



Un patrimoine pour l'avenir, une science pour le patrimoine

Heritage for the Future, Science for Heritage

**Une aventure européenne
de la recherche et de l'innovation**

A European Adventure for Research and Innovation

Colloque / Symposium

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AVANT-PROPOS / FOREWORD

Cette publication est la somme d'articles rédigés par les intervenants du colloque européen « Un patrimoine pour l'avenir, une science pour le patrimoine », organisé dans le cadre de la Présidence française du Conseil de l'Union européenne les 15 et 16 mars 2022 à Paris.

Les différentes contributions se veulent le reflet des présentations qui ont été données dans le cadre des sessions plénières et des tables rondes durant deux jours. Elles présentent les travaux menés par des doctorants et des chercheurs, mais aussi les initiatives portées par différents acteurs qui contribuent à la préservation, la valorisation et la transmission du patrimoine culturel.

Ces actes comprennent également une série d'articles, plus courts, publiés sur le site internet du colloque afin d'explorer les quatre grands thèmes proposés. Ces articles, présentés dans une section distincte, n'ont cependant pas fait l'objet de présentations lors de l'événement.

Les articles sont proposés en français ou en anglais, et reflètent la diversité des sujets qui animent aujourd'hui le domaine des sciences du patrimoine en France et en Europe. L'ensemble des présentations du colloque est également disponible sur la chaîne [YouTube du Heritage Research Hub](#).

Cet événement a été financé par l'Union européenne. Les vues et opinions exprimées dans le cadre du colloque et dans les actes ne reflètent pas nécessairement celles de l'Union européenne et de la Commission européenne. L'Union européenne et la Commission européenne ne peuvent en être tenues responsables. Par ailleurs, s'il n'a pas été organisé par le Gouvernement français, il est cependant autorisé par celui-ci à utiliser l'emblème de la présidence française du Conseil de l'Union européenne.

This publication is the sum of articles written by the speakers of the European symposium 'Heritage for the Future, Science for Heritage', organised in the framework of the French Presidency of the Council of the European Union on 15 and 16 March 2022 in Paris.

The various contributions reflect the presentations that were given during the plenary sessions and round tables over two days. They present the work carried out by PhD students and researchers but also the initiatives undertaken by various actors who contribute to the preservation, valorisation, and transmission of cultural heritage.

These proceedings also include a series of shorter articles published on the symposium website to explore the four main themes proposed. These articles, presented in a separate section, were not, however, the subject of presentations at the event.

The articles are available in French or English and reflect the diversity of topics currently being discussed in the field of heritage science in France and Europe. All the presentations of the symposium are also available on the [YouTube channel of the Heritage Research Hub](#).

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PRÉFACE FOREWORD

Mariya GABRIEL

European Commissioner for Innovation, Research,
Culture, Education and Youth
June 2020

There could not have been a better setting for this conference than the Louvre and the National Library of France. Just by looking up, participants were immediately reminded of the beauty and richness of our cultural heritage – and how important it is to protect it.

Modern heritage science plays a fundamental role in this context. Research and innovation, and notably new technologies and digital tools, have completely changed the preservation, protection, and enhancement of the tangible and intangible forms of our heritage. We are now able to take the challenges of our modern times into account, like climate change, social cohesion, economic development, digital transition, and cultural transformations.

The European Commission is proud that the new budget allocated to Horizon Europe 2021-2027 includes, for the first time, an autonomous intervention area for cultural heritage to support collaborations between heritage science and cultural and creative industries, drive innovation further, and eventually develop a new collaborative cloud for museums and cultural heritage institutions.

Through all these initiatives, we will continue to invest in heritage science and in cultural heritage collaborations. And I would like to thank the French Presidency of the Council of the European Union and the Foundation for Heritage Science for organising this symposium on heritage science, as well as the French Ministry of Culture, the French National Centre for Scientific Research (CNRS) and the universities of Paris-Saclay and Cergy Paris – all of them our trusted partners, sharing our ambitions to protect our cultural heritage for the generations to come.



INTRODUCTION

Isabelle PALLOT-FROSSARD

President of the Foundation for Heritage Science

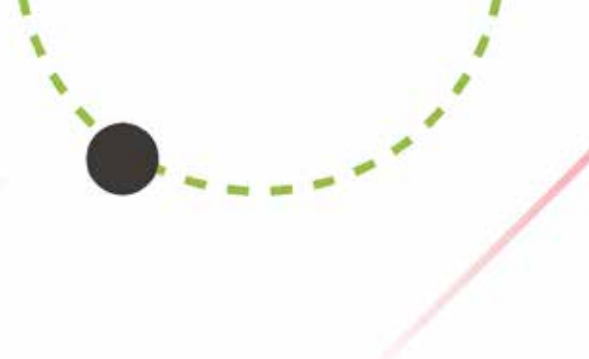
The notion of cultural heritage has very ancient roots and, over the course of history, it has taken many different forms depending on historical periods, geographical areas and cultural contexts. Object of attachment, admiration, recognition, cement of identity, but also target for destruction, hostage of political conflicts and ideological controversies, heritage has also been, for more than two centuries, a research subject. Archive often silent of past societies, cultures and technologies, the heritage object, taken in the broad sense, must be decoded, preserved and enhanced by the cross-disciplines and social sciences and humanities, experimental sciences and now, digital and engineering sciences. Today, heritage science encompasses a vast and interdisciplinary scientific domain that contributes to the identification, understanding, conservation and transmission of heritage, whether tangible, intangible, natural or digital. This field is subject to a robust and wide structuring that brings together researchers, heritage professionals, non-governmental organisations and associations that aim at transcending national visions and interests.

Organised by the Foundation for Heritage Science (FSP), the French Ministry of Culture, the National Centre for Scientific Research (CNRS) and the universities of Cergy Paris and Paris-Saclay, within the framework of the French Presidency of the Council of the European Union and with the support of the European Commission, the symposium 'Heritage for the Future, Science for Heritage', was opened on 15 March 2022 by Roselyne Bachelot-Narquin, Minister of Culture, and Mariya Gabriel, European Commissioner for Innovation, Research, Culture, Education and Youth. It met a great success as soon as the call for papers was launched in June 2021. The 182 proposals were examined by an international scientific committee, which selected the most relevant ones and those that allowed the broadest possible coverage of the symposium's vast and ambitious themes. During the different sessions held at the Musée du Louvre, the Ecole du Louvre, the Centre for Research and Restoration of Museums of France (C2RMF) and the National Library of France (BnF), participants heard 82 oral communications, organised into five plenary sessions and 15 round tables with a wide range of topics.

Speakers and participants came from 28 different European countries, such as, Albania, Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom, and also from further away like Brazil, Canada, Iran, Tunisia, and the United States. Testimony of this success, nearly 1,500 people registered for the event and had the opportunity to participate in the exchanges, both on-site and remotely, many happy to be able to exchange ideas directly with other heritage professionals, in the margins of the sessions and during the times of conviviality.

The programme of the symposium covered all the fields of heritage, the scope of which has now become very wide and is still widening: monuments, archaeological sites, historic towns and cities, urban and rural landscapes, industrial heritage, museum collections and intangible heritage. The concepts of resilience, tourism reuse and exploitation, conservation, identity, social values and human rights, knowledge, multi-sensory approach, transmission, climate change, biodiversity, green conservation, and creative industries were all discussed. Digital technology was encountered everywhere to manage, reconstruct, imagine, transmit and communicate, opening very broad prospects for progress, but also giving rise to anxiety in the face of a field that not everyone has mastered.

The main theme of these days was, as the organisers had expected, the association of three concepts: research, which is the action, science, which is the result, and heritage, which is the object; a fundamental association without which one cannot know and recognise, conserve and transmit. Through the four main themes that structured the symposium: a reflective heritage for a resilient society, sustainable management of cultural heritage, cultural heritage in a changing context, cultural heritage in the face of climate and environmental change, one saw the importance of transdisciplinarity. It is this transdisciplinary approach that the Foundation for Heritage Science promotes daily, with its five main founders, the universities of Cergy Paris, Versailles Saint-Quentin and Paris-Saclay, the Louvre, the Palace of Versailles



and the National Library of France, with the collaboration of its 15 partners, by supporting research on tangible heritage, with the objective of 'understanding and preserving for better transmission'.

At a time when UNESCO is preparing to celebrate the half-century of the World Heritage Convention, at a time when the war at the gates of Europe is destroying human lives and major cultural assets, raising legitimate emotions everywhere, one can see how much heritage is felt to be a common asset of humanity beyond borders, often hostage to conflicts, but also a source of peace, understanding and great international collaborations. On this occasion, we must send a message of warm solidarity to the Ukrainian population, which has been severely affected, and especially to all our research and professional colleagues, who fear both for their lives and for the preservation of their priceless heritage. May they be assured of our support and our contribution, when this will be possible and when heritage science will and shall be mobilised to ensure, in the best conditions, the conservation and restoration of sites, monuments and collections impacted by the war. The French Ministry of Culture is already providing funding for students, artists and cultural professionals.

The European Commission, which has been providing significant funding for heritage research for the past thirty years, must be particularly acknowledged and thanked for its support of this meeting and the publication of its results. Thanks to the support of the European Commission, an important European consortium, coordinated by the Foundation for Heritage Science, is now working on the maturation of a future Partnership on cultural heritage that could be launched in the framework of the second wave of the Horizon Europe programme. Our gratitude also goes to the very active hosts of these two days, the Musée du Louvre, the Ecole du Louvre, the National Library of France, the C2RMF and the Pompidou Centre. A message of thanks must also be addressed to Pascal Liévaux, from the Delegation for Inspection, Research and Innovation at the Directorate General for Heritage and Architecture at the Ministry of Culture and President of the Joint Programming Initiative 'Cultural Heritage and Global Change', who initiated this event and brought it to a successful conclusion, as well as to the entire team of the Foundation, who spared no effort in bringing this publication to fruition.

1.

SESSION PLÉNIÈRE PLENARY SESSION

Préserver et mobiliser le patrimoine culturel
face au changement climatique :
le rôle de la recherche et de l'innovation
dans un contexte d'urgence

Preserving and Mobilising Cultural Heritage
in the Face of Climate Change:
The Role of Research and Innovation
in an Emergency Context

Cultural Heritage Protection in Times of Climate Change. Contributions from the European Union's Open Method of Coordination 'Strengthening Cultural Heritage Resilience for Climate Change'.

Johanna LEISSNER

Chair of the Open Method of Coordination 'Strengthening Cultural Heritage Resilience for Climate Change', Fraunhofer-Gesellschaft for the advancement of applied research, European Union Brussels office, Belgium

Résumé

Alors que l'Union européenne entreprend une transition écologique majeure pour atteindre la neutralité climatique d'ici 2050, la place du patrimoine culturel au sein des politiques européennes et nationales d'adaptation et d'atténuation du changement climatique semble peu prise en compte. Dans ce contexte, une méthode de coordination ouverte entre les Etats Membres fut lancée en 2020 pour procéder à un état des lieux, échanger des bonnes pratiques et formuler des recommandations.

Mots-clés: changement climatique, méthode de coordination ouverte, adaptation, atténuation, politique européenne

Keywords: climate change; open method of coordination, adaptation, mitigation, European policy

Policies for the Preservation of Europe's Cultural Heritage

With Article 3.3 of the Lisbon Treaty of 2009, the European Union gives cultural heritage a high political priority: 'The Union preserves the richness of its cultural and linguistic diversity and ensures the protection and the development of Europe's cultural heritage.' In 2018, for the first time, the European Cultural Heritage Year was proclaimed, in which more than 12 million people participated. This success has led the European Parliament to call on the European Commission and the European Council to step up their efforts to promote the momentum of the European Year of Cultural Heritage and further develop it into a permanent political objective for local, regional, national, and European levels.

Cultural heritage in its entirety, be it materially in the form of cultural and industrial landscapes, buildings, monuments, books, manuscripts, or art objects, or immaterial as knowledge, skills, customs, oral traditions and performing arts, is an important source of our identity. It serves as an inspiration for innovation and creativity for each and every one of us and society. It also represents the topic of sustainability and invites not to consume resources but to preserve them for future generations because cultural heritage is a non-renewable resource. Unfortunately, in recent years, the uncertainties induced by acts of war paired with the consequences of climate change and the years of pandemic have made us feel that we are entering a new era. The limitations and loss of our natural and cultural resources can be experienced at an unprecedented scale and speed anywhere in the world.

Politics, economy, and society are looking for sustainable solutions. A look at the long history of human civilisation can help broaden our limited horizons. Solutions can be found in how our ancestors mastered crises and found answers to existential threats. The knowledge of the past is 'inscribed in our cultural heritage'. Yet, this cultural resource is threatened by the direct and indirect effects of climate change. The most important measure to stop global warming and the advancement of

climate change is a drastic reduction in greenhouse gases, first and foremost carbon dioxide.

In 2015, the Paris Agreement recognised these facts with the signature of 197 countries. The European Green Deal and the European Recovery and Resilience Plan are the answers of the European Commission to the climate crisis and the pandemic. These huge investment programmes will transform the European Union into a modern, resource-efficient, and competitive economy. They will ensure:

- No net emissions of greenhouse gases by 2050
- Economic growth decoupled from resource use
- No person and no place are left behind

However, cultural heritage is not mentioned at all in the European Green Deal, which is the successor of the European Union Sustainability Strategy. This drawback prompted ICOMOS and Europa Nostra to issue the European Cultural Heritage Green Paper in 2021, where Europe's shared heritage was put at the heart of the European Green Deal. The report highlights the role of heritage in making the European Green Deal a real success. The 2020 New European Bauhaus initiative of the European Commission at least mentions cultural heritage, but above all, if the European Green Deal is to be successfully implemented, it is all the more important for cultural heritage to be taken into account. The Council's conclusions of 25 May 2020 on risk management in the field of cultural heritage pointed out how important it is to protect cultural heritage against the diverse forms of risks that threaten it (natural hazards, climate change and man-made disasters). During the German presidency of the Council of the European Union, which took place from July to December 2020, the topic of climate change and cultural heritage was integrated into the Programme of the Federal Government. In October 2020, the Council's decision on the establishment of a European Union expert group on

strengthening cultural heritage resilience for climate change 'according to the open method of coordination' (OMC) was published.

