: 200 (fig.5, fig.9).

For the creation of the orthophoto maps of the settlements[54], a UAV or remotely piloted system - RPS was used, specifically a quadcopter DJI PHANTOM 3 PRo 4. The course of the UAS flights was planned from the beginning. In Kiafa area flight altitude was set to 100m above the ground surface, resulting in a 2.82cm size of the pixel on the ground. Also, in Samoniva, flight altitude was 100m above the ground surface, resulting in a 2.98cm size of the pixel on the ground. In the area of Souli, flight altitude was 90m from the ground surface with the result of 2.53cm pixel on the ground.

The overlap between the aerial photographs, both in length and width selected to be 80%. A total of 15 control points were placed in Kiafa, 12 in Samoniva, 51 in Souli, while several 20 minutes flights were performed (1 for Kiafa, 1 for Samoniva, 17 for Souli). Also, a great number of photographs were collected, 290 for the Kiafa area, 305 for Samoniva, and 3738 for Souli.

Final drawings (scale 1: 1000, 1: 200), were created using the orthophoto maps in digital rendering, as well as terrestrial geodetic measurements. For the measurements of the above characteristic points, integrated total stations that can measure distance without a reflector were used. Approximately 2500 points were measured, for the creation of the 1:200 scale drawings for specific areas, in which all the information that was deemed necessary is presented. In the context of this integrated topographic survey, the possibility of producing 3D diagrams of specific areas was investigated, using a multi-station. The multi-geodetic station is a modern robotic geodetic station that also incorporates Laser Scanner features. The Trimble SX10 multi-geodetic station was used to create 3D imaging derivatives for specific points of interest so that they can then be used as backgrounds for restoration work.

The geodetic and photogrammetric methods used led to the creation of derivatives of high precision. Geometric characteristics of the area (such as roads, paths, historical landmarks, constructions, natural relief, etc.) were depicted in order to be used in the next stage for the integration of quality characteristics - information. In Orthophoto maps all the elements that constitute the place are displayed. Thus, at a later stage, can be used for the identification, not only of geometric but also qualitative qualities. Also, the 1:200 diagrams, lead to a detailed geometric representation of smaller areas of particular historical importance. The detailed information included (e.g., ruins of buildings, routes, boundaries, wells, characteristic trees), form the necessary background for the recognition of the area and the future formulation of the proposals for its promotion. They can also be used to compare and detect changes over time (before & after the time of the geometric documentation).

How, though, surveying presented above relate to the interpretation of the place, and how it contributes to its emergence? The example of the recognition of public space presented below, attempt to provide some answers.

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[54] Kiafa, Samoniva & Souli at a scale of 1:1000, with an area of approximately 100, 100, 1100 acres

4.1.2 Urban fabric, the network of roads and paths

In the topographic survey presented above, roads, paths, and other elements of the man- made environment were recorded, elements that are "visible" in the first level. ***However, the "revelation" of the historical network of routes, which was one of the primary issues in order to formulate the proposals for the promotion of the area, was substantiated through the research that followed.*** In particular, in addition to the topographic survey, the historical routes were documented through historical documentation and research in older recorded testimonies and studies. Also, through the knowledge of local residents and on- site observation, but also synthetic thinking about space and the possible correlations of individual points.

Thus, we observe that human activity in the settlement of Souli develops along the main road that runs through the whole Tetrachori. A newer paved road is configured in the current residential area. The rest of the road network includes dirt roads, which were opened mainly for access to livestock facilities. Finally, there's an extensive network of trails that are currently inaccessible, organic linings that form a complex route system. Their engravings, either follow the old paths or are re-shaped by the animal and human movement.

Several of the old paths can be identified by accompanying structures (stone steps, ascents). In certain places, authentic cobblestone paths are recognized (e.g. On the axis that connects the houses of Botsari and Dagli), also paths that led to churches (path to Agios Donatos-mosque, the path around the hill of Agios Donatos and Ag. Paraskevi, etc.), or on other major roads (path to Alogomantra, the path to Mourga and Ioannina, etc.). Many pathways, however, are difficult to recognize in terms of dating. Such can be considered the paths connecting the houses of important families (e.g., a path that connects the houses of Botsari and Dagli), as the often-hostile relationship between the tribes probably indicates the absence of their spatial connection.

In addition, according to the oral testimonies of the breeders of the area, there was a network of continuous paths on three levels, which ran through the entire mountain valley and the four settlements. This intersected in many places with the paths that communicated with the villages of the prefecture of Ioannina. Today, as already mentioned, the paths are often indistinguishable, due to the lack of cleaning and maintenance.

The interpretive "reading" of the place, revealed an "internal system" of interconnection, a network of main routes connecting the most important historical buildings, public spaces, and natural landscapes. Also, an "external system" of interconnection with other areas and points of interest, historical routes connecting the area with the hinterland and Acheron River, the mountaineering routes of the wider area, the old entrances to Souli, etc. (fig. 3.4)

Fig. 2 Orthophoto map of Souli settlement, scale of 1: 1000

Fig.3 Road network interpretation_Souli, 1:2000

Fig. 4 Landscape interpretation, 1:2000

Public space is the primary level of understanding a place, while it is also the basic and primary element for its promotion. Thus, it is proposed to highlight the networks mentioned above, before other interventions in the area. The "internal" network is the first that should be restored to highlight the site, as it will be the backbone of the movement, not only for visitors but also for all future interventions in the area and the development of archaeological research. This network runs through the whole area, connecting important monuments, such as churches, houses of prominent Souliotes, and special buildings, proposed to be restored for cultural uses.

Specifically, for the settlement of **Souli** (fig. 5-7), a movement network organized in small closed paths (loops) is produced escalates from the "center" (which is revived today at the point of the wells and the so-called parliament) to the periphery. Thus, the visitor can choose short routes that include nearby monuments, such as the church of St. Georgios, the School, and the Bousi House, or even more distant routes such as the Tzavella house to the north, the Souliotes cemetery at Panagia and Hasomeri.

Also, from Bousi House, the central path leads visitors to Botsari House, and from there to Dagli House, all significant landmarks of historical and architectural value, as representing homonymous tribes and have rarely typological elements. Specifically, Dagli house is located in the heart of the contemporary residential core of Souli, with easy access for visitors from the existing network of roads. The research team considers the promotion of the monument important, creating a museum or other cultural use, also by creating a central public space - a small square, concerning both the residential area as well as the central historical area.

Fig. 5 Topographic plan, 1:200   **Fig.6** Promotion of public space, Center of Souli, plan 1:200   **Fig. 7** Promotion of public space, Center of Souli, 3d rendering

Visitors can move through the new path created, through this small square, to the old path revealed by research, towards the old main path that leads North to the "Center" of Souli and South to " Koulies". The area of Koulies (South Towers) is one of the most impressive sites in terms of view, as it "supervises" the entire history of Souli, from Kougki to the Castle of Kiafa. The place is proposed to be used as an observatory.

The descent to the west and southwest crosses through the residential area to an area of imposing rock formations, probably a battlefield of the defending Souliotes. From there begins the authentic path up the hill to Kougi, one of the most important historical landmarks of Souli, since the epilogue of the heroic resistance before the final abandonment of Souli, was written there, with the explosion of the fortress by Samuel. The main proposal of the research team is to highlight and restore this route, which today is indistinguishable and not used.

Another interesting path is highlighted on the steep slopes of the hill of the Dragon, the homonymous district of one of the major tribes, at the eastern entrance of the village of Souli. These defensive houses had a view of the whole of northern Souli and its entrances, and today are not easily accessible or recognizable. The connection with the area of Souli is proposed through the revival of two paths: first the path on the ridge connecting with Kougi and Ag. Donato, and second the path that starts from the center of Souli in a northwesterly direction to the center of the Dragon ridge. The paths are also connected with historical routes, to Tsagariotikos river, Souli Mills, etc.

In general, all the routes in the settlement of Souli are circular, allowing the visitor alternative ways of discovering the area, ending up again in the center, completing a course in place and time.

A particularly important area of Tetrachorion is **Kiafa** (fig. 8-10). A unique beauty landscape, with intense relief, scattered with ruins. The landscape is dominated by two ancient trees and also an area with wells, as in Souli, built in the center of the settlement and at the highest point of the ridge. From this central area, various paths start, connecting with landmarks and points of interest, offering excellent visuals to the rest of Tetrachori due to the large altitude difference.

| **Fig. 8** Orthophoto map of Kiafa, scale 1: 1000 | **Fig.9** Topographic plan of Kiafa, 1:200 | **Fig. 10** Road network interpretation_Kiafa, 1:2000 |
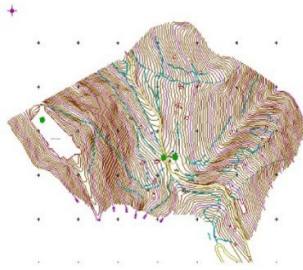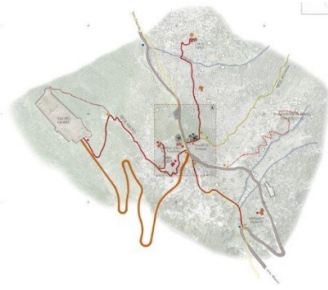
Although, the most important event in the landscape is the ascent to the Castle of Kiafa, which dominates the area metaphorically and literally. In the course of the path, that leads from the area of the wells and the trees to the two gates of the castle of Kiafa, one can find the ruins of the church of Ag. Constantine's and Eleni (11a, 11b).

Continuing to the Castle, one arrives at the Zervas house, another important tribe of Souli. The house, located on the edge of the "Bira" ridge, overlooking Tetrachori from Souli to Avarikos, is proposed to be restored as a "museum of the history of the fortifications". As a reference to the particularity of the area as the place of fortification, every time Souliotes were attacked, during the war conflicts. The visit to the museum (possibly digital) and the ascent to the Castle of Kiafa, will offer a complete experience of historical tour and restoration of memory in the area.

Fig. 11a   **Fig.11b**
Promotion of public space, Kiafa, 3d rendering

It could be said that the process of "revealing" this path highlighted to the maximum the issues of this paper, in relation to interdisciplinary cooperation in the field of heritage management.

5. Conclusion

The research on Souli revealed a place with important characteristics of a very

strong historical, cultural, and political identity. Mapping revealed the special characteristics of the area, as well as its present identity, perceived as the base from where a potential development will be deriving. The creation of geometric derivatives, combining methods of measurement and processing, contributes to the design and implementation of proposals that will highlight the historicity of places.

The significance of experiencing and drawing the realities of the place through the procedure of recording was the actual process of discovering new narratives of the site. Consequently, past and existing events were brought together in a new light and allowed to coexist. This paper highlighted the approaches and interpretations on "reading" the historical place through different scientific areas. Different approaches revealed multiple issues for the place, contributing to its "recognition" through time as well as its promotion. Continuous and ongoing collaboration, as information comes from different disciplines is dynamic, evolving into the research in relation to the findings.

The survey is therefore an eminently interdisciplinary activity that is constantly evolving and is fed through the cooperation of the parties. The importance and necessity of interdisciplinary approaches and the contribution to the research are indisputable in cultural heritage management issues.

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Old Fabrics

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Abstract. The proposed project positions itself within the field of museum, material culture and heritage studies but at the same time it shifts the attention to the history of fashion and fashion industry while drawing on local community and work force. The interdisciplinary nature of the idea links together the debate on sustainability and reuse of heritage with the social history of fabrics, retail shops and cloth makers and opens up possibilities for more transparency in the process of cloth making and the management of raw materials.
First, I look at the discourse of sustainability and link it with heritage and the fashion industry. Then, I turn to the particular and examine a) the repurposing of the Etmektzoglou silk deadstock produced at the Etmektzoglou silk mill in Volos during the 20th century b) the research idea revolving around the art of sewing and the reuse of fabrics and clothes from homes in urban Athens, during 1920-1980.

Keywords: Sustainability, Heritage, Fashion industry, Reuse, deadstock, Intimacy

Introduction

Childhood lens on: women of the family sewing. A seamstress is walking among tons of colourful textile pieces covering the floor. Mirrors reflecting their everchanging silhouettes. Fashion magazines laid on table tops, cut outs and a sewing moulage doll of dark green cardboard with all sorts of measurements to fit different body sizes. An android of the most promising quality. Adulthood lens on: visits to the attic at the change of the season.

A metal ladder clumsily set. Quick, there is an event to attend in a couple of days. Change, cut, destroy. Blissful creativity (*two photos*).

Περιττό in Greek means of no need, useless, a waste, while *οικείο* meansintimate. The whole phrase woven together translates however, into something else: 'about the

intimate' / 'peri to oikeio'.

Old fabrics are intimate traces. Pieces of clothes, whole garments, zippers, bindings for hemming clothes, buttons, handmade belts, all sorts of left overs.Spanning most likely a couple of generations, maybe more, old fabrics are populating our storage spaces lingering on because of our reluctance to draw the line and turn them into memorabilia or clear-cut waste. The project *Old fabrics. πε.ρι.το_οι.κεί.ο* is about the process of 'de- souveniing' the traces, ofindulging in intimacy that has to do with one''s own life filtered by use value.

We would like to reinstate use value, then, as we find it deeply meaningful. Use value possesses a kind of hands-on meaningfulness that stops the mind from getting astray. Its aesthetic, which has lately become number one trendsetter in fashion and design and has been labelled sustainable, circular, has been accompanied by "re" before verbs such as make, fashion, do, mold and so on, has a cathartic impact on consumerist souls. It is a collective guilt extinguisher and as such, it dominates the official discourse of goods production, be it clothing, furniture and homeware in general, packaging and the like. While this assumption might be epistemologically valid and financially prosperous no doubt, it makes claim – to our deep surprise and intellectual embarrassment – to an ontology of the self, a core of our existence that drawsupon cell memory: hands that weave, that sew, that dye, that cut and paste pieces together, that embroider. Reassigning intimacy to the waste appeals to our very need to keep going, and if the planet escapes its fate, so can humans carry the hope. Remembrance and action remove the romantic element of the souvenir and turn traces into actual companions, testimonies of the continuity of life narratives, however ruptured, flimsy and remote those narratives (and clothes for that matter) might appear to be.

The project is a two-faceted endeavor: there is a research part and a business idea. In this paper, I will just draft the main points of the brand-new research project that draws upon the idea of intimacy to map out incidents of fashion and cloth making from the 1920s to the 1980s. The business element is expected to support research by proposing a renewed attention to our drawers and stuffed old suitcases and engaging us into creative synergies withthe owners.

The socio-academic context: sustainability and reuse

We often buy or even make clothes ourselves but ignore the provenance of thematerials and the agents that make the process of clothing possible. Whereas the attempt to fill out gaps in origin and production seems like the new utopia from a global point of view, tracing production more locally maps out and visualizes real people, real shops and activities, styles and trends contained in everyday routines.

This is of course a catch for trendsetters. Recently, we witness a new everyday language filtering and communicating processes happening at higher levels of society, be they national and supranational executive bodies and / or the corporative world. Sustainability, as the idea of caring for the needs of the present without putting the next

generations at risk[55], has gathered moral concerns around buzz words such as ethical consumerism, socially responsible decisions and investments, second life of things, slow fashion and so on. From EU programmes to businesses to activism to the market, there is a frenzy revolving around the reduction of carbon footprint. Main constitutive element of this general concern is the care for humanity"s future and the therapeutic revelation that less is more[56]. Informed choice smoothens and justifies the anxiety of overspending while the markets prosper. As Basil Bernstein notes in his seminal book *Pedagogy, Symbolic Control and Identity* therapeutic identity relies on "sense-making resources"[57], ways through which individuals construct personalized narratives to achieve the so-called personal growth. The turn to the self from the perspective of personal growth and the emphasis on emancipation and freedom of choice becomes entangled with market-oriented identity, a condition detected even before 2000 and commented by philosophers and heritage analysts. Hilde Hein, in her book *The Museum in Transition. A philosophical Perspective* talked about the advancement of "experience economy"[58] and its direct connection with the therapeutic identity and the intimate self in museums and the heritage industry. What we now witness is the end result of several decades of preparation for more diversity and acceptance, less rich-kitsch shows and more ethical reflexes. Still, the emphasis on the experiential is what informs the current discourse on sustainability.

Since we agree that ideas do not come from nowhere but are iterated by specific subject positions invested with power (nations, international institutions, professionals and think tanks, big businesses etc.), governments and supranational bodies set the pace. Sustainable development and heritage preservation are top on the list of UNESCO"s strategic horizon. We read:

Based on a strong appeal from national and local stakeholders, the 2030 Agen-daadoptedby the UN General Assembly integrates, for the first time, the role of culture, through cultural heritage and creativity, as an enabler of sustainable development across the Sustainable Development Goals. World Heritage may provide a platform to develop and test new approaches that demonstrate the relevance of heritage for sustainable development[59].

When it comes to fashion industry, the corporate "profits, planet, people"[60] discourse is defracted down the line of ideas to social agents such as bloggers, small businesses, bigger fashion manufacturers, shoppers, activists. This frameof mind reshapes the premises upon which the heritage industry operates and sets new rules and regulations, new exigencies and expectations as far as preservation and sustainability guidelines are concerned. During 2020 and 2021, just as I was processing the concept of the project, *Vogue Greece* hosted numerous articles exploring the new grounds. International brands such as Marrashki Life, Albus Lumen, Mimi Prober, Another Heritage, Guiliva Heritage and other, couple high-end aesthetics with historical references. In February

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[55] https://www.investopedia.com/terms/s/sustainability.asp, last accessed 10.7.2021
[56] Tahtara 2020, 24.
[57] Bernstein 2000, 73.
[58] Hein 2000, 198
[59] https://whc.unesco.org/en/sustainabledevelopment/, last accessed 8.7.20212
[60] https://www.investopedia.com/terms/s/sustainability.asp, last accessed 8.7.2021

2020 the journal featured a contribution by Elina Dimitriadi titled "Ithiki Epilogi" [Ethical Choice] which introduced the socially sensitive brand *Collina Strada* to Greek audiences. The founder, Hillary Taymour, staged a wedding show in a New York park by having people of various genders, styles and body sizes walking hand in hand in an attempt to promote her motto: "sustainability is a journey"[61]. The company targets "climate awareness, social awareness, change and self- expression" and sells at a three-digit price climbing towards the fourth digit a piece[62]. Taymour supports new ecological materials such as vegan skin, saves on water during production process and advertises fair salaries. More than a year later, an article on vintage revival, again in *Vogue Greece* rebrushes the concept of vintage: the collaboration between Alexander McQueen and the platform Brand Approved confirms the eagerness of the markets to appropriate global directives and profit: the House of McQueen buys used garments back from its clients and restyles them in order to sell them through the digital platform Brand Approved. Vintage is „in" again and another digital platform, Farfetch, has recently added two new categories: Pre-owned garments for purchase and Second Life for those who sell[63]. At the same time, Greek brands like Zeus and Dione, Kepler, Ioanna Kourbela, Salty Bag, 3Quarters, Urban Owl, the activists Fridays for Future among others embrace both the sustainable approach, i.e. less is more and the heritage approach (traditional techniques, fabrics, motifs, cuts) and give Greek fashion and design an imaginative and up to date twist[64].

At the level of the academia, MoMA offered an online seminar on sustainability in fashion in December 2020 while the British Council in Athens continues its four-year programme under the general title *Circular Cultures* focusing on the role of design for a sustainable future. This year"s edition, 2021, was dedicated to circular design and materials from the perspective of material wisdom and material waste and hosted an international conference and workshops (March 29-30)[65]. The contributors emphasized the need to move from the concept and practice of recycling to that of remaking, redoing, upcycling and paid special tribute to new garments tailored out of old military uniforms (RÆBURN) and innovative digital models for pattern cutting with zerowaste[66].

Within the framework of the above, Old Fabrics bridges theory with practice in order to shed light on small-scale, home-contained fashion heritage in Greece by personalising the focus on local and synergetic forms of remaking.

Let me then turn to the specifics of the idea.

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[61] Dimitriadi 2020. "Ithiki Epilogi", *Vogue Greece*, February, pp. 38-39
[62] https://collinastrada.com/, last accessed 10 July 2021
[63] Kiss 2021. "Vintage Revival", *Vogue Greece*, April, 71
[64] On the topic of recent Greek brands operating along those line, see Kiss 2020.
[65] https://www.britishcouncil.gr/en/events/circular-cultures-materials, last accessed 10 July 2021
[66] https://decode.com/, last accessed 10 July 2021

The research idea

α. *Repurposing the Etmektzoglou silk deadstock*

The point of departure for this project has been, as it often happens, anecdotological, not academic. A friend who has been using silk to produce dyed scarfs, introduced me to one of the offsprings of the Etmektzoglou family whose silk production in Nea Ionia, Volos, had been well acclaimed during the 20th century and was even documented in the publication *Ιστορικός και Βιομηχανικός Εξοπλισμός στην Ελλάδαν Ελλάδα* (Historical Industrial Equipment in Greece)[67]. The two brothers Etmektzoglou with an origin from Vithinia, in Asia Minor, started the business in 1924 and in the first ten years, until 1935, they have expanded the exports to 12.000 kilos of silk sent mainly to Europe (Milan,Marseilles and Lyon) with just part of it sent to Athens to be turned into fabric bolts and decorative silk ribbons. The cocoons were mostly from Thessaly, thus Volos constituted the epicentre of the activity in that part of Greece. During World War II, the factory was commandeered by the Italians, while silk was used for parachute canopies. In 1955 the historic building was damaged by an earthquake and ceased to function and later on, its equipment was dismantled and transferred to Athens and was not used ever again. Gradually and for reasons relating both to the Greek history of deindustrialisation and import activity and to the microhistory of the family itself involving death and change, the business was no longer prosperous, even in Nea Ionia Athens, where it wastransferred. The building in Volos, on the other hand, owned since 1996 by Volos municipality, has acquired a new use as cultural centre and a museum for the history of silk in the area, thus preserving equipment that dates to the last phase of the whole enterprise between 1962-1991[68].

The story of the factory, the building and its function, fascinated me, especially after having the chance to see samples of the silk deadstock, in at least fifty different colours, all sorts of fabrics (*photos*): crêpe satin, crêpe de Chine, mousseline, organza, soie chauvage and other. The stock also includes fabrics made according to traditional weaving techniques and ordered to the Etmektzoglou brothers by local manufacturers who had ceased to produce silk,namely the famous Soufli silk mill and other producers from the Evros region, Ioannina and the islands. Within the Etmektzoglou deadstock there are bolts of fabric with only a few meters left, which makes them quite unique as objects of human craftmanship. The clients were many and well acclaimed: banks, couturiers, fur producers, the textile industry such as Peiraiki Patraiki, especially in the 1980s, monasteries but most of all Olympic Airways in its heyday, manufacturing duty free items and scarfs for the crew in collaborationwith top Greek designers such as Tseklenis (photo) and Tselios.

Soon the idea of turning the deadstock into something living and vivid by restoring its use value and at the same time unravelling the humble traces of its story (i.e slightly worn selv-edges showing the end of the piece of the fabric,photo) became an urge.

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[67] Dimoglou 1998, 229-232

[68] https://www.volovweb.gr/el/sights/politistiko-kentro-metaxourgeio/, last accessed 10 July 2021

Unica fabrics are like persons, with particularities and flaws that make them stand out. I came into contact with a pattern designer, Natali Pala, a graduate from the Department of Cultural Technology and Communication, University of the Aegean and decided to work together with her to find fitting patterns for the factory story. In the meantime, silk as heritage was establishing itself as the state of the art[69]. Yet, the Etmektzoglou heritage constitutes an 'extinct' source of material culture, which we aim to reuse for new garments and at the same time solidify the idea that reusing deadstock with a name, an origin and a narrative is part of our industrial and social history by and large dimly lit.

b. The art of sewing. Home-contained fashion heritage and its reuse

The initial idea deepened as the continuous need for raw materials began to puzzle me vis- à-vis the future of the project, after the Etmektzoglou"s deadstock would have been depleted. Deadstock is not expandable, thus howto continue? A more „sustainable" concept soon took shape, and seemed sustainable in every sense of the term: continuity, less is more, low-budget, existing networks, social engagement. If my personal story of attics and boxesfilled with textile remnants and stories behind them is the source of my long- term enthusiasm and attraction to clothing, so are other people"s storiestoo.

Discussions with friends often ending with the "what I am going to do withthose garments that I don"t want to get rid of" motto, led to the belief that those stories could reinstate a more complete picture of urban couture in the 20th century. Together with the more recent collaborator, Panagiota Korompli, a cultural officer and experienced administrator in EU programmes, we decided to set the research period between 1920s, an intense mid-war phase design-wise, and 1980s, when local tailors, dressmakers, seamstresses, textile retailers and the like began to fade from the map. Despite that reuse and refashion of older pieces had never really died completely, it had considerably withered under the pressure from the multinational chains of cheap casual clothing in the 1990s and onwards. Even though the wealth of traditional embroidery and national costume making in Greece is an uncontested fact, applied arts were not on the agenda of academic and educational institutions, therefore markets did not push for handmade products. For the most part, imports catered for the day-to-day needs of clothing supply. Greek design was definitely present with prominent brand names in haute-couture and prêt-à- porter (Tsouxlos, Eleftheriadis, Tseklenis, Parthenis, Valente to name but a few). Yet, the diffusion to larger audiences and most importantly, the mentality of preserving and remoulding was far from promising. Easy come easy go kind of mentality.

Panagiota drafted a first version of a questionnaire including the following: personal info of the owner/s, date and mode of acquisition of the particular garment, details of the garment (style, material, preferred features etc.), info of seamstress / tailor or retail shop, ateliers, other sources of material acquisition relating to the garment, patterns preserved or periodicals containing the patterns (for instance Gineka, Burda), process

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[69] https://www.zeusndione.com/story, last accessed 11.7.2021.

of making, eventual reuse and remakes, photographs, personal stories about the garment and its use. After a recent discussion with the Director of the Ethnological Museum of Thrace, Ms. Aggeliki Giannakidou, herself a heritage „activist" having devoted her work in sharing techniques with the local Pomak women, we realised that this whole enterprise could indeed become a more long-term project sketching the story of sewing, first in the urban areas of the Athens centre, and maybe later in other cities of Greece. Ms Giannakidou gave us invaluable information about Alexandroupoli and Thessaloniki, just to confirm the significance of the endeavour and attest to the wealth of data that could be extracted and documented after having built networks with our informers. We thank her and look forward to conducting and sharing research results with her.

Last but not least, the idea of preserving fabric and fashion heritage by reusingold stock is a process to be taken up with, for instance, Norwegian or Scandinavian academic and business actors, who have been deeply engaged in the domain of sustainability and materiality during the last decades[70]

Concluding remarks

Old Fabrics. πε.ρι.το_οι.κει.ο project attempts to particularise general discourses on heritage sustainability and reuse within localised contexts (researchers, pattern makers, seamstresses, informers) in order to delve into a topic still unexplored in Greece: dead-stock fabrics and clothes along with their trajectories. Our goal is to draft the scene of cloth making and purchasing first around urban Athens, distinguish between local makers and imports during thedecades 1920-1980 and consequently propose a creative exchange with the owners: they will see their stock, be it fabrics or clothes, returning to their wardrobes restyled and we will have gained insight vis-à-vis a hardly visible part of Greek contemporary history.

Grasping social history from the perspective of the less privileged applied arts in Greece, extorts the element of folklore and restores the status of productionand use, as part of people"s life narratives. Intimacy in this sense is not a buzz word without concrete meaning, an empty signifier having lost its ability to refer to a particular content, meaning everything and nothing, but a term pointing directly to the self and our memory traces, however fragmented, constructed and glued together these might be. While discourses produced from power positions, as discussed above, will never cease to shape individuals and the values we all like to flag, it is, I believe, challenging to detect them and attempt to work with them, from within. This diagnostic process, the what of things, is a process of real empowerment, which means finding micro- possibilities of action with healing effects. If sustainability, as any big idea, stands a chance for humans, it is in the process of desacralizing the term and appropriating it, so as to make sense of our being in the world. What is before and what comes after, in any way cultures, communities and individuals understand it, is what anchors us to life, not in the sense of *lacrimae rerum*, as Pearce names the souvenirs, the tears of things, but as

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[70] See for example https://betterworldfashion.com/, last accessed 11.7.2021

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continuation[71]. Exactly what sustainability in the heritage debate should stand for.

Logo design: Hara Vidopoulou

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The project "Preserve" and the related policy of the Hellenic Ministry of Environment and Energy for the protection of tangible Cultural Heritage

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Abstract : Nowadays, due to economic crisis, the number of "abandoned", empty or dilapidated listed or historic buildings of Greek cities and settlements is constantly increasing. In order to protect and enhance the Greek tangible cultural heritage, it is necessary to promote actions that give motives to owners or users of historic buildings to preserve them, by providing tools and financial support in the particularly increased costs of restoration and consolidation works of their necessary continuous maintenance.

The program "Preserve" introduced by the Hellenic Ministry of Environment and Energy, and more specifically the General Secretariat of Spatial Planning & Urban Environment, relates to interventions in designated as listed or monuments or buildings within historic sites and traditional settlements and historic buildings. The interventions will include facade cleaning (with gentle water jet to remove air pollutants or anti-graffiti painting for protection against vandalism), works in order to preserve the shell of the buildings so as to avoid it's partial or total collapse, restoration of facades and restoration of the interior of the buildings.

Along with the activation of the Digital Land Bank, the Building Rights Transfer, the Single Digital Map, and the Digital Building Identity etc., it will offer the owners of the listed buildings a holistic solution for the protection and enhancement of the tangible cultural heritage of Greece.

Keywords: Cultural Heritage, Built Environment, preservation, digitization

1.   Introduction

In Greece there are numerous of cultural architectural monuments all over the country that are recognized internationally as achievements of special historical and artistic value. However, the irreparable destruction of a huge part of our national architectural heritage is, unfortunately, an indisputable fact during the last decades. Especially after the financial crisis in Greece, tens of thousands of owners of listed traditional and historic buildings are unable to maintain their property. Most of them cannot use the available financial tools as there are restrictions (i.e. the conversion of the building to hotel) that set the required interventions difficult and demanding.

However, the dynamics and the importance of the architectural heritage in many fields (tourism, culture, creative economy, education, etc.) [1] require responsible actions for its protection, preservation, and enhancement, by the citizens and by the State. Moreover, addressing the challenges caused by climate change, the sustainability of cities and rural areas has emerged as one of the most important issues for the present and the future of human society [2].

For the aforementioned reasons, the need to preserve, protect and reuse the rich architectural heritage of Greece is further dictated by the necessity to prevent the further deterioration of the urban environment. Taking into consideration this need, a new program with integrated actions for the restoration, consolidation and renovation of cultural heritage buildings has been introduced by the Hellenic Ministry of Environment and Energy.

The scope of the program is the protection and enhancement of the tangible cultural heritage of Greece and more specifically of listed and historic buildings through a financial tool addressed to the owners or direct beneficiaries of these properties entitled as "Preserve".

The program "Preserve" for the consolidation and restoration of historic buildings aims to assist in restarting the economy by utilizing the available building capacity in city centers, where values (financial, tourist, etc.) are very high. The program will be funded by NSRF 2021-2027 (EU funds) resources, with the ambition to institute a financial instrument of support for maintenance, conservation and restoration of the significant building stock of Greece.

Finally, the activation of the Digital Land Bank, the Building Rights Transfer, the Single Digital Map, and the Digital Building Identity etc. will offer the owners of the listed buildings a holistic solution that for the first time after decades, activates mechanisms and financial tools as a unique opportunity for immediate economic recovery and long-term protection of our rich cultural heritage.

2.   State of the Art

The economic, social, and cultural value of historic buildings besides their significant contribution to sustainable development is globally recognized. The historic centers and settlements attract visitors from all over the world, who are willing to pay a high cost of travel and high cost of accommodation to visit them, while creating

employment opportunities and economic development. The demand for real estate for the above uses is increased and is particularly associated with the use of emblematic buildings, due to their increased aesthetic quality and for symbolic value, as these buildings testify the history and evolution of cities and settlements [3]. However, most of these buildings are abandoned and often dilapidated as they are not easy to be restored or functional, due to the increased cost of the relevant works, and as their demolition is not allowed (due to their "designation" as listed). Then, a vicious circle is created that "blocks" the economic development in the urban centers, and the utilization of the properties for the direct benefit of their owners or buyers.

On the other hand, interventions for the protection of listed or historic buildings are a direct measure to stimulate economic activity, both in the construction industry and in the production of construction materials, contributing significantly to the strengthening of the domestic market [4].

In addition, a large part of these properties is located in areas with increased real estate and investment interest (island and mainland traditional settlements). Indicatively it should be mentioned that from Greek Statistical Authority (ELSTAT) inventory data, in Greece 154,006 buildings before 1919 have already been recorded and counted, 324,701 buildings during the construction period 1919 - 1945, most of which concern city centers (in the 3 largest urban centers there are about 12.000 historic buildings). Also, out of the 4,105,637 buildings in Greece, 478,707 buildings were constructed before 1945. That constitutes the 11.67% of the building stock of the country [5]. According to an estimate of the General Secretariat for Spatial Planning and Urban Environment, the Ministry of Environment and Energy is responsible for 10,100 listed buildings, the Ministry of Environment for 8,500 buildings, the Ministry of Macedonia Thrace for 1,200 buildings and the Ministry of the Aegean for 1,000 buildings. About 600 of them are dual characterized. In total there are about 20,200 buildings. The traditional settlements in Greece characterized by legislation by the Ministry of the Environment and Energy exceed the number of 830.

Many of these buildings are in bad condition with severe structural pathology. According to the recent census - until 12-01-2021 - of the Ministry of the Environment and Energy in 127 Municipalities out of the 332 in Greece, 10,416 dangerously dilapidated buildings have been registered that set the public safety imperative through immediate consolidation works or restoration interventions.

It is therefore obvious that there are too many eligible buildings which can be funded with immediate financial results for the market, ensuring the safety of residents and passers-by, especially in a seismogenic country such as Greece.

2.1   The Hellenic Ministry of the Environment and Energy

The Hellenic Ministry of the Environment and Energy and more specifically the General Secretariat for Spatial Planning and Urban Environment is responsible for the protection and management of newer tangible cultural heritage in Greece, besides the Hellenic Ministry of Culture [6]. It provides specialized legislative coverage at the urban and building level, to the traditional settlements, to the historical centers of cities, and areas of particular urban interest. Individual buildings or parts of buildings or complexes of buildings can be characterized as listed buildings by Ministerial decisions that

specify special protection conditions and use restrictions.

The criteria for these decisions are the remarkable morphological and architectural elements, due to location, due to scale or completion of a whole. Also, the General Secretariat is responsible for the archive of traditional settlements and listed buildings that were evaluated by the competent service of the Ministry and are protected by Presidential Decrees or Decisions of the Minister of Environment and Energy [7].

2.1.1 The Building Rights Transfer tool and Digital Land Bank

Additional measures and motivations for the protection of architectural heritage such as the development of Rights Transfer Zones (RTZ) of the building is under the competence of the General Secretariat for Spatial Planning and Urban Environment.

The Ministry of the Environment and Energy through its recent legislation [8], activated two very important tools, the Building Rights Transfer and the Digital Land Bank which will function as a complementary policy with immediate benefit. To date, Rights Transfers have been issued from listed monuments and properties corresponding to over 1,100,000 sq.m., while the titles that correspond to 450,000 sq.m. are available, the value of which is estimated to exceed 185 million euros. At the same time, the Digital Earth Bank creates the necessary but simple mechanism in order to make it possible to transfer the building rights from supply properties to building factor receiving properties, organized in the Rights Transfer Zones (RTZ). It is pointed out that there is an equally high demand for "purchase" rate, and especially for investors in Spatial Development Plan of the Public Real Estate (ESHADA), owners of arbitrary with very large arbitrariness (category 5) who have settled for 30 years and must buy a building rate to legalize them - if in the area the urban planning has been completed (estimated number 400,000 buildings).

The plans of Rights Transfer Zones (RTZ) will define areas within the urban space in which a building coefficient transfer will be possible from a property outside the Zone to a property located within the Zone, which will function as the receiver of the building coefficient that cannot be used by the other property. Defining these zones will make it possible to create public spaces in densely populated cities at low cost and at the same time will release the owners of thousands of land-plots or listed buildings from the constraints caused by the "special" characteristics of the properties and / or of the areas where these properties are located (e.g., historic centers) and will give a new impetus to construction activity (especially in reception areas / zones).

2.1.2 Abandoned and vacant properties

The Ministry of Environment and Energy is examining the draft law concerning regulations for abandoned and vacant properties as well as the intervention procedures for their restoration and reuse.

From Greek Statistical Authority (ELSTAT) inventory data [5], of the total 6,384,353 private houses, there are 163,759 that were built before 1919, the 74,905 were inhabited and 88,854 were vacant. For the period 1919 - 1945 construction, there are 318,372 houses, of which 159,675 were inhabited and 158,697 were vacant. For the period 1946 - 1960 construction, there are 605,693 houses, of which 372,963 were inhabited and 232,730 were vacant. For the period 1961 - 1970 construction, there are 1,002,902

houses, of which 676,960 were inhabited and 325,942 were vacant.

The institutionalization of the appropriate framework will enable the activation of the private sector and the undertaking of initiatives for interventions and projects of abandoned or empty buildings with multi-property status, under conditions of legal certainty and with fast procedures.

It also studies the promotion of Public-Private Partnerships (PPPs) with the development of a financing mechanism for private and public real estate using – the at least possible - recyclable financial resources, coming from the NSRF and private resources.

The implementation of the above interventions and projects will aim at the improvement of the public space in selected areas, and definitely within the areas of application of the previously mentioned, second action.

In order to apply the above, the following procedure is necessary:
- Investigation of existing problems. Creation of a digital repository of abandoned and dangerously dilapidated buildings
- Preparation of legislative proposals for abandoned and vacant with unknown owners' buildings, as well as intervention procedures in selected areas with degraded building stock
- Legal and technical approach to the proposals.

2.1.3 Local Urban Plans, the Special Urban Plans, and the Strategic Urban Interventions

The programs of the Local Urban Plans, the Special Urban Plans and the Strategic Urban Interventions will be funded by the Recovery and Resilience Facility (RFF) [9] and will start in 2022 and will end in 2026. Due to the RFF, European Member States will be able to cope with the economic and social impact of the COVID-19 pandemic, while at the same time their economies will focus on green and digital policy to become more sustainable and resilient.

The Local Urban Plans (LUPs) and the Special Urban Plans (SUPs) are the main urban planning tools in Greece and through them are defined and endorsed (in their reference territory): land uses, building terms, regulations and restrictions, residential areas (existing settlements, plan extensions or new developments) which may also include private urbanization schemes, delimination of settlements, definition of protection areas, areas for the development of productive activities, important urban planning interventions, the development of Rights Transfer Zones (RTZ) (Fig.1), areas of special urban incentives (e.g. to facilitate the allocation of large investments), road network, transport, construction and environmental networks and infrastructure, measures to adapt to climate change, measures to support emergencies and manage the consequences of natural and technological disasters and other threats, and any other measures, conditions or restrictions required for the integrated spatial development and organization of the reference area.

Figure 1. The Local Urban Plans (LUPs) and the Special Urban Plans (SUPs) are the main urban planning tools for the development of Rights Transfer Zones (RTZ) and the Building Rights Transfer Tool.

The Local Urban Plans (LUPs) and the Special Urban Plans (SUPs) are important tools for the protection of cultural heritage, which will reduce arbitrary and unregulated construction and delimit special protection zones i.e. traditional settlements, historic sites, archaeological sites, Natura regions etc.

The program Strategic Urban Interventions includes a wide range of projects in the existing urban space with various characteristics, but with the end result the upgrade of this space not only from an aesthetic point of view but also in terms of its economic, environmental, functional and social revitalization. Interventions in urban areas of Greece, which incorporate elements of special cultural and / or environmental importance and can function as "urban landmarks". The program focuses on implementing projects of upgrading of the public space and the building stock with the use of smart and bioclimatic technology, the restoration and enhancement of cultural heritage elements and / or monuments, etc. within the urban web.

2.1.4 Single Digital Map

The Single Digital Map can be a key "pillar" of the digital advancement and transformation of public administration in particular - and of the country as a whole, as it will be provided directly and to all, high quality services without the need for physical presence in the respective public services, thus saving resources and time.

The related Joint Ministerial Decision [10] describes the procedures of compilation, distribution and maintenance of a Single Digital Map but also its observance, information and operation. Specifically, this is the creation of a single digital platform, common to all public administration and citizens, which will provide all the necessary geospatial data for the licensing of any type and size of investment.

To be precise, those interested will be able to see building conditions and restrictions, land uses, city plans, road and building lines, cadastral parcels, forests and forest areas (only if they are included in ratified and finalized forest maps), Natura 2000 network or special habitat protection areas, coastal, beach and port areas, waters, streams, wetlands, riverside and large lakes, archeological sites or historic sites, traditional settlements, historic sites or protected areas, special plans activities, including special spatial development plans (such as the Spatial Development Plan of the Public Real Estate - ESCHADA).

2.1.5 Digital Building Identity

The purpose of the Digital Building Identity is to capture the current condition of the building or shared property and their permits, as well as to monitor and control their changes during their lifetime. The Digital Building Identity will put an end to new arbitrariness and will shield the property of citizens, but also has a general utility, as an information infrastructure for all the forms of spatial planning in the country. In addition, the Digital Building Identity will develop synergies and will eventually be interconnected with other information infrastructures that are in the process of creation, such as the Land Register and the Single Digital Map. This creates a permanent system for monitoring the construction, but also the changes in historic buildings throughout their life.

2.1.6 Repository of Protected Buildings and Areas

The Repository of Protected Buildings and Areas of the Ministry of Environment and Energy, (including the listed buildings and traditional settlements of the Ministry of the Aegean and the Ministry of Macedonia and Thrace) will be designed to have interoperability with:
  a)   The Electronic Identity
  b)   Other collections, libraries or repositories e.g. National Archive of Monuments of the Ministry of Culture, Europeana etc. using linked open data
  c)   The future repository of BIM (Building Information Modeling)
  d)   Applications such as e.g. GIS
  e)   The digital repository of abandoned and dangerously dilapidated buildings.
Also, the use of crowdsourcing data of intangible cultural heritage information related to the listed buildings is examined (required by Heritage BIM - HBIM).

2.2   Description of the program "Preserve"

The current image of "abandoned", empty or dangerously dilapidated listed or historic buildings is constantly increasing in the historic centers of Athens and other cities and settlements of our country. The Constitution of Greece (article 24) as well as the Convention for the Protection of European Architectural Heritage (Granada Convention) which was unanimously ratified by the Greek Parliament with Law 2039/1992 [11] provide for the financial participation of the State in the particularly increased costs of restoration works and reuse or change of use and the necessary continuous maintenance of historic buildings.

For this reason, the creation of a new financial tool (program) entitled "Preserve" is proposed that will be included in the new NSRF 2021-2027. The new program applies mainly to property owners, professional sectors such as designers, manufacturers, suppliers, etc. and companies that operate with cleaner energy (traditional materials) in more than 5.500 buildings.

The program will involve interventions in:
  • designated as listed or monuments
  • historic buildings within historic sites, historic centers, and traditional settlements.
The interventions will include the following actions:

a1) Facade cleaning with gentle water jet for the exterior artificial coating of the interwar buildings to remove air pollutants or anti-graffiti painting for protection against vandalism.

a) Consolidation works in order to preserve the shell of the buildings - fixing openings, repairs to the tiled roof, etc - so as to avoid it's partial or total collapse e.g. due to the inflow of water, due to damages of seismic activity or due to corrosion of construction materials.

b) Restoration of the shell of buildings (facades and roof). Restoration of foundations, masonry, roof, coatings, balconies, plastic decoration, replacement of frames, repair of metal elements, etc.

c) Restoration of the interior of the buildings - restoration or reinforcement of wooden floors, restoration of stairs, changes in the partition for functional reasons.

For the eligibility of the interventions, it is necessary the electronic submission of all the necessary supporting documents e.g. contracts, leases, consent of the owners, Government Gazette for the characterization of the property / settlement or part of the city where the property is located, proof of implementation of necessary studies per sq.m. and the necessary Building Permit of the competent Service.

The Ministry of Environment and Energy has already received the intense investment interest for the restoration for the development of relevant real estate, through the sending of letters of expression of interest for the creation of a relevant financial tool. Indicatively, the letters from collective bodies (i.e. Panhellenic Federation of Property Owners, Association of Greek Tourist and Travel Agencies, Association of Real Estate Agents Athens - Attica), Social Partners (SETE- Association of Greek Tourist Enterprises), NGO's as well as companies. The Program is also supported by a letter from the International Secretariat of the European Organization of EUROPA NOSTRA, through the Secretary General. Sneška Quaedvlieg-Mihailović, who refers to the Program as "exciting and innovative for Greece and the entire European Union" and continues "PRESERVE is therefore a call that could be reproduced in many EU countries, as a pioneer project that gives the chance to regenerate private historic buildings in a mass scale and help them to become resilient in times of rapid changes".

2.2.1 Previous Experience

The Hellenic Ministry of the Environment and Energy has taken similar initiatives in the past. The "Program of aesthetic restoration - maintenance of buildings on roads and areas of Olympic interest" was officially announced by the political leadership of the Ministry was enacted in 2002 [12] and began to be implemented on 30.6.2003. The project with the final title "Aesthetic upgrade program of building facades /

Implementation proposal with co-financing (PDE - individuals)[72] " provided the possibility of a private subsidy from the State or the relevant local authorities for the

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[72] The basic institutional framework was supplemented with the JM No. 21585/2003 (Government Gazette 734 BD / 10.6.2003) - while some additional individual regulations with Law 3212/2003 (Government Gazette 308 A '/ 31.12.2003) - and the whole process and the conditions for the inclusion in the Program, the subsidized works, as well as the corresponding invoice were defined in detail, as well as the corresponding invoice which was in fact significantly increased in the cases of the listed buildings.

restoration and maintenance of building facades. The construction works that were sub-sidized were mainly the cleaning / painting of the external surfaces of the buildings, the railings and their external frames with the obligatory removal of the individual TV antennas, their replacement with a central antenna and the removal of the illegal advertisements and professional advertisements. There was interest in subsidizing 1,368 buildings in the areas mentioned above. Finally, they proceeded and completed the relevant work within the deadlines set by the owners of 834 buildings. The State paid for the specific action total credits amounting to €5,065,449, of which € 63,030 related to a cost of publicizing the program. The average amount of the grant per building amounted to € 5,998.

2.3 Impact on Employment, Economy and EU Strategies

The preservation and enhancement of our cultural heritage is beneficial for historical and national reasons, as they testify to the achievements of the Greeks in the past centuries under adverse conditions. In addition, it is beneficial for reasons of economic and tourist development.

The proposed "Preserve" program of the Ministry of Environment and Energy is a direct measure to stimulate economic activity, contributing significantly to strengthening the domestic market, both in the construction industry and in the production of construction materials, contributing significantly to the strengthening of the domestic market. Several new job positions will be created both locally and nationally, in order to support the elaboration of studies, construction projects (engineers, designers, workshops, etc.), the production of products (eg frames, coatings, plastic decoration, tiles, etc.) and the management of actions to achieve the goal of upgrading and protection of buildings.

This financial tool aims to the protection and upgrading of historic properties, especially in areas with increased real estate interest (island and mainland traditional settlements, urban centers such as Athens, Thessaloniki, Piraeus, etc.). Through the program the wider urban web will emerge, creating new added values, not only in the properties that will be included in the program, but also in their indirect or direct environment. Also, since the problem of dilapidated and abandoned buildings degrades the whole of a neighborhood, the immediate actions towards the problem will provide a solution not only in terms of public safety but also in the purchase value of the neighboring properties.

The financial impact of the consolidation measures and aesthetic upgrading interventions is directly linked to utilization and upgrading at the neighborhood level, as an abandoned and dangerous building "blocks" an entire area e.g. a road is excluded due to a dangerous building in favor of public safety, a dilapidated building may house homeless or may be a source of infection or danger of fire etc. As a result, not only the value of the property but also of the entire building block falls (purchasing and touristic). Especially in dense urban centers such as Metaxourgeio, Theater Square, Exarchia and Acharnes, entire parts of the Municipality of Athens have been degraded.

In summary, the benefits to short term and long-term planning are obvious:
- Protection of public safety e.g. of pedestrians in case of partial or total collapse of the building

- Development of real economy at the local level by creating jobs in hundreds of settlements in Greece.
- Shielding our historic buildings against climate change and other natural disasters, allowing them to be maintained in a dignified and exploitable form.
- Upgrading of the urban environment in extremely sensitive areas of the country
- Increasement of the attractiveness of island, continental and urban areas of our-country while giving opportunities for tourism development.
- Contribution to the preservation of this significant architectural heritage and, consequently, the country's historical identity that will inspire other actions by helping sustainable, creative, cultural economic development.
- Reuse of buildings and upgrading of living conditions in buildings that do not provide comforts to their users.
- Energy saving.

The upgrade of the buildings of popular travel destinations will attract more visitors from both inside and outside the country, while creating new jobs in the domain of tourism. The buildings that will be restored can be reused as spaces of:

1. Short-term accommodation of conference tourism visitors (especially in island destinations and in historic city centers)
2. Housing of start-ups (start up and spin offs companies), innovation centers and STEAM (Science, Technology, Engineering, Arts and Mathematics) spaces
3. Creation of Co - working spaces of new companies
4. Housing of Creative Industries Companies that want to connect their brand name with a historic building and the memory it brings to the city.
5. Housing of agricultural cooperatives or small businesses producing traditional products (gastronomy), as well as companies engaged in physical and sports activities (hiking, trekking, bike rentals, canoe & kayak, etc.) in traditional settlements.
6. Housing for students and young researchers, moving with EU programs e.g. Erasmus etc.
7. Accommodation of entertainment and educational spaces (environmental, artistic, etc.).

The use of new technologies through this action will also mobilize economic activity in new technological sectors of knowledge-intensive products and services, creating employment opportunities for highly qualified human resources.

Regarding the framework of the objectives of the European Green Agreement, the Sustainable Development Goal of the UN (Sustainable Development Goal 11) and the implementation of the Paris Agreement, the proposed financial tool aims at the protection and upgrading of the housing environment, through immediate intervention in it, but also in the long-term shielding of traditional settlements and historical sites of our country, from the problems caused by climate change to the structured cultural heritage. This goal follows the National, European and Global Environmental Policy concerning climate change and monuments. Greece has taken the initiative at international level on this issue, setting up a multidisciplinary committee to monitor the effects of climate change on cultural heritage and proposing in cooperation with UNESCO, the UN, the World Climate Organization, Annual meeting of experts to monitor and record issues

that arise.

In addition, the "Preserve" program is a parallel action and to the "Renovation Wave" published in October of 2020 by the European Commission [13] and meets broadly the expectations of FIEC (European Federation of the Construction Industry). As the EU announced, it is a fact that three key policy areas, carbon dioxide emissions, the cyclical economy and digitalization that have often been dealt with separately by the EU in the past, they are now united under the umbrella of this important initiative. The goal of the "Renovation Wave" is to quickly accelerate the thorough renovation of old buildings, and increase their energy efficiency, while creating more than one hundred thousand "green" jobs in the construction sector. A truly ambitious goal that will strengthen the construction industry after hard months with the Covid crisis and improve the lives of citizens.

The program could contribute also to the new European co-creation Bauhaus Project [14] where architects, artists, students, engineers and designers will work together to make it a reality. The New European Bauhaus project is environmental, economic, and cultural and combines aesthetics and sustainability.

Finally, the Program "Preserve" is addressing to the promising "European Cultural Heritage Green Paper" [2]. This initiative is a key intervention for the necessary addition of historic buildings to the new and groundbreaking European strategy towards energy efficiency, and the resilience of structures to climate change and has as its main goal the more than doubling of the rate of renovations and static interventions in the building stock of the built environment. As the title solemnly reveals, the goal is for the common European architectural heritage to find a place in the "heart" of the European Green Agreement, "Putting Europe's shared heritage at the heart of the European Green Deal". This Green Paper, as it is now called, highlights the importance of restoring the architectural heritage to achieve the climate goal of reducing emissions, harnessing alternative energy sources, and enhancing the resilience of historic wealth to climate change.
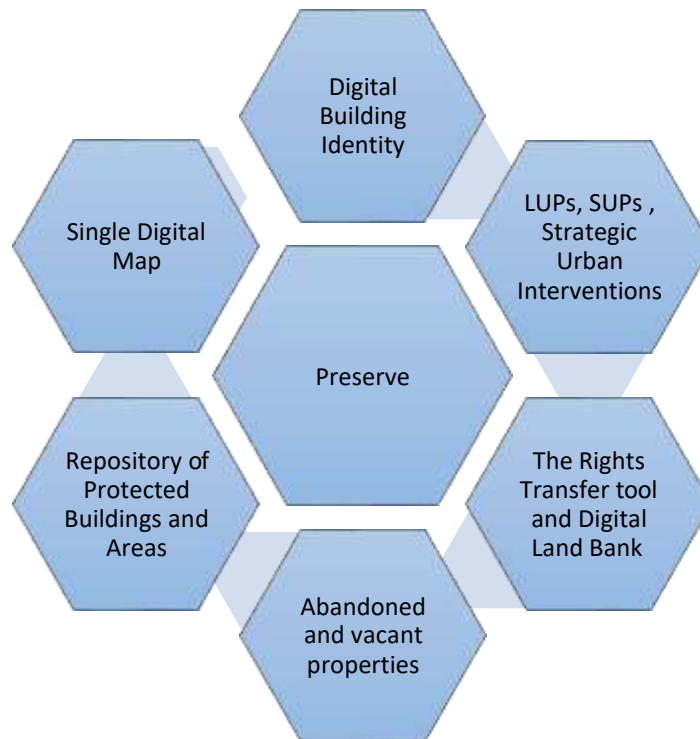
Figure 2. The holistic strategy of the Hellenic Ministry of Environment and Energy for the protection of tangible Cultural Heritage

2.4 Conclusions

Preserving the country's historic building stock is a key environmental choice, in line with the principles of sustainable development and the circular economy. By revitalizing these buildings, through funded restorations that combine the preservation of cultural values with new building restoration and energy upgrading techniques, we are unlocking enormous economic potential. At the same time, they are a key development resource, as they are associated with the attraction of cultural tourism.

The prolonged economic crisis that Greece has faced over the last decade in combination to the recent pandemic crisis resulted to a general decrease of investment and consumption. In this context the recovery, prosperity, and resilience of the Greek economy requires investments with added value in several fields.

The proposed program "Preserve" along with the other actions (Fig.2) for the preservation of cultural heritage responds to this challenge as it incorporates a wide range of investments upon the urban space which aim to:

- (a) to increase the resilience of urban areas to climate change phenomena (adaptation / mitigation),
- (b) to protect and to highlight urban landmarks of significant importance due to their historic or cultural character,
- (c) (d) to promote the energy upgrade of the building stock with emphasis

to the listed buildings.

In this framework, the combination of the selected interventions will have multilevel effects in terms of economic, environmental, functional and social revitalization of the urban space as they will result to: improvement of the quality of the urban space and the safety of the users, upgrade of the provided services, attraction of new functions and economic activities / companies that will promote the transformation of the local economies, connection of the natural and human-made environment, adaptation to climate change, upgrade of the existing building stock, etc.

Moreover, with these interventions, the market will be motivated to move towards investments that favor circular economy, holistic urban planning solutions will be presented, and smart technologies, data platforms and urban systems modeling will be promoted for better energy management of urban centers. In addition, many new jobs will be created at both local and national level to support development of applications, actions management, as well as the implementation of studies and projects.

For all these reasons, the proposed programs can be a crucial parameter to the acceleration of economic and sustainable growth and wellbeing, both in local and national level, as its implementation will contribute to the development of productive activities especially on the sectors of renewable energy sources, circular economy, construction of "green" materials, digital applications and products etc.

The result of all of the above is the gradual mitigation of the economic and social consequences of unexpected events (such as the recent pandemic or a natural disaster), especially in areas characterized by high housing densities, possibly low socio-economic background of residents etc. (ie degraded urban environment).

These actions will contribute to the green and digital transition of urban areas and increase their resilience (energy saving / upgrading of the urban environment in extremely sensitive areas of the country / upgrading living conditions in buildings to their users / protection of buildings in order to avoid their partial or total collapse / protection of public safety e.g. of pedestrians in case of partial or total collapse of the building / reuse of buildings). In addition, the enhancement of new technologies through these actions will mobilize economic activity in new technological sectors of knowledge-intensive products and services, creating employment opportunities for highly qualified human resources, thus helping to tackle youth unemployment.

Regarding the social utility of the program, it is noted that this is an overall effort from the bottom up, which requires the participation of the entire local ecosystem (Municipality, civil society, market, investors, academia, etc.) and support from all levels of Government.

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Heritage and Tourism

Heritage and Tourism
In the age of digital transition and pandemic

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Abstract. Digital transition together with all the related side effects plus the pandemic imposed a true stress test to tourism and cultural institutions. Extended lockdowns deeply impacted citizens' lifestyle, significantly reducing social life and cultural enjoyment. Following the fil-rouge of the evolution of tourism indifferent forms up to overtourism impacting both residents and heritage. The paper explores the key indicators of overtourism and related causes. From the advent of models based on the number of visitors and the carrying capacity of tourist locations, to the most recent assessments which also consider visitor behaviour, time dimensions and concentration phenomena of people in certain places. The term overtourism is an umbrella that covers a wide range of causes including urban planning, infrastructures, city managers, different stakeholders, citizens and of course tourists and daily visitors. This to do not forget undertourism and its origins.

Keywords: *Cultural Heritage, Cultural Tourism, Overtourism, Sustainable Tourism*

1. Setting the scene

Cultural heritage has always been an interdisciplinary sector, a wide range of applications involved from investigation to restoration, conservation, exploitation, education and communication each of them enjoying a different mix of expertise: art history, anthropology, social science, philosophy, science of materials, chemistry, art, structural engineering, etc., more recently, economy and marketing plus more and more high technology, from multispectral images to ICTs and bio-tech.

Such an articulated scenario with intrinsic richness of links and relations is potentially generating new skills and professional profiles, often as a result of a "crossover" of already existing professional profiles. As a follow-up of such a scenario both basic and applied research and educational strategies have to be duly tuned.

Our diverse and rich cultural heritage is one of Europe's greatest assets in the

emerging "global" society. Europe has over 5000 major museums and art galleries: They attract over 500 million visits every year, they are one of the most relevant income in tourism market and moreover represent, in some cases, a relevant component of local or national GDP. Nevertheless, Europe's Cultural Heritage is currently very poorly exploited, in terms of its accessibility to the public, schools/universities and the media/publishing industry.

Most museums and galleries are only open about 30 of the 168 hours each week and only about 20% of collections are on display. Up to now Cultural Heritage has rarely contributed effectively either to creating new jobs or in economic activity. Starting from recent trends and events including the contingency plans organised by cultural institutions this document will focus on the specific sector usually termed "cultural tourism" and the combined effect on it due to both digital transformation and recent pandemic.

2. Recent trends and events

As a follow up of the pervasive diffusion of online position aware mobile devices, both materialised as smart phones or tablets, digital communication became part of our daily life as well as such devices became part of our garderobe as our wallet or wristwatch. Through time this trend was synthesized in a buzzword "Digital Transformation (DX or DT)" the tight penetration of "digital" in every sector of our life from manufacturing to government, services, entertainment and more. Of course, independently from the weight that each oneof us assigns to "culture" DT impacted the cultural sector mainly through the Internet if we focus on fruition and communication. Albeit relevant contributions to research and preservation have been provided as well.

On the move to this new scenario another unexpected actor came on stage, the pandemic. This "extra"[73] surprised institutions and governments and suddenly the life of billions of people around the world has changed, extended lockdowns, the diffuse idea of sailing in some uncharted waters, led to the paralysis of major parts of the activities including the traditional ones in the field of culture: concerts, operas, museums, exhibits, travels, etc.

These aspects characterised the recent pandemic, long term lockdowns imposed to find the way to reconnect with researchers, passionate visitors and, why not, attract newcomers. Technological advances have provided ever-improving information processing and communication infrastructures. Cultural Institutions discovered the power of digital media especially on the occasion this unexpected event. Museums reacted to the lockdown creating virtual[74] guided tours[75], thematic on-line lectures[76], webinars and more.

Anyway, as a positive follow-up of the present crisis we can envisage different

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[73] Movimaker term - is a performer in a film who appears in a nonspeaking or nonsinging (silent) capacity, usually in the background

[74] https://rusmuseumvrm.ru/?lang=en

[75] http://www.museivaticani.va/content/museivaticani/it/collezioni/musei/tour-virtuali-elenco.html

[76] https://www.youtube.com/watch?v=U9UUIkr0l2U&feature=emb_imp_woyt

benefits: first of all, the acceleration of the switch to distant fruition of cultural heritage on the way to an improved resilience of the cultural ecosystem but even an empowered knowledge transmission and acquisition from the end of the crisis onward. "Resilience" another buzzword very popular in this period. All these technologies and services are not aimed to surrogate the direct fruition and enjoyment of cultural heritage but will improve its knowledge and understanding securing its access. To find a positive follow up of this combination of events, we can consider that now is the time to think about the future organization of cultural institution system bytaking advantage from the experience gained and adopting the best solutions to achieve a resilient infrastructure. What does it mean "resilience" in the specific field of culture, ensure continuity in visiting museums and cultural institutions even in case of disasters let's term it "cultural enjoyment continuity".

In addition, we consider these events a good opportunity to rethink about cultural organisations trying to expand and extend the audience to include young generations such as millennials and generation "Y". Before the outbreak of the coronavirus pandemic, the world was already dealing with a crisis in communication between cultural institutions and young generations, traditional methodologies were already outdated. A cultural and communication divide was already on stage between millennials (generation Y) and the educational and cultural system. A new model for communication processes is required. The global lockdown represented a unique opportunity to bridge a number of gaps and reshape our future, thinking out of the box, identifying what is useless, deleting biases due to customs, rethinking processes and protocols. Cultural system can take this opportunity to develop a new approach to improve its resilience and "generate deep knowledge" and critical thinking in millennials.

The following part of this document will focus on a specific sector laying under the heritage umbrella: heritage and tourism extending what it was termed time ago "cultural tourism".

3.   Tourism: appearance and evolution

To better deal with Cultural Tourism, we will start taking into consideration tourism [Ronchi A. M., (2019 H)] and the main stages characterizing its evolution starting from the era of aristocratic tourism, "grand tourers" and then moving on to mass tourism and finally reaching cultural tourism and sustainable tourism, the latter often associated with the concept of "positive experience". This to better understand evolution of tourism and tourists including the newcomers. Before the twentieth century, tourism was reserved for a category ofprivileged travellers. Tourism was in all respects a luxury asset. The eighteenth century marks the beginning of tourism, the beginning of the industrial revolution in England corresponds to an evolution of Western society, this habit extended in the nineteenth century. The development of transport induced by the industrial society provided tourism with better means and a more abundant clientele: the bourgeoisie, anxious to see and to show itself. The large hotel thus becomes a very lucrative investment, which stimulated the entrepreneurship of characters who have become famous, like the Swiss César Ritz. Another great classic of tourism sees the light

in 1900: the first edition of the Michelin guide. In 1910 the Office National de Tourisme was created in France, in 1913 the law on the protection of historical monuments was promulgated. The beginnings of modern tourism can be found around the Thirties.

"I believe tourists are very useful to the modern world: it is very difficult to hate the people one knows"
(J. Steinbeck, Shaping the Culture of Peace in a Multilateral World 2005 page 66).

By the end of the 1950s, however, with the spread of the automobile and the expansion of the motorway network throughout the countries internal tourism became increasingly common, developing the accommodation system of hotels, villages, campsites, holiday homes and the like.

4.   "Mass tourism"

The process of diffusion or "democratization" of tourism originated at the beginning of the twentieth century, the growth of population wealth and the consequent increase in consumption were the basic signals of the birth of mass tourism [Ronchi A. M., (2019 H)]. After the second world war, tourism has considerably developed. But it was a mass tourism, first of all the "bathing tourism" that invaded the planet. People essentially seek rest, peace and the sun.

Later on, in the 1960s this tourism was defined, in English, the 4S (sand, sea, sun, sex). The typical approach of city managers was mainly oriented to increase the number of tourists visiting the area; no specific focus was posed on excursionists (daily tourists) and resident tourists as well as on the typology of tourists involved. Few locations carefully planned which "typology" of tourists to attract thanks to: facilities, accommodation and attractions or sport opportunities. Some authors consider this trend as the birth of "overtourism". Over several decades this mass tourism has consumed without discernment, without respecting the bathing areas, the urban and heritage areas and even the mountain areas both in winter and summer time.

In the second half of the 20th century the intellectual level of the populations has increased thanks to the increase of the level of education and knowledge, the strengthening of communications, faster and cheaper transport, computer technology, namely the Internet. Tourism changed again the focus aiming to provide unforgettable experiences to travellers, the overall score assigned to a travel was, since that time, represented by the quality of the experience that it provides to tourists.

More recently under the "tourism umbrella" many other branches arose like spa, operas/concerts, surgery, dentistry, specific communities' meetings and tours, but even criminal and more.

As recently underlined, if a factor of 50 in communication speed has led to the incredible development enjoyed in the transition from horse to jet, perhaps we cannot even imagine what will bring us a speed increase equal to that offered by new forms of communication.

5.   **Tourism meets Globalisation**

Globalisation is one of the key terms used to describe actual trends, but there are many aspects of this concept that should be carefully considered, such as the impact on cultural identity [Ronchi A.M. (2017 UG)]. There is a need to preserve and transfer to future generations people's cultural identity many times jeopardised and blurred by dominant cultural models and languages; local cultural behaviors, lifestyle, food, artistic expression and more tend to disappear under the pressure of global trends. Uniformity is the nightmare concerning our future, one currency, one language, one "culture", one food, one taste, … Cultural diversity as biodiversity means richness, it is an asset that needs to be preserved, and to do so cultural models must be considered. Cultural diversity is the engine of cultural and economic growth; it provides incredible richness as well as traditions.

The internet, apart from different potential benefits, gave an incredible boost to globalisation trend, platforms and regulations-vacancy opened the way to new monopolies deeply influencing society. In such ascenario Cultural Institutions [Ronchi A.M. (2017 RF)] can play a relevant role in reconnecting globalised people with their own cultural roots. In the age of "googling" information and consuming them without any further critical evaluation and elaboration, a kind of surface "culture" made by islands and archipelagos of information quite different from knowledge and "Culture", Cultural Institutions through their active role in communities can elicit a positive behavior.