The OMC is a European policy-making process or regulatory instrument that Member States use to cooperate at the European level. The OMC does not result in European legislation. It is a method of soft governance which aims to spread best practices and achieve convergence towards European goals in the policy areas falling under the partial or full competence of Member States. These mechanisms involve establishing guidelines, quantitative and qualitative indicators, and best practice examples, backed by periodic evaluations and peer reviews. The evaluations aim at helping the Member States to learn from one another and, consequently, improve their domestic policies. Whether a Member State takes part and sends delegates depends on the importance of the issue within the Member State.

The Work of the OMC Expert Group 'Strengthening Cultural Heritage Resilience for Climate Change'.

After the adoption of a mandate in October 2020, the European Commission set up the OMC expert group in January 2021. Twenty-five Member States and three associated countries sent delegates to the group¹ whose objectives and work scope are specified in the mandate of the Council of the European Union. It examines the current and emerging threats and effects of climate change on cultural heritage, including cultural landscapes. It discusses the appropriate adaptation and mitigation measures, identifies potential risks, focuses on building the resilience of cultural assets in the face of a changing environment and simultaneously prevents maladaptation. The group also examines what contribution cultural heritage can make to combat climate change in line with the objectives of the Green Deal.

At the start of the work, it was first necessary to determine which forms of cultural heritage are addressed and, secondly, to study the state of play in the Member States. To this end, a multi-page questionnaire was designed. The results showed that policies considering cultural heritage already exist in about half of the countries, for example, in national adaptation plans on climate change or national recovery and resilience plans (e.g. Scandinavia, Italy, Greece, and Cyprus). In contrast, at least nine countries have no policies at all. A problem that most delegates addressed lies in the different responsibilities of ministries, which often hardly cooperate and exchange with each other. It results in a significant weakening of the cultural heritage sector both at the European and national levels.

What were the answers of the delegates about the dangers to cultural heritage induced by climate change? Not surprisingly, the consequences of extreme climate events such as extreme precipitation, heat waves or long-lasting dry spells were listed as the main dangers. Delegates also pointed out that the impact on the historical gardens and cultural landscapes could be perceived increasingly in recent years. For many Member States, sea level rise is an ever-increasing danger since many heritage sites are situated along the coastlines. As further dangers, indirect hazards such as socio-economic impacts or demographic change were also mentioned.

However, the creeping, slow climate change is an additional threat which damages cultural heritage and is often hardly considered and noticed. Slow climate change impacts are the acceleration of corrosion processes due to higher temperatures and the changes in the climate as a whole - rainfall, solar radiation, wind strengths and wind directions, day and night differences, frost/thaw cycles and absolute humidity, to name just a few climate parameters.

Another question dealt with the type of cultural heritage affected by progressing climate change. The delegates listed buildings and monuments in the first place and cultural landscapes where dramatic changes can be observed in the second place. Effects of climate change on mobile cultural assets such as art objects or books and manuscripts were reported to a lesser degree because, so far, only a little research has been performed.

An important thematic area of the mandate includes collecting so-called best practice examples. These examples are intended to demonstrate innovative and sustainable solutions, which methods and measures have already been implemented today to reduce CO₂ emissions on the one hand and to adapt to climate change on the other hand.

A central point of discussion in the work of the OMC expert group was how to consider better the overall CO₂ balance of historically valuable and listed buildings. The existing building stock and its preservation need to be assessed in a holistic view. Therefore, the aim of all regulations should be to ensure that the preservation of existing buildings, particularly the architectural monuments, is an advantage in achieving climate neutrality. In Europe, buildings consume the most energy and contribute around one third to CO₂ emissions. Even with new energy-saving buildings, half of the environmental impact is already achieved before they are even put into operation. In the case of existing buildings - and before everything of listed buildings - the grey energy should be considered and not only the operational energy consumption. Furthermore, the future climatic situation (i.e. climate change) has to be taken into account in the operation of the buildings (heating, cooling, dehumidification, shading) and during maintenance.

The listed buildings hold a top position in ecological, climate-friendly construction. A high percentage of these objects have been using many climate-friendly building

materials both in their earlier construction and during restoration. They also rely on local manufacturing and transportation, which are part of sustainable solutions. Thus, architectural monuments show a positive life cycle assessment because they often use local wood with high CO₂ sequestration capacities from domestic forests.

However, the OMC expert group has found that, precisely on this important topic, basic quantitative and qualitative data are lacking to translate these facts into a result-oriented political discussion on the energy efficiency of the building stock. The importance of architectural monuments and buildings of historic value in urban and rural areas, with their charisma as key points of the European identity, will retain the highest topicality within the Green Deal framework.

Research, The Indispensable Driver for Making Heritage Climate Resilient

The OMC expert group examined the role of research and innovation thoroughly. It was found that research is paramount and fundamental in understanding the impacts of climate change on preserving and protecting cultural heritage. The 83 best practice examples collected by the group members from all over Europe clearly demonstrate that research is the most important driver for implementation and action on heritage to combat climate change. Researchers were the first to draw attention to the threats posed by climate change to cultural heritage when the European Commission launched in 2003 the first call worldwide for research projects to investigate the impacts of climate change on outdoor cultural heritage. In 2008, research followed to study the impacts on indoor cultural heritage and future energy demand of the built heritage by coupling climate models with building simulation. Several years later, research and innovation, especially on a national level, remain an integral part of the mandate of the OMC expert group.

An evaluation of the state of play of research shows that there is still a requirement to better understand and identify the most severe threats. We need to understand

their impacts, good practices, and innovative measures to safeguard all forms of European cultural heritage from climate change. Additionally, we need to know the costs involved for heritage to adapt and mitigate climate change. The OMC expert group recognises the unique role that research has played and will continue to play in promoting cultural heritage in climate change discussions, actions and research development and its contributions to science diplomacy.

To conclude, climate change endangers our European cultural heritage at all levels and at an unprecedented speed and scale. What the costs are for our societies to protect the memory of our civilisation for future generations is not known. Therefore, economic studies will need to be carried out both at the European and national levels. Our cultural heritage is not only a victim but part of the solution. It represents a rich resource about how our ancestors have dealt with climate change and which sustainable solutions they have developed, which we should recall today. By overcoming these challenges, Europe will play a pioneering role in the sustainable preservation of cultural memory. The OMC expert group has identified the following issues and recommendations:

- Research is the indispensable driver for heritage protection and enhances cooperation and implementation at all levels.
- Extreme climate events and gradual climate change are affecting all kinds of cultural heritage, tangible and intangible, World Heritage as well as minor heritage all over the world.
- There are still many gaps in our understanding and knowledge about climate change impacts.
- Relevant and reliable data are missing, and it is difficult to collect the information.
- There is a lack of data about economic costs for maintenance and adaptation/mitigation measures.
- There is a lack of awareness about the urgency to adapt at all levels.

- We need to create a forum for mutual exchange, a common entry point or an observatory.
- We must invest in skills and training opportunities.
- We must intensify cooperation/exchange between heritage experts, climate services, and decision-makers.
- It is important to mainstream policies at the European and national levels. Cultural heritage is often not integrated. For example, many national adaptation plans do not consider cultural heritage, nor does the European Green Deal.
- We need to invest in and incentivise the safeguarding of cultural heritage against climate change at all levels.

The full report about the work of the OMC expert group, including an executive summary and ten recommendations to the European Union and the Member States, will be published in June 2022.

¹ Austria, Belgium, Croatia, Cyprus, Czech Republic, Estonia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Spain and Norway, Iceland, and Switzerland as associated countries.

Cultural Heritage and Climate Change: A Joint JPI Pan-European Effort to Identify New Challenges and Perspectives for Research

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Résumé

Les initiatives de programmation conjointes sont des partenariats intergouvernementaux établis afin de mettre en commun les efforts nationaux en matière de recherche et de favoriser la mise en œuvre de l'Espace européen de la recherche face aux défis sociétaux. Reconnaisant les liens importants entre patrimoine culturel et changement climatique, l'initiative de programmation conjointe patrimoine culturel (JPI CH) et l'initiative climat (JPI Climate) commencèrent une collaboration en 2019 qui donna lieu à la publication d'un livre blanc en mars 2022. Ce livre blanc identifie des lacunes et des opportunités de recherche à l'interface du patrimoine et du changement climatique et devrait aider les deux initiatives à générer des résultats de recherche pertinents pour les politiques.

Mots-clés: patrimoine culturel, changement climatique, initiatives de programmation conjointes, espace européen de la recherche, livre blanc

Keywords: cultural heritage, climate change, joint programming initiatives, European research area, white paper

In 2008, the European Commission introduced the concept of Joint Programming¹, a process led by the Member States to step up their cooperation in R&D across the European Research Area (ERA). Joint Programming Initiatives (JPIs) were designed to address major societal challenges, where public research plays an essential role in informing policy and solutions. JPIs are flexible intergovernmental partnerships that aim to better align the research and innovation investments at the national level and to avoid duplication and fragmentation for better use of the European Union (EU) Member States and Associated Countries' public research resources.

In 2019, the JPIs 'Cultural Heritage and Global Change' (JPI CH)² and 'Connecting Climate Knowledge for Europe' (JPI Climate)³ established an open dialogue on areas of shared interest, recognising that climate change provides a major threat to culture and heritage and that these can provide important insights for addressing climate change.

JPI CH brings together 18 countries in Europe represented by ministries and organisations responsible for research funding. Its main objective is to promote the safeguarding of cultural heritage - be it tangible, intangible, digital or natural - and enhance sustainability through better-coordinated research and innovation. Through its activities, the JPI CH aims to increase awareness of citizens, policymakers, and stakeholders, identify short and long-term research needs and priorities, concentrate and increase human, material and financial resources allocated to research, and promote joint and multidisciplinary approaches. In 2020, JPI CH published a new Strategic Research and Innovation Agenda that sets climate and environmental change as one of four priority research areas for the coming years.

JPI Climate is open to all ERA countries. It is comprised of representatives from ministries and organisations for research funding and aims, through its activities, to

connect research performers and funders across Europe to promote the creation of new knowledge in the natural and anthropogenic climate change domain. Since its establishment, JPI Climate has provided access to knowledge and expertise across Europe and beyond. In addition to its core role in funding research across the spectrum of climate change (from fundamental Earth System science to societal transition and transformations), JPI Climate is also acting to accelerate the transfer of knowledge from science to policy and practitioners on key issues, including achievement of climate neutrality and climate resilience.

A Joint Pan-European Research Effort in Cultural Heritage and Climate Change

In its Sixth Assessment Report (AR6)⁴, the Intergovernmental Panel on Climate Change (IPCC) presents the clearest evidence to date that changes in the climate system are widespread, rapid, intensifying, and unprecedented in thousands of years. Furthermore, climate change is affecting nature, people's lives and infrastructure. Its impacts are evident in every region of our world. These impacts are projected to increase as the global temperature increases, threatening global sustainable development and increasing biodiversity loss. Communities, cultures and heritage are also impacted, with losses and damages occurring in climate-vulnerable and exposed areas.

Despite the increasing body of knowledge on the impacts of climate change on all forms of cultural heritage, several gaps still remain, and more research is needed to complement and build upon existing knowledge so that it can inform future prevention and adaptation policies.

If cultural heritage is often described as being challenged by climate change, global agreements - such as the UNFCCC COP21 Paris Agreement and the 17 United Nations Sustainable Development Goals (SDGs) - acknowledge its potential to play

an active part in the transition toward more sustainable socio-economic and governance models. Many opportunities have arisen from research, and many are still to be discovered.

Recognising the links between cultural heritage and climate change, JPI CH and JPI Climate agreed to develop a collaborative effort to explore areas of shared interest. This resulted in a joint workshop in September 2020, where experts discussed the impact of climate change on cultural heritage and the opportunities for climate mitigation and sustainable development. The workshop identified ten key messages on joint priority research themes and gaps and the role of the JPIs in addressing these⁵.

This workshop served as the basis for the development of a joint White Paper⁶ focused on the identification of research gaps and opportunities at the interface of cultural heritage and climate change that could be addressed jointly by the JPIs. A working group of 20 experts was established to draft this White Paper under the coordination of a joint Task Force composed of representatives from both JPIs.

The White Paper was published and officially launched at the symposium 'Heritage for the Future, Science for Heritage', in Paris, in March 2022. It includes a short state of the art of research in the field of cultural heritage and climate change, key research gaps and priorities requiring attention in the coming years, and a list of actions and instruments that both JPIs could implement to support research and innovation that informs policy.

The development of a joint White Paper between JPI CH and JPI Climate was motivated by the notion that tackling climate change and building resilient and sustainable societies would benefit from greater collaboration between the cultural heritage and climate research communities. This is particularly relevant for the

understanding and assessment of risks, impacts and vulnerabilities that threaten the values of cultural heritage, but also for the development of adaptation and mitigation strategies powered by the knowledge, data, experiences, and skills inherited from the past and which are at the heart of people's daily lives.

The publication of this White Paper, as AR6 reaches its conclusion, is both very timely and opportune. It enables consideration of the current context and roles of research in cultural heritage and climate change, their interrelationship, and shared contributions to finding solutions in taking action to protect our future.

The White Paper highlights the crucial links between cultural heritage and climate change at European and international levels. It provides visibility and momentum for developing research to inform effective responses by relevant national, European, and international processes and policies.

Concretely, both JPIs will aim to work collaboratively to support and promote:

- Research that complements and builds upon existing knowledge, ensuring that it contributes to future prevention and adaptation policies.
- Research that further explores how to make cultural heritage a readily available resource for climate mitigation, adaptation, and sustainable development.