The explosion of tourism world-wide, a kind of "global" tourism, was boosted by the increasing number of low-cost airlines and the opening of new markets in the actual millennium, due to the opportunity and increasing interest to travel abroad that animated people living in big countries that before were "closed" within their borders or even metropolitan areas. This phenomenon increased both internal and international tourism, their airports once populated by foreign travellers are now crowded by locals. Consumers have greatly appreciated the offers by "low cost" companies and have favoured short distance journeys. These companies will continue to develop, despite COVID-19, even if, the general economic conditions will improve, because the public has easily adapted to the new standards of service[77] appreciating the savings achievable. This new scenario can benefit both cultural tourism in general and specifically museums thanks to the opportunity to spend a week end abroad visiting museums or even flying abroad day travel to enjoy a specific temporary exhibit. In fact, travellers have become increasingly accustomed to the low prices charged by these airlines. At the same time, they appreciated the convenience of small airports to get later by bus to the main locations, e.g., Cultural Capitols. This custom to use cheaper airports located sometimes in a different country close to the main destination offered the opportunity to revitalise some heritage assets located outside the big of well-known locations on the way to get from or to the small airport.

Despite the opportunity to easily reach a far bigger number of destinations, some areas and location/museums are still suffering the overcrowding problem that, if on one side can jeopardise heritage, on the other side generates a citizen's negative feeling.

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[77] We can term it "all exclude", so tourists will pay for what they really need.

Different approaches have been applied to minimize these aspects: to limit the number of visitors, apply an entrance ticket, differentiate transportation tickets' costs[78], differentiate the offer adding some alternative appealing locations, to offer virtual visits or create clones to setup temporary exhibits travelling around the world.

The pandemic has gradually reduced and finally stopped the flow of tourists, diverting interests towards online content and services. The lockdowns acted as a compression on a spring that returns to its initial state as soon as it is released, tourists quickly resume planning visits and trips. A slow onset change is represented by the general aging of the population, mainly in Europe and in the United States, but not limited to, this will soon lead to the development of types of travel, such as cruises or cultural holidays, to the detriment of traditional holidays. We add to this that the development of e-Commerce offers consumers greater flexibility and allows them to organize their trips in their own way; holidays are "sewed" increasingly tailored. The "adventure" holidays will have to be more developed, as they are appreciated by both young consumers and the elderly. A certain part of the population increasingly avoids organized holidays, for these consumers the holidays represent the freedom, the lack of schedules, the absence of commitments and constraints, an "experience". It is foreseeable that short-term holiday offers will develop, stays will become shorter and more frequent.

6.   Tourism and cultural heritage

As we introduced before, the evolution of tourism through the centuries met "Cultural tourism" as one of the trends, some years ago this approach was many times merged with the idea to spend vacations in historical towns, arts cities, enjoying monuments, museums, art galleries and sometimes adding operas, concerts and, why not, food and drinks if typical in that area. Of course, this option is still valid but, in the meantime, many relevant things happened and on one side the taste or, if preferred, the expectations of citizens changed, on the other side, due both to changes in socio-political conditions and the continuous need to invent new appealing offers.

The overall structure of the tourist sector has been revolutionised since the web technology become popular, some of the new trends were:

- Direct selling of travels and accommodations
- New mediators such as tourism internet portals
- Easy access to the distribution channels once utilised by tour operators
- Customers' expectations satisfaction thanks to constant interaction online
- Constant updating and customisation of the touristic services
- Improved transparency in costs and terms
- Introduction of added value services such as the opportunity to publish a feedback concerning any part of the experience.

Tourists nowadays are constantly dealing with web sites and apps, platforms and navigation systems are stimulating them thanks to push messages promoting "nearby"

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[78] E.g. Venice – Canal Grande cruises are more expensive than the Giudecca's ones.

points of interest so cultural institutions, hotels, restaurants, relevant sites must be included in the lists of navigation systems as a first approach to new tourists' trend. Managers must create new "experiences" enriching the life of tourists.

Often the cultural heritage is perceived by most as something obsolete, cryptic, with no appeal to the audience, unable to provide real added value to citizens and ultimately a pure "cost" in terms of conservation, maintenance, custody, etc. On the contrary cultural heritage represents one of the key attractors for tourists, the promotion of heritage addresses two issues: cultural enrichment and economic sustainability of the sites. The exploitation of such values will not, necessarily, jeopardise our heritage; cultural assets are not rivalling, and a wise exploitation will not "consume" them. "Wise" means not damaging the artefacts or sites, as a consequence a limited number of visitors may be admitted at a specific time, online booking of visits managed by optimisation algorithms will harmonise the flow of visitors. The "standardisation" of visitors' numbers and timing are often based on a briefing that introduces the cultural asset and outlines its most relevant features. Other approaches aiming to reduce the "pressure" of visitors are based on the promotion of alternative locations offering similar an appeal.

The upgrade of tourism consumption is the driving force behind the globalization of tourist towns. With the increase of economic income, the development of information exchange and the change and upgrade of national concepts, the personalized experience needs of tourists have been fully released. The in-depth experience of consumers from sightseeing to vacation and leisure, and the continuous improvement of consumption levels are conducive to optimizing the transformation and reform of the supply structure.

The consumer's travel concept is not limited to simple sightseeing tours. According to global tourism experience, characteristic towns and tourist towns are the targets of tourists' choice. The increase in tourism demand leads to an increase in the supply of tourism and related industries, which will change the production structure of tourist towns and promote the sustainable development of tourist towns. The boundaries of the tourism industry are gradually blurring and shrinking, and the tourism industry continues to merge. In tourist towns, the superposition of cultural experience, entertainment, service provision, holiday lifestyle and other tourist functions is a necessary supplement to traditional tourist products and has become the focus of market development through cultural transition. For towns with insufficient tourist resources, the tourist market is restricted; in such a case to expand the tourism resource market is a must, both from the perspective of leisure and vacation, this could be achieved through innovation and improvement of tourism product functions. Some middle-ages towns rediscover ancient tournament with horses and knights, other locations offer cultural festivals and happenings. We will come back on these aspects in the "undertourism" paragraph.

From point to line - "point of interest"-based development hinders the development of tourism activities, management and industry. The income of simple tickets is no longer the core of the tourism economy, and the planning of exquisite tourism routes, such as the hiking trails of the Cinque Terre, and the choice of different boat tour in Sankt Petersburg. It breaks the space restriction between the scenic spots and connects the dots into a line to give tourists the best experience. The development of tourism and the continuation of cultural heritage are closely related to two types of people (tourists

and local residents). The first category is tourists. Whether it is their contribution to the local economy or exposure to cultural heritage, tourists play a vital role in the tourism industry. The economy of the town will eventually provide a better life for local residents, and the world heritage will be left to future generations. Cultural heritage is generated and evolved based on the architecture, living environment and production methods of local residents and their ancestors. Therefore, another important significance of developing tourism is to protect the interests of local residents, the second category, who are in fact part of the cultural heritage. Only by enabling local residents to live better on this land can they better protect and continue cultural heritage. This aspect will be explored in the following paragraph devoted to "overtourism" and its impact on citizens.

Tourism generally refers to industries that provide tourists with leisure facilities and services. It is a complexsocial phenomenon, involving politics, economy, culture, history, geography, law and other social fields. Tourism is also a kind of leisure and entertainment activity, which has the characteristics of remoteness andtemporality. According to the latest annual research report of World Travel & Tourism Council[79], the travel and tourism industry grew by 3.5% in 2019, surpassing the global economic growth of 2.5% for nine consecutive years. In the past five years, the tourism industry has created a quarter of new jobs, making tourism the government's best partner for job creation, these are good news considering the usual cultural heritage performance in job creation rate.

With the further democratization of travel, this brings great potential to the sector and the global economy. Emerging economies contribute a greater proportion of travellers to this global trend and are increasingly becoming ideal destinations because they show greater competitiveness in travel and tourist.

According to statistics from the World Bank[80], the number of international tourist arrivals increased from less than 500 million in 1996 to 1.44 billion in 2018. In the past two decades, Europe and North America have continued their reputation as popular tourist destinations. The emerging international tourism market represented by the Middle East and East Asia is developing rapidly.

7.   International Tourism Flows

In order to have a clearer idea of the importance of valorisation of cultural heritage to enhance tourism and other cultural and economic activities, we will analyse briefly the tourism flows in the last few years taking data manly from UNWTO[81] (United Nations World Tourism Organisation) research-inbound tourism dashboard. Due to evident reasons, we will not include 2020 and 2021 as significant data, they will be considered while evaluating the impacts created by the pandemic, relevant to plan a mitigation strategy in case of further similar events both due to natural and human disasters.

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[79] [WTTC 2020] Economic Impact Reports . https://wttc.org/Research/Economic-Impact
[80] [World Bank 2019] International tourism, number of arrivals. https://data.worldbank.org/indicator/ST.INT.ARVL
[81] https://www.unwto.org

The tourism industry is a fast-growing sector across many parts of the globe. Today, this industry needs to be reconciled with new challenges such as the increased customer expectations, intensified global competition, and tourism demand fluctuations [Bulencea & Egger (2015)]. In this sense, having competitive advantages such as the provision of memorable experiences for tourists is considered an essential key by academics and practitioners alike [Bulencea & Egger (2015)]. Each and every year, thanks to the emergence of new facilities ranging from accommodation and transportation to new means of entertainment and attraction in destinations, many visitors tend to embark on new touristic experiences. This flow of tourism can bring about positive and negative consequences, which opens a whole new world for research. In order to delve into these consequences, it seems necessary to go through the concept of sustainability as we will see later.

Considering for a while the larger picture and having a look on touristic flow all over the world, we can note that, considering the last year for which "normal"-reliable data are available, Europe accounted for more than 50% of the total flow of Tourism at global level, Asia and Pacific for 25%, Americas for 15%, Middle East for 5% and Africa for 4%. The distribution of receipts divided by country has a similar share, but it is interesting to note that, generally, travelling into Asia and Pacific and in Americas result to be more costly than in Europe, also due to costs of means of transport.

Europe indeed results to be the most desired country to be visited but also the continent which contributes the most to touristic international flows all over the world as shown in the charts below [source UNWTO research-inbound tourism dashboard].
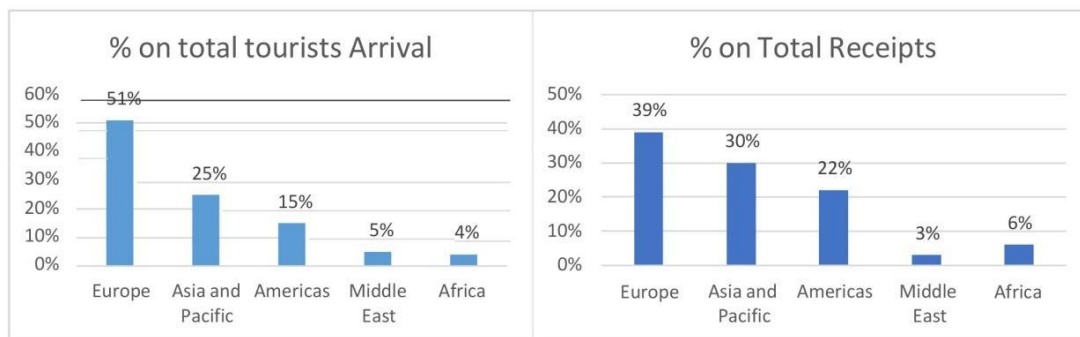
In the following charts instead is reported a snapshot of the international tourism trend:
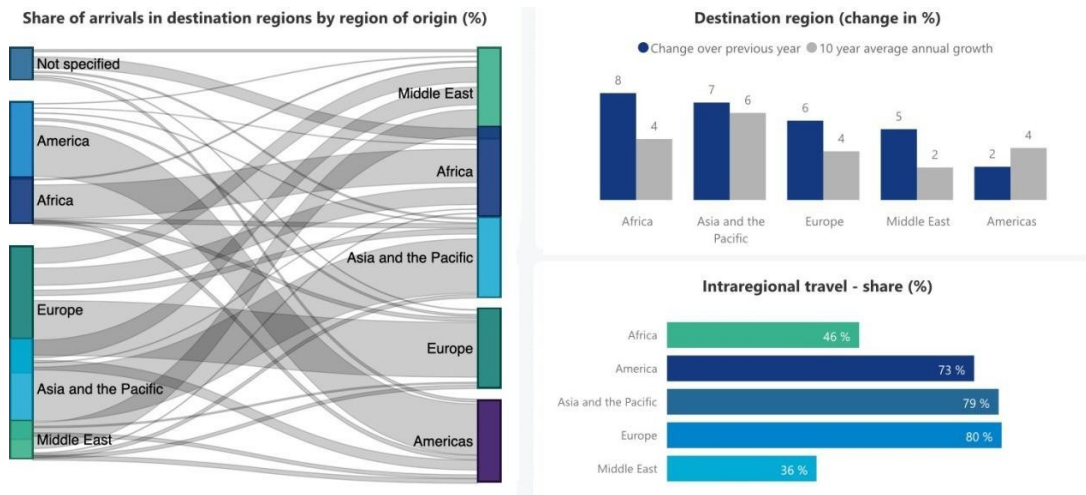
In particular, it can be interesting to highlight that in Americas, Asia & Pacific and Europe the major tourism flows are Intraregional travels, accounting for 80% in Europe and the remaining 20% is split in:

7% from Americas

7% from Asia and Pacific

4% from not specified countries 1% from Africa

1% from Middle East.

This element can be explained by several factors as, for example:

- duration of the travel and the availability of times to be spent for vacation since going in a country in the other part of the world requires much more time also due to jet lag disorders
- budget available as for making a trip in a country near the one of origin requires a lower expenditure compared to very far locations
- cultural proximity
- better knowledge of places closer to the region of origin
- higher frequency of intraregional exchanges due to working experiences and business travels
- other reasons.

If we refer to the period of the pandemic, we can observe that immediately before the early lockdown as well as after, citizens were looking for short distance accommodations with the option to stay there longer in case of lockdowns, during the "opening" periods, vacations were planned, in general, inside the country and many times within the same region, this to minimize both risks and bureaucratic procedures.

8.   Reasons of Travels

Looking to the reason of travels, according to UNWTO, for travellers coming in Europe, the most relevant reasons is leisure, recreation and holidays, follows personal reasons (as health or religion) and finally business and professional purposes. Among these different reasons, the one that is showing the higher growing trend is the one related to leisure and recreational purpose which currently accounts for 59% of the total travels organized in Europe. Follows personal reasons as health, religion and other for which it has been registers an annual average growth rate of 4% from 2008 but which still cannot be compared with the predominance of leisure trips. Finally, Europe confirms to be an important destination also for business reasons (especially for intraregional exchanges) since this aspect covers about the 15% of the tourism industry in the region.

To briefly comment also other countries situation, it can be noted that the general distribution is quite uniform since the predominant purpose of travel remain, in any case, leisure, recreation and holidays. A quite peculiar situation can be registered in Middle East where, thanks to the concentration of religious places of particular relevance for religions spread all over the world, travels for personal causes equal in dimension the one for recreation.

Other two small misalignments can be noted in Africa and Americas: in the first indeed the % of travels for business purposes results to be much higher than in any other country and then the worldwide average, while, for the latter, it is difficult to add further comment since a high portion of trips (18% vs 5% on average) are registered without specified motivations.

9. "Overtourism". Loving places to death

Although tourism and tourists have been the subject of complaints for decades, if not centuries, specific term "overtourism" is relatively recent [Ronchi A. M., (2020 H)]. According to Google, the word "overtourism" was first used as a search term in 2006. This relatively new term, also sometimes called "loving places to death","dealing with success" and "tourismphobia"[82], has been defined as "the excessive growth of visitors leading to overcrowding in areas where residents suffer the consequences of temporary and seasonal tourism peaks, which have enforced permanent changes in their lifestyles, access to amenities and general well-being[83]" Overtourism as a term has proven very marketable and was trademarked by online travel magazine *Skift*[84] in 2018 "Overtourism: Will the World be able to Handle Two Billion Tourists?". This phenomenon is usually strictly connected with the terms "mass tourism" and "globalisation". More recently even the term "resilience" has been associated with this phenomenon. The concept of resilience, in this domain, outlines the ability of locations to absorb shocks and troubles and recover autonomously as well as the ability to adapt to changing circumstances[85]. According to Goodwin[86], destinations experience overtourism when "hosts or guests, local or visitors, feel that there are too many visitors and that the quality of life in the area, or the quality of the experience has deteriorated unacceptably". Researchers created additional terms to identify this phenomenon, namely "carrying capacity", "resilience in environmental, economic and socio-cultural terms", as well as health and safety issues. Anyway, the preferred term among tourism scholarship is "overtourism", due to the relevance of the prefix "over" that directly recalls that there is too much tourism;tourism exceeds the ability, limits or capacity of the specific destination. The effects of "overtourism" are overuse of local resources such as shops, mobility, local goods, like for instance bakeries, restaurants, roads, parking and trams or beaches, environmental oasis, mushroom picking and any other local resource

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[82] Dianne Dredge (2017), "Overtourism". Old wine in new bottles?, URL: https://www.linkedin.com/pulse/overtourism-old-wine-new-bottles-dianne- dredge/ (accessed: 20.12.2019); Harold Goodwin (2017), "The Challenge of Overtourism", Responsible Tourism Partnership Working Paper 4, October 2017; Majorca Daily Bulletin reporter, Tourism minister plays down "tourismphobia" anxieties, URL: https://www.majorcadailybulletin.com/news/local/2017/03/ 09/47196/tourism-minister-plays-down-%20tourismphobia-anxieties.html (accessed: 05.07.2021).

[83] URL:https://www.majorcadailybulletin.com/news/local/2017/03/09/47196/tourism-minister-plays-down-tourismphobia-anxieties.html (accessed: 05.07.2021).

[84] The document created by Rafat and colleagues is entitiled Overtourism: Will The World Be Able to Handle Two Billion Tourists? https://docs.google.com/document/d/1OMyiOzBMxZju-SHNzfnBW8crPPIhAUkzlTkRrl3bwGI/edit?ts= 57620 cb9

[85] Richard Butler (2018), "Sustainable Tourism in Sensitive Environments: A Wolf in Sheep's Clothing?", Sustainability 2018, 10, 1789; doi:10.3390/su10061789, www.mdpi.com/journal/sustainability (accessed: 05.07.2021); Josef Cheer and Alan A. Lew (2017), Understanding tourismresilience: Adapting to social, political, and economic change, ISBN: 9781138206786, Routledge, London.

[86] Harold Goodwin (2017), "The Challenge of Overtourism", Responsible Tourism Partnership Working Paper 4, October 2017.

subjectto competition between locals and visitors. This means that different touristic locations – cities, natural parks, mountains, lakes and seaside, deserts – feel the impact of tourists.

The diffusion of the Internet boosted the DIY (do it yourself) tourism once limited to the "Lonely planet" addicted travellers. In addition, sea and river cruise tourism is seen as a potential problem in cities like Venice, Barcelona, Cannes, Genova, Amsterdam, Copenhagen, Lisbon, Salzburg and Tallinn. Ships are becoming bigger and bigger, MsC and Royal Caribbean cruise line ships have a typical capacity of nearly 5,000 passengers. This increase in size of cruise ships caused negative side effects on harbours and maritime infrastructures and, last but not least, accidents. As cruise ships get larger, more people can flow into a destination at one time causing negative effects on local population. In this specific case there are not so many economic benefits for locals due to the fact that passengers are accommodated and have meals on the ship. The extremization of such an effect is usually termed bio-piracy when tourists use and consume local resources without compensation. Findings like this confirm criticism on using carrying capacity as an "objective" means for measuring tourism impacts. The same happens in case of travel agencies, navigation companies and airlines; as other stakeholders they do not care too much about the carrying capacity and impact on the environment and local community, the focus is on yield.

Tourism is considered by many stakeholders, including governments, a relevant source of incomes; countries having reduced opportunities to rely on industrial production or trade, if possible, they focus on tourism as one of or the key income generator. When tourism is the main source of incomes natural or human disasters can represent a real nightmare, simply consider the recent case of Sri Lanka[87]. When profit is the key objective of the strategic agenda very often there are no specific plans concerning job creation, increasing quality of life, poverty alleviation and community well-being. As a consequence of profit-oriented tourism plans the objective is almost always focused on increasing, as much as possible, the number of tourists instead to further develop third parts related business. Considering the growth of tourists in the recent period, in 2018[88], last figures provided by WTO the international tourists arrivals were 1,407,1 million and the corresponding tourist revenues of 1,458,4 billion USD. The UNWTO forecast for 2020 and 2030 is globally up to 1,40 billion in 2020 and 1,80 billion in 2030[89].

Another relevant aspect concerning the increasing number of tourists[90] is due to the easing of visa restrictions for many travellers and the better economic situation of some countries. As a consequence, new tourists' segments are emerging. For instance, before the Olympics Chinese airports were populated mainly by foreigners and few locals,

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[87] June 2021 - The Singapore-registered X-Press Pearl had been on fire for almost two weeks before the blaze was put out, hundreds of tonnes of oilfrom fuel tanks could leak into the sea, devastating nearby marine life.
[88] Source UNWTO 2017.
[89] Overtourism? Understanding and Managing Urban Tourism Growth beyond Perceptions, UNWTO: Madrid, Spain, 2018.
[90] As already stated we do not consider the 2020 -2021 years, they effects of the pandemic are considered separately.

after this event the situation is reversed: airports are crowded by Chinese travellers and to a lesser extent, Indians. Dealing both with China and India the key aspect is related to numbers and percentages, in 2018 only 4% of the Chinese population had passports, the 2025 forecast considers a growth up to 12% that means 220 million potential Chinese travellers and according to the China Outbound Tourism Research Institute (CO-TRI[91]) the number of Chinese travellers in 2030 will reach 400 million people.

10.   Is overtourism due to tourism?

Referring to the typical effects of overtourism [Ronchi A. M., (2020 H)] is it correct considering overtourism only as a tourist problem, rather than a social and urban one[92]? Numbers without the contexts and effects are meaningless, the focus must be shifted from numbers to the perception of benefits and drawbacks. Both benefits and drawbacks are tightly connected with the responsibilities of political managers, stakeholders and tourists themselves. So, we prefer to speak of visitor pressure or overcrowding typical of the spring months, while in the summer peak the cities empty themselves of the residents. Getting more in detail, looking at stats and data collected by local authorities we discover that "visitor pressure" or overcrowding is not only due to foreign tourists but even to locals and neighbours exceeding the resilience of the location. This phenomenon is favoured by the extension of the tourist season, more flexible work arrangements, the dilution of holidays in shorter and more repeated periods during the whole year, so it makes the inhabitants of some cities perceive the phenomenon throughout the year. Key aspects characterising "pressure" are concentration, timing, visitor behaviour, location, experience with tourism, local etiquette and more. These aspects are indeed as important as tourist numbers. Analysing the "pressure" in detail, on the one side, it is relatively easy and reliable to foresee the impact of tourists on the physical environment, while it is much more difficult and less reliable to estimate the impact on the social side, due to different perception of disturbance in different areas and different level of tolerance of the host community. Some case study outlines that the top-down promotion of a touristic point of interest may impact the level of tolerance of the local population, they may suffer because of the "invasion" of their territories and impact on their lifestyle due to others will. To ensure success it is paramount to reach the local community consensus. This discourse overlaps with overtourism in that it both describes an exclusion of residents and other local stakeholders and the "touristification" and "museumfication" of popular tourist areas[93]; this phenomenon is particularly evident in Malastrana (Prague) and Venice. Online platforms such as Airbnb, Amazon or Uber, low-cost carriers or cruises, Instagram and other social media complete the

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[91] China Outbound Tourism Research Institute/ URL: https://china-outbound.com (accessed:17.12.2019).

[92] Ko Koens, Albert Postma, Bernadett Papp, "Is Overtourism Overused? Understanding the Impact of Tourism in a City Context", Sustainability 2018, 10, 4384; doi:10.3390/su10124384 www.mdpi.com/journal/sustainability

[93] Maria Gravari-Barbas and Sandra Guinand (2017), Tourism and Gentrification in Contemporary Metropolises: International Perspectives, ISBN: 9781138642782, Routledge London,

accused bench, but how guilty are they really? Factors that cannot be considered at the same time as something to be hindered in the name of corporate interests or anachronistic ideological battles. Displacement due to Airbnb and similar platforms and excessive pressure on the local environment are separate causes of concern. Airbnb looks like an appealing source of revenues; real estate owners increasingly prefer to rent their properties for a short period of time through Airbnb than to rent it to locals. This trend induced two main effects: a quick increase of real estate value and displacement of locals outside the "hot" areas. If residents are forced to move out of the city due to tourism improvement, this puts further pressure on the city infrastructure: "People are leaving the city [because] rental prices are way too high. There are many people moving to the surroundings and then commute by car every day. It is a circle that never ends"[94]. Actually, some local administrations are working on new regulations to manage this problem (e.g., Berlin, Paris) setting limitation on the number of days a property can be rented out, the fact that a house- owner needs to live in the rented place, taxation, registration systems, etc. If we focus on the "pressure" or overcrowding looking at the stats it appears that day visitors, coming both from neighbouring cities and from abroad, constitute up to 50% of the people that visit the city for leisure purposes, they blend in relatively well and are often not viewed as tourists by residents, they also cause overcrowding and bothers. Drawbacks on local societies are often associated with global platforms as it happens with Uber, Amazon, Expedia, etc. The relevant increase of online shopping further impacts the perceived crowdedness, as an increasing number of different delivery vehicles blocks roads and causes congestion and pollution. Time ago, governments and key stakeholders preferred not to regulate tourism opting to open market a kind of self-regulation. This choice powered a rush to big numbers. In dealing with overtourism issues, recent research emphasises the need for regulation and government leadership. Before pointing a finger at certain alleged culprits, administrators of cities should think about toilets, waste disposal, electric vehicles, parking lots and green areas, as well as optimise control and surveillance activities.

11. "Touristification" and carrying capacity

The complexity of overtourism reveals itself again when looking at the effects of policy measures. It is revealed that these have been, at times, different from what was expected. Thus, to plan for sustainability in a tourism context is to plan to operate within the carrying capacity limits of the destination and its resilience capabilities and avoid a state of overtourism. Posing the focus on the concept of sustainability, the links between the level of tourism and the quality of social and environmental factors in a destination are evident with the logical conclusion that tourism levels should not exceed a point at which immitigable impacts occur and where tourism becomes "unsustainable". The "touristification" of city centres and online accommodation platforms also needs further clarification, tourism has strongly impacted city centres and suburban neighbourhoods, but this impact can at least partially be attributed to real-estate developments. This

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[94] Ibid.

implies the responsibility of "managers" because of the direct impact on the carrying capacity and the resilience to overtourism due to tourism management. It is evident that there are different causes that merged together to create the "overtourism" effect so the solution could not be based on tourism alone. There is a need for a global approach to the problem putting around the table all the stakeholders and authorities involved in the process; single initiatives, such as admission fees, expensive tickets for parking and local transportation, do not solve the problem. In recent times there is an increasing number of decision makers and stakeholders that, driven by the anti-tourism sentiment, curbs the growth of measures to regulate traffic, creating coach free zones, or to regulate tourist behaviour, for instance, in tourism hotspotsat night, taxes for daily visitors, cruise ships restrictions and more. Nevertheless, as it usually happens, policy measures and regulations play often the role of followers and have up to now had difficulty keeping pace with the rapid development seen within this sector.

12.   The opposite side of the coin

While there is still a lot of confusion about overtourism, a new keyword is on stage: undertourism. This is on the other extreme side of the tourism sustainability spectrum, which is yet to be thoroughly studied, and there is a lack of references among the literature to this concept. This term is used in English but has not yet been verified by any dictionary [Mihali T. (2019)].

This term represents the places still little visited or not performing enough in relation with their beauties. Many times, this is due to the lack of a proper "value analysis[95]" [Ronchi A. (2014)] outlining all the potential "values" associated to the asset and the existent gap between each value and actual situation [Montella M. (2015)]. One of the typical aspects concurring in generating undertourism is lack of infrastructures: hospitality, transportation, entertainment, and more. The risk is that the less visited destinations face too many illusions about being able to overturn their tourist fortunes with marketing campaigns and messages such as "come to us, there are fewer people, but the experience is more authentic, etc". The already famous ones boast about the fact that without promotion flows can calm down. Fertile ground and excellent starting points for conferences and academic articles, they are always happy to insist on concepts such as relocation and experiential tourism, but risk diverting attention once again from the real problems of hospitality and tourism. The problems that actually limit the growth of the less visited places are the infrastructural ones, which, together with an often ineffective, if not non- existent, marketing, are the main factors of what we can define as the structural and ancestral sub-tourism.

The World Economic Forum WEF[96] based on an analysis of 136 countries draws up a ranking of the results achieved by the various countries analysed. In detail, human

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[95] This methodology analizes the different families of values: cultural, social, economic, communication, etc.

[96] "World Economic Forum": an independent international organization "committed to improving the state of the world by engaging business, political, academic, and other leaders of society to shape global, regional, and industry agendas".

capital appears to be one of the most deficientaspects in addition to the supply-demand conditions for assignments in the tourism sector. This variable is particularly strategic and probably one of the most alarming data in this field is the one that reveals the lower percentage of qualified personnel employed in the tourism sector compared to the other main European attractions: the share of graduating workers operating is, in fact, among the lowest in Europe.

Furthermore, as partially anticipated, the WEF survey highlights a serious and persistent lack for some countries in the effectiveness and ability of marketing policies to affect the country's attractiveness for foreign tourists. This aspect, which continues to worsen, represents one of the weakest aspects of some national tourism system which, once again, weighs upon problems such as the coexistence of various competences of different levels of government and the limited long-term strategic vision that have characterized the policies in some countries in the last two decades.

A final element that contributes to the mismanagement of a huge wealth owned by some countries is the inability to collect a sufficient number of data, the timeliness in carrying out this activity and the ability to extract strategies from them.

Probably the most important aspect highlighted by the institution is the need to adopt an integrated approach to tourism policy management which is expressed in the importance of a "whole of government approach" [Ronchi A.M. (2019 D)] characterized by:

- Vertical integration between the different levels of central and local government,
- Horizontal integration between the different levels of government e.g., between ministries oftourism, transport, economy, etc. ...

The OECD[97] [OECD (2020)] also recommends effective and continuous involvement of all stakeholders potentially included in the tourism industry processes such as involved economic operators, residents in theareas visited and tourists. OECD affirms that tourism is an economically important sector, globally and locally it represents the 4.4% of the GDP, the 6.9% of employment and 21,5% of service exports. Domestic tourismis the backbone of the sector in the majority of OECD countries, 75% internal tourism and 25% international tourism. If we consider the global arrivals and travel spending OECD countries receive more than 50%: 56,9% of global arrivals and 61,1% of the global travel spending. Each single dollar spent by international tourists generates 89 cents of value added in the domestic economy[98].

One element on which OECD and UNWTO are completely in agreement is the development of a "sustainable tourism" which is a tourism system that reconciles the demands of economic agents, residents and tourists, taking into account present and future economic, social and environmental impacts. All this is possible, according to the aforementioned entities, through the identification of financial instruments (public, private or "mixed") for the realization of "green investments" aimed at improving the management of resources, promoting the care of the territory, biodiversity and the cultural heritage of each country.

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[97] https://www.oecd.org/cfe/tourism/oecd-tourism-trends-and-policies-20767773.htm
[98] Source OECD Tourism Trends and Policies 2020

Another strategic priority identified by the OECD is the promotion of an integrated and intermodal transport system: "seamless transport system" that allows travellers - especially international ones - to reach the desired destinations and to easily reach the destination country by reducing the time and costs of displacements. Furthermore, an integrated and widespread transport system capable of ensuring full accessibility even to lesser-known places, would allow to limit the negative externalities generated by over- tourism and would limit the environmental impact generated by poorly coordinated systems.

All this would guarantee greater sustainability of tourist activities as well as better management and distribution of flows.

The last element of attention of the OECD on which we intend to finally focus, is the need to promote heritage and territories less known to the general public and to fully exploit their natural, cultural and human resources, so reducing undertourism problems. In this perspective, in fact, the OECD considers the care as well as the promotion of the whole national territory and of all the goods - of any kind - that a country is able to offer to tourists and residents to be of fundamental importance. It would be utopistic to think of being able to completely redistribute the tourist flows by making known territories less infrastructurally connected but still rich in places of interest at the expense of well-known locations or large cities of art, but the objective it is not exactly this as we will see later in this paragraph.

When talking about undertourism, we are coping with the generation of income and economic viability. Nevertheless, it is worth mentioning that income generation cannot directly improve sustainability, but higher income can provide the destinations with more resources to invest in sustainability (McKercher and Ho, 2006). Having fewer visitors in a given destination, taking unchanged other conditions, brings fewer negative impacts on the natural, cultural, and social environment. By the same token, too small a volume may not allow for full economic sustainability activation. This trend might lead to the destination's failure to cover the operation costs and force them to compensate the situation through inappropriately increased prices unit cost of the product [Mihali T. (2019)]. Thus, failing to reach a critical mass of positive impacts stemming from tourism possibly undermines tourism profitability and drives potential visitors back for the overall experience.

As some authors believe, addressing undertourism phenomenon not only does it alleviate the problem of overtourism and strike a balance to better reach sustainable tourism, but it also opens up to discovering new hidden destination [Mihali T. (2019)] in her paper about economic sustainability, explains in this respect a roughly vicious cycle. She claims that too low volume of visitors causes the destinations not to achieve the advantage of economies of scale and does not make sufficient use of the economic capacity of tourism development, therefore on the demand side the purchasing power of visitors and their willingness to pay for tourist products is not in line with the offered touristic facility and consequently a smaller number of visitors would be willing to diminished, which per se add fuels to the undertourism phenomenon.

Some of the approaches to reduce undertourism have been already mentioned in the previous paragraphs: low-cost flights, take advantage from the long transfers by bus from minor airports to capitols stopping on the way in heritage locations, reroute

visitors to similar locations (e.g., Terracotta army), and more. One of the strategies to overcome undertourism activated time ago in China is to organise international events in locations usually not included in touristic tours, such international events, conferences, fairs, sport competition, shows, attract a relevant number of visitors that activate thanks to word of mouth the promotion of the location.

Time ago some software applications were designed to integrate different already existing services and, accordingly with the specific tourist profile, create on the fly a tour taking into account user interests, extracting information from the tourist's previous tours, tourists' remarks (e.g., TripAdvisor), dates, season, weather, transportation, meals and pit stops. This integrated solution use to include/discover fewer known locations to enrich the experience. The basic outcomes of the application were:

- For the realities already known to the large national and international tourist flows (large metropolises and cities of art or the most well-known naturalistic locations) a well-structured application would allow to limit the time needed for travel, the "dead times" for waiting in places ofinterest or for the purchase of entrance tickets as well as a better distribution of the flows of people within the cities and a better organization of the time available for visits a greater knowledge of places of potential interest;

- For the more unknown realities, on the other hand, this tool would be extremely useful in the field of promotion and enhancement of the territory since, through the "power of sharing" and the possibility of uploading content by other users or local inhabitants, the database available results tobe continuously updated. In this way, any user, at any time, could be struck by an image of "new" places, activities and cultures that are not known but absolutely of interest. The project also aims to integrate and implement a series of already existing but not completely proper services such as the suggestion of the most suitable and convenient means of transport to reach even remote areas of the country.

Other options are based on typical marketing tools like the creation of "bundle" offers including in the subscription a selection of point of interest mixing the key ones with less known ones. Once more marketing tools suggest creating "customers" profiles and subdivide the offer by profile. Such offers are usually packaged at different levels of geographic scale: city, province, region usually including public transportation fares.

To conclude let's add some remarks on the impact of COVID 19 on tourism this year and in near future. Tourism continues to be one of the sectors hardest hit by the coronavirus pandemic. The outlook for the tourism sector in the near future remains highly uncertain due to the different policies applied in the different EU countries ranging between full openings, COVID 19 as a normal flue and partial or full locks imposing thegreen pass for restaurants and bars. The coronavirus (COVID-19) pandemic continues to hit hard in 2020, with international tourism expected to decrease by around 80%. Domestic tourism is helping to soften the blow, at least partially even if a number of potential tourists doesn't want to use airplanes and other public transportation means. Governments have taken impressive immediate action to restore and re-activate the sector, while trying to protect jobs and businesses. Many countries are also now developing measures to build a more resilient tourism economy post COVID-19 taking

advantage from the experience acquired in more than 18 months emergency. These include preparing plans to support the sustainable recovery of tourism, promoting the digital transition and move to a greener tourism system, and rethinking tourism for the future. To achieve such goals key policy priorities include:

- Restoring traveller confidence
- Supporting tourism businesses to adapt and survive (digital transition, better infrastructures, ...)
- Promoting domestic tourism and supporting safe return of international tourism (clearhomogeneous regulations,...)
- Providing clear information to travellers and businesses, and limiting uncertainty (to the extentpossible)
- Evolving response measures to maintain capacity in the sector and address gaps in supports
- Strengthening co-operation within and between countries
- Building more resilient, sustainable tourism as in many other sectors this is the key challenge.

13.   Sustainable tourism

Sustainability is considered one of the most relevant issues facing the tourism sector in recent decades. Usually scholars consider "sustainable tourism" a subcategory of sustainable development[99] and is defined as all forms of activities, management and development of tourism that preserve natural, economic and social integrity and guarantee the maintenance of natural and cultural resources.

The definition of sustainability is a unitedly accepted territory, while the scope and nature of this term are confused areas [Ren & Han (2018)]. One of the most significant definitions of sustainability focuses on three factors, namely economic, environmental, and social factors in decision-making [Ren & Han (2018)]. Speaking of sustainable development in economic terms, this concept is most often described as the need to sustain a constant amount of income generated from non-declining assets so that overall return remains positive [Spangenberg J. (2005)].

In addition to these factors, UNESCO's Universal Declaration on Cultural Diversity in 2001, added a fourth dimension to the sustainable development definition which is the cultural factor[100].

These pillars[101], although each of them has a separate definition, are interconnected,

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[99] Sustainable development is a development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development (WCED), 1987)

[100] Noting that culture is at the heart of contemporary debates about identity, social cohesion, and the development of a knowledge-basedeconomy (UNESCO Universal Declaration on Cultural Diversity - 2001) http://portal.unesco.org/en/ev.php-URL_ID=13179&URL_DO=DO_TOPIC&URL_SECTION=201.html

[101] Economic, environmental, social, and cultural factors in decision-making

and the synergy among them demands challenging considerations. In fact, unless having interaction and integration among these dimensions, achieving sustainability and its appraisal seem undoable [Ren & Han (2018)]. For a system to be sustainable, each of the abovementioned four aspects has to maintain its capability to survive and evolve, while the connection between them must enable a permanent assessment [Spangenberg J. (2005)].

Since the early 1990s this term has become commonly used encompassing an approach to the tourism community, the way the staff are treated and the desire to maximize the economic benefits of tourism for the host community. Businesses, governments, non-government organizations, destinations and, increasingly, tourists are looking for ways to reduce their environmental impacts and negative social impacts while simultaneously continuing to enhance the economic and experiential benefits that tourism can bring [Gross et al. (2015)]. For a long time, the European Commission is engaged in the promotion of sustainable development concerning tourism in Europe [European Commission (2016)]. A number of initiatives, including:

1. the EU eco-management and audit scheme (EMAS), and the EU Ecolabel,
2. the Tourism and Environment Reporting Mechanism (TOUERM),
3. the Corporate Social Responsibility initiatives (CSR),

are applied to facilitate sound environmental, social, cultural and economic management for businesses and destinations [European Commission (2016)]. Moreover, several private organizations representing the tourism industry or destinations have established monitoring tools and certification schemes regarding sustainable tourism. Being the leading paradigm in planning, monitoring, and managing tourism, sustainable tourism growth and development is the prevailing matter of interest in tourism destination development [Kuščer & Mihalič (2019)].

The principles of sustainable tourism stem from the four pillars of sustainable development. The implementation of sustainable tourism principles is followed by three implications:

- The environmental aspect which contains optimized use of natural resources. What this factor deals with is mainly related to the preservation of the cultural heritage, primary ecological processes, and biodiversity.
- Regarding the social and cultural aspects, the authenticity of host communities should be preserved. The traditional values and intercultural perception of the built and living cultural heritage is another factor in the need for conservation.
- The third aspect deals with the economic operations and provision of economic advantages to all the stakeholders. This aspect possibly involves the introduction of job opportunities and increased income for the host community, and in the end, it contributes to poverty eradication.

It is inferred that besides the optimal use of resources and the environment as mentioned above, sustainable tourism requires the sustainable growth of tourism's contribution to the economy and society, which will be gained by a deep perception and proper management of tourism demand [Liu S. (2013)].

While the concept of sustainable tourism has been strongly promoted, many if not most tourism destinations and attractions have failed to meet the requirements of

sustainable development, partly as a result of vested economic interests [Ren & Han (2018)]. Therefore, economically speaking, societies not only are deprived of a significant income source, but they face a loss. In order to overcome the adversity of this trend, it is necessary to delve into the administrative aspects of sustainable tourism regarding both macro and micro territorial scales of policymaking. It is helpful to mention that achieving sustainable tourism is a continuous process, and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary. Moreover, sustainable tourism should also maintain a high level of tourist satisfaction and ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices.

14. Conclusions

In recent times cultural and memory institutions faced a new challenge, the combined impact of two relevant factors: digital transformation and the pandemic. Extended lockdowns interrupted touristic flows and stopped citizens fruitions of almost any form of cultural enjoyment. This situation forced them to find solutions mainly taking advantage from digital technology. Almost all the sectors from education to memory institutions reacted positively inventing new opportunities to meet the expectations of citizens ensuring as much as possible cultural enjoyment continuity. Cultural tourism, based on onsite visits to heritage in all its forms suffered a relevant crisis far bigger if we consider, as necessary, the indirect key beneficiaries of cultural tourism, the galaxy of travel agencies, hospitality infrastructures, restaurants, shops and more.

The great number of discussions and papers surrounding cultural tourism, overtourism and its impact on heritage has helped to draw attention to the negative consequences of unconstrained tourism growth. It has pointed out the limitations of market-oriented voluntary approaches to effectively deal with this issue. Instead, possibilities for more regulatory, government-led approaches to manage tourism that seemed to have gone out of fashion since the start of the century are up for discussion again as key partners in ensuring tourism resilience. However, overtourism issues can also be rooted in wider societal developments, like changing lifestyles and seemingly unrelated things, like the increase of internet shopping and social media. This suggests that overtourism should no longer be perceived as a tourism problem or as an urban problem, but rather as a social problem within a city context.

On the opposite side, we find undertourism, this is, many times, caused by the lack of appropriate infrastructures, transportation, hospitality, and more plus the lack or inappropriate marketing strategy.

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Is "Authentic Tourism" a means of preserving living cultural heritage?A case study in Old Akko, Israel

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Abstract: The goal of this paper is to question the idea of authenticity in the tourist industry, using the Old City of Akko (north Israel) as a case study. It willquestion the ability of tourism to serve as a tool for preserving living-cultural-heritage. Is there "authenticity" in tourism? Is cultural-based-tourism a means of preserving intangible heritage? Does cultural-based-heritage recreate heritage, invent heritage or is it just a means of creating experiences? Situated on a peninsula in North Israel, the old city of Akko is a vertical of many historical layers, from 5000 years ago till date. Imprints of tangible heritage from all periods and living intangible cultural heritage entwine with each other in the ancient allies of the city. Intensive excavations uncovered massive Middle-aged Crusader remains dated to the 12th and 13th century. They lie beneath the existing Ottoman fortified city, constructed in the 18th and 19th centuries. Akko of today is a vibrant city. Residents reside within these Ottoman buildingsconstructed 300 years ago. Updated research indicates that the cultural heritage of Akko includes many additional values. These include intangible heritage values that are practiced by these residents in the historic allies. This 'Living Heritage' is linked to the current community of the city and represents the 'continuity' of traditions and practices that comprise living dimensions and the continuity of traditions, skills, and craftspeople. Successful scientific research methods, documentation and safeguarding procedures of these intangible values are still developing. This paper will present examples of intangible heritage in the Historical Urban Landscapes of Akko and will question the ability of new touristic initiatives as a means of preserving this heritage and the spirit ofthe city. Some of these examples are led by the locals but most of the new initiatives are belong to entrepreneurs new to the city. They all offer an authentic experience in the city. They suggest a combination of visits to the main tourist attractions developed by the authorities and an opportunity toencounter living-traditional-culture aspects in the city. They include tours with local guides, living-in local houses, participating-in local traditional meals with the residents, meeting and watching various craftsmen or joining traditional community events. For tourists, these are unique opportunities that could be called "authentic experiences". For tourist experts these experiences are often regarded as means to present rare cultural heritage aspects. For the

authorities,these experiences are regarded as new development resources and tools. For the locals these are new economic opportunities. So, is this a win-win-win- win situation? Are these initiatives means to preserve and safeguard the authentic intangible heritage values and the unique spirit of the city?

Keywords: Authentic Tourism, Cultural-heritage-based-tourism, Living Cultural Heritage, Intangible Heritage, Built Heritage.

1. INTRODUCTION

In November 1994, the International Council on Monuments and Sites (ICOMOS) adopted the Nara Document on **Authenticity**. This deceleration designated authenticity as an essential factor in conservation procedures of cultural heritage. It addressed cultural diversity as a means of evaluating authenticity in a more objective way. It suggests that "*All cultures and societies are rooted in the particular forms and means of tangible and intangible expression which constitute their heritage, and these should be respected*" (NARA Declaration, 1994). It continues to say that *"Responsibility for cultural heritage and the management of it belongs, in the first place, to the cultural community that has generated it, and subsequently to that which cares for it"*. Understanding that "authenticity" varies from culture to culture was the end of many philosophical discussions that had underlined the importance of authenticity within the conservation and restoration procedures of cultural heritage. The declaration clarified prolonged misunderstandings that had limitedthe scope of decision-making in the field. It justifies the cultural context as the main key when assessing authenticity in the field of cultural heritage.

While this declaration might have supplied a tool for preservation specialists, a theoretical understanding of authenticity as a tourist experience is still very much debated (Bueno de Andrade Matos, 2018). Given the lack of consensus, this paper questions the idea of authenticity in the tourist industry, using the Old City of Akko (north Israel) as a case study.

The paper investigatesthis Historic Urban Landscape and questions the meaning of an authentic tourist experience in the city. It will show examples of intangible heritage in the Historical Urban Landscapes of Akko now 'on sale' as authentic tourist experiences. It questions the ability of these touristic initiatives to preserve intangible heritage and the spirit of the city. Is there "authenticity" in tourism? Is cultural-based-tourism a means of safeguarding intangible heritage? Does cultural-based-tourism recreate heritage, invent heritage or is it just a means ofcreating experiences? This paper will show that while the developing tourism economy can contribute to preserving intangible heritage values, it can also abuse them and endanger their actual existence forever.

This paper will begin by clarifying some basic terms used in this paper such as cultural heritage, Historical Urban Landscapes and the theoretical connection between built heritage and intangible heritage. It will then discuss cultural-based-tourism and its contribution to safeguarding intangible heritage. The paper will continue by presenting three touristic case studies in the HistoricUrban Landscape of Old Akko. Through them, the paper shows how tourism can safeguard intangible heritage values. Final

conclusions will suggest that sustainable frameworks for preserving intangible heritage values in a Historic Urban Landscape should include unique tourist projects as well as inclusive new tools.

Studies of the relationship between these components require an integration of multiple research methods and sources. Literary and historical sources, protocols and documents found in the offices of the different organizations involved in the conservation and development of the city enable a better understanding of the urban space. A full understanding of the of authenticity and cultural-based-tourism in Akko this study includes field observations, in-depth interviews with a sample of residents, senior officials from different organizations involved in the conservation and development of the city and tourists. A combination of these resources enables a deeper understanding of this relationship.

2.   CULTURAL HERITAGE

Cultural heritage developed simultaneously with the development of modernity. Although the concept of heritage evolved from a concern of preserving relics from the past, the evolution of cultural heritage has led to some important changes in its orientation (Ashworth, 2013). In the past, these relics from the past were mostly tangible, built, artistic or symbolic characteristics, which each culture inherited from its past. Built heritage mostly regarded architectural - aesthetic properties (such as archaeological sites), historical urban layouts andgeographic settings of archaeological and historical sites. These various places and structures from the past are called cultural properties. They are unique and irreplaceable. Their characteristics enrich the cultural identity of a society and give it its unique character.

Over the last two decades regeneration processes, which occur in historic urban areas, increasingly integrate heritage as a lever for physical, social and economic development (Amit-Cohen, 2005). They raise the values inherent in the historical built fabric as a tool for accelerating cultural activities and tourist attraction, for creating a unique and rich urban environment and for fostering a sense of pride and of community identification. It is now understood that cultural heritage in urban settings has an additional meaning that include intangible aspects. These could be cumulative reservoirs of human experiences, like beliefs, values, philosophy, customs, arts, history, experiences, languages, social relationships, institutions, material and spiritual products that belong to a group of people and are transmitted from generation to generation. This can all be described as *intangible heritage*. This term is used to describe aesthetic, spiritual, symbolic, or other social values that associate people with a place through ongoing *'living heritage'* such as rituals, music, language, know-how and oral traditions (Deacon 2004). Living heritage is practiced by different groups of people that are defined by race, age, ethnicity, language, religion or any other category. These people that hold traditional knowledge and skills and practice cultural heritage can be described as *'living treasures'* within Historical Urban Landscapes. They shape their unique identity and sense of continuity and strengthen the place they live in.

In the cultural heritage conservation field, we are consistently faced withchallenges

on three fronts (Avrami, Mason & De La Torre, 2000): 1. Physicalconservation procedures: materials and structural systems, deterioration causes, possible interventions, long-term efficacy of treatments, etc. 2.

Managing these procedures: availability and use of resources, funds, training personal, and technology; political and legislative mandates issues; land use issues, etc. 3. Understanding cultural significance and social values: Why is an object or a place meaningful, to whom and how are these places understood orperceived.

The discussion of social values, social diversity for making decisions on what to preserve and how, is compatible with the *Faro Convention*. This Convention focuses on the value of cultural heritage for the civil society and deals with the question of why and to whom cultural heritage belongs (Faro, 2005). It was signed in 2005 by the Council of Europe and is based on the understanding that heritage is part of human rights, and that each community isentitled to express and defend its heritage.

The annual ICOMOS conference held in 2008 in Quebec was devoted to understanding the connection between built heritage and intangible heritage. At the end of this conference the *Quebec Declaration* was signed (ICOMOS, 2008). It referrers to the *'spirit of the place'* and presents a holistic approach according to which cultural heritage includes tangible as well as intangible aspects, all of which are expressions in the urban landscape. This declaration gave equal significance both to tangible and intangible heritage within the process of decision-making for preservation in urban spaces.

UNESCO's definition of a historic urban landscape emphasized this idea (UNESCO, 2011). The declaration suggested that intangible elements such as memories, narratives, rituals, customs, and events, contribute to the creation of a unique *Geni Loci* (spirit of the place). These elements add meaning to a place and therefore need to be included in the discussion about the characteristics, various components, and values of an historical urban landscape.

The 2005 Faro Convention, the Quebec Declaration of 2008, and the UNESCO recommendations of 2011 all underscore the connection between thebuilt heritage and the intangible heritage in a historic urban landscape.

3.   HISTORICAL URBAN LANDSCAPES

The ICOMOS Charter for the *Conservation of Historic and Urban Areas* from 1987 indicates in article 1 that *"All urban communities, whether they have developed gradually over time or have been created deliberately, are an expression of the diversity of societies throughout history"* (Washington Charter,1987). It continues to suggest that historic urban areas can be large or small, can be cities, towns, historic centers or quarters. According to this charter theseareas have a role as historic documents and in addition they embody the values of traditional urban cultures. The charter continues and presents qualities to be preserved in these areas and sets methods and instruments for this purpose. Nonetheless, the charter refers to physical historical features only and oblivious to the culture those communities and societies living in these historic areas. It is unconcerned with them as carriers of intangible cultural heritage that is unique to these historic urban areas.

The UNESCO document suggests that Historic Urban Landscapes are complex and delicate places that contain cultural assets from ancient times, which create a special character. It respects inherited values and traditions of different cultural contexts. Article 3 of the introduction indicates that "*Urban heritage, including its tangible and intangible components, constitutes a key resource in enhancing the liveability of urban areas, and fosters economic development and social cohesion in a changing global environment.*" (UNESCO, 2011). This wider approach enables to understand the historic urbanlandscape as an urban area of historic layering of cultural and natural values and attributes, extending beyond physical structures and ensembles. It proposes a wider context that includes both physical features of the urban structure (such as topography, built environment, both historic and contemporary, its infrastructures above and below ground, its open spaces and gardens, its land use patterns and spatial organization) as well as social and cultural practices and values, economic processes and the intangible dimensions of heritage. This approach enhances the productive and sustainable use of urban spaces and recognizes the dynamic social and functional character and diversity. It creates a sustainable relationship between the urban and natural environment, the needs of present and future generations and legacies from the past. This approach learns from the traditions and perceptions of local communities and states an absolute connection between them and theirsurroundings of built heritage.

In Israel, it is often found that the term 'historic city' refers to a defined historical district within the territory of a city. It is acceptable to determine that aHistorical Urban Landscape is a product of a unique historical developmentprocess within an individual city. In recent years, these Historical Urban Landscapes have been subjects for various heritage studies as well asdiscussions on policies, the creation of national conservation frameworks and public awareness activities (Peleg, 2017). Each urban historic area in Israel is aproduct of a unique historical urban development. Management of urban historic areas in Israel, is conducted by local authorities, which issue tailored regulations and it is them that have the ability to determine the development goals in an entire city, including those of the historic area. Each city has its own unique principles, approaches, standards and tools for conservation of thehistorical area.

4.   CULTURAL-HERITAGE-BASED-TOURISM

As tourism boomed in the last decades, local communities became increasingly eager to find ways to attract tourists and economically benefit from this developing industry. Unique small-scale touristic initiatives focused on identifying and leveraging local cultural heritage assets as tourism drivers. These initiatives are often regarded as authentic- touristic-experiences. They became far more beneficial to local economies than the rapid expansion of massive enclaves that had previously dominated tourism. (McNulty & Wafer, 1990). Organizations realized that "*tourism needs to be part of a community mobilization strategy that can reinvent the role of heritage so that it serves the needs of everyone*" (McNulty, 2014). This motion is reflected in the explosion of niche market designations that include adventure tourism, culinary tourism,religious tourism, ecotourism, sustainable tourism, and educational tourism. A big and dominant

market in the industry is cultural-heritage-tourism.

As the term implies, cultural-heritage-tourism involves visiting places that are significant to the past or to the present cultural identity of a place or a group of people. It provides an in-depth touristic experience of another culture. Based on the mosaic of places, traditions, art forms, celebrations and experiences, cultural-heritage-tourism portrays the unique spirit of a place and reflects its diversity and character. It is rooted in local languages, customs, practices, history and experiences these groups have commonly shared over the years. It enables a local community to utilize their unique intangible heritage as an economic drive for their own development. In other words, it can also be called authentic tourism.

Cultural-heritage-tourists visit historical attractions, monuments, landmarks Museums and art galleries. They take part in festivals, concerts, or performances. They expect to experience culturally significant neighborhoods orcommunities. They hear stories and meet locals. These tourists learn about the beliefs and practices, the struggles and successes that have shaped the sharedidentity of a people. They encounter the Geni-Loci of a Place which is often represented through its intangible heritage values.

Cultural heritage tourists might be thought of as amateur ethnographers. But while they are interested in learning about other cultures, they are first and foremost tourists. They travel to experience other cultures and learn about the past, but they do so as tourists. They have the need for amenities such as restaurants and hotels that the tourist economy depends upon.

In this respect, cultural-heritage-tourism encourages communities to select their intangible heritage values, interpret them and find creative ways to engage tourists with them. They become touristic entrepreneurs in these uniquecultural heritage places. It can be said that these initiatives highlight intangible heritage values and encourage local communities to safeguard them. More than often newcomer residents are intrigued and touched by these values. But some are less sensitive. While their new investments are important to the development of the local economy they can become a threat to these values and to the Geni-loci of a place. Keeping a balance between the intangible heritage held by the locals and the investments of newcomers is delicate and a tricky challenge and is a key to safeguard intangible heritage values.

5. THE HISTORICAL URBAN LANDSCAPE AKKO

The Historical Urban Landscape Akko (also known as Acre) in North Israel can serve as a case study to discuss these issues. Due to its unique culturalheritage values, efforts to base the city's economy on tourism began decades ago. But it was only in 90ties of the twentieth century that the State of Israel designated the city as tourist designation and prioritized the unique cultural heritage as the base for tourism (Peleg, 2017). The official development plans emphasized the built heritage of the city which yet needed to be excavated and developed. It was only after these developments were completed that newcomers were exposed to the unique intangible heritage in the city. It was only after the investments of these newcomers, did some of the locals begin to understand and realize the importance and uniqueness of their own intangible assets.

Situated on a peninsula, on the northern coast of Israel alongside a natural harbor of the eastern Mediterranean, Akko is adjacent to ancient international crossroad (Waterman, 1969). As a result of this geographic location the city became a trade center in ancient times. The urban space is limited due the fact that it developed on a peninsula. Therefore, the city developed in layers, the Crusader city first, and above it the Ottoman layer. Twice in its history, Akko became an international city - in the thirteenth century,as the Crusader capital city of the Latin Kingdom of Jerusalem and in the nineteenth century, under El-Jazzar Pasha, the Ottoman ruler. Despite the many years that have passed, authentic archaeological and historical evidencefrom these two periods remain in the city. It is within these remains, that modern life continues to this day. Within these archaeological remains and the historicalspace people live and work today. Within the city resides a multi–cultural population. It is vibrant and has a unique character (Peleg, 2017). The currentpopulation in the Old City of Akko consists mostly of an Arabic Muslim traditional society, which is primarily of a low socioeconomic status. This blend of archaeological historical layers from the past and modern life, exist togetherand nourish each other, contains archaeological remains and a historical spacein which people live and work.

Figure 1 A view of the Old City of Akko,Photo: Hadar Peleg

The aesthetic, historical and scientific values of Akko were designated during preparations of the new Master Plan in 1993 and again during thenomination for World Heritage in 2001 (Killebrew, DiPietro, Peleg, Scham & Taylor 2017). The city's unique values are embodied in her shape, texture and size derive on the peninsula surrounded by the sea. The remains of the crusaders that were discovered in archaeological excavations uncovered thetransition from the Romanesque architectural style to

the Gothic architectural style. Narrow alleys, government buildings, public buildings, mosques, markets, bathhouses, workshops and commerce, wealthy and traditional homes from the Ottoman period give the city its eastern atmosphere and character. This city underwent massive conservation and development procedures that turned the city into an important touristic attraction in North Israel.

Figure 2 The Refectorium in the Crusader Hospitaller Compound Photo: Pixabay

Updated research shows that living cultural heritage values are in fact embedded in intangible heritage still very much alive in the city (Peleg, 2017). It is this heritage that creates local patriot pride, gives life to this Historical Urban Landscapes and a special meaning. The continuity of intangible aspects in the city, maintains the significance of the past, present and future. It is now clear that these intangible and tangible values are inextricably linked.

It is an authentic Mediterranean, oriental Islamic city. Centuries of history are stacked on this peninsula within the Ottoman walls. Pencil minarets and painted church domes strain above ramparts smoothed by sea winds. Its stone bastions and deep moats are the very same that greeted Marco Polo and countless pilgrims, mystics and scholars who passed through the city years and years ago. Walking down the narrow alleys of the old city of Akko is an experience of authentic Middle Eastern markets, the blue Mediterranean Sea and ethnic foods. Wafts of spices, Arab black coffee and pita bread dart in a zigzag through the old city's alleys, leading disoriented visitors deep through bewitched jumble of streets. Sounds call residents to prayer in mosques whilst merchants call out in the markets at the same time as the ocean breezes splashes up. You can immerse yourself in the colors, sounds and scents of the fishing port's market. You can taste famous fresh hummus with warm homemade pita bread, a popular street lunch

that the city is famous for. Street vendors offer a variety of homemade authentic candy or variety of caramelized nut-based sweets. Mental maps, place names, traditional unique crafts, food recipes and local beliefs, local stories and legends all give special meanings to places in the city.

Figure 3 Ottoman Islamic features in Old Akko Photo: Shelley-Anne Peleg

It is estimated that about 1,500,000 – 2,000,000 international and Israeli tourists visit the city of Akko each year[102]. Only about 400,000 tourists buy ticketsto visit the tourist

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[102] This data was given to me by one of the leading touristic developers in the city who requested to remain anonymous.

sites in the city. It is therefore clear, that most of the tourists are not satisfied just with a visit to the well-developed touristic sites in the city. Instead, most search for an in-depth understanding of the city, wanting to experience the local lifestyles, customs, and culture. These visitors and tourists seek an authentic-tourist experience. Some live-in local houses that have been transformed into beautiful and attractive rooms, participate-in traditional meals with the locals, meet and watch various craftsmen or join unique traditional community events. They undergo a significant and meaningful interaction with locals. It enables them to visit in the city, as well as experience other aspects of the city.

Figure 4: An Example of an Authentic Bed and Breakfast Tourist experience, Photo: Shelley-Anne Peleg

The new touristic experiences themselves are based on unique intangible values such as traditional customs, food, cotumes and music. Theyare representative of the local Muslim community. Sometimes these experiences are simple, embodied in gritty and slummy areas of the city. Thiscombination enables an encounter with the glittery

historical built heritage and the intangible heritage as well. It gives the tourists a genuine and true feeling one that can be called an authentic experience.

6. INTANGIBLE HERITAGE AND GUIDED TOURS

The importance and the connection between tourism and intangible heritage in Akko was first recognized by a local tour guide during the development procedures held in the 90ties of the twentieth century. Abdu Matta, a descendant to an Arab Christian Orthodox family that has resided in the city for 10 generations, was born in Old Akko and grew up in it. Not only does he have historical knowledge of the city, but he also has a deep understanding of the city's unique intangible heritage and a profound acquaintance with the residents. The local folklore is his own background, the language is his mother tongue and the community customs are a true part of his life. At the early stagesof the development procedures, Matta understood that these unique intangible heritage values in the city needed to be safeguarded and even rescued before they disappeared under the developing tourist industry. He was the first independent tourist entrepreneur to lead tours around his hometown revealing and interpreting these values, thus stressing their importance. His tours served an example for external tour guides just discovering the values of the city. His ideas became pillows of growth for his fellow residents in the city.

Matta's efforts were not only restricted to tours. He became part of many of the city's new initiatives in cultural heritage. He was a co-author of a book that collected many of the local folklore stories. He participated in endless educational programs, in which he discussed with the local school children many of the intangible values in the city. He took part in discussions in the city and consulted the authorities on means of safeguarding the unique local intangible heritage. His activities included outdoor afternoon lectures for the locals, storytelling sessions with the local children and local tour guide training programs. He has suggested to create workshops that revive traditional handicrafts and add them into the tourist itinerary. In his opinion this could raise awareness, create new sources of livelihood and ensure that the local heritage is passed to future generations. Time and again, he has urged the official development and non-profit organizations to establish social activities that complement the tourism experience and preserve the Geni-loci of Akko.

Figure 5: Visiting a traditional Bakery Photo: Shelley-Anne Peleg

He views authenticity, solidarity and cultural symbiosis as unique intangible components of the of the city[103]. According to him: *"These components feed each other and are the basis for establishing social codes, fed to human beings from their early stages as embryos, in their homes and in their neighborhoods"* (Matta, 2020). His activities in the city are led by his opinion that: "*authenticity in Akko is strong enough to face virtual materialism that could cheaply run down the unique 'spirit of the place'."* His dramatized tours and activities are *double targeted: "On the one hand my need to earn a living and on the other hand my understanding that it is important to present the unique spirit of Akko in a way that it is faithful to my noble heritage and the collective memory of my own intangible culture."* He believes that "*only those who breathe and live this intangible heritage can express it and "translate" it faithfully and responsibly. This is because it has been that person's legacy for generations. Therefor authentic intangible heritage cannot just be an academic research. It must continue to breath and live as a real mechanism without discussions about its essence."* He has declared over and over that he favors considerate tourism and he sees over-tourism predatory and destructive.

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[103] I would like to thank Mr. Abdu Matta for contributing his personal ideas to this discussion on Authentic Tourism as a means of preserving Intangible Heritage. The quotes presented in this paragraph are Mr. Matta's ideas and were presented by him in Hebrew in an ongoing virtual group discussion held during the month of August 2020 with tourist entrepreneurs from the City of Akko. His comments were translated into English by the author of this paper.

7. INTANGIBLE HERITAGE, HOME STAY AND CULINARY

"From the moment a person enters my house he is invited to receive love and give love" says Miriam Aik a religious Muslim woman who turned her house into a home-stay project[104]. Located in the heart of Old Akko, the structure itself is an example of a magnificent traditional Ottoman house. Living with her, guests are introduced to the city and to the local Arab culture. It is unique opportunity to get to know an authentic home, learn about the life of a religious Muslim woman and her rituals, understand traditional Muslim every-day life, customs, and costume and experience local ceremonies and culinary. It adds authentic sociocultural richness to the tourist's experience and portrays the cultural richness of the city Akko.

Figure 6: Miriam Aik in her home with visitors Photo: Shelley-Anne Peleg

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[104] I would like to thank Miss Miriam Aik for conducting with me endless discussions, for sharing with meher ideas and for contributing to my thoughts on Akko. The quotes in this paragraph stem from a talk she gave in Hebrew to a group of Jewish visitors that visited her house with the author of this paper during August 2020. These quotes were translated into English by the author of this paper.

Home Stay refers to accommodation in a residence outside a person's own local community (Chakraborty, 2019). It allows tourists to experience a different lifestyle, authentic culture or even a language. Herein the host community offers their furnished accommodation to a tourist package with a personalized, homely hospitality which is authentic to the local habitat. The infrastructure like amenities, living space etc. is shared with the tourist such thatthey can enjoy a homely hospitality. To make it an experience, the offering is usually packaged with meals, utility items and even allowing them to participate in their local festivals. Homestay packages are highly customizable based on the preference of any individuals based on the length of their stay or even extended or long stays unless specified by the host

This form of sustainable tourism in Akko is currently one-of its kind. On the one hand, it shows the active role of a community member in promoting cultural-based-tourism. On the other hand, this kind of tourism is an example of a simple way to safe-guard intangible values such as local arts, cuisine, costume, music, rituals, or others.