Figure 1 -Front Cover Image of the JPI Cultural Heritage & JPI Climate Joint White Paper

¹ European Commission. Communication 'Towards Joint Programming in Research: Working together to tackle common challenges more effectively', retrieved 4 May 2022, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008DC0468&from=EN>

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Increasing Cultural Heritage Resilience Facing Climate Change Challenge: The HERACLES Project Experience

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Résumé

L'Europe est riche d'une diversité culturelle, d'une multitude de bâtiments anciens et de collections exceptionnelles qui attirent chaque année des millions de touristes. Ces biens culturels porteurs d'une valeur inestimable doivent être préservés pour les générations futures. Le projet HERACLES propose une approche holistique, multidisciplinaire et multisectorielle qui vise à fournir un système opérationnel et des solutions favorisant la résilience future du patrimoine culturel.

Mots-clés: résilience, changement climatique, patrimoine bâti, surveillance, risques, impacts

Keywords: resilience, climate change, built heritage, monitoring, risks, impacts

The concept of resilience from mechanical sciences migrated to various fields (psychology, ecology, social studies, urban planning, and others). It includes the capacity to be prepared for the unforeseen, to withstand disturbances, and reactively and proactively adjust or transform to changing conditions.

In the last decades, the world has been facing the effects of climate change (CC), which require interventions in many different fields, from the environment and agriculture to land protection. Cultural heritage (CH) too, particularly in Europe and in the Mediterranean basin where many important and prestigious monuments and sites are located, must face this emergency. In many situations, the presence of extreme meteorological events can severely damage historical buildings and works of art.

Effects on CH assets deriving from natural and environmental hazards related to CC are many and complex. Environmental and natural hazards can cause damage or destruction of CH assets through various natural catastrophic processes; this entails the necessity to consider preservation and protection issues.

CC impact functions as a risk multiplier to existing problems and increases and accelerates them. Climate stressors can directly affect CH buildings, monuments, and settlements. Sea level rise threatens coastal assets with increased erosion and saltwater intrusion. More frequent and intense storms and flood events can damage structures which were not designed to withstand prolonged structural pressure, erosion, and immersion. Changing precipitation patterns can quickly erode assets built for a different climate. Also, stability issues can arise since the increased ground soil moisture can reduce the physical stability during extreme rainfall events and trigger landslides. Warmer temperatures and increased humidity can damage building materials and structures by encouraging rot, pest infestations, and erosion.

The most significant global CC risks and impacts on CH are well known, and an example is reported in the table *Principal Climate Change risks and impacts on cultural heritage* of Working Document 30¹.

The HERACLES Project Contribution

In this framework, HEritage Resilience Against CLimate Events on Site (HERACLES) proposes a novel, pioneering, and systematic approach to ensure the sustainable management and protection of the different CH typologies in Europe and worldwide and with respect to the CC impacts, contributing to increasing its resilience. The approach benefits from a multidisciplinary methodology that bridges the gap between the two different worlds: the CH stakeholders and the scientific/technological experts, who were both involved in the project.

Based on the end-user requirements and investigations on-site, HERACLES proposes the integration of wide-area surveillance (satellite) including asset and surrounding territory, observation on-site of single elements of the asset, together with material diagnosis. In such a way, a multi-temporal and spatial situational awareness of the CH asset is achieved, managing data from different sources and scales.

Case studies were in Italy and Greece, countries with many CH emergencies. In Greece, the testbeds were the Koules Fortress in Heraklion and the Knossos Palace. In Italy, the project studied the historical town of Gubbio, notably the Consoli Palace and the Town Walls, to address the problems faced by historical centres and buildings due to hydrogeological risk worsened by heavy rains. Moreover, Gubbio is located in the Apennine chain, a seismic area that creates further concerns.

Results & Discussion

A selected part of the study conducted on the Consoli palace is shown in this paper as an example of what it is possible to achieve with the HERACLES approach. Satellite observation was used, using maps of displacement in time, providing timely and accurate geospatial information, such as structural failures of buildings, as well as terrain deformation in the surrounding areas. The displacement is measured with millimetric accuracy. In **Figure 1**, 3D results of the persistent scatterer pairs (PSP) synthetic aperture radar interferometry (IFSAR) monitoring on the Consoli Palace in Gubbio (descending dataset) are shown. The persistent scatterers (colour-coded according to their annual mean velocity along the line of sight) are 3D-localised to show the different displacement phenomena affecting the building. A crack was found in a façade, and the two sides (West and East) are indicated with red arrows.

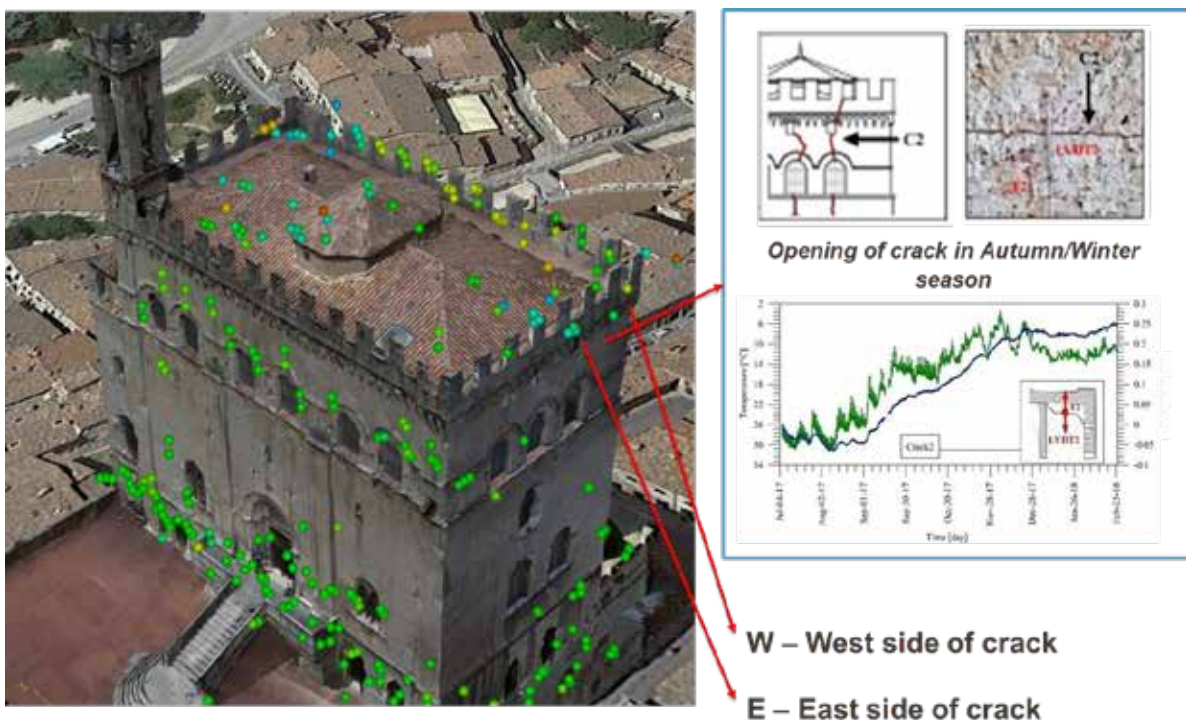


Figure 1. Identification of two different displacement trends affecting the Consoli Palace together with the temperature and crack amplitude values during the monitoring period from July 2017 to February 2018.

The crack was also monitored with in-situ sensors (Linear Variable Differential Transducer, LVDT), correlating its amplitude behaviour with the variation in temperature, daily and seasonally. It was found that the crack opens in winter due to the stone thermal coefficient, and the opposite happens in summer, generating a cyclic behaviour, per se, not critical. Nevertheless, based on historical data from earth observation, it was possible to acquire information on the opening extent since 2011.

As stated above, an opening trend of the monitored cracks corresponding to the Autumn/Winter period has been detected during the monitoring period. The DIFSAR analysis conducted at the Consoli Palace can also confirm this trend.

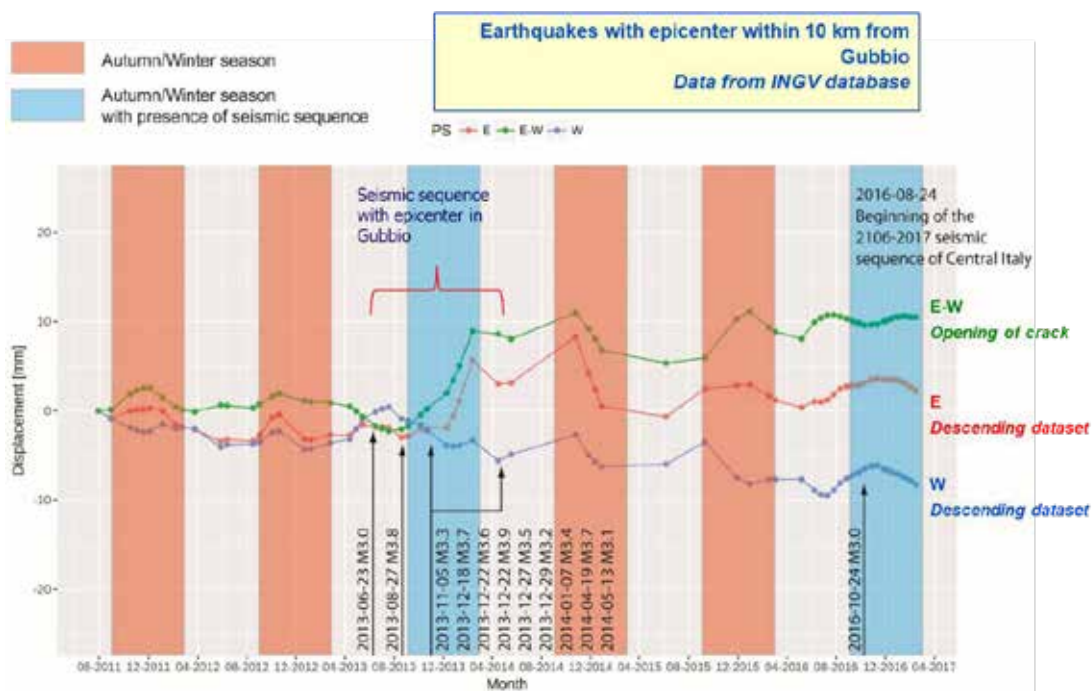


Figure 2. DIFSAR data of scattered points across the crack monitored through an in-situ sensor (LVDT).

Figure 2 shows in more detail a correlation between the data recorded by the in-situ sensor and displacements retrieved by the analysis of synthetic aperture radar (SAR) satellite sensors which has been conducted by considering the differential displacements (detected by DIFSAR analysis) between two points, W and E, taken on the East and West side of the crack, respectively. The figure highlights the displacement trends of the scattered points

taken on the East (E – red line) and West (W – blue line) side of the crack, while the differential displacement E-W is depicted in green. The areas of the graph highlighted in orange refer to the Autumn/Winter seasons, during which an opening of the crack is observed from the in-situ (LVTD) data. Moreover, **Figure 2** reports some anomalies in the time series of the displacements, corresponding to the occurrence of small/medium intensity earthquakes that occurred in the area of Gubbio. The seismic events have caused a permanent displacement between the E and W points. With respect to this permanent displacement, the seasonal temperature introduces oscillations according to the behaviour already detected, i.e., increase/decrease of displacement with decrease/increase of the temperature. This is an important result confirming the validity of the HERACLES monitoring protocols in providing useful data containing key information on structural conditions. Unfortunately, from **Figure 2**, it can be seen that the seismic events that occurred in this area (in 2013 and 2016) are acting as a risk multiplier, producing cascade effects. In fact, following the green line in the figure, we can observe that the opening increased by a factor of 5.

This example shows what can be observed and understood, therefore providing helpful information to the decision-makers responsible for the CH assets for planning mitigation actions. By integrating multi-risk, multi-source, and multi-scale data, it is possible to obtain valuable information and solutions to be made available for end-users and managers of CH assets.

The approach and tools developed in HERACLES are flexible, of general applicability and easily transferred to other sites/assets. Accordingly, general protocols were developed together with preventive measures and remediation actions.

Further information on the project is available at <http://www.heracles-project.eu/>

Acknowledgements

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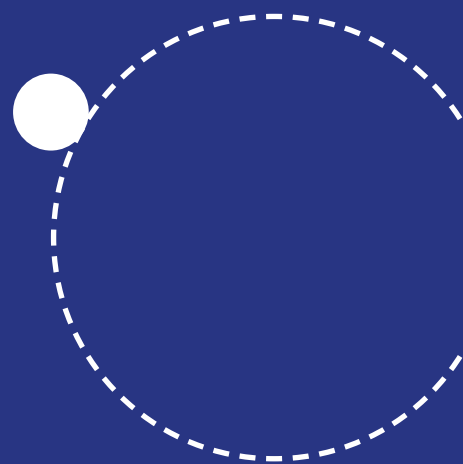


2.

SESSION PLÉNIÈRE PLENARY SESSION

Sciences du patrimoine et transformation numérique :
défis et opportunités

Heritage Science and Digital Transformation:
Challenges and Opportunitie.



The Heritage Digital Twin – A New Ontological Approach for Cultural Heritage Knowledge Organisation

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Résumé

Cet article présente le concept de jumeau numérique du patrimoine comme un élément constitutif de l'organisation des connaissances sur le patrimoine culturel. Selon les auteurs, il permettra la création d'un monde virtuel documentant le monde réel et, à terme, le lieu où les processus simulés et réels s'intégreront pour produire et organiser la recherche sur le patrimoine culturel.

Mots-clés: jumeau numérique, patrimoine culturel, données accessibles

Keywords: digital twin, cultural heritage, open data

Heritage science, as a domain discipline, has been only recently defined¹ as the interdisciplinary domain of scientific study of cultural or natural heritage. It draws on diverse humanities, sciences and engineering disciplines and is an umbrella term encompassing all forms of scientific enquiry into human works and the combined works of nature and humans, of value to people. As such, there are many converging disciplines operating under this term, primarily from natural sciences and from exact sciences. The need to include data from the social sciences and the humanities (SSH) as well has been identified as a priority for building a cross-disciplinary repository for cultural heritage^{2,3}. In such a newly defined discipline, so far there is a lack of procedures, standard investigation protocols or canonical workflows, and the methods implemented are experimental, with little or no standardisation or testing. Likewise, standard vocabularies and related thesauri describing the terminologies used are yet to be defined.