8. INTANGIBLE HERITAGE AND NEWCOMMER TOURIST ENTERPANAURS

It is often thought that outsiders lack a full understanding of the cultural heritage in Akko. Local residents have expressed their fear that these newcomers could endanger 'their city', change its character and run-down values that are important to the traditional community (Peleg, 2017).

Till date about 10 newcomer tourist entrepreneurs have proven the exact opposite. The case of "Carma-Akko" a self-catering a quaint vacation home situated in the heart of Old Akko, can show the sensitivity these newcomers have towards tangible and in-tangible values in the city. *"The Old City of Akko is an unpolished diamond. And, as such, it has many facets"* says the owner of the project. In her opinion "authentic tour-ism" can be misleading or at best given to multiple interpretations. It is a home-cooked banquet shared with locals during the month of Ramadan. It is the clack-clack-clack of the horse-drawn carts conveying visitors through the cobblestone streets accompanied by blaring music. It is in her opinion the mesh of old and new, classy and modest,so-phisticated and simple that gives Old Akko its charm and allure.

Figure 7: A local workshop for boatbuilding Photo: Shelley-Anne Peleg

In 2011 Carlos and Mali Cortes - Mali originally from Cleveland, Ohio andCarlos from La Serena, Chile, both Jewish - purchased the building from the Qassem family[105] The house, that features historic elements dating back to the Crusader era, was run down, with outdated and dangerous infrastructures and a roof that was on the verge of collapsing. Carlos and Mali renovated it, with the timely assistance of local artisans well-versed in the complexities of stabilizing, cleaning and replacing the local Akko stone. At the risk of unearthing too much history, lest the discovery of antiquities scrap the entire project. Carma's neighbors lended a helping hand where needed or just a nice cup of local coffeeand light conversation. Finally, when Carma officially opened in September 2017, the owners felt that: "*inside the house you can literally touch history spanning four different periods*". These include the upper part of a 1000-year- old Crusader arch, the rest of which lies deep below ground. Various other archeological elements uncovered during renovations offer an enchanting look into how people lived hundreds of years ago. During the Ottoman Period, the townhouse was in the heart of the small Ottoman Jewish community in the greatMubellata Quarter.

Intangible values were captured as well. The neighbors recount that "*about 100 years ago, the house doubled as the dwelling and 'fast-food joint' ofa man named Abu Ibrahim who sold the best boiled dried fava beans and pita bread in town.*"

Today, the house welcomes visitors from all over the world with all of the modern amenities including air conditioning, WiFi, a fully equipped kitchen, satellite TV,

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[105] I would like to thank Mrs. Mali Cortes for contributing her ideas and thoughts in a virtual discussion onAuthentic Tourism as a means of preserving Intangible Heritage with tourist entrepreneurs from the Cityof Akko. The quotes presented in this section are Mrs. Cortes's ideas and were written by her during the month of August 2020.

comfy beds, wine bar, and a rooftop terrace to chill after a long day of discovery, to mention only a few. To each tourist, Carlos and Mali unfold the tale of Carma Akko. By documenting the past of the structure, by retelling stories of its former owners and usages and by enabling visitors experiencewhat it really means to live in the city, they feel that they are sensitive to the unique character of the city and that they are implementing strategies that safeguard intangible values. This is in their opinion the actual meaning of'authentic tourism'.

9. CONCLUSIONS

This paper has shown how sensitive tourist initiatives can become strategies that have many targets. They contribute to the local economy, create local pride, and safeguard the geni-loci as well as the intangible heritage values. It also stresses the importance of all residents, old and newcomers in these procedures. This heritage links new and old residents, Jewish and Arabs to the city and gives a special meaning to their life. All residents now share a unique local identity and a diverse collective memory of a rich and magnificent past. These memories create the intangible heritage of the city. These intangible aspects are nurtured and relate to the built heritage. The interactions between them form the unique cultural heritage of Akko. Recognition of this heritage has had the power the power to unite them. It is this cultural heritage that has developed into a new source of income for the local city residents and integrated them into the new developing tourist industry in their city. Till date, these intangible values are being regarded delicately. They are returning to life and contribute to maintaining the uniqueness of the city. It is therefore quite clear that when discussing Historic Urban Landscapes, we should be referringto cultural heritage in a holistic inclusive way. The case study in Akko also stresses the importance local touristic initiatives, of grassroot procedure and of down-top initiatives for intangible heritage. As no predatory tourist projects have yet harmed the cultural heritage, it remains to follow the touristic developments in the Historic Urban Landscape of Akko. This approach can suggest a new model and a management plan for the conservation of cultural heritage assets in Historic Urban Landscapes. It is based on acknowledging intangible heritage, as a drive for the tourist industry.

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Smart cultural and political narratives in urban and peri- urban landscape

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Abstract. Urban space constitutes in general the historical, cultural and political environment, the important 'cultural landscape', correlated not solely to material indices but, moreover, to immaterial, intangible mnemonic references. The possibility to present this multifaceted info-sense tissue to visitors is usual- ly assigned to guides personifying the description of the city, in a time and space restricted way, delimiting the volume of information and proposing a pre- confined number of guiding narratives only. Furthermore, these conventional guiding itineraries are usually directed to tourists, or to specialized didactic and presentational events; they are not offered to the immediate desire of knowledge or to the game-oriented tendency of the urban 'flâneur', of the urban stroller. Behind a conventional guiding tour, extended libraries, or galleries may be concealed, many hours of musical references; differentiated 'ontologies' of information, of semantic sequences which could be reorganized and reconnected again and again.

Our effort presented in three different projects of urban landscape design, has to do with the correlation of this enormous quantity of interconnected in- formation with real space visiting itineraries, associated to virtual digital guid- ance as well. The scope of the projects presented is the same in all three pro- posals. It has to do with the importance of public urban and peri-urban space as a generator for social identity and cohesion. Considering that identities are basi- cally formed through socializing among members, as well as by exposing col- lective affiliations in public, the primary role of public space and the extended offer of cultural, historical and political information in such a process, is easily understood.

Keywords: Cultural Urban Landscape, Virtual 'Smart' Digital Guidance, Cultural Historical and Political Identity

1 Virtual 'Smart' Guidance, important for the coherence and promotion of the place identity in general

It seems rather needless to explain in detail the informative value of virtual digital guidance in sites of specific historic and archeological value, in Acropolis hill or Kerameikos ancient cemetery in Athens, in Forum Romanum, in Pompei, or in Jerusa- lem.

What we should further insist on is, however, that urban space in general, in every possible city of the world, constitutes an important cultural and political environment, a 'cultural landscape' par excellence, being correlated to the mnemonic past refer- ences of its population, as well as to their historic future to come. Didactic narratives, concerning the presentation and promotion of the urban identity, is thus crucial not only for the touristic development or for consummative proposals but, moreover, for the development of the cultural and politic conscience of the city inhabitants; for the acknowledgment and the coherence of their collective identity, which has to be pre- served, promoted and developed.

Conventional didactic approaches, through lectures, conventional material exposi- tions, printed booklets, seem to be necessary. Nevertheless, it is in many terms strictly organized and usually enclosed in spatial terms. ***Virtual communication, on the other hand, offer a game-like continuous possibility of approach that does not stop even when we leave from the specific 'real' urban space of reference, going back home, moving to another part of the city, or to another city, or even to another part of our extended geographically and geopolitically world.***

1.1 'De-territorialization' and 're-territorialization' of concepts

It is in this technologically updated way that we may translate and reform Gilles De- leuze's and Félix Guattari's concepts about 'deterritorialization' and 'reterritorializa- tion' [1]. According to them, immediate experience is intimately correlated to earth bas- relief, to the material extension of earth. Out of this material substratum, our morals, ethics, ideas of general reference, abstract notions, concepts of 'epistemic' and precise scientific formation, are produced. Afterwards, however, they may return to the earth material receptacle, to the cultural landscape, in order to be rematerialized; in order to produce material constructions and through them modes of social behavior and every- day expression. Real places, real landscapes, urban or periurban, are undoubtedly the immediate presupposition of our existence. They do not exist isolated, in their tangible expression solely. Reality and 'mater – reality' are always escorted, nourished and re- produced by intangible mental conditions; memories, fantasies, desires or even phobias, symbolic or semantic expressive formations.

1.2 "After all, the penis is only a phallic symbol:" the intangible symbolic presupposition of inhabiting space"

"After all, the penis is only a phallic symbol" [2]. The previous provocative phrase, attributed to Carl G. Jung, insists on the fact that material, real eroticism, cannot exist outside a symbolic, immaterial, intangible approach. In an analogous context, a clo- serto us psychoanalyst, Jacques Lacan, proposed the metaphor of the 'Borromean

Knot', 'Noeud Borromien' in its first French appellation; a nodal structure of three interlocked rings. The first of them represents 'reality', the second one the 'imagi- nary', and finally the last one the 'symbolic' formation [3].
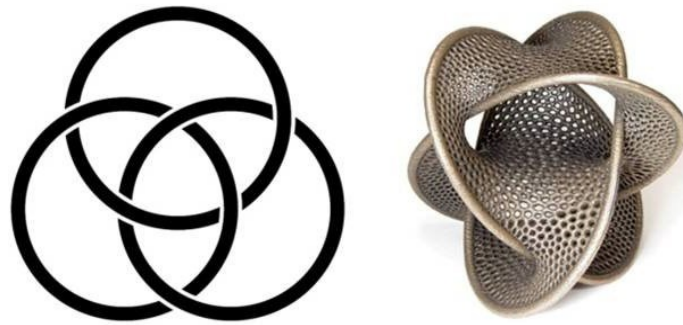

Fig. 1. The *Borromean Knot*; three inseparable rings, in a continuous topological correlation representing the inseparable fusion between the 'real', the 'imaginary', and the 'symbolic': no 'real' condition could be experienced without the 'virtual' association to the imagination and the 'symbolic', the semantic organization of meanings.

The three rings are correlated in a topological continuous coexistence; if one them is cut off, the triple association collapses. Then we may accordingly accept that we cannot reach reality, materiality as well, outside the intangible projection of its immaterial approaches; of our desires and fantasies concerning the possible transformation of the real, material existence. However, this reality-imaginary association cannot be expressed outside the symbolic order that is to say without the semantic expressive organization of our volition for intervention to the real. Reality does not exist isolated; it never exists outside our immaterial, in many ways virtual mental projection. Virtual immaterial condition is not solely a matter lately introduced by 'smart' electronic technology. Moreover, it always participated as a constitutive part of our correlation to reality; constitutive part of our effort to understand reality, abstract it and create schematized conceptual formations; finally attempt to expressively synthesize our possible future intervention upon real conditions.

1.3 Quantitative and qualitative 'smart' organizational chances

What 'smart' electronic technology offers to contemporary culture seems to refer principally to an 'augmented' organizational possibility of the 'intangible', 'immaterial' information offered, an augmented possibility for its management and publicizing. We could thus suppose in a simplistic way that virtual guidance, in correlation to real space references, is principally of cumulative, quantitative value. Let us augment the field of information, in association to a multiplicity of possible, previously unpredictable interfaces, of previously unpredictable interconnectivity that may be established in the future. Then the value of virtual guidance in the extended informative field of the web, may reach a qualitative prestige of rich cognitive validity. Multi- referential associations do not solely offer a larger amount of information but, moreo- ver, they

may offer the chance of new 'ontologies', new semantic structures reorga- nizing the overall approach of previously distant or disarticulated informational particles. They may thus recreate the extended 'symbolic order' and, in correspondence, the specific 'signified' meaning of every isolated 'signifier'.

We shall further remark that digital information networks may contribute a multi-sensorial and multi-level 'rhizomatic' apperception in contrast to an 'arboreal' pre- organized narrative. [4] They may thus produce an augmented sensation of temporali- ty, going back and forth in time, in a way extending real body synaesthesia. They conse-quently do not solely augment our already inscribed knowledge, but moreover lead to previously unpredictable conceptual associations, to a continuous multiplica- tion of cognitive formations.

1.4 Smart virtual guidance, is cultural in its essence

Supporting further our previous arguments, we may describe smart virtual guidance, as cultural in its very essence; even disassociated from specific historic, cultural envi-ronments. It is cultural because it strongly invigorates and expands the realm of intan-gible cultural formations. It is in this context that we present a number of proposals having to do with the virtual smart presentation of the urban and peri-urban cultural identity. In our examples, cultural, historical and political references partly forgotten, or partly diminished in value are 'excavated'. They are extracted out of the not-clearly visible past and promoted again, in search of a new place identity. They may be even partly 'invented', at least in relation to the form and the narrative of their presentation, expecting to recreate both the denotative image of the space and its connotative mean-ing.

2 Design of a 'smart' historic and cultural itinerary in the centre of the city of Trikala, in Thessaly, Greece

Our first example is correlated to the architectural proposal for the redesign of two interconnected central squares in the city of Trikala, in Thessaly Greece [5]. The two squares, the orthogonal one, the square of the 'National Technical University Heroes' and the triangular one, the square of the 'National Resistance Heroes', may be de-scribed as the 'heart' of the city, in correlation to important public and commercial buildings and various entertainment functions. They are, moreover, associated to Ly-theos river, a significant environmental element of the city landscape.

However, this urban landscape is neither solely natural, nor restricted to its appar-ent material formation. It is, in addition, a cultural and political landscape of extended historical depth, going back to the very beginning of the Hellenic legendary past. Ac-cording to the Hellenic mythology, Thessaly the territory where the city of Trikala is located was the initial natal place of Greeks.

There, in Thessaly, Deucalion and Pyrrha, who survived after a disastrous flood, were throwing stones behind them and a new race, the Creeks, out of the stones, was born. It was in the same territory, in the ancient city of Trikke that the initiator of the medical science, Asclepius was born, according to the ancient tradition; Asclepius a

legendary character, hero and semi-god. References to this remote mythological past could be equally seductive for the possible visitors of the city as well as for its inhabitants. It could be presented as historically transmitted knowledge, or as a sequence of cultural metaphors; it could describe the power of the agrarian development in the fertile plain of Thessaly, where a new race could be fed - or, it could also describe the transformation of the agrarian culture to an organized civilization, able to produce the first ancestor of the scientific medical knowledge.

Fig. 2. The two central squares of the city of Trikala: the orthogonal one, the square of the 'National Technical University Heroes' (on the left) and the triangular one, the square of the 'National Resistance Heroes' (upper part on the right). A third square, the circular Rigas Ferreos square is also depicted (bottom right), at the other side of Litheos River.

Fig. 3. From left to the right: *Deucalion and Pyrrha – Asclepius*, the initiator of medical science – Rebetico Singers – and, the statue of the Hellenic Resistance hero, *General Sarafis*.

Could we offer those fragments of information to the visitors of the city and its inhabitants as well, in a seductive game-like way? Could we continue and present the history of Trikala during the Byzantine and Ottoman period? Could we proceed and refer in our narration, to the creation in the city of an important part of the neoteric

Greek folk culture; to the creation of important trends of the Rempetico song? We could even enrich our narration with sound documentary, with Greek folk music, equally attractive for foreigners and locals.

It was in the same territory of Thessaly that strong military resistance, against Nazis was manifested, during the German occupation of Greece. The memory of this heroic past is already presented in the place of our intervention, through the monu- mental statue of General Stefanos Sarafis, a legendary Greek Resistance leader.
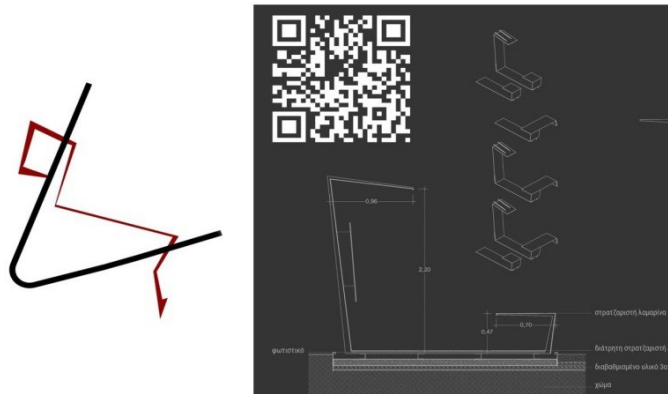

Fig. 4. The red zigzagged promenade, driving the visitor form the first square to the second (on the left), and the metallic indicative structures used as points of reference, through QR codes printed on them, to the virtual 'smart' narration (on the right).

The decision of the architectural team that designed the reformation of the two squares was not to limit its proposals to conventional material intervention. It further decided to articulate all possible historic and cultural references, in a sequential presentation narrated at the length of a continuous itinerary inscribed on the surface of the two squares, in the form of a red zigzagged promenade leading the visitor from the first square to the second. On the length of this visually indicated route, metallic em- blematic structures were used as points indicating virtual 'smart' narration, through QR codes printed on them.

3 A 'smart' garden dedicated to the historic landscape of Thessaly, Greece

Our second example presents a pan-hellenic architectural competition proposal, for the design of a 'Mnemonic Botanical Garden' under the name 'Deucalion's Cycle', in the city of Larissa, again in Thessaly [6]. The name of Deucalion was used, in refer-

ence to the legendary description of Thessaly as natal place of the Greek race, a refer- ence already presented in our primary example.

Fig. 5. A 3D presentation of a mnemonic botanical garden' under the name '*Deucalion's Cycle*', in the city of Larissa, again in Thessaly (on the left) and the metallic structures with the inscriptions of QR codes inavting the visitor to enter the digital, virtual 'smart' itinerary (on the right).
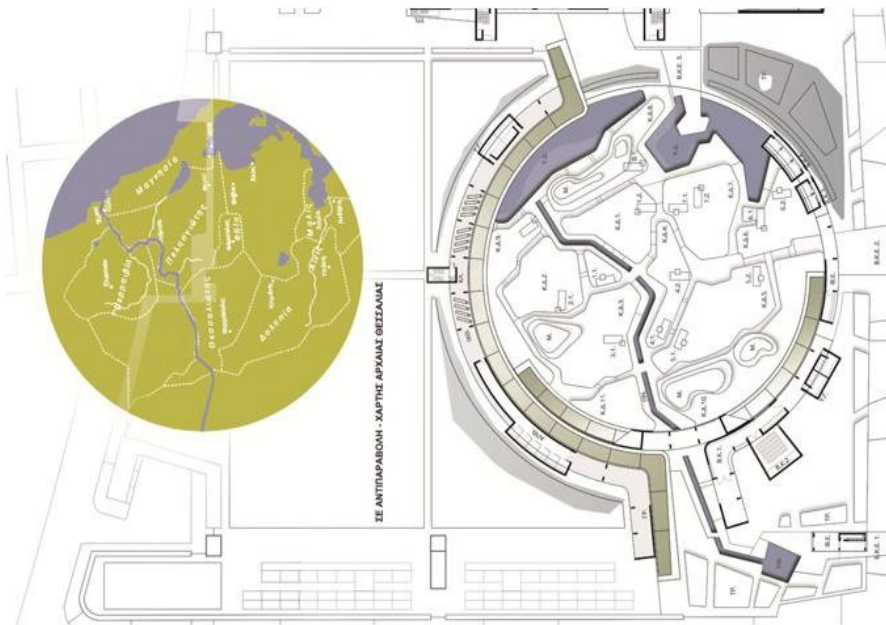

Fig. 6. The map of ancient Thessaly (on the left), and the master-plan of the mnemonic botanical garden' (on the right). An artificial lake on the upper part of the master-plan represents the Aegean Sea.

The intention of the architects in this second project, had to do with the presentation

of the cultural landscape of ancient Thessaly, depicted as the correlation of its consti-
tutive natural elements with its cultural elements; geo-morphology and the en- demic
plantation of Thessaly, interconnected with its important ancient cities and historic
places, and possibly, with its intangible cultural and historic references, which could
also be narrated through virtual 'smart' guidance.

It was in this context that the master-plan of the garden was organized as a map, ar-
ticulated in accordance to the important principal parts of ancient Thessaly. A line of
water was crossing the map formation of the botanic garden, connoting Pineios River
of Thessaly, while in every part of the garden, a corresponding plantation was pro-
posed, as described by the ancient historic sources, or even by the myths. Moreover in
every spot of the map, corresponding to an important ancient city or other historic place,
a metallic structure was located. There the visitor could discover as in our pri- mary
example, the inscription of a QR code, inviting him to enter to the realm of a digital,
virtual 'smart' itinerary.

4 Design of a 'smart' guidance network and a 'smart' historic map, at the municipality of Kaisariani in the periphery of Athens

Our last example refers to the municipality of Kaisariani in the periphery of Athens,
in the vicinity of the important environmental zone of Mount Hymettus. Our architec-
tural approach, [7] in the case of Kaisariani, refers to the proposal of strategies, pro-
moting cultural heritage in correlation to the contemporary exigencies of urban life. In
this context we insisted on: 1: The proposal and design of visiting itineraries, in the
interior of the urban tissue, interconnecting places of recreational interest, through a
network of important open-air public spaces, as squares and urban parks. 2: The inte-
gration, in the above designed recreational and social network, of places of historic,
cultural or political interest. 3: The extension of the previous urban landscape network
to the peri-urban cultural landscape, in association with green visiting pathways and
nodal places of natural or historic interest on Mount Hymettus. 4: The enforcement of
the previous real space network through the parallel creation of a virtual informational
network, offered to the real space visitors or to an extended public, able to come in
contact with the cultural landscape in question, through virtual navigation principally.
Such a virtual visiting network could offer a continuous data mining able to enrich both
the offered virtual touring structure and the future use of real space as well.

The principal square of the municipality is located at the center of Kaisariani, con-
stituting a place of trans-local recreational activities, for the whole Athenian metropo-
lis. The square is recently under a re-design condition, aiming to offer to visitors, be-
sides everyday amusement, the possibility of a virtual narrative of the historical and
cultural past of the surrounding territory. The re-design of the square and the organi-
zation of the virtual narrative were inspired by the still vibrant historic traces of the
municipality. Kaisariani was founded by the Greek government in the 30's, in order to
provide housing for as many as possible Greek refugees from Anatolia, deriving mostly
from the areas of Smyrna, Cappadocia and the Black Sea. It was in this pros- pect that

the surface of the square was designed as a map depicting the eastern part of the Aegean Sea and the west coastal zone of Minor Asia. On this map, metallic signs inlayed on the floor of the square offer to the visitor QR codes calling him to a virtual navigation through the history of the Minor Asia Hellenic communities.

Fig. 7. The surface of the central square of Kaisariani, was designed as a map depicting the eastern part of the Aegean Sea and the west coastal zone of Minor Asia. On the surface of the map, metallic signs inlayed on the floor of the square offer to the visitor QR codes, for digital virtual navigation to the history of the Minor Asia Hellenic communities.

5 Concluding

It is clear that the basic concept transcending all three proposals presented, recognizes the importance of public urban space as a generator for social identity and cohesion. Considering that identities are basically formed by socializing among members, as well as by exposing collective affiliations in public, the primary role of public space in such a process is easily understood. What we have to remark in addition is that virtual presentation of information concerning this valuable publicity, of cultural, historic and political information could be a great help for the invigoration of com- munity conscience. It could be a valuable help for the formation and promotion of place identity, the organization of cultural affinities, the people's sense of connecting to the place, exceeding simplistic managerial formation of a touristic oriented 'place branding strategy'.

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7. The project was designed by 'Arsis Architects' (A. Chelidoni, V. Koliaki, K. Moraitis, E. Theodorakoglou) in collaboration with Alcon Consultants Engineers Ltd and the Municipality of Kaisariani.

Figure References

Figure no. 1 partly created by the authors and partly provided by the designer of the figure. Figures no. 2, 4, 5, 6, 7 are drawings created by the authors. Figure no. 3, is a collage using an authors' photograph and images of the Public Domain.

Novel educational approaches

Innovative experiences in teaching conservation.
Involving communities' interests on preservation topics by fast investigations and social media dissemination

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Abstract. Since 2019, the authors carried out a didactical experience trough the Preservation Studio workshop in the historical center of Vimercate, a town in the north east area of Milan, implementing a convention agreement between the Mu- nicipality and the Atheneum. The convention was arranged in order to set the relationship between the three academic courses of the Politecnico di Milano and the administration of Vimercate, supporting the teaching staff by providing ac- cessibility to various services and some public properties located in the city-cen- ter. Thanks to this kind of agreement, the courses could be supported in their activities by document centers, public associations and the members of the local community, while the teaching staff offered a constant sharing of the main activ- ities by social media and periodical disseminations through public lectures. After maturing several years of didactical workshops on the main buildings of the his- torical center of Vimercate, this paper shows the results collected with the stu- dios: the active class strategies, the on-site survey cam- paigns, the evolution of the results observed by year after year inspections, ND testing activities and local community involvement. The impact coming from the researches developed by the preservation classes and specific in depth studies realized by graduation thesis showed an increasing participation of the community to the topics connected to the city center: from conservation policies to future uses, historical buildings reached the attention of the people through the development of a new sensibility and perception of new values associated to the local architectural heritage.

Keywords: Vimercate, Villa Sottocasa, thermography, dissemination, living- lab.

1 Introduction

This paper discusses the issues collected by the teaching activities carried out by the coordinated courses of Preservation Studio carried out with the students of the first year master degree in Architecture. The preservation course is characterized by a workshop that provides to the students the opportunity to get in touch with the several degree of complexity offered by historical buildings. The conservation de- sign is the final goal of a long analysis process and the preservation workshop gives the chance to train the class through the different steps required by historic, geometric, material and pathological character- izations. The organization of the workshop in Vimercate, 25 km from Milan, was recently supported by an agreement between the ABC Dept. of Politecnico di Milano and the municipality of Vimercate. The convention gives the opportunity to organize three preservation studios in parallel on different buildings of the city center, in order to enrich the studies on the city and its architectural heritage. The administra- tion provides the accessibility to the public buildings, the local museum, the local public archives, while the results obtained by the courses are shared with the municipality. In addition, the teaching staff is involved into local initiatives for presenting the works matured at the end of each academic year.

This paper draws a balance of the last 3 years workshops carried out by the authors with other col- leagues in the city center of Vimercate [1] within the Architectural Preservation Studio, an academic course formed by two integrated subjects: conserva- tion of historical buildings and advanced survey techniques. The studio is addressed to the first year students of the master degree in Architecture – Built

Environment – Interiors of the School Architecture – Urban Planning – Construction Engineering of Politecnico di Milano. The course is supplied in English language for international students. The attenders are composed by a consistent percentage of Italians students, whereas the foreigners come from Asia, in particular from China, Turkey, Iran and In- dia, from Eastern Europe and sometimes from Latin America. The heterogeneity of the class offers the opportunity to set a first peer to peer confrontation among the students and their personal academic background by applying some active classroom strategies. Respect to the students that had their bachelor in Italy, where courses on the history of architecture and on the theory of conservation are supplied in architectural schools, these topics are not always considered abroad. Thus, the work in the class is initially organized for setting the bases of the conservation principles according to the Italian tradition, compared to other approaches that are diffused in other geographical areas.

International classes testify the cultural relativity of the judgement applied to archi- tectural heritage, according to the personal background of each student. Among the various ideas on the role of conservation referred to cultural heritage, or to the enhancement of historical sites, the main differences on the meaning of preservation are depending to the definition of the concept of time. This is defined as a progressive linear development of events, according to the western culture, founded on a tradition coming from Greek philosophy and Enlightenment, but in eastern culture it is intended as a cycle, where the events are characterized by the periodical repetition recalling the idea of the eternal birth-death circular process. The different definition given to the time influences the tangible and intangible values attributed to the historical buildings, changing the goals attributed to the conservation design.

An important grounding for the discussion is offered by the international standards: the shared principles for setting the conservation interventions on historical buildings represent a vision of the issue that is overpassing cultural differences. ICOMOS char- ters, in particular, represent a set of principles summarizing the main issues matured along the time by important experts, a sort of resetting for the entire class that can achieve a new view of the problem connected to architectural heritage. International associations of experts and transnational standardization groups offer also detailed contributions on the technical interventions set for specific steps of the conservation design. The translations of Cesare Brandi's theory and critic on restoration, the ICOMOS documents collecting the definitions of the decays, the diffusion of damage atlas and expert systems for the analysis of the state of conservation of the historical buildings are all valid examples of the diffusion of several devices for guiding the interventions by using a shared language and a shared methodology all over the world.

The educational experience offered by a technical university like Politecnico di Mi- lano is founded on the elaboration of different analysis on the historical building ad- dressed to a complementary study of the geometrical, material and historical characteristics of the historical building. The workshop is organized on a specific case study that offers the possibility to train the students on different aspects in order to refine their ability in considering the geometrical organization of the spaces, the used building technologies, the historical evolution of the complex, its state of conservation, its tangible and intangible values according to the final proposal for the reuse project.

The on-site workshop of the coordinated Preservation studios took into consideration a selection of historical buildings located in Vimercate, a town not too far from Milan, characterized by an historical center documented form the Roman age that underwent several transformations and is still characterized by noble palaces dated back to the XVIII centuries, surrounded by buildings belonging to different historical periods. The authors proposed a research on some of these buildings that lasted more than two years and the main results achieved during the academic workshops are presented in this paper.

2   The impact of the on-site workshop analyses carried out in Vimercate

The idea of a coordination among three studios on the same subject started in 2015 and anticipated the innovative teaching strategy now called digital twin lab. The three Preservation courses were organized on three different historic complexes identified in the historical center of Vimercate. This town is characterized by an interesting urban environment, with ancient churches, historical palaces now converted, or partially reused for public purposes. The center conserves the street pattern of the medieval structure of the town, actually deriving from the structure of the first Roman settlement, and several buildings are still occupying the sites of documented ancient nucleus.

Along the academic years, different researches were carried out by the coordinated workshops organized in Vimercate and the main topics can be summarized as follow:

- The S. Antonio Oratory and its stratigraphic interpretation.
- The disappeared defensive system of the center, with the monumental gates.
- The stratigraphic analysis of the medieval fortified bridge.
- The mensiochronological analysis of the bricks used for different buildings of the center [2]
- The relationships between the public streets and the facades of the historical building in the center.
- Some analyses of the ancient quarters of the center.
- The study of the reuse of the ancient hospital of the town, a large quarter hosting some historical buildings realized on the previous medieval settlement.
- The complex of Villa Banfi and the rests of the previous existing St. Francis convent.
- The researches on different topics of the main palaces of the center: Villa Sottocasa, the residence of one of the main influent family of the town, renewed along the XIX century, but founded on previous existing XV century structures, and Palazzo Trotti, the incomplete residence of the feudatory family of the town.

Some of the researches were used as base-study for developing graduation thesis. Actually, a master degree work was developed on a GIS system applied on Vimercate city center with the aim of enhancing the knowledge of the characteristics of the historical buildings and their characteristics, from historical, geometrical and technological point of view.

Among the others, one of the most evident impact obtained by the workshops is the constant control of the evolution of worsening conditions analyzed on the buildings selected for the on-site activities. Villa Sottocasa, a large monumental complex, par- tially converted into the local museum of the territory and partially in a semi-misuse condition, offers an interesting example for evaluating the results provided by the courses. It has been very useful, also to make students learn, to compare pictures from different times, showing the development of crack patterns, raising dampness and sur- face decays on mural paintings in the interiors. The students got the opportunity to focus on the analysis of single points, framing their interpretations in the understanding of the issues related to the whole building and its poor management model, but also in the progress of the recognition of values [4], as also historical and artistic knowledge has been deepened, increasing the awareness of the palimpsest of periods, which contributed to make the Villa what it is.

The example was therefore perfect to teach the complexity of architectural conser- vation as a discipline, then also as a lab, in which getting acquainted with scientific investigations and heritage management issues.

3   Fast investigations for materials and decays control

The workshop activity proposes a consolidated praxis that introduces the students to the use of advanced survey techniques: digital photogrammetry and laser scanner for the acquisition of dense point cloud. This is a fundamental step for the realization of some models of the assigned building and a useful training for combining traditional surveys obtained by direct measuring with innovative strategies. In parallel, the students start the classification of the materials observed on the surfaces of the building and focus on the interpretation of the building technologies that are composing the different structures. After these analyses, the students, organized in workgroups, have to detect and classify alterations and decays observed on materials and structures. As a support for these kind of analyses, thermography is carried out on some of the most representative portions of the building in order to investigate peculiar aspects of the main structures [3].

Thermovision is a completely non-destructive test allowing the characterization of large areas of a building by a thermocamera, a device set for the acquisition of the infrared emissions from the framed surfaces. The survey of the thermal radiations is influenced by the thermal conductivity (the capability to transmit the heat) and the heating capacity (the capability to hold the heat) of the material. In conservation field, ther- movision is used to observe the features of structural elements hidden by rendering or plaster. The information provided by thermographic tests can reveal the geometry of the masonry components and also the presence of defects such as discontinuities, detachments and lack of materials. The analysis of the thermal data consists in the interpretation of the function of surface temperature versus cooling time for selected areas which were previously heated naturally or artificially. Building elements composed by different materials (such as historic masonry or ceiling systems), when a heating transition is present, will show a different distribution of temperatures due to their different capability in transmitting and holding heat. The acquisition of thermal images by an infrared camera allows the evaluation of

temporal changes of the surface temperature distribution, in order to recognize the characteristics of the structure.

The thermographic tests applied in Villa Sottocasa constitute a valid example for qualifying the most extended decays on the facades (fig. 1). The technique can provide also a useful monitoring of the conditions of the parts of the building, like the wing hosting the museum of the territory, already restored.

Thermovision is also used for identifying moisture contents into masonry elements and interpreting the nature of the structures (fig. 2). In Villa Sottocasa, thermovision clarified that several vaulted systems are realized with a light timbering structure. Ap- plied into another building, Trotti Palace, seat of the Municipality, thermographic tests revealed a hidden structure: a masonry arch inserted into a wall (fig. 3) as reinforcing system of a massive vertical wall built over an underlying barrel vault that could not face its vertical load without the risk of serious deformations.
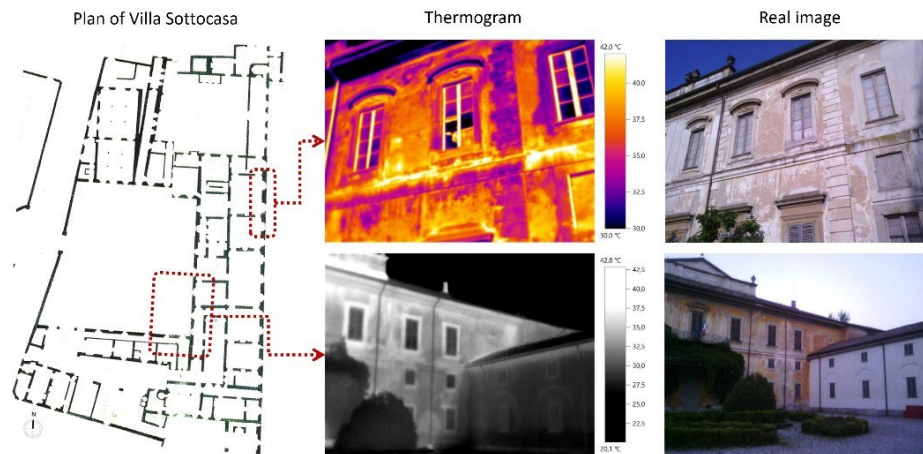
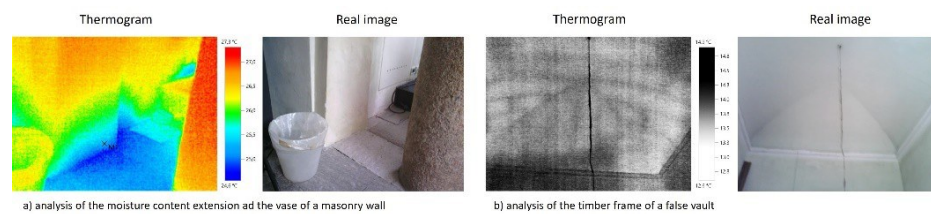**Fig. 1.** Examples of thermographic tests carried out in Villa Sottocasa

Fig. 2. Examples of different analyses carried out by thermographic tests: a) moisture extension and b) false vault timbering frame.
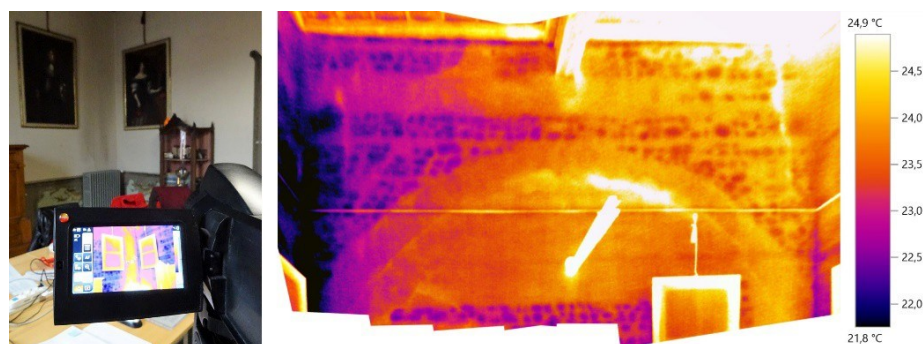
Fig. 3. Visualization of a hidden arch through thermograms mosaication.

Thanks to the fast characterizations obtained by thermographic investigations, those areas revealing peculiar problems, such as moisture contents, or peculiar aspects, like change in the hidden structure, in some cases were also further investigated by using other testing techniques, like radar (fig. 4), showing to the students the complementary use of non-destructive methods.

Fig. 4. Example of radar test applied for studying the extrados of a vault.

4   Community involvement by innovative didactical strategies: Vimercate Living Lab

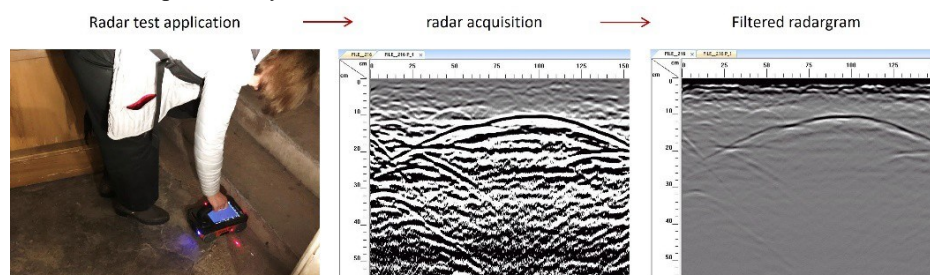The social media page of the coordinated preservation studios (fig. 5) was created for encouraging the contact of the students with the local people living and working in the historical center of Vimercate. It was used by the students for sharing their work activity during the on-site workshop and for describing the methodology followed during the different phases of the analyses. Also the teaching staff promoted the activities of the course by this website with the aim to activate the local population in order to catch their interest towards the history of the site and to stimulate cross-relationships among people that could provide information and proofs about the buildings assigned for the various workshops.
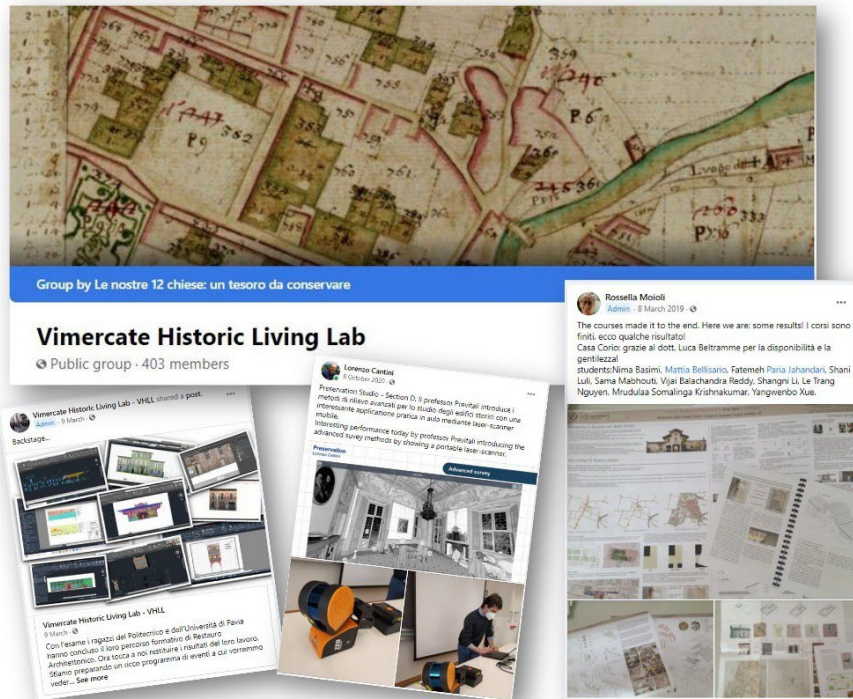
Fig. 5. Example of the posts used on Vimercate Living Lab webpage for promoting the activi- ties of the work-shops.

One interesting result was immediately obtained when a resident of Vimercate rec- ognized one of the monumental room of Trotti Palace where he worked several years before, during the 70s of the previous century, bringing an important testimony of a strengthening intervention that was here carried out. Infor- mation about the restoration works on the decorations of the palace, carried out during the 90s, are present in the public archive of the municipality. Other documents about recent interventions are still in the technical office of the Municipality and were not yet considered by the course. Thanks to the social media page of the studios, an important testimony about the consolidation of a floor, characterized by a serious damage, was finally achieved. The worker of the construction company wrote some information in the chat of the Vimer- cate Living Lab site and was invited to speak to the students. He described in detail the solution that was adopted in a sector of the palace for substituting the compromised timbering system of the first floor, without modifying the decorated planking constituting the ceiling of the room at the ground floor. With the aim of preserving the original thickness of the wooden floor, a resistant diaphragm was realized by inserting a corrugated sheet steel, over the planks forming the decorated ceiling of a room at the ground floor (fig. 6).
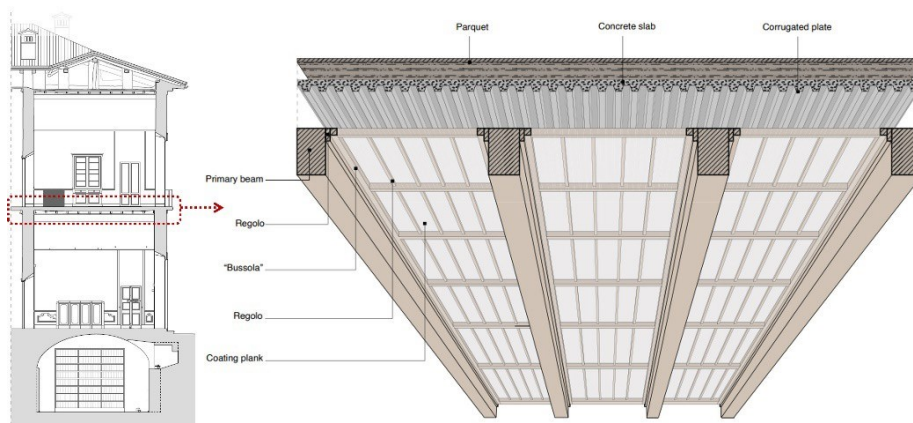

Fig. 6. Interpretation of a consolidated flooring system on the basis of the oral proofs provided by a member of Vimercate Living Lab social media.

5 Conclusions

In 2020 Vimercate workshops became one of the field-tests for the reflections on the recovery strategies for Heritage sector after the pandemic crisis: a very important topic[5], on which several scientific contributions are appearing in the various National contexts.

The experience of teaching and learning during the pandemic crisis has been defi- nitely challenging [6], forcing to exploit the knowledge background and the digital tools in order to keep alive at least some of the characteristics of these on-site laboratories. Therefore, even if the trip to Vimercate were restricted or cancelled, the supply of point- clouds, surveys and pictures to students enabled them to emulate the process of detecting, understanding, modeling the problems, proposing remedial actions and long-term strategies. On the other hand, social media platforms became a field, in which interactions with the local communities was still possible.

At the moment, it is impossible to be confident about the results. On one hand, the use of digital twins allowed to carry on teaching, with most of its contents, in spite of the restrictions; on the other hand, it is difficult to believe that this digital, that is mostly visual, experience could substitute the real taste of the direct five-senses exploration of the historic site. Nevertheless, it is very important to capitalize the making of this method, also for the purpose of enabling sharing workflows among teammates. The obvious conclusion is that an important goal of next steps will be the implementation of digital techniques to increase the value of the reality. In the alternative between Virtual Reality and Augmented Reality, the point of keeping Architecture over the limits of visual approaches is crucial. Students should learn that Architecture can't be understood only by images, nor by 3D models, but by use. That's why, working on site shall ever be a mandatory part, as well as today the implementation of digital tools is a mandatory part as well, and the two approaches need the most interoperable integration.

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Heritage Preservation Education for the General Public – The role of Hands-on Education

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Abstract. Heritage education for the general public by conservation experts is the key to success in preserving the world cultural heritage. An extended State- of-the-Art Review on educational activities for the general public on conserva- tion of cultural heritage (CCH) was undertaken as part of the European Project ELAICH (Educational Linkage Approach In Cultural Heritage). Its results have not yet been published. This article revisits some selected data from the conclusions of the Review, drawn up by the leading partner of the project, with a glimpse into some present aspects of heritage education, concentrating specifically on educating the general public in CCH.

Keywords: Heritage Education; Conservation of Cultural Heritage (CCH); Ed- ucation for Conservation of Cultural Heritage (ECCH); Heritage Preservation Education; General Public (GP); Non-Professional Audience (NPA).

1 Introduction

1.1 Heritage education

Heritage education is a wide area that aims to facilitate the understanding of and responsible approach to culture and heritage by the general public and contributes to diverse areas of education. Conservation of cultural heritage is an interdisciplinary and multidisciplinary field. Since the 20th century, general public has become gradually included and interested in heritage education and preservation (Cuenca-López 2021; Hunter 2021; Fontal & Martínez 2017; Moropoulou & Konstanti 2013; Eurobarometer 2017; Heritage education). These inclusive initiatives for the general public are mostly of two types: hands-on assistance of general public in actual conservation of historic sites; and heritage education of a more theoretical character. Though both types of activities differ significantly, they have a common objective: raising awareness of cultural heritage among the general public, with a view of instilling a careful approach to cultural heritage among the participants of these activities.

1.2 The main idea of the ELAICH Project

The Euromed Heritage 4 Project "ELAICH" (Euromed Heritage Project ELAICH - Educational Link- age Approach In Cultural Heritage - ENPI 150583) was specifically focused at educating the general public on the *values of cultural heritage, and challenges, principles and methods of its conservation*. Thus, target audience of the project was general public. Direct target audience of the project, in accord- ance with the EU Call for Proposals, was youth, namely - high school students. However, by its comple- tion, the project has developed a methodology, and an educational e-learning platform and toolkit for raising awareness of the importance of Cultural Heritage and its conservation by the general public, suita- ble for diverse types of audience (Lobovikov-Katz et al. 2014). It was used as a reference material on conservation of cultural heritage (CCH) for university courses, and in other frameworks. Furthermore, the ELAICH Project extended the accepted limits of connecting general public to cultural heritage: it

aimed and achieved basic research contribution by general public to preservation of cultural heritage, through a specifically developed scientific methodology (ELAICH Methodology). At the time of the project, conservation-related educational activities for the general public were mostly focused on hands-on activities, i.e., actual assistance on basic conservation works on historic buildings and sites, provided by the general public learners. The ELAICH Project allowed for the accessibility of inter- and multidisciplinary research in CCH to the general public learners, and allowed for "intelligent" or "intellectual" contribution of the general public to a basic collection and analysis of data on conservation state of historic sites.

1.3 Introduction to the ELAICH Project State-of-the-Art Review of Heritage Conservation Courses

Outline.

An extended State of the Art Review of educational activities on Conservation of Cultural Heritage (CCH) for the general public was undertaken by the ELAICH international research team in the first phase of the project. The Review focused at collecting and analyzing information on a large number of heritage conservation awareness courses for the general public with a dual aim in mind. First, it aimed to analyze the state of education on the conservation education for general public, to learn from good practices, to review tendencies. Second, it aimed at searching for an intellectual com- ponent of the course curricula; for verifying the uniqueness of the main idea of the project. The Review was designed to serve the specific objectives of the ELAICH Pro- ject, with regard to (1) type of the audience; (2) type of the courses.

Target Audience.

According to the ELAICH Project objectives, the Review focused on general public audience, or "Non-Professional Audience" (NPA). As defined by the project, non-professional audience means that the reviewed courses' participants should be non-professional in the field of conservation of cultural heritage, both before and after learning a reviewed course. They should not be conservation experts in any area. At the same time, they might have been skilled professionals or experts in other areas, e.g., they might have been architects, engineers, teachers. Thus, only awareness courses were considered, excluding courses for the general public which were targeted at their specialized education and training in CCH.

Types of Courses

The Review analyzed only the specific type of the courses, relevant to the project. Unlikely wide number of courses available about cultural heritage, the Review focused on the courses that introduced specifically Conservation of Cultural Heritage (CCH) to the general public. The Review also included the analysis of educational components of the courses.

Results of the Review of Courses on Conservation of Cultural Heritage for Non- Professional Audience (CCH-NPA courses) have not yet been published, and this paper outlines its main findings, with a view to their relevance to the present heritage conser- vation education for the general public.

2 Research Management and Structure of the Review of CCH- NPA Courses

2.1 CCH-NPA Review: General Data

The Review of Courses on Conservation of Cultural Heritage (CCH) for Non-Professional Audience (NPA) (CCH-NPA courses), was led by the coordinator of the project - Technion (Israel Institute of Technology). The criteria, plan, and parameters of the analysis of the Courses on Conservation of Cultural Heritage (CCH) for Non-Professional Audience (NPA) (CCH-NPA courses) were formulated before the start of the data collection. Questionnaire for collecting data on the Courses on Conservation of Cultural Heritage (CCH) for Non-Professional Audience (NPA) (namely: NPA-CCH Questionnaire), was developed by the project's PI (Dr. Anna Lobovikov-Katz, Technion), and technically adjusted by the ICT expert to enable computerized data collection and analysis. The Questionnaire was distributed to the ELAICH partner universities lead researchers and their teams: Prof. Rene Van Grieken (University of Antwerp); Prof. Antonia Moropoulou, Agoritsa Konstanti, Kyriakos Lampropoulos (NTUA); Prof. Jo-Ann Cassar, Roberta De Angelis (University of Malta); Prof. Guido Biscontin, Francesca Izzo (University Ca'Foscari), and other research team members. Data collection on CCH-NPA Courses was also contributed by Prof. Pilar Ortiz of University Pablo Olavide, Spain. Upon the completion of data collection by the ELAICH consortium, including Technion, it was processed and analysed by the Technion ELAICH team (Dr. Anna Lobovikov-Katz and Tali Chitaiad).

Each of the ELAICH partners was assigned several countries and international or- ganizations for review. In addition, collaborative programmes held in Europe were also reviewed. The number of courses was either the actual number of courses found in a country, or representative (in cases there was a large number of relevant courses in a specific country, and only several courses were submitted to represent the common trends in CCH/NPA in a country). The responsibilities on data collection were divided as following:

Table 1. Countries reviewed by ELAICH partners

ELAICH Partner	Country reviewed
University of Antwerp	Spain
	Belgium
	Poland
Israel Institute of Technology	Israel
	Russia
National Technical University of Athens	Greece
	USA
	Turkey
	Serbia
	FYROM

	Croatia	The review
University of Malta	Malta	of the state of
	Great Britain	the art was un-
	ICCROM	dertaken
University of Malta	UNESCO	through targeted
	Getty Conservation Institute	internet
	Council of Europe	searches and
	World Heritage Centre	personal inquir-
	OWHC (Youth on the Trail of World Heritage)	ies and inter-
Ca' Foscari University of Venice	Italy	views. Of more
	France	than five hun-
	UNESCO	dred courses re-
	ICOMOS	viewed by the

ELAICH Consortium, 281 courses were found to be of most relevance for ELAICH and included in the overall analysis by the Technion ELAICH team (Lobovikov-Katz et al., 2012). According to the task definition, those were courses on conservation of cultural heritage for non-professional audience (CCH/NPA courses). In some countries large numbers of CCH/NPA courses were found, and in other - just a few. In the countries with a large number of CCH/NPA courses, some partners have chosen to review a selection of the most typical courses and educational activities available. Therefore, the Review, its data collection, analysis and conclusions, traced the major trends in the field, and aspects applicable for the ELAICH project.

2.2   Structure of the CCH-NPA Questionnaire

Aims of the Questionnaire. As outlined in the Introduction of this paper, CCH-NPA Questionnaire aimed to analyze the state of education on heritage conservation educa- tion for general public, to learn from good practices, to review tendencies; and also to search for an intellectual component of the course curricula; for verifying the unique- ness of the main idea of the project, i.e.:

1. to analyze the state of education on the conservation education for general public, to locate its trends, needs and achievements;
2. to search for an intellectual component (if any) of course curricula, for verifying the uniqueness of the main idea of the project;
3. to learn from good educational practices

Overall Structure of the Questionnaire. The review targeted a clearly defined type of courses for a specific audience. Due to a large number of courses reviewed, along with ELAICH partner teams, exter-nal researchers were involved in data collecting. To clarify the tasks for all researchers involved ("data collectors"), the Questionnaire's guidelines explained the content requirements (e.g., how to identify the courses relevant to the ELAICH) and provided clear management and data processing-related instructions (e.g., with regard to unified labelling of Questionnaires). Each single Questionnaire contained data on a specific CCH-NPA course.

Besides the guidelines, CCH-NPA Questionnaire consisted of four parts:

A. Data collector info
B. Course: general info
C. Course: detailed info
D. Course provider info

Part A - Data collector info, included data on a specific researcher, university, contact details, and also "Person in charge". "Persons in charge" were partner researchers of the ELAICH project. In some cases data collector and partner in charge was the same researcher; however, in many cases data collect-ing was delegated to researchers which were not part of the ELAICH team. This structure of Part A allowed to easily locate, and, if needed, to correct, any detail on all courses.

Part B - Course: general info. This part included Course code; Course area; Course provider, and other data. (Fig. 1)

Part C - Course: detailed info. Part C provided detailed data on audience; course duration; course structure; topics and teaching methods. (Fig. 2)

Part D - Course provider info. Part D consisted of D1 and D2. D1 contained detailed information on

course provider, including the providing organization profile; involvement of other organizations (if any), and other data (Fig. 3). D2 contained con- servation-related (or not) profile of course instructor and other teaching stuff, and other information. (Fig. 4)

B	Course general info		
B1 Course code[2]			
B2 Course title			
B3 Course provider			
B4 Course area[3]			
B5 Course audience			
B6 Course location			
B7 When?	Permanent		
	Once		
	Once per[4]		
	Other		
B8 Active now?	No		
	Yes		
B9 Other			

Fig. 1. CCH-NPA Questionnaire: Part B Course: general info (© A. Lobovikov-Katz).

C	Course detailed info	
Course aim		
Audience CH background[5]	No	
	Yes	
	Specify	
Audience description		
Length (hours)		
Structure (hours)	Class	
	Lab	
	in situ	
	e-learning	
	Other	
Topics		
Teaching methods		
Free comments[6]		

Fig. 2. CCH-NPA Questionnaire: Part C Course: detailed info (© A. Lobovikov-Katz).

D	Course provider info						
D1	**Administrative: providing organization**						
Country							
Organization name							
Provider data[7]	Activity			Education		CH Preservation (CHP)	
			Non-CH	CH/CHP	Research	Other	Other
	Level	Internation.					
		National					
		Regional					
		Local					
		Other					
	Type	State					
		NGO					
		Private					
		Other					
	Education level	University					
		College					
		School					
		Other					
Free comment							

Fig. 3. CCH-NPA Questionnaire: Part D Course provider info: D1 Administrative: providing organization (© A. Lobovikov-Katz).

D2	**Teaching: course instructor[8]**	
Course instructor CH background	No	
	Yes	
	Specify	
Organization[9]		
Country[10]		
Course instructor	Name	
	Position	
Contact details	Email	
	Tel	
	Fax	
	Address	
Other teaching stuff		
Teaching staff CH background	No	
	Yes	
	Specify	
Free comment		

Fig. 4. CCH-NPA Questionnaire: Part D Course provider info: D2 Teaching instructor; other teaching staff (© A. Lobovikov-Katz).

Data collected by all ELAICH partners was reviewed by the Technion team, and, upon approval, data available from up to 281 of 523 courses was processed by the Technion. The results of computerized analysis brought to conclusions. The following chapter summarizes their findings.

3   The Review of CCH-NPA Courses: Conclusions

3.1   CCH-NPA Review

The Review of Courses on Conservation of Cultural Heritage for Non-Professional Audience was led by the coordinator of the project - Technion (Israel Institute of Technology). It was carried out in 2009. Educational activities on conservation of cultural heritage (CCH) for the general public (non-professional audience - NPA) have undergone changes in the past decade, e.g., in Israel, there was a significant growth in the number of courses, while the main course-content trends remain much the same. At the same time, at some major heritage authorities in this country, conservation of cultural heritage has claimed a more important place, both with regard to actual conservation activities, and to educational introduction of heritage conservation to the general public provided by these bodies. Retrospective of the situation in this area is instrumental for understanding of the contemporary trends, and for a future development of heritage conservation education for the general public. This chapter of the paper presents some of the main conclusions of the Review as analysed and summarized in 2009 by the ELAICH Technion researchers, based on findings by all ELAICH partners, including Technion (Lobovikov-Katz & Chitaiad 2009).

The number of CCH/NPA courses varied widely amongst the different countries re- viewed. It seems that the number of courses in 2009 was closely related to conservation traditions and to the history of conservation in each of the countries, as well as to the level of interest and awareness to, and understanding of the importance of the subject of conservation in the various countries. Thus, the more developed the level of aware- ness of cultural heritage in a country, the larger number of courses in CCH was provided.

3.2   Course providers

Course providers' data was accumulated in Part D of the Questionnaires. In countries where there was abundance of CCH/NPA courses, there were also a wider variety of types of course providers, both public, such as universities, research centers, NGOs, public councils, as well as private organisations such as art centers, private colleges, etc. In those countries, like GB, France, Italy, and the USA, a considerable role be- longed to NGOs in providing CCH/NPA courses. In Greece the most common type of provider was the government (Ministry of National Education and Religious Affairs). This might have been indicative of the high level of awareness for cultural heritage conservation and preservation in Greece. In countries less prolific in courses, the variety of providers was limited. Thus, for example, in Israel, about 18 CH/NPA courses were found altogether in 2009, and most of these courses were provided by universities. The rest (2-3 courses) were provided, e.g., by a public council. In Malta most of the courses were given by the Institute of Conservation and Management of Cultural Heritage (ICMCH). Fig. 5 represents the relation between the types of the course providers and the number of courses.
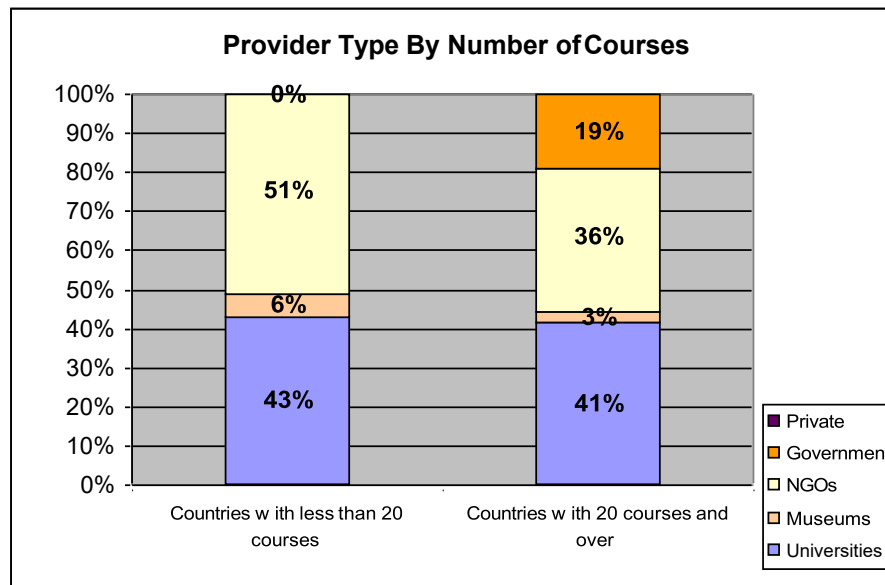
Fig. 5. Course Provider Type by Number of Courses (© A. Lobovikov-Katz).

3.3   Structure of the Courses

Data on the courses' structure was collected in the section "C" of the CCH-NPA Questionnaires. Most of the courses were structured in the traditional class format. Significant number of courses combined class and laboratory; less courses consisted of on-site activities only. Only one course combined the entire spectrum of course' components: class, lab, in-situ, and e-learning. There was an inverse correlation between the level of complexity in the structure of the course and the number of the courses using it, i.e., the more complex a structure was, the less courses with this structure were likely to be found. Fig. 6 represents data collected on the relation between courses' structure and their quantity.
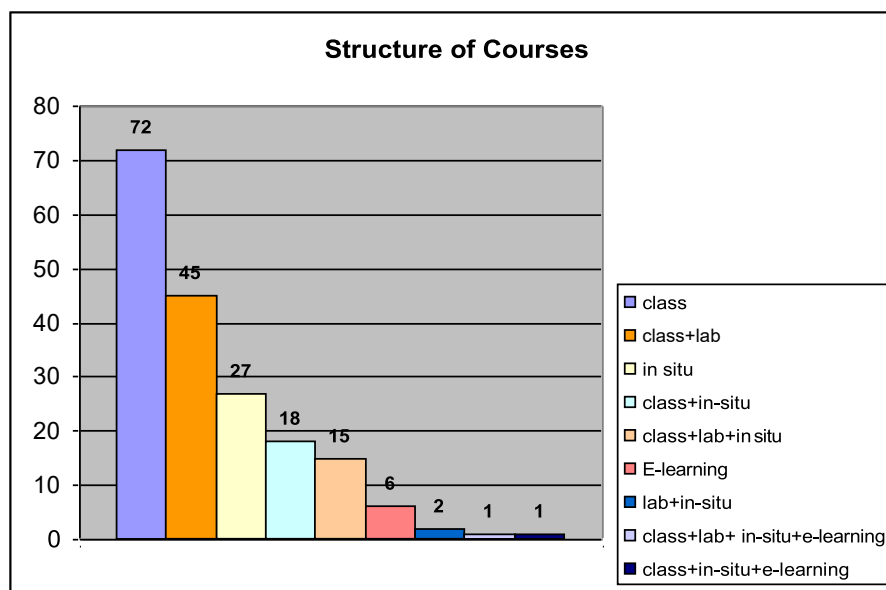
Fig. 6. Structure of the Courses (© A. Lobovikov-Katz)

3.4 Relation between course provider, area of the course, course topics and teaching methods

In the countries where less courses were located, the courses were given by fewer main providers, mostly - universities, and the courses had more general introductory topics. These courses were given within departments of related areas such as geography, interior design, and architecture; and employed traditional teaching methods such as lectures and case studies discussions. However, there were a few courses, with a more specific topic even in this framework, which employed more innovative teaching methods (e.g., the 'Studio' courses provided by the Academy of Design, Haifa (today: The NB Haifa School of Design and Education); other). In countries with a large number of courses, embedded in a strong culture of conservation, there was a larger variety of providers, a larger variety of courses, and various teaching methods (see also section 3.5). A special role was played by international organisations: in addition to their activity in the European countries, where, for the most part, awareness of preservation of cultural heritage was not a new issue, the international organisations provided attractive courses in countries with a less developed culture of conservation and were thus ful- filling their mission of increasing levels of awareness of cultural heritage and its preservation (e.g., ICCROM course in Tunisia; and UNESCO course in Petra, Jordan).

3.5 Course Providers

In general, there was very little collaboration between institutions as to providing a joint course. From the 281 courses documented, only 18 were joint courses with the following distribution: Israel-3, International courses-8, Great Britain-4, Greece-3. These collaborative courses seemed to be carefully thought of and planned. They usually employed innovative teaching methods and used various advantages of each of the partners, thus each and every partner brought its own expertise and knowledge, and all partners together wove it into an innovative and exciting educational fabric. In addition, as some may have more experience with certain subjects, such collaboration brought about both educational and economic benefits. Furthermore, each organisation was able to promote the course to its constituencies, and a collaborative effort could yield more fruits. Fig. 7 illustrates the ratio between single and multiple course providers.
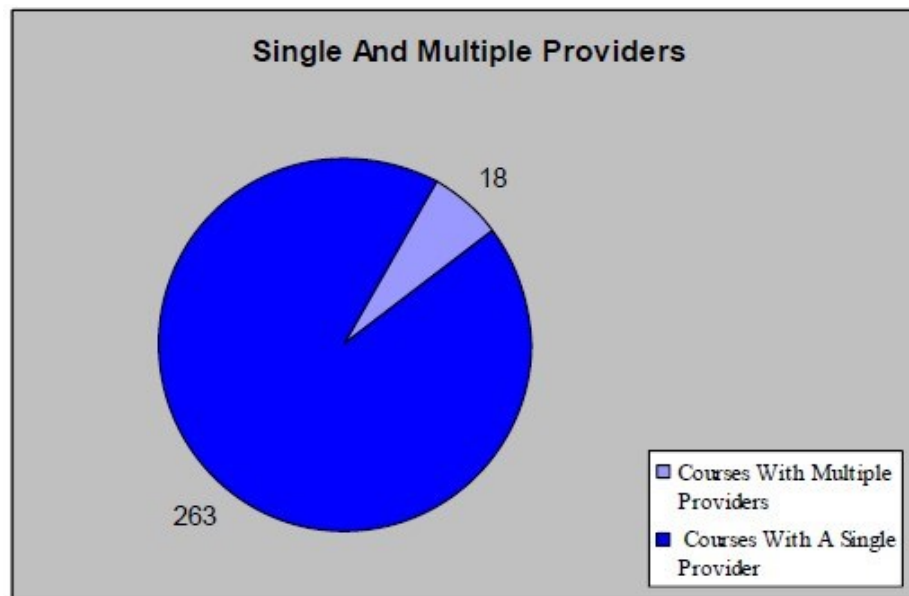
Fig. 7. Single and Multiple Course Providers (© A. Lobovikov-Katz

3.6 Teaching Methods Versus Course Audiences

General Trends. Analysis of CCH-NPA Questionnaires brought to formulation of sev- eral main trends:

- Courses, which targeted younger audiences, applied more innovative trends in the teaching approach, including, e.g., interactive and creative work; hands-on activities; project-based learning; e-learning, and other.
- About 50% of the courses provided by multiple providers used innovative and attractive teaching methods.
- Countries with a larger number of CCH courses also counted a larger part of innovative teaching methods included in courses, e.g.: while in Israel about 7%-14% of 18 courses reviewed used more innovative methods, in Greece 60 out of 140 courses reviewed (44%) used innovative teaching methods.
- There was also a correlation between innovative teaching methods and the international institutions: 10 of the 16 (63%) international courses reviewed applied innovative teaching methods.