Heritage Sciences as Open Data-Driven Research

While the aim of a typical heritage science investigation is primarily to gain a better understanding on the materiality, state of conservation and measures to be taken for the preservation and restoration of heritage assets, the means to achieve such goals are multiple, heterogeneous, and involve a multitude of techniques, methods and tools primarily deriving from chemistry, physics, or computer science.

We propose to adopt the concept of digital twin – detailed below – to describe a heritage asset and the combination of the above steps and of their effects when applied on it. In our opinion, this approach guarantees to assess the quality of the investigation, provides the interoperability of (the data derived by such) experiments and enables their re-use: in sum, it documents what is happening, how it is being done and which are its effects on the heritage asset, both for analyses and for conservation interventions. At the same time, it enables the *in vitro* (or, as someone says, *in silico*) execution of experiments.

Defining Digital Twins

The digital twin concept⁴ was coined by Michael Grieves, of University of Michigan, during a presentation to industry in 2002, for the formation of a Product Lifecycle Management centre. As stated by Grieves and Vickers (2017), the digital twin is based on the idea `...that a digital informational construct about a physical system could be created as an entity on its own. This digital information would be a `twin' of the information that was embedded within the physical system itself and be linked with that physical system through the entire lifecycle of the system...'⁵. Thus, for the industry sector, the digital twin approach requires creating high-fidelity virtual models for each physical entity to emulate their states and behaviours with abilities of evaluating, optimising, and predicting⁶.

While the concept of digital twins is making a gradual entry in the world of cultural heritage, it is primarily addressing issues of conservation of built heritage⁷ or preservation of artistic heritage⁸. and primarily using H-BIM as the environment for defining it⁹. A first and promising attempt to link between semantics and digital twins has been published in relation to the restoration project of the Notre Dame cathedral in Paris¹⁰. Acknowledging the fundamental importance of integrating data and making them interoperable, and of taking into consideration the multi-disciplinary aspect of cultural heritage research, conservation, preservation, and valorisation, we propose here that to build the heritage digital twin (HDT) based on a solid and well-defined ontological model, it needs to be at the core of a more extended system achieving the desired merge between the physical and the digital space mentioned above.

Thus, at the core of any HDT, there is the virtual representation of a heritage asset. Such a real-time digital counterpart semantically integrates all the data related to its tangible and intangible attributes. Physical processes are then modelled as simulations, and their effects add to the HDT data content.

Defining the HDT is a challenging task. Consider for example a painting, which was painted on top of another painting, or an archaeological site containing the superimposed remains of several manifestations of human occupations, the only relation between them being that they share the same physical location, or an architectural building, ceasing to exist as a single structure, but its architectural components being amalgamated in other adjacent buildings. Such simple but frequent examples show that extreme care must be put into distinguishing the asset features, i.e., the classes pertaining to it, and the asset status, i.e., the instances of such classes that may vary in time.

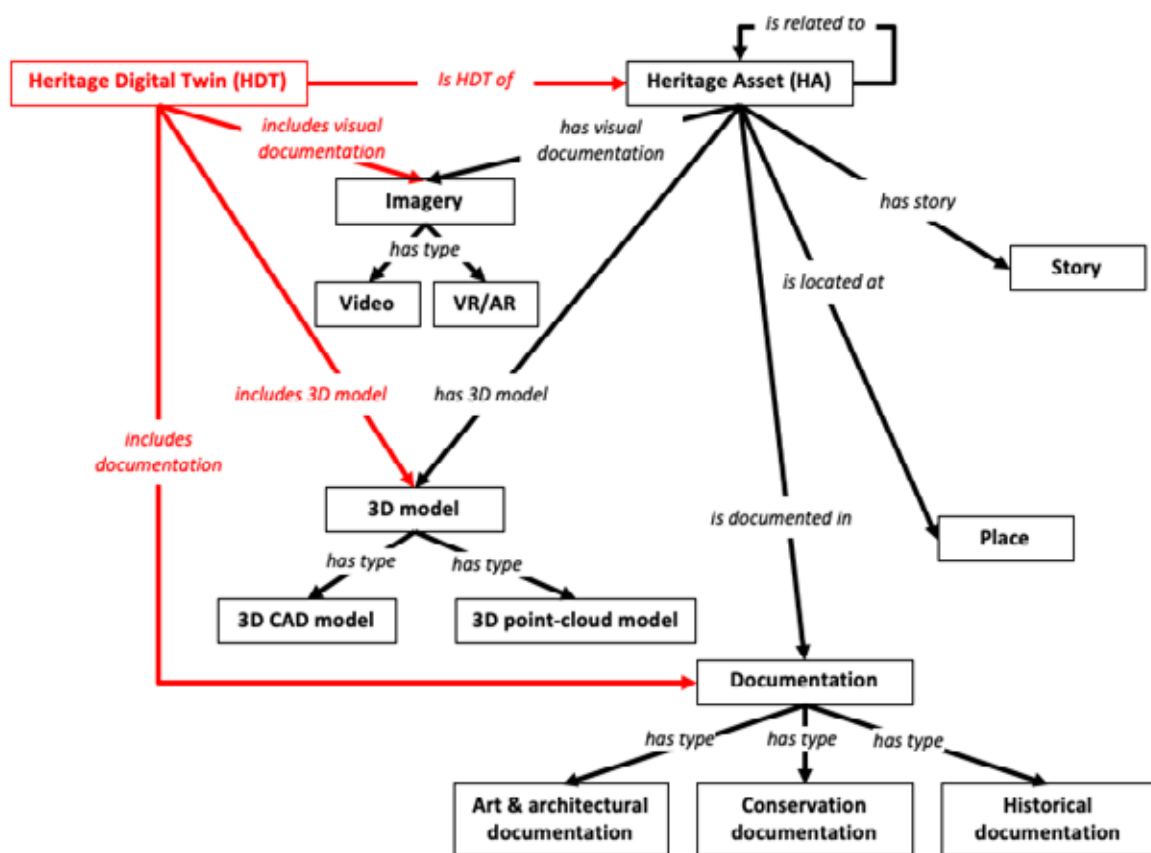


Figure 1. A simplified semantic graph describing the core of the HDT ontology. The part in red concerns the HDT

Figure 1 describes a simplified semantic graph of the core HDT ontology, exemplifying the role of the HDT versus the heritage asset (HA). This association induces properties relating the latter to various attributes of the former, such as digital objects, e.g., a 3D model, the written documentation or visual documentation, and so on.

The HDT ontology under development is an application profile of CIDOC CRM, an ISO 21127:2014 standard. As such, it will be compatible with other semantic models compliant with this ontology, such as, for example, EDM, the Europeana Data Model¹¹; any of the other CRM application profiles, from which it draws concepts, especially from CRMdig and CRMsci; and many others CRM derivations in use in various heritage domains.

The Heritage Digital Twin is apt to deal with intangible heritage components as well, for example with the Story class, a general class encompassing stories, history, beliefs, traditions, skills, regulations, and also co-creation and community participation. Such a general class is being further developed by defining specific subclasses, tailored to describe each of these immaterial components.

The HDT ontology is being progressively developed to cover all the details of cultural heritage documentation and to enable a structured description of activities carried out on heritage assets, such as those typical of heritage sciences, and of their outcomes. Such developments are being verified with heritage, conservation and restoration professionals to test the suitability of this ontology to describe with the required detail the related activities, events and their consequences on heritage assets, under all regards, both tangible and intangible. We anticipate that digital twins will allow not only a complete documentation, but also enable experimenting, in the virtual world they will create, the effects of activities such as conservation and restoration, and the effects of uncontrolled degradation phenomena caused by the environment, by disastrous events or by anthropogenic activities. For this reason, the HDT approach goes well beyond technological paraphernalia: it will be the pillar for a complete integration between laboratory and data-driven research.

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Digital Transformation in Progress - Challenges for Museums and Thoughts on a European Museum Collaboration Space

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Résumé

Cet article donne un bref aperçu du processus de transformation numérique en cours dans les musées, et plus particulièrement au Staatliche Kunstsammlungen Dresden (Allemagne). Il énumère les principaux défis et obstacles rencontrés dans le travail pratique et introduit le concept d'un espace européen de collaboration muséale comme solution possible pour y répondre.

Mots-clés: musées, défis, transformation numérique, cloud européen pour le patrimoine

Keywords: museums, challenges, digital transformation, cultural heritage cloud

Digital transformation is fundamental for museums as it is fundamental for society and the economy. Therefore, digitisation is in progress within many museums and cultural heritage institutions, becoming more and more important. For various reasons – technological, content-related, or organisational – it is a challenging process. The following discussion illustrates the main aspects of the very complex area of using digital technologies within the museum's activities.

Main Challenges and Obstacles to Digitization in Museums

First of all, the nature of digitisation itself must be regarded. While institutions build on long-term preservation and sustainability, museums are confronted with fast and dynamic technological changes. Sometimes, using digital technologies requires fundamental turns in museums' work processes and all areas of museum activities are affected. For example, while trying to make knowledge about the artefacts persistent, the choice of technology is crucial. It is necessary to use enduring technologies because digitising large collections could last decades. If a key technology depreciates halfway, results cannot be used anymore, and the digitisation maybe has to start over again. An example of this is the fading of the Adobe Flash technology¹, which was very common at the time. To be aware and prepared for the very versatile aspects of digital systems, the main challenge for museums is to build up competencies in planning, implementing, and operating digital systems as well as implementing digital methods into their working life. In addition, establishing and operating digital systems often requires extra funding and staff. Running a vast database that is safe, secure, reliable as well as fast in access often exceeds the capabilities of a curator who is responsible for the artefacts. Moreover, the funding to enable working with digital systems usually has to be raised additionally to museums' regular activities.

Another aspect is that cultural heritage institutions in general - and especially museums - have particular requirements for digital systems because they work in

various areas and with very different data types. Possible fields of data processed in museums involve, for example, data of objects, artworks, history, exhibitions-making, research data, the provenience of artworks, restoration processes (documentation), educational programs, event management and art creation. Usually, existing (collaboration) platforms are designed to care only for a few aspects of the complex data processed by the whole museum.

However, despite the advantages of using digital systems being obvious, certain obstacles prevent museums and other cultural heritage institutions from using those, especially for better communication and collaboration with other stakeholders. There are concerns, for example, that the protection of intellectual property, privacy and cultural heritage data may be problematic as commercial systems are often bound to US jurisdiction and have very specific agreements on data protection and use. This indirect fear of giving away control, rights, and data itself often repels cultural stakeholders from using suitable services. Privacy issues and resulting governmental or administrative restrictions may not allow the usage of certain services and systems as well. Moreover, on a very practical level, giving external users access to internal systems is often not possible or needs high effort.

Small and mid-sized institutions are not capable of using (allowed) commercial systems at all or may not have the capacity to run open source solutions on their own because they lack the skills and staff needed. In opposition, large institutions often have their own solutions and staff, but those individual systems and concepts do not fit together with other museum systems. Consequently, a key issue is to promote digital collaboration between museums!

For example, in 2015, the Porcelain Collection of the Staatliche Kunstsammlungen Dresden started a project to catalogue 8,000 East Asian porcelain objects². Over 30 experts situated all over Europe and abroad worked on identifying and cataloguing

the objects. Digital systems should have been used, but there were practical problems. Direct exchange of a large data amount (e.g., multiple high-resolution views of the objects) was not possible due to limited server resources. External scientists only had limited access to the internal database system or no access to the assets management system. Only systems with monolingual interfaces were in operation when the project started.

Regarding this, the main challenge was to integrate external experts into the internal digital project workflows, although there were not members of the staff. In the end, a specific digital solution was developed but with high effort and by using workarounds or semi-automatic procedures.

A European Museum Collaboration Space as a Possible Solution

Looking at museums' digital activities in general, we came to the opinion that there is a need for effective collaboration tools addressing the above-mentioned special requirements to increase the acceptance and usage of digital technology. Therefore, we support the idea of a European Museum Collaboration Space as a centralised platform to offer those tools to related stakeholders. We suggest the following key features:

- Easy access for all stakeholders and easy ways to collaborate
- European jurisdiction, privacy standards and data protection as the most important point.
- Multiple collaboration tools, including a shared data space for joint research, mutual document edition, mutual exhibition planning, calendar sharing, etc.
- An independent European institution that ensures safe, secure, and trustworthy communication and collaboration to operate this space.
- A permanent infrastructure based on Open Access technology to allow long-time usage.

The development of a European Museum Collaboration Space has to be accompanied by infrastructural actions to ensure broadband access even for institutions in rural areas. Luckily, the European Parliament has granted funding for a cultural heritage cloud within the Horizon Europe program, and currently, European working groups are defining the features and main concept for this platform. Some projects have started, and the first tenders on this topic have been published³.

To sum up, digital transformation challenges museums in a special way. Frequently, Digital solutions for collaboration are not used due to various concerns. Therefore, a key issue is to support digital collaboration between museums by establishing suitable systems, easy to participate in and safe to use. A European Museum Collaboration Space could be a solution. First steps have already been made.

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²Das ostasiatische Porzellan aus der Sammlung Augusts des Starken, <http://forschung.skd.museum/projekte/details/c/pC/a/show/project/129-das-ostasiatische-porzellan-aus-der-sammlung-augusts-des-starken>

³European Museum Collaboration and Innovation Space, https://cordis.europa.eu/programme/id/H2020_DT-TRANSFORMATIONS-24-2020



3.

SESSION PLÉNIÈRE PLENARY SESSION

Former les acteurs du patrimoine :
enjeux et perspectives

Training Heritage Stakeholders:
Challenges and Prospects



Training Heritage Stakeholders: Challenges and Prospects

Harald HARTUNG

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Résumé

Le patrimoine culturel, aujourd'hui facteur de cohésion sociale, n'a pas toujours été si inclusif. Une nouvelle dynamique et compréhension du terme au cours de ces dernières années ont notamment permis de donner un nouvel élan au secteur, animé par des acteurs de plus en plus nombreux et diversifiés. Leur formation est par conséquent un sujet central dans l'appréhension des enjeux et du devenir du patrimoine culturel. Afin de favoriser l'innovation, la transversalité, et la collaboration entre acteurs, les institutions comme la Commission européenne portent et accompagnent des programmes de recherche visant à valoriser le patrimoine culturel, en s'adaptant aux défis de demain.

Mots-clés: acteurs du patrimoine, patrimoine culturel, enjeux, perspectives, formation

Keywords: heritage stakeholders, cultural heritage, challenges, prospects, training

The question of challenges and prospects of heritage stakeholders must be addressed from three angles which are a) the evolution and the understanding of the cultural heritage term, b) the impact of this widened approach on our stakeholders and c) the manner we intend to efficiently prepare and train them considering this matter.

Comprehension of the Cultural Heritage Concept Over Time

Firstly, it is essential to understand and define the term cultural heritage. While in the past, this term was often limited to artefacts and their preservation, this has evolved together with our societies. It now includes also intangible cultural heritage like values, traditions, and beliefs. In the end, they form the perceptions of individuals and societies. And, as it is often used in the Anglo-Saxon world, we add to the culture with a big C, culture with a small c as represented by street dance or graffiti arts.

This dynamic understanding of cultural heritage helps strengthen the glue which holds together a society in a time when globalisation, artificial intelligence, big data, and disinformation create a feeling of unease, insecurity and losing control. Not only does this approach enable us to develop a better understanding and tackle the major challenges of today and tomorrow, but it also offers new opportunities for the inclusion and participation of young people and those at the margins of our societies. With this, we embrace the diversity that exists in the cultural heritage of our societies. This is the essence of Europe's motto 'united in diversity', and through our research, we strive to make it a reality.

The European Commission has embraced the vision of a widened, dynamic, and forward-looking understanding of cultural heritage, which reaches out and engages with citizens from all 'walks of life'. This approach is a direct result of our understanding of cultural heritage, not as a relic of the past, relevant only to elderly

and well-off people, but rather as the solid ground that sparks the creative tension required to develop as humans and societies.

Heritage Stakeholders: Involvement and Impacts

Secondly, the stakeholders themselves also have an undeniable and determinant role in this discussion. This approach widens the group of our stakeholders and the ones engaged with and in culture. In addition to the traditional stakeholders such as cultural institutions, museums or curators, new stakeholders, including civil society organisations, educational and technological institutions as well as cultural and creative industries (CCIs), need to be added to create wider partnerships - a new ecosystem - that contribute to the major challenges that are ahead of us (political, technological, climatic, etc.).

These are ambitious goals. As a result, it is crucial to go further on this issue. More than ever, cross-cutting work must prevail, and heritage stakeholders must expose themselves and work together with the ones with whom they want to engage : young people, CCIs, and interested citizens. This is a challenge, and if we want to be successful, we need to review our well-established positions and look at things from a different angle.

Equally, we need to involve more specialists from different domains in addition to art historians, historians, and restorers. We need to increasingly involve professionals like specialists in laser techniques, biologists, chemists, physicists, programmers, IT specialists, and economists, just to name a few.

The Importance of the Training Issue

Last but not least, training is as well a key theme that must be mentioned. The truth is that contemporary challenges are often so complex that we cannot afford to work in silos. We must develop horizontal skills to be able to work in teams. We also need to develop our communication skills together with new and innovative methods for citizen engagement to be able to reach out to the public in a meaningful and relevant way. These skills will not replace the expertise acquired in the different domains, but they will come on top of it.

We see an example of such a challenge in the digital field. During the pandemic, the lockdowns, distance learning, the teleworking have completely changed our habits. Indeed, the downsides were many and often detrimental to our well-being. But at the same time, new technologies opened up new and exciting ways of reaching out and engaging with our public, with the civil society, and with young people. We now know that the possibilities these technologies offer can help us involve in our activities people who otherwise would have never been able to participate. In this reality that has emerged, the question of how to best embrace the new technologies in cultural heritage and in the arts will be central.

The European Union plays and will continue to play a key role here. Through its research themes and support of cultural projects, the European Union helps further develop our understanding of the value of cultural heritage as an answer to contemporary problems. For example, through the Horizon Europe programme, we are funding research to develop a better understanding of the role of CCI as a driver of innovation and competitiveness, how digital technologies can preserve and enhance cultural heritage and, as another example, the role of games in shaping our societies.

These are examples of how our research can spur new ways of dealing with cultural heritage in terms of scope and in terms of engaging old and new stakeholders. The pandemic has confirmed that there are new and more efficient ways to deal with stakeholders and engage with the public. Digital technologies, including AI as well as augmented and virtual reality, are all tools at our disposal that offer new opportunities to people who, otherwise, would have never been able to access and connect with cultural heritage from their living rooms. This is why we are carrying out research on these topics.

Naturally, not everyone masters all the skills required. That is why the role of education and training is so important. It enables people and institutions to be digitally fit for the challenges ahead. Therefore, we have incorporated training aspect in various of our research topics to equip actors involved in cultural heritage projects with the necessary digital skills to help develop new concepts and new business models for cultural heritage projects where professionals from various backgrounds as well as the wider public are coming together to ensure their sustainability.

For example, in the topic of 'Green technologies and materials for cultural heritage', we aim to provide solutions and explore ways for quality conservation and restoration in a green and sustainable way. In addition, we strongly encourage the involvement of the cultural and creative sectors, policymakers, public entities, young people, and civil society organisations to ensure sustainability. Training is an essential part of these projects as engineers will need to train CCIs in the new green technologies. Otherwise, we risk producing academic knowledge that is not useful to anybody.

Another example is the topic of 'traditional crafts for the future: a new approach'. Our goal is to bring together traditional knowledge with cutting-edge digital technologies to develop improved and new products, services and professions. We

also aim to set up platforms and develop methodologies, curricula, entrepreneurship skills and courses for vocational training. We believe that upskilling and reskilling the heritage stakeholders are necessary to meet the challenges ahead. That is why we will continue investing in training through our research topics to support our stakeholders in this transition.

In conclusion, I would like to highlight a project in which many of you have been involved in over the last few years: the restoration of Notre Dame. The devastating fire has shown the power of cultural heritage throughout the continent. Within a few days, it has mobilised one billion dollars for its restoration. At the same time, it has mobilised all the skills, knowledge, and research capacities the cultural heritage sector has at its disposal. It made work together craftsmen, engineers, digitisation specialists, and many other professions for the same goal.

Acknowledgements

I would like to thank the French Presidency of the Council of the European Union 2022 for having given us the opportunity to tackle these questions in a comprehensive and holistic way throughout this symposium.

Una-Her-Doc, L'expérience doctorale de l'alliance européenne Una Europa

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Abstract

Una Europa is a unique project born from the association of eight major European universities. Together, these universities are seeking to develop a new doctoral programme in the field of cultural heritage, notably through the creation of a joint, doctorate called 'Una-Her-Doc'. This initiative, which is unique in Europe, aims to create high-level European research in cultural heritage and could be launched in October 2023.

Mots-clés: patrimoine culturel, doctorat conjoint, universités européennes, interdisciplinarité

Keywords: cultural heritage, joint doctorate, European universities, interdisciplinarity

L'alliance européenne Una Europa réunit en 2022 huit universités européennes : Freie Universität Berlin (Allemagne) ; Alma Mater Studiorum – Università di Bologna (Italie) ; Uniwersytet Jagielloński w Krakowie (Pologne) ; University of Edinburgh (Écosse) ; Helsingin Yliopisto (Finlande) ; KU Leuven (Belgique) ; Universidad Complutense de Madrid (Espagne) et l'Université Paris 1 Panthéon-Sorbonne (France). Imaginée dès 2017, et préfigurée par un premier protocole d'accord signé à la Sorbonne en février 2018, elle a été dotée d'une personnalité juridique en 2019 par l'intermédiaire de la constitution d'une association à but non-lucratif de droit belge.

Le projet 1Europe soumis par Una Europa a été sélectionné en 2019 et financé pour une durée de trois ans dans le cadre de l'appel Erasmus + pour la constitution d'alliances européennes. La constitution d'une association, et donc d'une gouvernance propre gérant l'ensemble des projets portés par l'alliance, offre à Una Europa un cadre d'actions pérennes visant à structurer des projets de longue haleine avec, comme vision à long terme, la constitution d'un véritable campus européen.

Le patrimoine culturel a été défini dès juin 2018 comme l'une des thématiques prioritaires d'Una Europa. Parmi les différents projets lancés dans le cadre de cette thématique, le programme doctoral Una-Her-Doc est certainement l'aventure scientifique, académique et humaine la plus ambitieuse et passionnante de l'alliance européenne.

La création d'un écosystème académique en patrimoine culturel

Le doctorat en patrimoine culturel a été pensé comme un doctorat conjoint, ou double, sur un champ d'études fondamentalement interdisciplinaire. Sa création reposait de façon incontournable sur une communauté de chercheurs ainsi que sur

une véritable cohorte de doctorants. Elle impliquait, par conséquent, la constitution de ces collectifs et pas seulement le développement d'un diplôme.

Une des premières étapes a été la formulation de thématiques de recherche commune en matière de patrimoine culturel. Celles-ci ont été définies par un travail ascendant, initié dans chacune des huit universités. Cette démarche a permis, par un processus itératif, l'identification de quatre thématiques communes pour l'ensemble des huit universités. Ces thématiques interdisciplinaires ont agrégé les chercheurs des universités et les premiers doctorants au sein de quatre équipes de recherche transnationales. Pensées également dans le cadre plus large des priorités européennes et telles que portées, entre autres, par l'Initiative de programmation conjointe de recherche « patrimoine culturel et changement global » (JPI CH), les thématiques sont les suivantes :

- Patrimoine culturel, migrations et mobilités mondialisées
- Patrimoine et numérisation de la société
- Patrimoine culturel et capital social
- Conservation du patrimoine culturel.

La préfiguration des cohortes doctorales a été faite dans le contexte de plusieurs ateliers doctoraux qui ont permis d'expérimenter des formules de formation par la recherche réunissant des doctorants des universités concernées. Les thématiques de ces ateliers ont été définies de façon à réunir des doctorants de différentes disciplines intéressés par le champ du patrimoine. Ceux-ci ont abordé des thématiques telles que « patrimoine et hybridation », « patrimoine et dissonance », « patrimoine et numérique » comme entrées susceptibles d'apporter un éclairage complémentaire à leurs travaux doctoraux en cours. Les ateliers ont été pensés dans la durée, avec une agrégation des doctorants autour de travaux communs en amont, pendant et après le déroulement de l'atelier¹

Le concept d'Una-Her-Doc

La création d'un doctorat conjoint a été proposée par huit universités présentant de fortes et anciennes traditions de recherche disciplinaire. Avec comme localisation huit pays différents, mais aussi neuf langues officielles, et offrant des doctorats aux contours, concepts et durées très divers, il est rapidement devenu nécessaire d'harmoniser les cadres administratifs et juridiques de ce doctorat conjoint.

La création d'un doctorat conjoint, offrant un diplôme cosigné par les huit universités partenaires, est une démarche longue, d'autant plus que rien de tel n'existe actuellement en Europe. « L'approche européenne », qui consiste à faire habilitier un diplôme par une des agences d'habilitation dans un des pays partenaires et faire ensuite reconnaître cette habilitation par les autres pays des universités cosignataires semble être une des méthodes à privilégier. Elle est explorée dans le cadre du doctorat d'Una Europa dans la perspective de l'ouverture du doctorat conjoint en octobre 2023.

De façon plus pragmatique, il a été décidé d'ouvrir, dès octobre 2021, un programme de doctorats doubles assortis d'un certificat en patrimoine culturel décerné et signé par les huit universités d'Una Europa dans le cadre d'un accord de consortium. Ainsi est né le programme doctoral « Una-Her-Doc ». Il a été conçu autour d'un ensemble de dispositifs :

- Une double inscription dans deux universités d'Una Europa sur la base d'une convention cotutelle ;
- Un comité de thèse réunissant deux codirecteurs ainsi que deux autres enseignants-chercheurs de deux autres universités d'Una Europa ;
- Une mobilité cumulée de douze mois vers l'université de cotutelle au cours des études doctorales, et d'autres mobilités électives vers d'autres universités d'Una Europa ;

- La participation dans une des équipes de recherche transnationales d'Una Europa ;
- Le suivi du programme pédagogique des cours obligatoires, et éventuellement électifs, créés collectivement par les huit universités²

À la fin de leurs études, les doctorants recevront non seulement un double doctorat dans la discipline choisie, dispensé par les deux universités ayant signé la convention bilatérale de la cotutelle, mais également un certificat en patrimoine culturel signé par toutes les huit universités d'Una Europa. Un accord de consortium, signé en mai 2021 par les huit universités, définit précisément des conditions d'attribution de ce certificat. Un comité doctoral valide l'inscription des doctorants au programme Una-Her-Doc, en examinant en particulier la pertinence d'inscrire leur travail doctoral dans la thématique des études du patrimoine.