3.7 Selected Innovative and attractive teaching methods at CCH/NPA courses targeting young audiences

Students' engagement. Students were engaged in interactive activities tailored for specific learning outcomes. Such activities usually included an initial tuition phase (e.g., lectures), required to introduce basic concepts and terminology (i.e., tools for implementing the activities). In the courses provided by international organisations (UNESCO, ICCROM, Getty Conservation Institute, OWHC, Council of Europe, World Heritage Centre), students were assigned active role during the learning process. E- learning platform was considered a valuable asset for its great potential for interactive resources.

Course materials. Course materials were based on excellent visuals: lectures included simple diagrams, a large number of photographs, use of video clips (e.g. filmed interviews with experts, youth or other stakeholders involved in the field, filmed demonstrations, etc.), 3D reconstructions, animation, etc. Interactive worksheets and/or quizzes were usually used during activities to encourage discussion. A wide range of interactive digital resources could be found in museum websites as educational tools to engage youth.

Teaching packs. Besides providing material useful to implement the project/course (e.g. worksheets for students), "teaching packs" provided guidelines for teachers (e.g. list of tasks that needed to be carried out before implementing the activity, list of materials required, etc.), basic information useful for the course (e.g. history of a site, definitions of conservation, CH, etc.), and ideas on activities to be implemented (generally more than one option was provided to adapt to different needs). (E.g., courses provided by the Council for Conservation of Historic Sites in Israel and also a course by The Avi Chai Foundation and the Zalman Shazar Center for Jewish History).

Cross-curricular activities. There was a noticeable effort/tendency to develop the course/activity content and structure as part of school curriculum, with an emphasis on cross-curricular activities. This was particularly evident in short activities implemented in museums and historic sites, but could also be found in medium or long courses/pro- jects. This approach could significantly benefit from multi- and interdisciplinary char- acter of the field of conservation of cultural heritage.

3.8 Course, student, and a historic site

Connection between a course, a student and a historic varied significantly among the courses.

Course content and historic sites. Content of some courses was built around a specific historic site, e.g., introductive part, as study tours on site. This helped to connect students to their local cultural herit- age, and also facilitated educational process though exemplification of learning material on actual his- toric site.

Courses and preservation of historic sites. Several types of activities could be out- lined, with regard to an immediate contribution of CCH/NPA course to preservation of historic sites, as based on infor- mation provided by the ELAICH international team.

- Course/Projects/Campaigns aimed at increasing awareness of local CH and of its protection usually adopted a "catchy" project/course name for inducing in the course participants a sense of ownership of the heritage (site/monument).
- Actual preservation activities on historic sites were part of or a sole content of many courses.

Students and cultural heritage. Diverse courses instilled diverse approaches to preservation of cul- tural heritage. Courses, defined as "Studios" introduced specific sub- jects which differed from introduc- tory CCH courses, and should be specially men- tioned. Those were mostly university courses, and in some cases, they combined prac- tical implementation alongside theories; their lesson plans were more varied, and they utilized more unique teaching methods, which derived from architectural and design education, and included e.g.: research conducted by students, hands-on practice, team- work, planning sessions, presentations, etc. Those were actually architectural design studios, based on examples of his- toric buildings. This practice has undergone little change during the past decade (e.g., in Israel), and it has both advantages and disad- vantages, the latter originate from the lack of an educational background in CCH un- derstanding prior to the design studio, including lack of awareness and understanding of heritage conservation challenges and principles by students.

Specific examples of course activities could be mentioned, e.g.: in Greece, many of the courses target- ing youth, provided by the Ministry of National Education and Religious Affairs, used more attractive teaching methods and aimed at the development of creative procedures, which promoted cultural herit- age. Through the programme, students evaluated cultural achievements and comprehended the meaning of cooperation. The knowledge of the past became the motivation for new creation and students became active citizens and part of the cultural creation.
Other worth mentioning courses in Greece were provided by museums. Among the activities were:

- Tours of the museums and observation of exhibits
- Identification of characteristic features of art and culture
- Reviewing the relationship between religion and Greek culture, etc.
- Use of visuals such as slides and maps
- Trips in the monuments in the footsteps of Greek greats. (as preparatory, stu- dent read related texts, learned the history and context of the period)
- Simulation of the process of building temples, the most important building type of ancient Greek architecture. During the programme, students built, little by little, their own ancient Greek tem- ple. They became ancient Athenian citizens, architects, sculptors and craftsmen, and they par- ticipated in both the decision making and the building process.

3.9 "Intelligent" In-Situ Work/ Learning

One of the main targets of the ELAICH project was to develop the "intelligent" in-situ work- learning (which was successfully fulfilled by the completion of the project). "Intelligent" in-situ work means that the in-situ work itself would be focused on intellec- tual work, such as understanding, analysis, survey, and not focused on manual work; the latter was and still is currently the practice in many CCH/NPA educational activities. The review that was conducted reaffirmed our work assumption that there were

only very few courses, which used "intelligent" in-situ component, and that this aspect definitely needed enhancement, which ELAICH sought to do. Out of the 281 courses reviewed, only six included an "Intelligent" in- situ work (one in Israel, two in the USA, three in Greece). Fig. 8 shows the ratio between courses, which included "Intelligent" in- situ work, and those which did not.
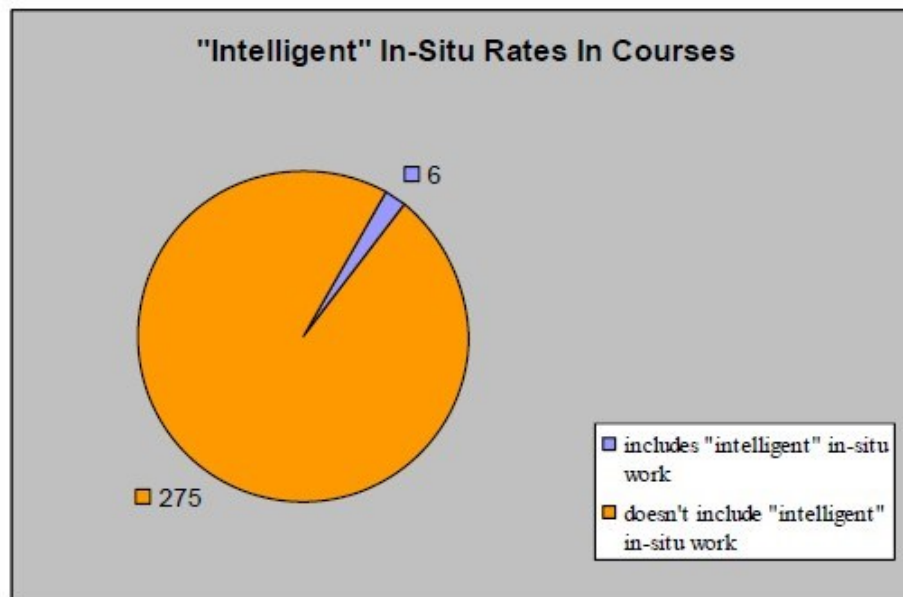

Fig. 8. Intelligent In-Situ Component in Courses (© A. Lobovikov-Katz).

3.10   Distance Learning / E-Learning

In 2009, when the Review was conducted, only nine courses out of the 281 used distance learning platform. Significant changes occurred in this direction. The number of distance learning activities has grown tremendously in 2020 - 2021, the years of the Covid-19 pandemic. These changes should be analysed, while a distinction should be made between distance learning and e-learning. The graph (Fig. 9) illustrates the ratio between courses, which included distance learning platform, and those which did not, as per 2009.
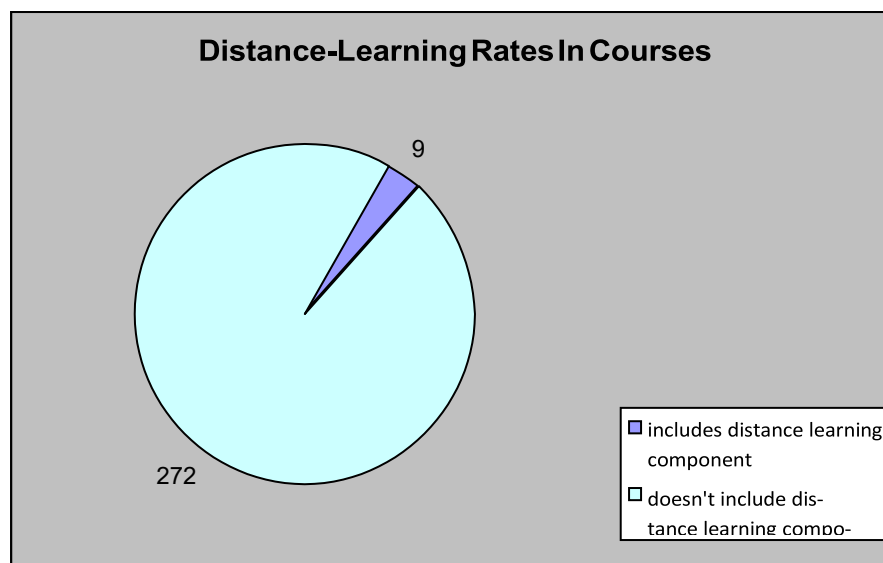
Distance-Learning Rates In Courses

9

272

☐ includes distance learning
component

☐ doesn't include dis-
tance learning compo-

Fig. 9. Distance-Learning Component in Courses (© A. Lobovikov-Katz

4 A Glimpse into the Selected Aspects of Present Education for Conservation of Cultural Heritage for the General Public

A glimpse into the present CCH-NPA education shows certain changes in overall approach to and content of CCH-NPA educational activities. For example, a very significant growth in overall number of heritage courses, and of those provided by a cooperative effort of multiple course providers, are a significant change in heritage education in Israel in recent years. Since the three main heritage authorities in Israel (Israel Antiquities Authority - IAA; Israel Nature & Parks Authority - INPA, and the Council for Conservation of Heritage Sites in Israel) are required by law to promote heritage education, they held, often collaboratively, many hundreds of educational activities for the general public. However, though larger than in 2009, still only a relatively small part of heritage education activities seems to be dedicated to conservation of cultural heritage at present. Israel Antiquities Authority's educational focus is on archaeology, hence, of hundreds of educational activities provided by IAA, only few types of activities presently include conservation, with a focus on actual participation in conservation. The Council for Conservation of Heritage Sites in Israel shows a very different picture. The Council was founded in 1983 by the Ministry of Education. Overall number of educational activities provided by the Council, has grown significantly since 2009, from few educational activities, to more than a hundred per year, and they all include conservation theme in their content. Furthermore, they also include an investigative part, which in some courses reminds to some extent the "intellectual" component of the ELAICH Project. However, while the ELAICH e-learning Toolkit and Methodology enabled active learning and contribution of NPA students to the basic data collection and basic analysis on historic sites, the Council for Conservation students mostly conduct archive research and collect historical data about specific historic sites, but not on conservation state of the sites.

In 2009, there was very little collaboration between institutions as to providing a joint course. From the 281 courses documented in different countries, there were only 18 joint courses. In the last decades this situation has changed, e.g., in Israel, all main heritage authorities - course providers, collaborate in many courses. Since the Review showed a positive educational and awareness impact on courses given as a joint initia- tive of several providers, this might be a significant point for a further review.

Another important feature of the present heritage education in Israel, is the inclusion of practically all groups of general public in educational activities. These include schoolchildren of all age groups, from primary school through high school, pre-military preparatory educational frameworks, university students, tourists, local population. Many educational activities, e.g., "Adopt a site", focus at connecting local public, di- rectly, or through educational establishments, to historic sites in their vicinity, and aim at educating them for learning about and taking care of historic sites in their town, vil- lage, neighbourhood.

Digitization of cultural assets and learners' experience was on its way in 2009 and has been further developed in recent years. Museums often stand out in this process, some of them have played leading role since the early 2000-s (Monteagudo-Fernández et el. 2021; Hazan 2011; Hazan & Lobovikov-Katz 2017), and their experience should be further examined for its targeted application to education of the general public for conservation of cultural heritage.

5   The importance of hands - on education through the use of NDTs

Through hands-on education, trainees have the chance to learn and acquire a deep understanding of the concepts theoretically taught at lectures' level by applying this knowledge in a tangible way. The use of non-destructive testing is an important tool that can be utilized in hands-on approach of cultural heritage education, giving the chance to trainees to learn by doing on site with the use of high-measuring techniques, where significant results are revealed at real time on site.

Non-destructive testing approaches are widely used for minimal invasion as they can provide important data regarding the current state and response of the monument. The combination of non-destructive techniques is nowadays a common practice for diagnostic maintenance and monitoring purposes, highlighting NDT as an ideal tool to determine pathology before any interventions and assess and monitor the effectiveness of applied conservation and restoration interventions. NDTS have also an important role in the decision-making process during dynamic situations, such as throughout the progress of rehabilitation works conducted on complex monuments (Alexakis et al. 2018). NDTS are extensively used in hands-on education in the framework of NTUA Post Graduate Master Program "Protection of Monuments", revealing the value of interdis- ciplinarity in understanding in a better and a more holistic approach the theoretic knowledge gained in class through the collaboration of various disciplines for obtaining integrated results.

Fig. 10. Work in situ and in labs, presentations, educational visits of students (Efesiou et al., 2018)

Additionally, as another example of NTUA Research Team experience, through the use of ground penetrating radar, in combination with historical, architectural and geometric documentation, trainees can acquire information about the structural layers and state of preservation of cultural heritage assets and infrastructures (Alexakis et al. 2018), (Daniels 2004), (Jol 2008)
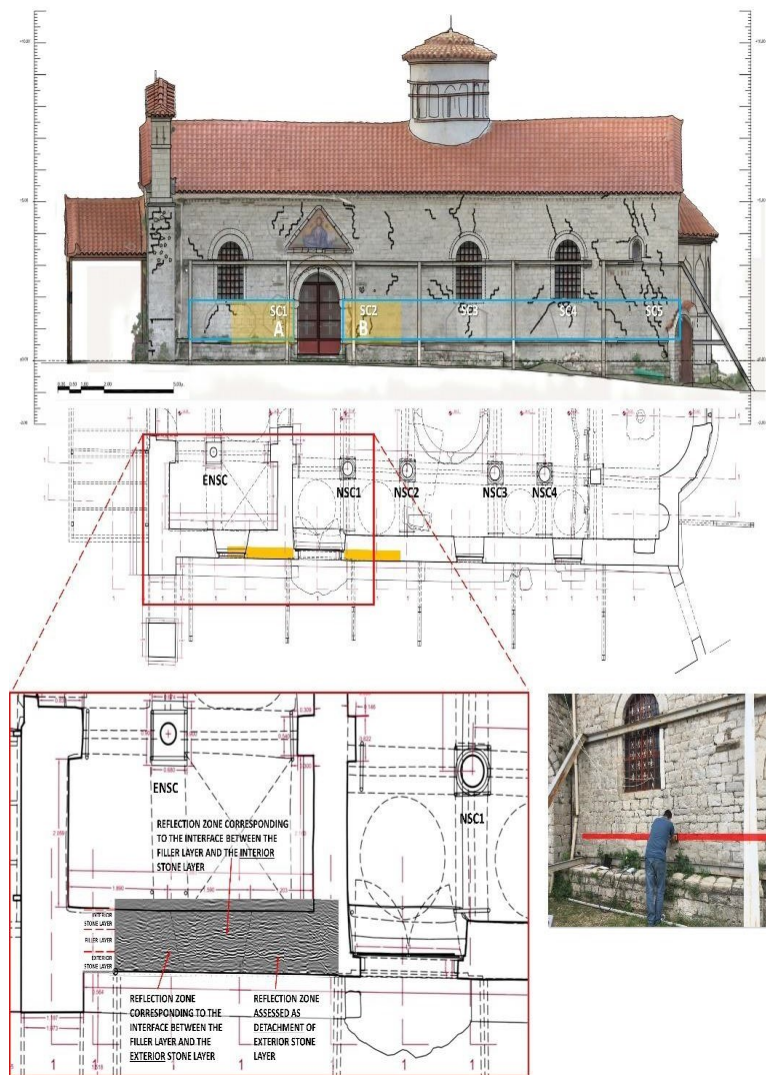
Fig. 11. GPR prospection at the south masonry of the Katholikon. The radargram de- picted overlaid on the plan of its corresponding area, shows indications of detachment of the exterior stone layer from the filler layer. The af- fected areas are depicted with yellow-color (Keramidas et al. 2021)
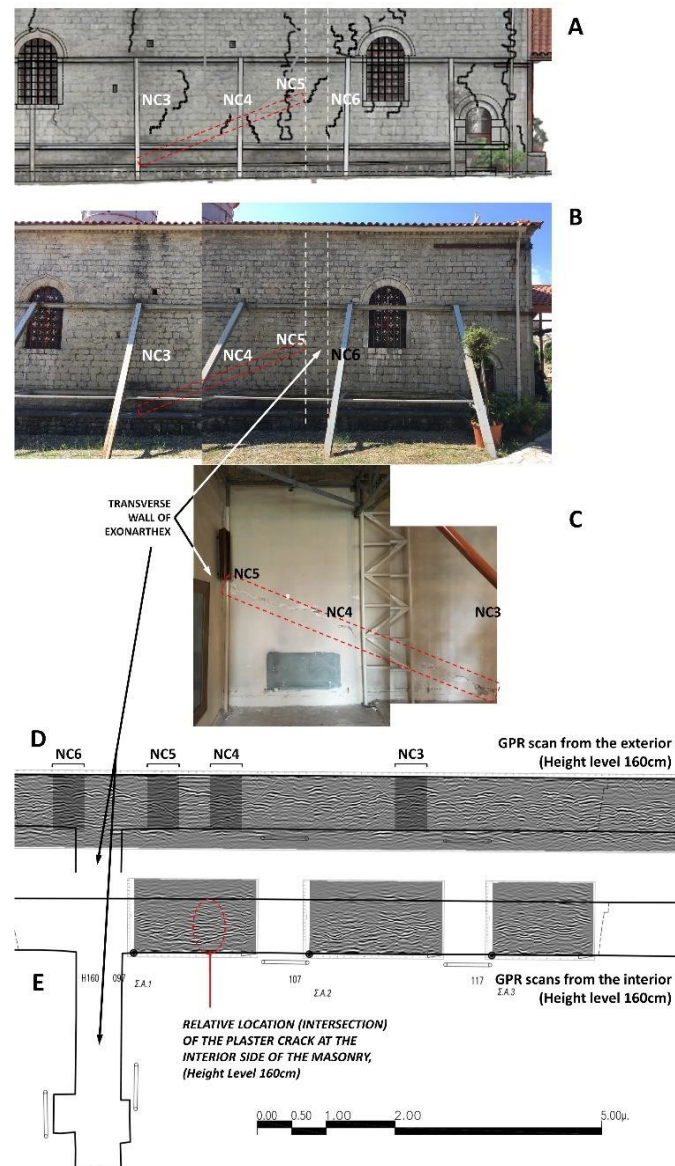
Fig. 12. Assessment of the state of structural cracks in the western segment of the north masonry of the Katholikon and their correlation with the documented diagonal crack at the interior of the nave. A. Location of the cracks on the north view of the Katholikon. B and C. Photos of the actual area. D. Segment of GPR scan from the exterior surface of the masonry. E. GPR scans from the interior of the masonry. D & E overlaid on the plan of Katholikon (Keramidas et al. 2021)
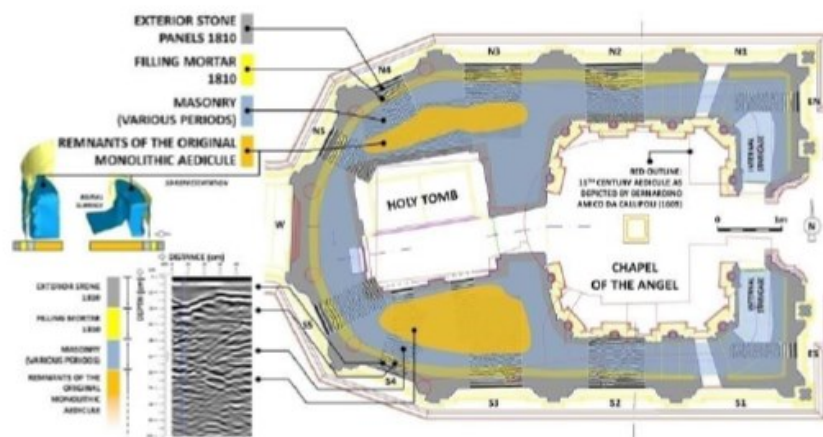
Fig. 13. GPR revealed the internal structure of the Holy Aedicule. Gray: stone fa- cades, yellow: filling mortar, blue: masonry, orange: Remnants of the original mono- lithic Aedicule (Holy Rock) (Alexakis et al. 2018)
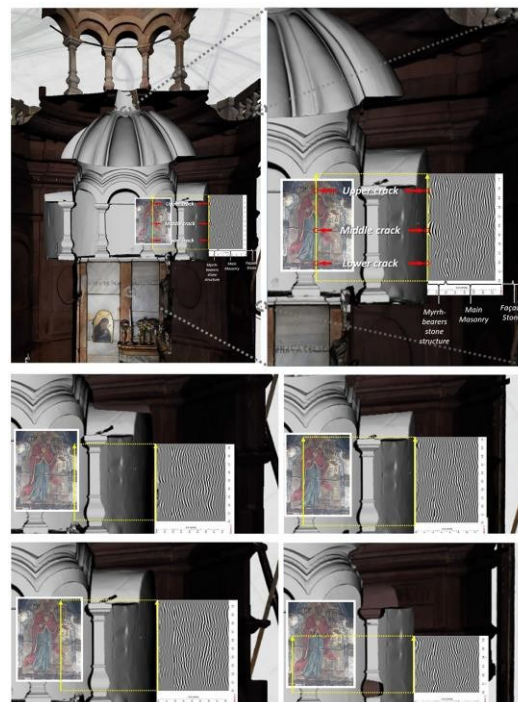

Fig. 14. GPR survey on the Virgin Mary wall-painting, prior to interventions. Upper left depicts the cross-section of the Aedicule at the center axis of the Virgin Mary painting. Upper right shows the main findings and the layers revealed, lower four images depict the other four GPR scans at this painting. (Alexakis et al. 2018)

6 Conclusions

Review of hundreds of courses on conservation of cultural heritage (CCH) provided for the general public, (non-professional audience - NPA) (CCH-NPA courses) in Europe and beyond, undertaken at the first stage of the European project ELAICH (Educational Linkage Approach in Cultural Heritage), systematically analysed data, with regard to many aspects of the courses, including organizations, teaching methods, courses' structure, audience, as of 2009. The Review provides a retrospective resource, and might be an asset for a deeper understanding of the development, present trends and reviewing perspectives of heritage education, and specifically - education for understanding the values of cultural heritage, and challenges and principles of its preservation by the general public. The Review methodology and tools could be useful for a similar analysis of the modern situation in this area.

The specific focus of the ELAICH Project on introducing Conservation of Cultural Heritage (CCH)

to general public derived from the idea that understanding Conserva- tion demanded for a deeper and better understanding of the cultural heritage, than a generic heritage education, thus, allowing for better educational outcomes and heritage preservation capacity of general public learners. The idea was verified by the results of the learning process with the use of the ELAICH Methodology and educational Toolkit by the end of the project.

Besides the innovative changes in education in general, and heritage education and conservation of cultural heritage in particular, innovative teaching methods have emerged following the urgent demand for online learning since the start of the Covid- 19 pandemic in 2020, which has brought to qualitative and quantitative metamorphoses in education on all levels, for diverse types of audience.

Research innovations in conservation of cultural heritage, including advancements in research and data collection methods and technologies on historic sites, provide new opportunities for involvement of the general public in heritage conservation, as based on the ELAICH Methodology, including digital applications, combining tangible and intangible in learning (Lobovikov-Katz et al. 2014) and onsite-online shuttle learning (Lobovikov-katz 2015).

Hands-on education gives the chance to trainees to acquire deep understanding of complicated multi-disciplinary concepts in cultural heritage preservation and protection field, making use of non-destructive techniques at real time on site.

Reviews undertaken in the recent years add important data on heritage education for general public (Fontal, 2016; Castro-Calvino et al. 2020). However, a specific focus on education for *conservation* of cultural heritage seems to remain a predominantly ELAICH feature. A new review of recent development of CCH-NPA education with a view of heritage education in a wider sense, might provide an important data for defining the future goals and strategies for the development of heritage preservation education. Combining the ELAICH Methodology with the results of recent research and development in the field of conservation of cultural heritage, and in education and heritage education, might allow for the develop-ment of powerful tools for active involvement of the general public in conservation and preservation of cultural heritage.

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ICT tools in Designing Preschool Educational Activities on Historical Events

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Abstract. Digital technology is advancing at a rapid pace today. During the Covid-19 pandemic, the forced transition to e-learning promoted non-traditional work practices and time-sensitive tools. In Greek universities, like in most parts of the world, the lockdown changed curricula and lecturers responded by modi- fying course designs. Different academic disciplines and specific topics began to be delivered in different ways using the non-traditional teaching approaches of microlearning. In this study, conducted during the 2021 spring semester, we re- viewed the digital material that under-graduate students studying to become teach- ers had prepared as part of their ICT course. One hundred seventy students com- pleted their teaching internship reports with the help of digital infrastructure and ICT tools. The students were asked to deliver a preschool lesson addressing the historically significant topic of the Greek Revolution of 1821. Participants used 90 different ICT tools, lying in 5 categories: web search engines, social media, game-based learning platforms, collaboration plat-forms and task-specific tools. These ICT tools had different functionality, as some helped to create digital ma- terial, some helped to edit it, while others served to transmit it through online communi-cation channels. Digital material and ICT tools can enhance and support educational experiences by providing various pathways to overcome the possible disruptions caused by the Coronavirus Era.

Keywords: ICT Tools, Digital Material, Digital Infrastructure.

1 Introduction

With each passing day, there is a growing demand for information, resources and materials to be made available in digital form to assist with humanity's various activities in different domains and world regions [1-2]. Digital material is content accessible usually by computers. It can be born-digital, i.e., originally designed digitally, such as a web page, or converted to digital through digitization, like a printed page that was scanned using an electronic infrastructure [3]. To digitalize means "to change some- thing, such as a document, into a digital form, that is, a form that can be stored and read by computers" [4].

Digital technology is advancing faster than any innovation in our history, according to the United Na-tions e-resource [5]. Digital documents, literature and art, photographs and e-books are replacing the fa-miliar conventional storage media that mankind has been using for centuries. A significant share of dig-ital materials has special value, and therefore must be protected and preserved for current and future generations [2, 6]. Digital heritage may exist in any language, in any part of the world, and in any form of expression the creator chooses to make it applicable to the relevant industry [2, 6].

Information and communication technology (ICT) tools provide varied digital ma- terial forms. This term often refers to various digital tools, such as software or applica- tions that can be used for different purposes [7]. Each ICT tool has one or more func- tional tasks: file creation (e.g. video, audio), editing (e.g. texts, images), data transfer, etc. [7]. Other sources in the scientific literature define ICT tools as digital infrastruc- ture, such as personal computers, laptops, tablets, printers, scanners, interactive white-boards, etc. [8]. However, the most comprehensive definitions of the ICT tools term include technologies, devices and interaction concepts [9].

The role ICT plays in education today is emphasized by researchers [10-12] and leading institutions.

The United Nations Educational, Scientific and Cultural Organiza- tion (UNESCO) is the leading global agency responsible for providing good practices and guidelines for ICT use to disseminate knowledge at all levels [13]. In the face of the Covid-19 pandemic, UNESCO has facilitated the teaching and learning resources distribution to support educators and students [14]. Similarly, a list of national learning plat- forms and ICT tools was published [15]. These platforms were launched by the Ministry of Education, including online books and TV programs aimed at students in Greece [15]. The implementation and use of ICT tools in the educational context offers new educational pathways. In particular, the ability to create and distribute digital ma- terials away from the classroom facilitates the development of non-traditional work practices such as microlearning [16-17], project-based learning [18-19], and the flipped classroom approach [20-21]. The teaching and material design scenarios across various academic disciplines in uni- versities, schools and kindergartens around the world have become problem-oriented [22-24].

The aim of this study is to examine the digital material prepared and used by pro- spective teachers, in their placement experiences, during their undergraduate studies, when teaching history to preschool- ers. The study intends to identify the preferred ICT tools participants used in preparing and delivering digital materials related to history.

2 Materials and Methods

2.1 Design and participants

At the University of Ioannina, Greece, the entire academic year was delivered online due to the social distancing measures imposed by the Covid-19 pandemic, since the start of the lockdown until now (at the time of writing this paper). All lecturers and students continued to engage in collaborative work on the Microsoft Teams business communication platform.

In the e-learning environment, the University's Early Childhood Education Depart- ment lecturers offered students a variety of different approaches to master deep knowledge and understanding of the curriculum they participated in. This study is based on an undergraduate ICT course that applied the mi- crolearning approach. The micro- learning approach assumes that the learner step by step acquires some skills and knowledge within a short period of time [25], moving towards micro perspectives on and the significance of micro dimensions in the process of learning. A structured plan, time, content, mediality and teaching materials are of particular importance to this ped- agogical practice [25].

Students in their 3rd year of studies, studying the spring ICT module, were asked to develop a lesson plan on the historically and socially relevant topic of the Greek Rev- olution of 1821. This was the lesson topic that the preschool teachers-to-be had to pre- pare and present as part of their placement with pre- schoolers. The lesson contents had to be structured in such a way as to be easily understood by the young learners, empha- sizing micro-content in small timeframes. The preschoolers could be introduced to any aspect of the Greek Revolution: famous personalities, significant events and the War of Independence causes or consequences.

One hundred seventy participants gave their consent to complete the task and share their assignment reports in platform-relevant formats to the appropriate module channel on Microsoft Teams. Ethical im- plications were met and participants were made aware of their right to withdraw, anonymity and confi- dentiality.

2.2 Data analysis

The student-prepared digital material were presented in DOC and DOCX (Microsoft Word files), PPT and PPTX (PowerPoint), PDF (Adobe), MP4 (video files), and JPEG and PNG (image formats). These formats are available in preview mode (web view) in the Microsoft Teams relevant group channel.

Data analysis was based on descriptive statistics.

Students' reports were classified based on the list of digital infrastructure engaged in their work and the list of the ICT tools used based on popularity and functionality.

3 Results and Discussion

The number of the ICT tools used by the participants when preparing for and delivering the lesson were 90, with mean = 9.4588235; median = 10; mode = 10. These different ICT tools referred to 5 categories: web search engines, social media, game-based learning platforms, collaboration platforms and task-

specific tools (Table 1).

Table 1. A complete list of the ICT tools identified during the study.