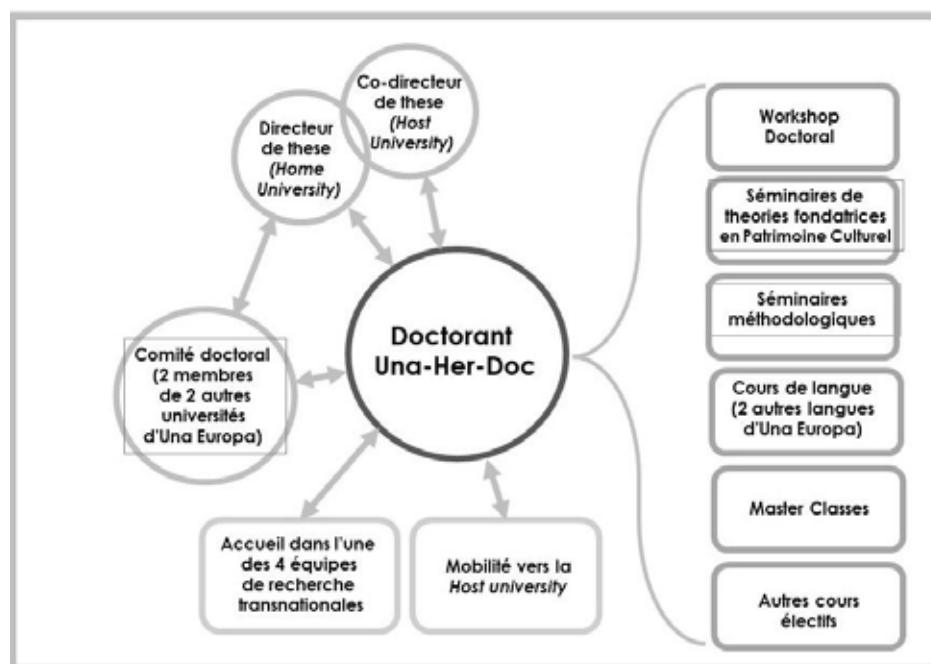


Figure 1. L'écosystème du doctorat en patrimoine culturel d'Una Europa (doctorat en cotutelle + certificat en patrimoine culturel signé par les huit universités) © Maria Gravari-Barbas

C'est dans ce contexte d'interconnaissance des enseignants-chercheurs et des doctorants qu'a été pensé et produit le matériel pédagogique commun du doctorat en patrimoine culturel d'Una Europa. Celui-ci est proposé pour la durée de principe de trois ans et est composé de matières obligatoires (théories fondatrices du patrimoine, séminaires méthodologiques, ateliers doctoraux, séminaires organisés dans le cadre des équipes transnationales) et électives (séminaires de projet, écoles d'été, etc.). Ces matières sont construites *ad hoc* et prennent en compte la diversité des champs du patrimoine culturel, matériel et immatériel, et la diversité des relations que les sociétés entretiennent avec celui-ci.

Una-Her-Doc repose sur un concept clair et partagé et la communauté des chercheurs se construit de façon très engagée. Les doctorants ayant expérimenté les formats pédagogiques proposés se disent enthousiastes, et la préparation du matériel pédagogique commun offre un terrain très propice à la réflexion sur le champ du patrimoine. Sur l'année 2021-2022, onze doctorants ont été recrutés via ce dispositif. Ils forment la première cohorte doctorale d'Una Europa.

Le lancement du doctorat conjoint doit toutefois encore franchir plusieurs obstacles au niveau national et européen avant son ouverture pour l'année académique 2022-2023. Nous mesurons pleinement ces difficultés, mais nous restons optimistes quant à la capacité des structures à accompagner ce formidable élan pour la constitution d'une recherche européenne de haut niveau en patrimoine culturel.

¹ GRAVARI-BARBAS, Maria & STANKOVI, Isidora, 'Heritage Hybridisations. Concepts, Scales and Spaces', Una Europa PhD Workshop Proceeding (online), 2021 https://heritage-hybrid.sciencesconf.org/data/pages/Paris_1_Una_PhD_Workshop_Proceedings_3.pdf

² GRAVARI-BARBAS, Maria, « Vers un doctorat conjoint en patrimoine culturel. L'expérience d'Una Europa », *Culture et Recherche*, Vol. 142, 2022, pp.118-120.

Artistic Research as Heritage Activator

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Résumé

Cet article propose une brève discussion sur la recherche artistique en musique telle qu'elle est développée à l'Orpheus Instituut de Gand (Belgique). Après avoir situé l'émergence de l'institut, il se concentre sur le rôle du patrimoine culturel dans ses programmes de recherche et de doctorat.

Mots-clés: patrimoine culturel, recherche artistique, doctorat, Institut Orphée

Keywords: cultural heritage, artistic research, doctorate, Orpheus Instituut

Many bright music graduates had no idea where to go after completing their conservatory training until about a quarter of a century ago. Some followed masterclasses to bring their craftsmanship up to a virtuosic level. Others satisfied their hunger by pursuing university degrees in musicology, philosophy, and literature. To immerse oneself scholarly in musical practice, by contrast, was yet impossible in academia, except from the distanced perspective of a historian or scientist. Existential fears and academic dogma prevented the musical research object from being put into the hands of those who cultivate it daily. If this sounds obvious, picture some physicians or surgeons who would carry out their investigations solely on paper rather than empirically in the clinic or laboratory. Or that electronic engineers would never test their calculations and designs on microchips and other tangible materials. Who could accept such passive and cerebral knowledge acquisition, such *savoir* without *savoir-faire*? That, however, was the reality for musicians in 1996, when Orpheus Instituut saw the daylight.

The first logical step for the institute, which was established between the conservatories and universities of Flanders (Dutch-speaking region of Belgium), was the creation of a postgraduate degree. This short-term program offered talented musicians the possibility to conduct research under a mentor in view of a final lecture-recital and an award called 'Laureaat van het Orpheus Instituut'. In 2004, Orpheus teamed up with some Flemish and Dutch institutes of higher education to establish docARTES, a genuine doctorate in musical arts with a four-year curriculum of training and research, leading to an artistic portfolio, a dissertation, and an academic degree. In 2008, Orpheus became a fully-fledged research centre staffed by senior and junior scholars, working in thematic research teams or 'clusters', each led by a principal investigator.

From its beginning, Orpheus has produced knowledge and know-how about cultural heritage in the guise of artefacts and documents of all kinds: musical scores which can challenge performers on account of their notational complexities; instruments and the technological premises which can only be fully understood through artistic interaction; but also, primary sources, such as iconography, manuals, autobiographical writings, etc.

However, the institute's uses of the past are distinctive because the knowledge envisaged by its researchers focuses less on the objects themselves than on the musical acts needed to transform these mute materials into intangible sounding matter. Efforts are dedicated to active musicians whose questions and methods are determined by artistic practices and concepts. Artistic research in music is primarily carried out through making music rather than being research about making music. By conducting an original investigation in and through musical objects and processes, artistic research seeks to connect theory with practice, intellect with embodied knowledge, and thinking with doing. Heritage, in this context, constitutes a means to an end, allowing musicians to gain a deeper understanding of their art.

Two cases can help to illustrate this matter. Firstly, the 'Resounding Libraries' research cluster was established at the end of 2019 around the newly-acquired private library of the renowned musician Ton Koopman. The nearly twenty-thousand items in the collection, of which five thousand early printed editions and four-hundred manuscripts, testify to sixty years of intense reading, reflecting and experimenting with Baroque music. But it is not just the volumes themselves that make this library stand out; its metadata set is unique. Nearly every volume contains a handwritten index by Koopman (**Figure 1**), who developed idiosyncratic keywords to translate each book's contents into contemporary concepts and ongoing research questions: how to play certain rhythms, and in what tempo? Which instrument is meant by which term?

All of this material could be turned into a documentary resource on an important figure (Koopman), epoch (from the 1960s to the present), or practice in music history (Historically Informed Performance), but instead, this cultural heritage is wedded to the open science philosophy. Using International Image Interoperability Framework (IIIF) and Semantic Web technologies, a discovery tool is being created for musicians and humanists in whatever discipline. Heritage thus provides a key to help solve a vital challenge of our digital era, the retrieval of information.

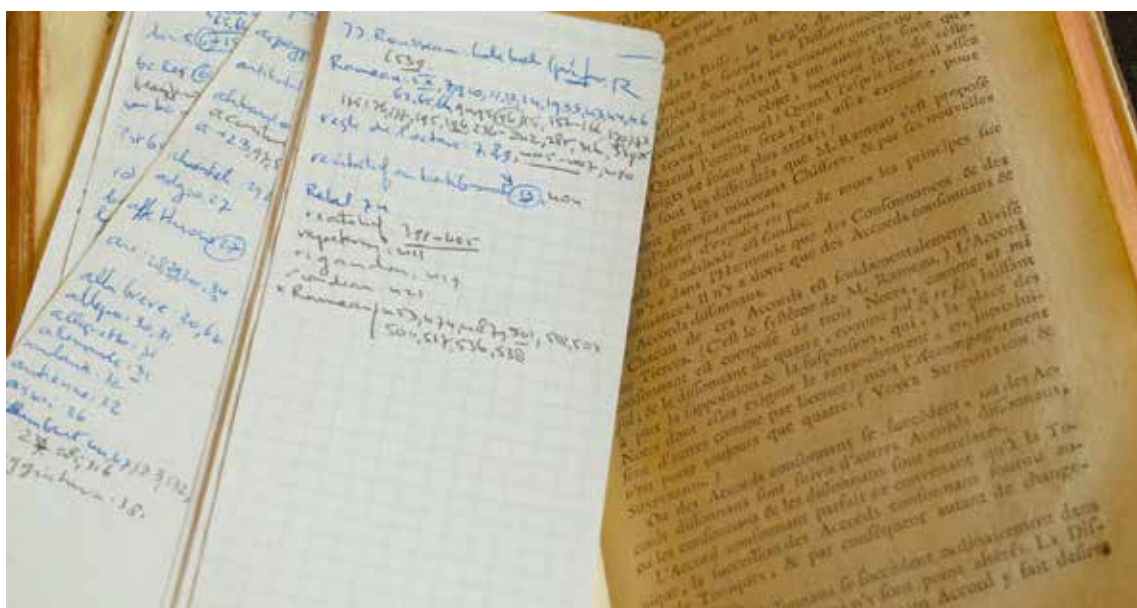


Figure 1. The first edition of Jean-Jacques Rousseau's *Dictionnaire de musique* (1767) as indexed by Ton Koopman. © Victoire Bonin

'Declassifying the Classics', the cluster around Tom Beghin has had several fortepianos rebuilt from Beethoven's estate, and one instrument was donated to the composer by the London Broadwood company in 1817. The original piano came into the hands of a Viennese music publisher, who passed it on to Franz Liszt, who, in turn, presented it to the Hungarian National Museum, where it can still be played, though not as intensively as active musicians would like. Nor can it, of course, be tweaked or transported to concert halls. More importantly, the preserved artefact no longer represents the piano Beethoven used to play; his instrument was not an antique but a brand-new exemplar. Whence, the project is to have it reverse engineered together

with other pianos owned by Beethoven. Tom Beghin also subjected the replica to empirical research with an interdisciplinary group of musicologists, acousticians, and piano makers. This helped challenge petrified ideas about Beethoven's keyboard sonatas and produce a new understanding of the composer's hearing loss and its impact on his compositional style. For the latter purpose, the Broadwood replica was equipped with a reconstructed artefact mentioned in Beethoven's legendary conversation books, a hearing aid through which the deaf composer could still perceive vibrations (**Figure 2**). Artistic research thus opened up a window on disability studies and future projects. One doctoral student, Luca Montebugnoli, is currently using the replicas to make new keyboard arrangements of, among others, Beethoven's 'Eroica' symphony. Another student, Prach Boondiskulchok, is developing modern compositional practices around those instruments.



Figure 2. Replica of Beethoven's 1817 Broadwood fortepiano supplemented with a reconstruction of the composer's 1820 *Gehörmaschine*. © Pieter Peeters

As both cases illustrated, artist-researchers at Orpheus Instituut invest substantially in developing innovative practices regarding cultural heritage. In keeping with the institute's educational objectives, knowledge is transferred to peers and younger artist-researchers, particularly in the aforementioned doctoral program. Each year, around fifty candidates from all over the world apply for docARTES with the hope of expanding their artistry, knowledge, and methodological skills. After a rigorous admissions process, which typically withholds some fifteen percent of applicants, candidates can start digging their pathways with regard to musical heritage. Over forty students have, so far, obtained their PhD degrees, with many of them landing jobs at institutes for higher music education, instruments museums, early music festivals, or at Orpheus itself. The flame of artistic research continues to be fanned.

4.

SESSION PLÉNIÈRE PLENARY SESSION

Les industries culturelles et créatives,
nouveau champ d'application des sciences du patrimoine

Cultural and Creatives Industries,
A New Field of Application for Heritage Science

Les industries culturelles et créatives, un atout européen.

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Abstract

Cultural heritage plays a key role in generating creativity, innovation, or social cohesion. Therefore, its safeguarding is paramount and greatly benefits from the interrelation with crafts and cultural and creative industries. However, the cultural and creative sector faces economic, technological, and environmental challenges that must be addressed to unlock their full potential. In response, the European Union has been implementing an increasing number of support actions.

Mots-clés: industries culturelles et créatives, économie, politique européenne

Keywords: creative and cultural industries, economy, European policy

Le patrimoine culturel est un catalyseur important de créativité et d'innovation dans nos sociétés et du fait, sa protection, sa gestion, sa valorisation et le partage avec l'ensemble de nos sociétés s'impose. Il est aussi un élément clé pour la cohésion sociale et l'inclusion et, à ce titre, il convient de le connaître, de le conserver, de le restaurer, de le transmettre et de l'interpréter. L'artisanat et les industries culturelles et créatives (ICC) jouent un rôle capital dans ce processus précis car ils garantissent à la fois sa pérennité, sa diversité et sa vitalité. Ceci est l'une des raisons essentielles pour lesquelles les ICC vont de pair avec le patrimoine culturel dans le cadre des programmes communautaires de recherche et d'innovation.

De plus, ces dernières renforcent substantiellement le lien social, contribuent au développement économique urbain et régional, génèrent de nouveaux emplois et accroissent la compétitivité européenne, aussi bien sur un plan communautaire qu'à l'international où elles reflètent les valeurs et l'excellence européennes. À elles seules, les ICC emploient 8,4 fois plus que le secteur des télécommunications (7,6 millions d'emplois contre 0,9 pour les télécommunications) et deux fois plus que les secteurs industriels de la chimie et de l'automobile combinés (1,2 et 2,6 millions d'emplois respectivement). Avant la pandémie, en 2019, la balance commerciale des biens culturels en Europe communautaire s'élevait à 8,6 milliards euros.

Les ICC couvrent toute une gamme de secteurs et d'activités du design à l'architecture, de l'audiovisuel et des jeux vidéo à la presse et les arts visuels, pour ne donner que quelques exemples. Elles témoignent de l'importance croissante de la créativité et de l'innovation dans les sociétés et l'économie du savoir. Pourtant, ces industries représentent à la fois une force clé de l'Europe et l'un des secteurs d'activités parmi les plus vulnérables. Plus que 90% des structures du secteurs sont de petites et moyennes entreprises (PME) et 33% des employés sont des indépendants, soit plus que le double par rapport à l'ensemble de l'économie

européenne (14 %). Avec la pandémie, l'évolution spectaculaire qu'avait connu le secteur depuis plus d'une décennie s'arrête brutalement. En 2020, l'économie culturelle et créative a perdu 31% de ses revenus comparé à l'année 2019. Cette perte a ainsi rendu les ICC l'un des secteurs économiques parmi les plus touchés en Europe communautaire, plus que les secteurs de tourisme (-27%) et de l'industrie automobile (-25%) et tout juste un peu moins que le secteur du transport aérien.

Les ICC vivent aujourd'hui une réalité d'autant plus complexe que le numérique et la technologie accélèrent les changements et induisent des pratiques plus variées. Elles doivent par conséquent s'adapter aux nouvelles attentes générationnelles car on ne « consomme » pas la culture ou le divertissement de la même manière selon son âge ou son milieu social.

Les ruptures technologiques à venir sont profondes et qu'il faut anticiper les sujets brûlants comme les NFT, le métavers, les réalités virtuelles, ou encore l'expérimentation des visites et les découvertes touristiques et culturelles en réalité augmentée. Par ailleurs, la politique verte de l'Union européenne impose de nouvelles normes strictes en matière d'émissions de dioxyde de carbone (CO₂) et d'autres gaz à effet de serre. Par conséquent, la question qui se pose est de savoir si les ICC sont à même de contribuer à cette nouvelle donne et de devenir des acteurs actifs de la politique « verte ».

La pandémie et les nécessités de contribuer aux politiques verte et digitale de l'Union européenne auront un impact massif et durable sur la chaîne de valeur des industries culturelles et créatives et par conséquent, sur leur compétitivité, leur créativité et leur capacité d'innovation.

L'Union européenne, parfaitement consciente de l'enjeu, met en œuvre un nombre croissant d'actions de soutien aux ICC depuis un certain temps, notamment par le biais de sa politique culturelle. Depuis 2018, la politique de recherche et d'innovation

a initié des activités destinées tout particulièrement à ces industries. Ces dernières figurent dans une large gamme de programmes d'Horizon Europe, comme c'était déjà le cas avec son prédécesseur Horizon 2020, afin de renforcer leurs capacités et leur potentiel innovant.

Dans un premier temps, les activités développées visaient l'approfondissement des connaissances sur le potentiel de compétitivité et sur les besoins de développement du secteur. Les recherches portent désormais sur les structures des ICC et les relations et coopérations qu'elles entretiennent entre elles, au sein des secteurs d'activités, entre ces secteurs, et avec d'autres domaines industriels et économiques. L'identification des facteurs qui permettent à certaines d'entre elles de gagner en compétitivité sur la scène internationale ainsi que leur rôle dans la cohésion sociale et l'inclusion font également partie des recherches en cours. Enfin, les recherches actuelles examinent dans quelle mesure les ICC sont impliquées dans les chaînes de valeur de l'Union européenne mais aussi internationales. La capacité de résilience de ces industries en période de pandémie est également examinée dans ce cadre.

La vision actuelle est ambitieuse : il faut rendre les ICC moteur d'un écosystème européen d'innovation, axé sur la créativité et la culture, qui contribue de manière décisive à la prospérité, au bien-être, à la cohésion sociale et culturelle de l'Europe ainsi qu'à la durabilité environnementale.

Il s'agit d'un programme ambitieux où la contribution du Parlement européen fut et continue d'être décisive. La mise en œuvre du nouveau plan de recherche et d'innovation avec et pour les ICC est structurée autour de 4 axes d'intervention :

1. Le premier axe consiste à soutenir la compétitivité des ICC et leur résilience face aux crises. L'intervention est le plus souvent sectorielle puisque les caractéristiques particulières de chaque branche sont déterminantes. Il faut développer de nouveaux modèles économiques et des stratégies de

développement qui tiennent compte du changement rapide des technologies mais aussi de l'évolution de la demande sur les marchés internes comme internationaux.

2. Le second axe veille à la mise en œuvre d'activités inter- et multidisciplinaires - notamment dans le domaine du patrimoine culturel et des arts - avec une participation active des ICC. La restauration, la conservation, l'interprétation ou la transmission du patrimoine culturel constituent autant de domaines d'intervention où la participation de ces industries est déjà importante et se développera davantage à court terme.
3. Le troisième axe vise le renforcement structurel de la coopération entre les ICC au-delà des frontières sectorielles, géographiques ou culturelles, ainsi qu'avec d'autres secteurs industriels et économiques. Ce type d'activités cible la mise en place durable de larges réseaux intersectoriels afin que l'interopérabilité et l'effet d'échelle soient renforcés en permettant ainsi au secteur d'assumer un rôle proactif en faveur de l'innovation culturelle et créative.
4. Le quatrième axe porte finalement sur le soutien au secteur afin de transformer les défis de la transition climatique en opportunités et de tirer parti des technologies numériques.

Les actions de recherche et d'innovation lancées en 2021 et 2022 permettront la mise en œuvre de 13 projets dont une plateforme collaborative destinée aux ICC. Avec un financement de l'ordre de 48 millions euros, les thèmes portent sur l'accroissement de la compétitivité des secteurs du cinéma, de la musique et des jeux vidéo ainsi que sur les stratégies et les modèles en faveur de l'accroissement du potentiel innovant de ces industries. D'autres thèmes de recherche promus en 2021

et en 2022 favoriseront une participation active de ces dernières aux programmes d'Horizon Europe.

L'effort s'amplifiera dans les années à venir, tout particulièrement au sein du Cluster 2 d'Horizon Europe qui cible la promotion de la recherche et de l'innovation en lien avec le patrimoine culturel et les ICC.



5.

SESSION PLÉNIÈRE PLENARY SESSION

L'apport des sciences du patrimoine
au Nouveau Bauhaus européen

The Contribution of Heritage Science
to the New European Bauhaus



The New European Bauhaus and the Role of Heritage Communities

Mariachiara ESPOSITO

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Résumé

Il existe une dimension culturelle intrinsèque à la vision d'une société plus inclusive, plus belle et à un mode de vie plus durable. Le nouveau Bauhaus Européen est une approche et un projet qui offre de nouvelles réponses aux défis sociétaux contemporains : il s'appuie sur une perspective transdisciplinaire qui combine la science et la technologie avec les arts et la culture. La recherche et l'innovation appliquées au patrimoine culturel, et en vue d'expérimenter les principes du nouveau Bauhaus Européen, sont indispensables pour transformer notre relation avec le paysage, la nature et les espaces de vie. La culture et le patrimoine sont des biens irremplaçables, qui rassemblent les gens et créent un sentiment d'appartenance. Le Nouveau Bauhaus européen peut contribuer à façonner un héritage que nous partageons tous.

Mots-clés: nouveau Bauhaus européen, patrimoine culturel, pacte vert pour l'Europe, horizon Europe, industries culturelles et créatives

Keywords: new European Bauhaus, cultural heritage, European green deal, horizon Europe, cultural and creative industries

At the European Parliament Plenary in September 2020, in the State of the Union address, President Von der Layen advocated a more beautiful, sustainable and inclusive way of living together. She, therefore, launched the New European Bauhaus (NEB) movement based on these three principles to inspire a new collaborative and inclusive European project.

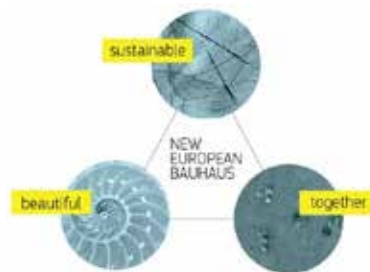


Figure 1. The three principles of the NEB

The NEB has a core cultural dimension in its intrinsic participatory and transdisciplinary process and in its multi-level vision from global to local. It aims to make all citizens actors in the transformation of our society based on the three fundamental values of sustainability, inclusion and aesthetics, all of which are crucial to a better quality of life.

A co-design phase of several months took place during the difficult times of the pandemic - between January and June 2021 - and helped the Commission build a community of engaged followers and partners who developed activities, website visits, conferences, debates and workshops. This enabled mobilising forces and resulted in a high number of accesses to the NEB website as well as newsletter subscribers and Instagram followers.

Cultural and creative sectors, and the world of cultural heritage were major contributors to the co-design phase.

420+
partners

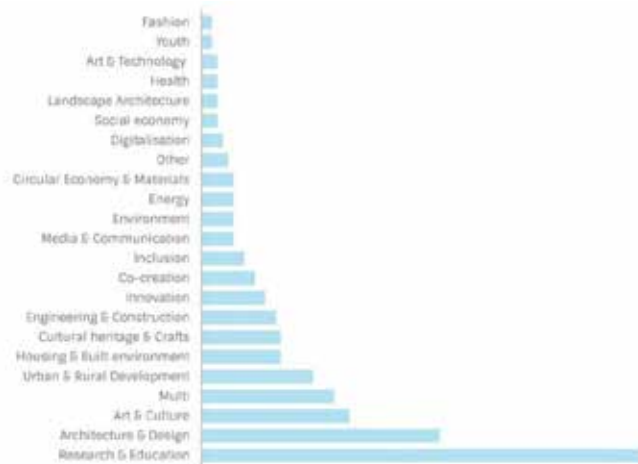


Figure 2. A diverse and vibrant community of partners

The NEB principles are bound to a transformational path aiming to anchor them to four thematic axes for future implementation and next steps. They are identified in the Communication adopted by the Commission in September 2021 as follows:

1. Reconnecting to nature;
2. Regaining a sense of belonging;
3. Prioritising places and people;
4. Life cycle thinking in the industrial ecosystem.

Cultural heritage is strongly connected to these thematic axes:

- In the role that culture plays in influencing behavioural changes and values;
- In its capacity to bring people together and create a sense of belonging based on shared cultural legacies, traditions and experiences;
- In exploiting its potential by widening access, to all its forms, for all people;
- In the smart restoration and adaptive reuse of unused heritage buildings and the economic and social dynamism connected to it, such as reducing unsustainable urban sprawl.

The Communication presents a rich diversity of actions coordinated through the New European Bauhaus Lab, such as the New European Bauhaus Prize, a New European Bauhaus Festival (9-12 June 2022) and a pack of financial opportunities.

The crucial role that culture can play alongside the delivery of the NEB and the variety of its possible impacts are evident. It can transform places on the ground, enable ecosystems for innovation, and diffuse new meanings, which are key expected outcomes strongly intertwined with cultural factors and drivers.

One of the main European programmes contributing to the NEB is Horizon Europe and particularly Cluster 2 'Culture, Creativity and Inclusive Society', which incorporates the specific cultural heritage dimension of the NEB. European cultural heritage faces important challenges due to pollution, climate change, and man-made disasters. Access to cultural resources requires high-quality digitalisation and curation of digital heritage assets. The social fabric and the collective consciousness of our societies are eroding, and, consequently, cultural heritage is gradually losing its role in strengthening the sense of belonging and fostering shared values. Therefore, the objectives of research and innovation actions (RIAs) in Cluster 2 of Horizon Europe have been established in a number of topics and targets to reinforce cultural heritage in its potential for transformation and a better way of life. The NEB principles are cross-cutting to topics ranging from tangible or intangible cultural heritage to the arts, including cultural and creative industries (CCIs). They are relevant and strategic to the participation of heritage stakeholders, local/regional/national authorities and the civil society, that can use opportunities in Cluster 2 Calls to design new methods for preserving and enhancing cultural heritage and translate the green deal priorities into practice, which is the core value of NEB.

Research projects on these topics should address ways to better protect, conserve, restore and safeguard the European cultural heritage, promote its use as one of the substantial European resources, boost its traditional and contemporary artistic expressions and finally

create wider awareness of it as a common good. Moreover, it is essential to explore the economic role and innovation potential of CCIs and promote their competitiveness in Europe and abroad.

The NEB proposes, through a dedicated call launched in January 2022, a greener and fairer way of life in creative and inclusive societies through architecture, design and arts. The main scope of this call is to leverage the power of creativity and innovation by architects, designers and artists in contemporary societies:

- To shape a better way of living, improve the quality of experience and the quality of the built environment;
- To pave the way to inclusion, participation and creation of more resilient communities, in line with the principles of environmental, social, cultural and economic sustainability;
- To fully exploit multidisciplinary research, combined with cultural and creative sectors' engagement, on innovative artistic practices in living spaces, on new applied solutions to heritage sites and cultural landscapes, aiming to increase well-being, sense of belonging, new opportunities for cultural spaces as well as to support long-term recovery after Covid-19.

The expected end result is to create innovative architectural and design solutions for the use of new forms and materials in line with the European Green Deal and to leverage the social function of architecture, arts and design by combining functionality and sustainability with aesthetics, promoting social inclusion and accessibility, and by exploring cultural transformations for sustainability through new ways of cooperation.

Horizon Europe's Cluster 2 will continue to fund the cultural dimension of the NEB in the coming years, and a new innovation action is already under preparation for the work programme 2023-2024. It will involve tangible and intangible cultural heritage and cultural and creative sectors and focus on quality architecture and regenerative design for all to validate new tools, processes, and methodologies through pilot actions. These pilots will

operate as 'demonstrators' to test innovative responses under near-real conditions and to reach transformational changes through a place-based approach adaptable to the needs, values and cultural traditions of local communities. The main goal will be to learn from experimentations of the NEB principles applied to cultural heritage built environments or landscapes, heritage sites and services, cultural assets and spaces of cultural value for new meanings, a better quality of life and experience by end-users.