ICT tool name	ICT tool type	Number of references by students
YouTube	Online video platform	163
Google Search	Web search engine	146
Pinterest	Social media platform	143
Kahoot!	Game-based learning platform	123
Microsoft PowerPoint	Presentation program	116
Wikipedia	Online encyclopedia	107
Jigsaw Planet	Game service	90
Padlet	Knowledge management service	80
Canva	Graphic design platform	65
Skype	Videoconferencing platform	51
Wordwall	Game-based learning platform	51
Google Maps	Web mapping	45
Microsoft Word	Word processor	44
Facebook	Social media platform	37
SlideShare	Slide hosting service	30
ThingLink	Interactive media editor	20
Google Drive	File hosting service	19
Instagram	Social media platform	19
Tux Paint	Raster graphics editor	17
Gmail	Webmail	16
Edmodo	Social learning network	14
Microsoft Sway	Presentation program	11
Google Forms	Web survey	10
Piktochart	Infographic software	10
Cisco Webex	Videoconferencing platform	9
Google Scholar	Bibliographic database	9
Prezi	Presentation collaboration	8
Vimeo	Video hosting service	8
WordArt	Online art creator	8
Google Docs	Word processor	7
MyPuzzle	Game service	6
Edpuzzle	Assessment-centered platform	5
Microsoft OneNote	Notetaking software	5
Storyjumper	Storybook creating platform	5
Powtoon	Video maker & animation software	4
ScratchJr	Visual programming language	4
Twitter	Social media platform	4
Windows Movie Maker	Video editor	4
Audacity	Digital audio editor	3
Educaplay	Educational games generator	3
EdWordle	Word clouds editing platform	3
Socrative	Assessment-centered platform	3

StoryboardThat	Digital storytelling	3
Bee-Bot	Game service	2
Blogger	Blog hosting	2
Crossword Labs	Game service	2
Firefox Browser	Web browser	2
Google Classroom	Educational software	2
iTunes	Media player	2
PicPick	Screenshots editor	2
SurveyMonkey	Online survey	2
Tayasui Sketches	Digital drawing platform	2
WordPress	Blog software	2
Zoom	Videoconferencing platform	2
Apeaksoft Video Editor	Video editor	1
Book creator	Digital storytelling	1
Chrome Music Lab	Music editor	1
Filmora Video Editor	Video editor	1
Freemake Video Converter	Video editor	1
Gadwin Printscreen	Screenshots editor	1
Google Chat	Communication software	1
Google Earth	Virtual globe	1
Google Meet	Communication software	1
Google Translate	Neural machine translation	1
ibis Paint X	Graphic design platform	1
LinkedIn	Social media platform	1
Magisto	Video editor	1
Mentimeter	Presentation program	1
Messenger	Social media platform	1
Microsoft Teams	Collaborative platform	1
MindMeister	Mindmapping	1
myStorybook	Digital storytelling	1
Nearpod	Game-based learning platform	1
Notability	Note-taking service	1
Planner 5D	Design software	1
Quizizz	Game-based learning platform	1
Quizlet	Game-based learning platform	1
Rakuten Viber	Instant messaging	1
Sketchpad	Drawing & animation software	1
SlidePlayer	Slide hosting service	1
SnagIt	Screenshots editor	1
Spin The Wheel	Game service	1
Spotify	Music streaming service	1
Unsplash	Stock photography	1
Visme	Presentation program	1
Web QR	QR code scanner	1
Weebly	Web hosting service	1
WhatsApp Messenger	Instant messaging	1
Wix	Web hosting service	1

YouCut	Video editor	1

According to Table 1 and Figure 1, the most popular ICT tools used among students were: YouTube (referenced by 95.8% of students), Google Search (85.8%), Pinterest (84%), Kahoot! (72%), Microsoft PowerPoint (68%), Wikipedia (63%), and Jigsaw Planet (53%). The other ICT tools on the list were used by less than 50%.
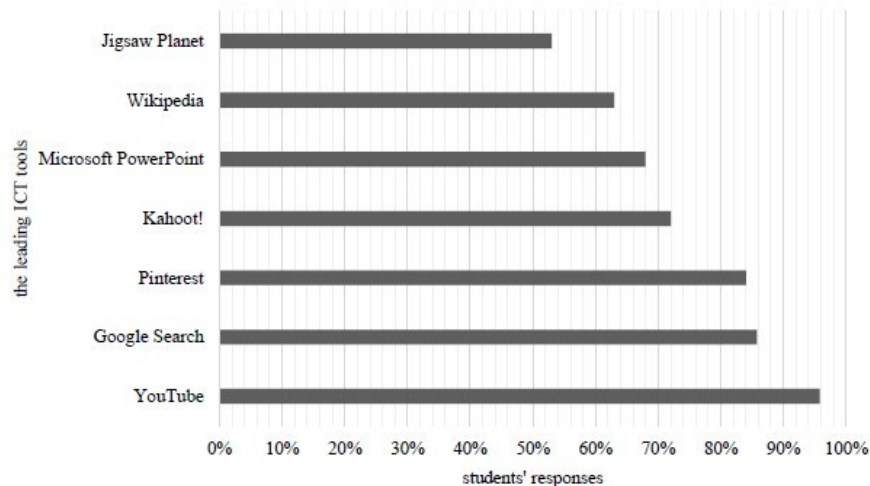

Fig. 1. The most popular ICT tools used among students in this study

Each ICT tool has one or more functionalities. Some tools have a specific purpose and perform on one specific task. Other tools can be described as multitasking. Hence, YouTube could be used as both a video hosting service and a social media platform.

There were six different social media platforms (Fig. 2) and three videoconferencing platforms (Fig. 3) identified, through which remote communications with preschoolers, the university community, and peers took place.
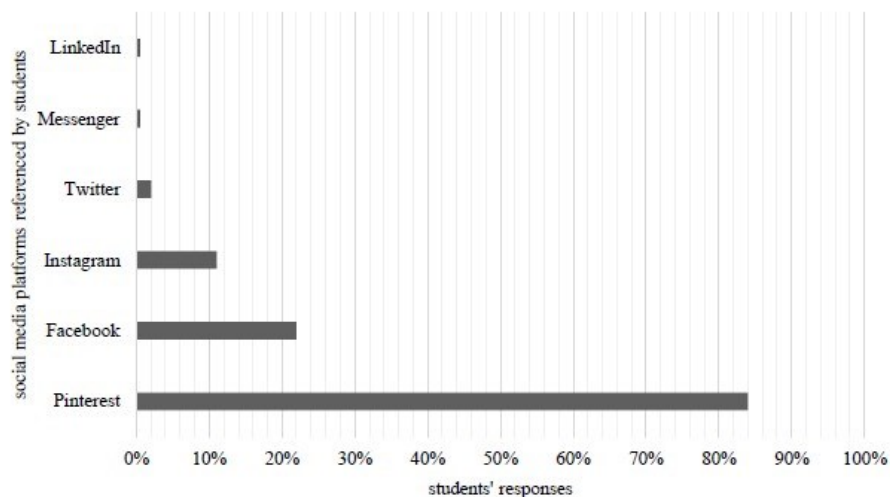

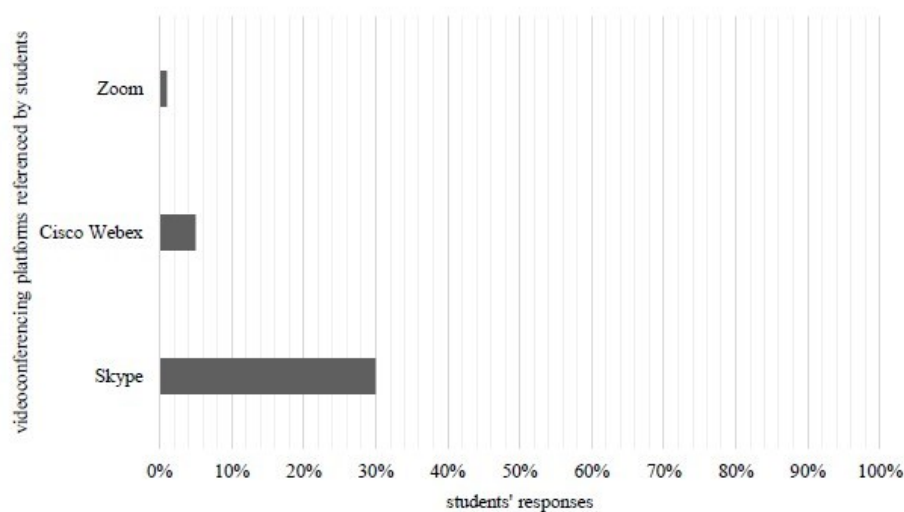**Fig. 2.** The most popular social media platforms used among students in this study

Fig. 3. The most popular videoconferencing platforms used among students in this study

Five gaming services (Fig. 4) and five game-based learning platforms (Fig. 5) were reported, allowing to confirm the usefulness and relevance of gamification in the young children's learning.
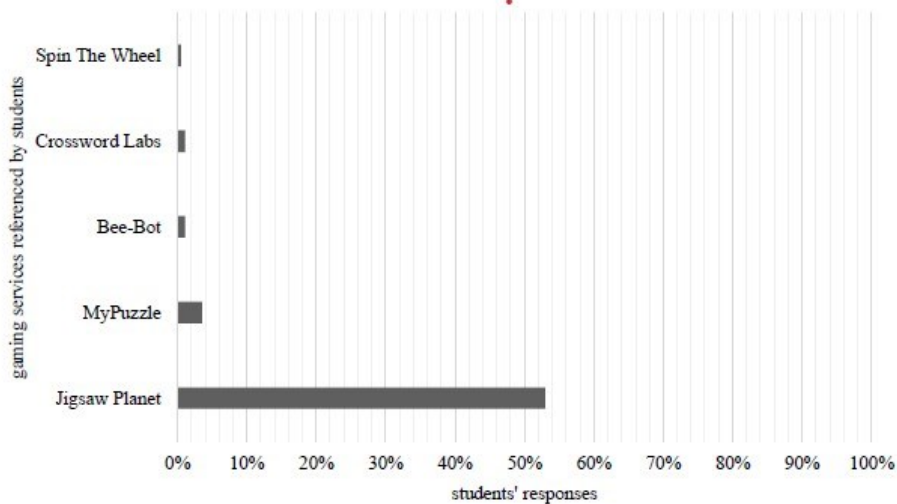

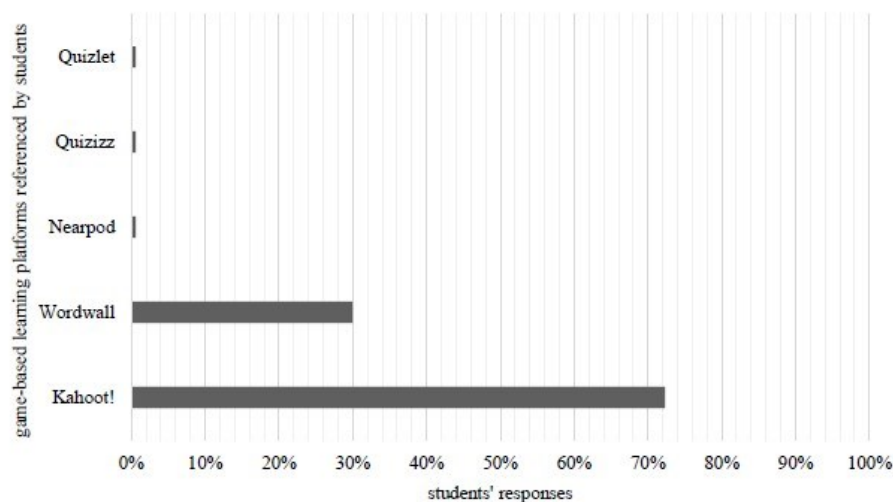**Fig. 4.** The most popular gaming services used among students in this study

Fig. 5. The most popular game-based learning platforms used among students in this study

In addition, programs for data editing were encountered a few times: video (8), graphic (4), and audio (2 times).

In presenting information to preschoolers and setting the theme of the activity, stu- dents often used

the presentation format, which was confirmed by the consideration of four different programs for creating presentations (Fig. 6).
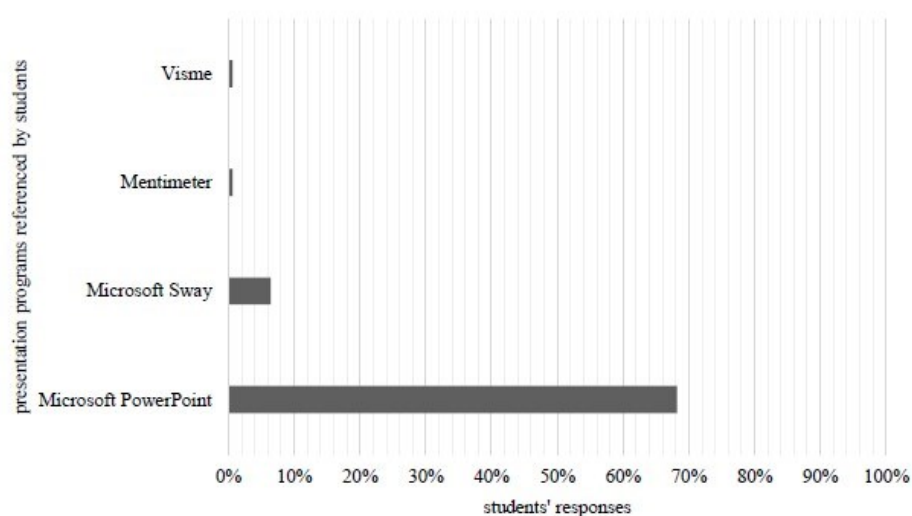

Fig. 6. The most popular presentation programs used among students in this study

Students who indicated the digital infrastructure they would use most often men- tioned tablets, personal computers, laptops as well as interactive whiteboards, projec- tors and music speakers to present digital material. Some students noted that they needed to transform digital material into paper-based materials to meet their work needs and thus, would apply a combination of digital and non-digital resources to preschool- ers. In these cases, students would use printers to print digital files.

4 Conclusions

Findings showed that when preparing history lessons for preschoolers, undergraduate students studying to become teachers employed a wide range of ICT tools. These ICT tools and digital material can be used in a number of ways in the educational process. They can be applied as a way of introducing the topic, or as a way of engaging pre- schoolers in interactive tasks, or as a way of setting problems and reflective activities. Among the tools used, we identified five main categories: social media, game-based learning platforms, collaboration platforms, web search engines, and task-specific tools for working with text documents, videos, images, and other multimodal stimuli. Students used standard digital infrastructure such as personal computers, laptops, tablets and special equipment to present digital material when preparing for and delivering the lesson.

In the compulsory e-learning environment imposed by the Covid-19 pandemic, the microlearning approach allowed the School of Education students at the University of Ioannina to explore and engage with their ICT module without disruptions. On the con- trary, new avenues and opportunities to develop their ICT skills considering digital ma- terial and ICT tools as part of the educational process were experienced. Studentsused a variety of digital tools as part of their placement experience, through the creation,design and presentation of small learning units and short-term learning activities. Historically significant issues relevant to the Greek people were introduced to young children.

We see the global digitalization process in education as a positive development. The availability, accessibility and effective use of digital material makes it easy to share and critically reflect on information disseminated through the digital world. The issues re- lated to the abovementioned availability are now on the agenda: data access security and information reliability. However, these are ongoing issues to be researched in the future. To sum up, the educational context is undergoing change and is evolving so as to enable the unfamiliar communication channels and tools to be employed, developed and mastered by all users at all ages.

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Exploring the Process of Educational Visits to the Primary schools as an Educational and Cultural Experience.
A study based on Empirically Grounded Theory, in parallel with the Perspective of Cultural Communication.

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Abstract. The educational visit, regardless of its multiple valuable functions and concepts, is a process of institutionalized education that takes place in places of cultural reference, according to the instructions given in the respective school curricula. It starts at school and ends at school, with an intermediate phase at the Museum. It is, therefore, typically an educational and cultural experience. However, it includes a series of activities that take place in different spaces of identity and philosophy, actions of people from two different scientific and professional fields, interactions of people who approach the process with different means and of course have different goals, needs and motivations. To the pluralism of this peculiar framework of the educational visit are added the qualitative parameters of the condition related to the person who participates and gives a special imprint to the process with his uniqueness, depending on his role. The comparative analysis of three studies on primary school students, teachers and museum professionals sought to provide an explanation from three different groups of subjects actively participating in an educational visit on the identity of the heritage-focused museum experience. The aim was to highlight the points of identification and differentiation in order to improve the effectiveness of the institution with an emphasis on the goals of cultural communication. In other words, how the educational visits as an institutionalized pillar of cultural heritage communication contribute to the formation of awareness attitudes, and the conscious participation of those involved in the whole process.

Keywords: Educational Visit, Experience, Education, Cultural Heritage, Cultural Communication

1.   Key points of the research problem.

The process of educational visits is an experience of education and culture because it starts from the institutional framework of the school, and it is experienced in places of culture. The concepts of education and culture are inextricably linked, in other words they are in constant dialogue. This dialogue was sought to be determined in the school practice from 1995-2004, with the practices adopted during this period by the uniform policy of the Ministries of Education and Culture in Greece in the direction of documenting this principle. The expression of this change was the national program "MELINA: Education and Culture", both in formal education and in the areas of cultural reference.

This program for the first time proposed a systemic model of didactic content for the "experiential-educational visit". The process of educational visits is a communicative experience that starts in the classroom, culminates in cultural spaces, and ends in the school with multidimensional influences as well as perspectives for the participating students, teachers, museum professionals, which frequently refer to the pedagogical relationship- communication, and the principles of cultural communication.

Schools and Museums, in the context of the continuous redefining of their role and mission on the occasion of the condition of educational visits, produce and offer pedagogical and cultural experiences that can be performed as a narrative and the creation of meaning, either in the classroom or in a selected cultural space, or both. The institutional framework of educational visits, while clearly defined by law in terms of procedural parameters (number of visits per school year, participating students, transportation,

approval minutes) at the same time remains vague and undefined in terms of the critical stages of planning, planning, implementation and of its assessment within the schools, and is left to the teachers' choices, i.e. their personal interests and internal motivations.

We have to point out that what we call as experience plays a leading role in both educational sciences and cultural studies as a key concept for the all-round development of the individual and as crucial for his relationship with the historical, social, and cultural environment. Nevertheless, the experience has been studied through the prism of various scientific fields, but never as a holistic communicative approach to the process of an educational visit through the perspective of cultural communication, which includes the politics of communication, the interpretation, the reception, and the production of high aesthetics quality of cultural good, awareness, participation, awareness by recipients of the dynamic value of every aspect of culture.

Today, however, different approaches are adopted between the school and the museum in terms of utilizing the pedagogical potential of an educational visit, as well as the emphasis given to the intake of cultural goods. Teachers perceive museums as places for the realization of cognitive goals in an experiential way, while museum professionals as places for the dynamic development of experiences through the interpretation of the objects of the collections, but also as tools to strengthen communication through participation.

In an attempt to scientifically decipher communication, two main Schools of analysis were created according[106]. The School of Process (Linear) and the School of Semiotics. The models developed, in the first School, focus on the message and include in the dialogue the concepts (epigrammatically) medium, channel, transmitter, receiver, noise, feedback, access and thus are related to the process of its transmission. On the contrary, Semiotics emphasizes the meaning that is transmitted, introduces us to concepts such as sign, signification, image, signifier and signified, while at the same time it emphasizes the codes and the culture in which they exist[107].

The most common short definition of Semiotics is the study of signs or the theory of signs. It is more fully defined as "the study of signs, signification, and signification systems. It includes the study not only of what we call signs in everyday language, but also of anything that represents something else. For semiotics, signs include words, images, sounds, gestures and objects[108].

Thus, semiotics affects archaeology, museology, visual arts and any expressive code that uses images, sounds, gestures, objects and differs from words. Fiske, underlines that: "Semiotics focuses on the analysis of a structured set of relationships that allows the message to mean something"[109].

The representations of cultural objects (museological-cultural representation) constitute a complex code of cultural communication and highlight as important the familiarity with the production process of exhibitions in museums and art spaces[110].

Educational visits, therefore, take place in communicative contexts related to literacy practices. The process is part of an organized teaching condition in a meaningful context of action, with the aim of maximizing students' potential, resulting in them using semiotic resources for meaningful purposes. This presupposes, however, a familiarity, if not specialization, of adult animators (educational and museum professionals) with the "reading" of different cultural works.

2. Purpose and objectives of the research.

Educational visits are an issue of concern to the community internationally. They appeal to a generation that has been nurtured with mass media and polyliteracies. Learning about the pedagogy of multiliteracies is a dynamic and multifaceted process, an act of meeting students and teachers with other sources of understanding the world, apart from language, such as audio or visual sources, images, music, gestures, the works of art. That is why the teaching material is drawn from everyday speech, print and electronic media, art forms, literature, theater, photographs, films, paintings, magazines, documentaries,

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[110] Νίτσου, Π., o.p.

etc.[111].

According to the modern understanding of culture[112] as expressed in UNESCO's Universal Declaration on Cultural Diversity (2001), namely that everything constitutes culture, "the totality of the human creation of a society and an era", the culture of "everyday life" and the participation of all in culture is particularly emphasized. After all, the right to culture is recognized as a human right in article 27 par. 1 of the Universal Declaration of Human Rights (UN, General Assembly, Paris, 11/12/1948) as follows: "Everyone has the right to participate freely in cultural community life, to enjoy the arts and to participate in scientific progress and its benefits"[113].

Childhood is recognized as decisive in shaping a person's personality. Based on this position, Strasburger et al. (2013)[114] point out through the findings of their long-term research the necessity of audiovisual literacy (Audiovisual or Media Literacy) through the provision of audiovisual literacy by the school, in order to achieve the cultivation of conscious receivers with increasingly higher quality requirements). The reflection that develops in the area of cultural studies has clearly been influenced by the approaches that analyze the question of the effects of the media, but it is equally closely connected with the perspective of literary analysis[115].

Theories in general of content reception[116] have been developed in recent decades after the emergence of modernist texts with ambiguity and polysemy. Based on a psychological and research orientation, the theory of reception connected the horizon of experiences and expectations of the reader with the communicative structure of the text. They emphasized how a literary text acquires meaning (meaning production) for the reader and the act of reading as a process, and the effect it has on the reader[117].

Museum exhibitions do not constitute a neutral presentation of the objects but constitute an interpretive presentation-narrative of them by the curator. However, they also leave room for personal interpretation of the objects by posing questions to the visitor that lead him to research and form his opinion. As the theory of content reception may also apply to cultural organizations, it is worth mentioning that, in this) sense, the structure of education shaped by/in the media today – which has moved to the stage of the passive recipient or slightly informed citizen at the stage of the active citizen (performer), who now participates as an intelligent interlocutor (player) in the process of communication[118] – also gains interest as a structure of education that can be shaped by/in museums. One of the most persistent questions today regarding this theory is whether uptake differs from response, affect. Both terms have to do with the work's influence on someone, and it is not clear that they can be completely separated. "There are, however, several important features that separate reading response criticism from reception theory" (Holub 2004)[119].

From this perspective, the influence of an educational process at a young age, which involves the targeting of a systematic exercise of a reflective-critical approach to a multimodal narrative that combines in turn different semiotic codes in the classroom and in the museum, is interesting to investigate if affects adult uptake/response. Our study attempts to lead to a change in the way of approaching cultural goods as a carrier of messages with another perspective that emerges and supports the field of cultural communication.

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[111] From the exhibition narrative of the third periodical exhibition of the Museum of School Life of the Municipality of Chania, "Learning Resources" March 2014, curated by M. Drakaki

[112] Καραμπέτσου Α. Πολιτιστική Αναπαράσταση και Διαχείριση της Πολιτιστικής Κληρονομιάς. Το Μουσείο της Ακρόπολης (Πτυχιακή Εργασία). Πανεπιστήμιο Πατρών, Πάτρα (2019).

[113] Πρόκου, Ε. Εκπαίδευση ενηλίκων και δια βίου μάθηση στην Ευρώπη και στην Ελλάδα. Εκδόσεις Διόνικος, Αθήνα (2009).

[114] Strasburger, V. C., Wilson, B. J., & Jordan, A. B. Children Adolescents and the Media. Sage Publications, New York (2013).

[115] Κωνσταντινίδου, Χ, Τα Μέσα Μαζικής Επικοινωνίας και η Παραγωγή Νοήματος, Θεωρητικές Προσεγγίσεις και Προοπτικές. Επιθεώρηση Κοινωνικών Ερευνών, 108-109, 139-188 (2002)

[116] Chemama, R. Ταυτότητα, απόλαυση και οι δημοκρατικές δυνατότητες του λαϊκϊσμού. In Hoffmann, Ch., & Birman, J. (επιμ.) ΜΙΑ ΚΑΙΝΟΥΡΓΙΑ ΑΝΑΓΝΩΣΗ ΤΟΥ ΛΑΪΚΙΣΜΟΥ. ΨΥΧΑΝΑΛΥΣΗ ΚΑΙ ΠΟΛΙΤΙΚΗ (μτφρ. Κ.|Γούλα), pp. 79-115. Εκδόσεις Πλέθρον, Αθήνα (2020). Iser, W., The Implied Reader: Patterns of Communication in Prose Fiction from Bunyan. Johns Hopkins University Press, Baltimore – London (1974). Iser, W., The Act of Reading: A Theory of Aesthetic Response. Routledge & Kegan Paul, London (1978). Jauss, H. R., Η θεωρία της Πρόσληψης: Τρία Μελετήματα (μτφρ, Μ. Πεχλιβάνιος). Βιβλιοπωλείο της Εστίας, Αθήνα (1995).

[117] Holub, C. R. Θεωρία της Πρόσληψης. Μια κριτική εισαγωγή (επιμ. & μτφρ. Κ. Τσακοπούλου, & Α. Τζούμα). Εκδόσεις Μεταίχμιο, Αθήνα (2004)

[118] Κωνσταντινίδου, Χ., o.p.

[119] Holub, C. R., o.p.

Educational visits are detected as a meaning-making process by the participating students, teachers, and museum professionals, with the character of an original intellectual challenge that requires synthesis for the balanced effectiveness of the goals set by each organization. Educational visits are not limited to museum environments, but take place in every space of cultural reference, and the palpation of their process attempts to approach exhibition narratives that follow the practice of representation in museological design, and to inspire, respectively, both the initiation and the completion of any process that takes place in the classroom, with an emphasis on other economic codes apart from the linguistic one.

The process of the educational visit is investigated as a functional interactive multi-meaningful and open to interpretations communicative field from the phase of choosing the place of visit until the return to the school environment with active persons the three groups of research subjects.

This article briefly presents important points of the writer's thesis, with the researcher specifically seeking to detect the process of educational visits to the Primary School, so that:

- To perceive all this as a field of critical consideration of a variety of works that utilize different semiotic systems.
- To make use of the multiple communication possibilities of the institutional framework of educational visits as a field for safeguarding cultural democracy.
- To map skills of all participants for the communication of meanings, but also for the codification of the ideas and social discourses that intervene and invest the process of educational visits.
- To highlight necessary changes in the field of educational and cultural policy related to the central authority and affecting the process of educational visits.
- To propose communication policies to cultural organizations that take advantage of the relationship between formal education and the family in order to improve the quality of entertainment and free time.
- To highlight the need to empower each age group of participants, through the familiarization with multiliteracies and contemporary art.
- To contribute to the investigation of how participating teachers, students, and museum professionals make sense of and decode visual representations (cultural representations).
- To trace the process of developing critical literacy skills and analysis of visual representations and cultural representations in all participants.
- To highlight the necessity of emphasizing the implementation of this institution in the Primary School, and in particular with regard to the targeting of the process with the friction of students in codes, from a wide range of media, as well as an equally wide network of contemporary cultural sources world.
- To detect whether the process of educational visits plays a significant role in the cultural and social meaning of contemporary artistic works, as well as cultural heritage evidence.

Formal education teachers, museum professionals, but also students are invited to respond both in the classroom and on educational visits to new study skills of multiliteracies and the hyper-image that are the protagonists both in everyday school practice in teaching and learning, as well as and in the procedures of the educational visits, where they are reinforced in a new communicative context, namely from the museological and museographic narrative to the cultural organizations. Consequently, based on all the above, the subject of the study is formulated as follows: "Exploring the process of educational visits to the Primary School as an educational and culture experience. A study based on empirically grounded theory, in parallel with the perspective of cultural communication.

Accordingly, the main research question is formulated as follows: Based on the critical changes that took place in many theoretical fields of the sciences and arts, in the modern era does the process of educational visits need changes? What is the added value in carrying out the process of educational visits with the perspective of cultural communication?

In addition, the following subqueries are formed:

1. What changes and in which fields are they necessary, so that the process is ultimately effective for all participants?
2. In what ways can the institution of educational visits contribute to the role of art in the community in modern everyday life
3. In what ways can the institution of educational visits contribute to the relationship between cultural and school organizations?
4. In what ways can the institution of educational visits contribute to cultural education in the school community?

5.   In what ways can the institution of educational visits inform national policies on education and culture?
6.   What is their importance for the lives of the participating adults and minors?
7.   Why defend their role in formal education?

3.   Research method

Empirically grounded theory (EGT) aims to produce a theory about the researched subject; a theory that is based on empirical data, which is collected and analyzed in a systematic way[120].

The use of grounded theory was chosen because it was deemed appropriate to explain the process of communicating the museum experience in a multi-prismatic manner by each group of subjects who actively participate in the educational visit. According to a previous study[121] "grounded" theory provides a better explanation than a 'off-the-shelf' theory. It responds to the situation, it really works in practice, it shows sensitivity to the people of an environment, and it can represent all the complexities encountered in the process.

Empirically grounded theory is characterized as a systematic process with precision that quantitative researchers wish to see in an educational study. It has traits that include a self-correcting character[122]. Based on the analysis of one set of data the researcher ensures direction for the next set of data[123]. Also, in data analysis the researcher systematically creates categories from incident to incident and from incident to category. In this way, the researcher remains close to the data at every moment of the analysis.

In each working group the researcher, after defining the category "museum experience" at the focus of the educational visit, approached the data again with a re- analysis in order to identify causal conditions, intervening categories and context categories, strategies and consequences to develop them later at the stage of axial coding their interrelationship. The third set of coding procedures is selective coding, where theory is developed. This process involves the process of intercorrelating the categories into a coding pattern. It may include the process of refining the axial coding pattern and presenting it as a model or theory of the process. It may involve writing proposals that provide testable ideas for further research. This stage may also involve writing a story or narrative, which in turn involves the interrelationships between the categories[124].

Based on the coding pattern in each working group, the researcher developed the emerging theory and grounded the description of the findings by highlighting a new theoretical discussion (third theory writing-propositions). The researcher in each working group, after formulating the theory, validated the process of the educational visit based on the axes of cultural communication by comparing it with existing processes mentioned in the bibliography (Conclusions – Placing the interpretations in a context of wider meanings).

4.   Conclusions

In an attempt to capture comprehensively and synthetically the comparative analysis of the coding patterns and theoretical propositions of the three foundational theories, the results of the present study led to two critical parameters for the detected process.

A. The holistic communicative approach to the symbolic process of the educational visits with a convergence of interpretive and pedagogical practices, with the main condition being reciprocity from the school and the museum at all stages.

The theories generated by the methodology adopted in qualitative research, as it was conducted, are narrow

[120] Τσιώλης, Γ. Μέθοδοι και Τεχνικές Ανάλυσης στην Ποιοτική Κοινωνική Έρευνα. Εκδόσεις Κριτική. Αθήνα (2014).
[121] Creswell, J. (2015). Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research. Pearson, New York
[122] Creswell, J., o.p.
[123] Charmaz, K. Grounded Theory:Objectivist and Constructivist Methods. In: Denzin, N. K., & Lincoln, Y. S. (eds.) HANDBOOK OF QUALLITATIVE RESEARCH, pp. 88-163. Sage, Thousand Oaks (2000).
[124] Creswell. J. (2011). Η Έρευνα στην Εκπαίδευση, Σχεδιαμός, Διεξαγωγή και Αξιολόγηση της Ποσοτικής και Ποιοτικής Έρευνας (μτφρ. Ν. Κουβαράκου. Επιμ. Χ. Τσορμπατζούδης). Εκδόσεις ΙΩΝ, Αθήνα.

in scope. However, the comparative study of all three working groups with the identifications and differences that emerged, lead in addition to the perspective of the process as a symbolic system, at the same time to social interaction.

The term symbolic indicates throughout the process, at all stages, the semiotic approaches needed for their management, the importance of specialization of the animators- coordinators regardless of the space (school or museum), regardless of the role of the institutional framework or the policy of the organization, whether they are educators or museum professionals. The research findings per group of subjects, but also synthetically, emphasize social interaction and cultural symbols and tools, which are necessary for man to adapt the various forms of knowledge to his daily life.

> B. The systemic approach to the process with the development of the relationship at all levels, from the classroom to the school and the museum, to the community and the center, in order to achieve the intended influences directly on the participants and indirectly on the families, in the local community in the state.

The synthetic evaluation of the findings by all the participants in the process highlights the effectiveness of the systemic approach to education and is directed to its necessity with the starting point - the field of application of the educational visits. The systems linked to the process of educational visits are schools, museums, central and local authority, the family, the local community, the state. Nothing can be understood by itself, all elements are related, interact, and co-determine.

The study established in many ways the criticality of the concept of the system, not only in the process itself, but also in the participants as organized entities, and in the organizations involved in the occasion of the visit, as environments.

Mid-range theories were produced, however, the continuous and methodical critical dialogue of the findings with existing theories by working group, comparative and synthetic, built step by step and gradually the building blocks of the results of the present research that indicates trends and opens windows for new fields of study. The educational visits revealed a complex communicative, pedagogical, and cultural event that unfolds unexpected possibilities.

Such possibilities are the following:

- Convergence tool for national policies on education and culture.
- Pillar for the implementation of self-evaluation policies in cultural and educational organizations.
- Field of application of community synergies towards shaping interesting lifelong learning attitudes.
- A means of mitigating social inequalities through the mutual feedback of formal, non-formal and informal learning.
- Training sector for the utilization of cultural heritage and all forms of contemporary artistic creation in education as expression and communication, with the interdisciplinary approach of cultural and pedagogical sciences, with an emphasis on Museology, Psychology, Pedagogy, Communication.

This research marks the answers given to the research question and sub-questions, as well as the answers that echo the systemic principles to be followed. An educational visit process is a fruitful pedagogical cultural experience according to the findings of the research, when it is based on the effective exchange of messages, within a strong psychological and moral communication framework, which surrounds the participants.

The process of educational visits underlines the restructuring of an open educational system, which will give priority to persons as organized wholes, with an emphasis on functional "belonging" and "connection", equal importance in the dynamic development of all its groups, space to welcome any change and the new, taking the difference as wealth and the mistake as a feedback opportunity to improve the functioning of each system. And all this, of course, giving constant and regular stimuli for a living connection of space and time, for the co-evolution of all the living parts of the system, with interaction in the small-medium groups and the connection with the plenary session through animating tactics, so that finally there is effective handling of complexity at all levels, and therefore each system produces itself while remaining alive.

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4. Russell, A. M., & Fiske, S. T., o.p.
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