To learn more about the New European Bauhaus:

- #NewEuropeanBauhaus
- **Web:** <https://europa.eu/new-european-bauhaus>
- **Instagram:** @neweuropeanbauhaus
- **Pinterest:**
<https://www.pinterest.com/eucommission/new-european-bauhaus/>
- **Newsletter:**
https://europa.eu/new-european-bauhaus/stay-touch/e-zine_en

Time of Transition:

Built Heritage for the Future Generation

Ruth SCHAGEMANN

President of the Architects' Council of Europe (ACE)

Résumé

Alors que l'Union européenne entreprend de transformer nos sociétés pour faire de l'Europe un continent climatiquement neutre d'ici 2050, le Conseil des architectes de l'Europe (ACE) défend une approche culturelle et transversale, où le patrimoine bâti pourrait prendre toute sa place. Le secteur de la construction joue un rôle important dans la réalisation des objectifs du Pacte vert et la réhabilitation des sites patrimoniaux peut avoir de nombreuses vertus, qu'elles soient sociales, économiques, environnementales ou culturelles. Cela requière l'instauration de nouvelles actions et la mise en place d'un dialogue.

Mots-clés: pacte vert, renovation wave, patrimoine bâti, réhabilitation,

Keywords: green deal, renovation wave, built heritage, reuse,

The European Union (EU) has entered a new phase in its history, as it set itself the objective of becoming the first climate-neutral continent by 2050. For the first time, the EU is explicitly addressing the built and living environment as part of a broader climate change and resilience strategy.

Now that the consequences of the climate crisis are starting to enter the consciousness of European citizens and the corona pandemic has loosened its iron grip somewhat, we are confronted with a brutal attack on a sovereign European country – Ukraine. The Architects' Council of Europe (ACE), which represents 560.000 architects from 43 organisations in 31 countries, expressed its deepest solidarity with all those affected by this war and condemned Putin's war in Ukraine. Mindful of the fact that a built environment of high quality and heritage are strong drivers of well-being, identity, social cohesion, and economic growth, ACE is very concerned about the threats to the invaluable Ukrainian cultural and architectural heritage and the destruction of its built environment.

ACE strongly believes that the New European Bauhaus (NEB) could take on its full meaning and utility in this context. The values and ambitions of the NEB, and the community of partners supporting it, could help Ukraine to face the challenges of the future.

After the Debate, It Is Now Time to Act.

The construction industry, local public administrations, policymakers, professionals (architects, landscape architects, urban planners, designers, engineers), and European citizens play an important role in and have responsibility for the contribution of heritage for the future and the NEB initiative. It is about the preservation of our nature and cultural identity to create a sense of belonging.

ACE aims to turn the technocratic approach, which has been the leading parameter, at the European level, in public procurement, energy- and environmental policies, into a cultural and cross-connecting project.

Make the Green Deal and the Renovation Wave a Cultural Project!

Heritage is about culture. There is an unprecedented window of opportunity for changes in EU policies. 'High-quality architecture' considered as a 'nice to have' in recommendations (Davos Declaration, Council Conclusions and OMC report) could possibly become fully integrated, for the common good, in EU legislation flowing from the Green Deal and the Renovation Wave strategy, which have a strong impact on public procurement, energy- and environmental policies.

Construction Sector's Important Role

The construction sector can greatly contribute to the achievement of the EU's climate neutrality objective. Buildings consume 40% of our energy and are responsible for 36% of our greenhouse gas emissions. Additionally, 75% of the building stock in Europe is considered to be energy inefficient.

Built Heritage for the Future Generation

Europe has a rich and multi-faceted built environment, incorporating strong spiritual, cultural, social, and economic values. The built heritage for future generations is strongly impacted and needs to be incorporated into the current discussion. Due to evolutions in our economies and societies, many heritage sites, whether listed or not, are nowadays disused or have lost the functions for which they were originally built – notably industrial, religious, and military sites but also contemporary buildings from the second half of the twentieth century.

Adaptive Reuse as Strategy

Adaptive reuse offers itself as a strategy aiming at the one side to preserve the values incorporated in our built environment and on the other side to adapt the place for new uses. New functions are brought together with heritage values in an active and meaningful dialogue, transforming and re-imagining industrial, religious and military spaces for the regeneration of urban and rural areas. Through smart renovation and transformation, heritage sites can find new, mixed, or extended uses. As a result, their social, environmental, and economic value is increased while their cultural significance is enhanced!

Social Aspects

The adaptive reuse of our built heritage can generate new social dynamics in its surrounding areas and thereby contribute to urban regeneration. It is about involving citizens in the shaping of their living environment, resulting in a greater sense of place and democracy. Reused heritage can provide the basis for school and educational programmes. Adaptive reuse is, therefore, a key lever for more cohesive territories, both in urban and rural areas.

Environmental Aspects

The adaptive reuse of our built heritage reduces the consumption of construction materials, saves embodied energy and limits urban sprawl. A deep energy retrofit can be undertaken, resulting in better-performing, climate-proof, healthier buildings. Moreover, high-quality projects, by their very nature, ensure long-term usability, flexibility, and adaptiveness to future needs. Buildings are more resilient, cities are more sustainable, and the principles of circular economy can be applied in the built environment.

Economic Aspects

The adaptive reuse of our built heritage can contribute to increasing the attractiveness of areas. On the one hand, quality architecture is a major factor in place branding, generating jobs and growth, notably in the tourism sector. On the other hand, new functions generate new users and situate territories in new economic networks. Reused heritage sites cease to be isolated places and can act as catalysts within a broader context.

Cultural Aspects

Heritage sites are often spatial and social landmarks that characterise the landscape and confer a strong identity on the environment. They create a sense of place and are a major determinant of local and regional identity. By preserving our heritage, adaptive reuse can help to maintain and strengthen people's perceptions of their own traditions and history and provide perspectives for the future.

Actions Are Needed

Adaptive reuse projects bring about specific challenges throughout their life cycle and therefore require tailored processes which should favour and ensure flexibility, participatory approaches, innovation combined with traditional construction techniques and the use of regional materials. They should also be built on quality-based procurement, multidisciplinary teams, and good storytelling. All these aspects are covered in the Council Conclusions on 'Culture, high-quality architecture and built environment as key elements of the New European Bauhaus initiative'. This knowledge has now to be implemented in public procurement, energy, and environmental laws, in addition to the execution of best practice examples to find their way to the hearts of European citizens so that they are willing to adopt these ideas in their own building sites.

Dialogue Is Needed

The dialogue between past, present and future is an obvious characteristic of reuse projects. The architectural project makes things tangible and concrete and constitutes the right moment for bringing the various possibilities into the debate. A reflexive dialogue between past, present and future is needed, along with a multi-scale and territorial approach and a case-by-case, knowledge-based approach.

Generating Our Built Environment for the Future Generation

The adaptive reuse of our built heritage brings multiple benefits to individuals and society for present and future generations. Yet, it can still be regarded as being an unviable option, while planning and building regulations may prevent the development of reuse projects. It is essential to sensitise all stakeholders to the benefits and challenges inherent to such projects and to foster peer-learning across Europe, as many good practices and solutions already exist. We all can and must contribute now.

To find more information about ACE: www.ace-cae.eu

La contribution de la Cité du design au Nouveau Bauhaus européen

Isabelle VÉRILHAC

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Abstract

As an official partner of the New European Bauhaus, the Cité du Design is an institution that cultivates experimentation and transdisciplinarity within its activities and the networks in which it is involved. To contribute to the movement, it participates in the implementation of European projects to create a more sustainable and inclusive future for cities.

Mots-clés: Cité du design, nouveau Bauhaus européen, multidisciplinarité, projet européen

Keywords: Cité du design, new European Bauhaus, multidisciplinary, European project

Partenaire officiel du Nouveau Bauhaus européen (NEB), la Cité du design joue un rôle important en matière d'interconnexion entre les acteurs et les disciplines en jeu au sein de ce mouvement européen. Etablissement public de coopération culturelle depuis 2010, la Cité du design a pris racines en 1803 avec l'école de dessin de Saint-Etienne, créée sous l'impulsion des industriels du textile de la rubannerie du territoire. Elle regroupe trois activités complémentaires qui tirent leur force d'être sur un même site symbolique et classé patrimoine historique, l'ancienne Manufacture Nationale d'Armes, devenu le quartier créatif de Saint-Etienne :

- Enseigner l'art et le design au sein de l'Ecole supérieure d'art et design de Saint-Étienne (Esadse) ;
- Diffuser la culture design à tous les publics ;
- Accompagner les entreprises, les établissements publics et les territoires dans leurs réflexions, formations et actions design.

L'éducation joue un rôle clé pour rapprocher la transmission des savoir-faire du monde de l'entreprise et répondre aux enjeux du NEB. L'Esadse a pour vocation de former des artistes, des designers et plus largement des créateurs dans les nombreux champs de ces disciplines. Misant sur la complémentarité des disciplines en art et design, l'organisation des études encourage le dialogue et les synergies en favorisant les passerelles et la porosité entre deux filières : Art et Design.

En 1998, sous l'impulsion de ses équipes pédagogiques, l'école lance la Biennale Internationale Design Saint-Etienne, étape déterminante qui a généré de nombreux partenariats et une visibilité internationale. Pris en référence par de nombreuses villes du réseau de villes créatives Unesco, cet évènement est unique et présente le design sous toutes ses formes.

En 2010, Saint-Étienne, grâce à la candidature portée par la Cité du design et soutenue par le territoire, est désignée ville créative Unesco de design. Aujourd'hui, elle est toujours la seule représentante française dans un réseau de 43 villes internationales.

S'appuyant sur un tissu partenarial dense hérité de son passé industriel et minier, la Cité du design mène des expérimentations sur son territoire en impliquant les acteurs locaux, les enseignants, les étudiants et les partenaires internationaux. L'établissement est donc reconnu pour son rôle de pionnier posant l'art et le design et l'enseignement artistique comme vecteur de changement social et de travail collaboratif, et rejoint ainsi les enjeux du NEB.

Les projets collaboratifs font converger les forces vives de l'établissement avec celles des partenaires étrangers sur des problématiques qui viennent nourrir les champs de la recherche et des enseignements, dans un mode transdisciplinaire et transectoriel. La Cité du design est fortement impliquée dans la vie des réseaux. Elle est par exemple membre du Bureau of European Design Associations (BEDA). Premier partenaire du NEB, ce réseau regroupe 53 membres, dans 27 pays européens (plus la Turquie). Cinq autres membres français participent activement au BEDA et démontrent le dynamisme des acteurs français : l'Alliance française des designers (AFD), l'Agence pour la Promotion de la Création Industrielle (APCI), l'Institut Français du design, Designers +, cluster de designers professionnels, et Valesens, association en Val de Loire.

Pour capitaliser sur le patrimoine et travailler d'une autre manière dans les années à venir, la Cité du design mise sur les projets européens pour accompagner les réponses aux axes du NEB. Ainsi, avec le projet Horizon Europe HERITAGE 01-10,

CityScaleUp, les designers, les architectes et les artistes aident les villes à atteindre les objectifs du développement durable.

CityScaleUp s'appuie sur une équipe multidisciplinaire réunissant différents départements universitaires, des organisations indépendantes de recherche et d'innovation et des représentants de villes de six pays de l'Union européenne, des architectes, des artistes, des ingénieurs, des concepteurs, des représentants de l'industrie, des décideurs et des citoyens afin de co-créeer un avenir plus inclusif et durable pour leurs villes.

En effet, le défi que le changement climatique pose au patrimoine naturel et culturel, ainsi que les nouvelles nécessités des villes désindustrialisées qui prospèrent sur la créativité, exigent des mesures radicales. D'une part, il existe une nécessité reconnue, liée au climat, de faire progresser les solutions de mobilité inclusive. D'autre part, il est également nécessaire de co-créeer de manière durable, en valorisant le patrimoine culturel des villes européennes tout en innovant dans la manière dont les gens se comportent et participent à la vie urbaine.

CityScaleUp vise à aider les villes créatives à atteindre les objectifs de développement durable (ODD) 7 à 12 des Nations unies, qui convergent autour de la question de la mobilité future et de la nécessité de devenir plus vertes et inclusives. Pour ce faire, CityScaleUp s'appuie sur des approches existantes d'apprentissage par la pratique, intersectorielles et transdisciplinaires, et teste la manière dont elles peuvent servir de modèle à l'innovation collaborative. Le projet mettra en œuvre 7 démonstrateurs urbains, qui seront activement documentés et analysés, et aboutiront à des modèles d'innovation collaborative par l'apprentissage, par la conception, en apportant des mesures économiques d'efficacité, des indicateurs de durabilité et de participation,

et en combinant à la fois une recherche académique rigoureuse et une analyse pratique à travers les démonstrateurs.



**TABLES
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**Un patrimoine réflexif
pour une société résiliente**

**Le champ toujours plus vaste de la patrimonialisation :
enjeux et perspectives.**

-

**The Ever-Expanding Domain of Patrimonialisation:
Challenges and Perspectives.**

L'apport du numérique pour la préservation, la valorisation et la transmission du patrimoine minier des Hauts-de-France

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Abstract

This paper presents the results of the ANR Mémomines project (<https://memomines.hypotheses.org>), which contributes to the preservation of the mining heritage of Hauts-de-France and to its valorisation among various audiences. This project has created an indexed and annotated audiovisual corpus that can be used as digital resources for research projects, territorial valorisation and cultural mediation; a thesaurus and a domain ontology to organise, describe and access this content; and various innovative 3D simulation and augmented reality visit devices.

Mots-clés: Mémomines, numérique, patrimoine minier, médiation culturelle, web sémantique

Keywords: Mémomines, digital, mining heritage, cultural mediation, semantic web

L'activité minière a structuré une grande partie de l'économie de l'actuelle région des Hauts-de-France du milieu du XVIII^e à la fin du XX^{ème} siècle et a laissé des traces, encore vivantes, sur le plan industriel, linguistique et culturel, mais dont une grande partie est menacée en raison de la disparition progressive des principaux acteurs. C'est dans ce contexte que le projet Mémomines (ANR 16-CE38 0001)¹ a été lancé afin de participer à la préservation de ce patrimoine culturel proche de la disparition, à sa valorisation et mise à disposition auprès de publics variés. Il s'agit en particulier de sauvegarder les mémoires individuelles par leur conversion en traces mémorielles, leur diffusion sous forme de corpus d'archives numériques et leur remédiation numérique. Le projet s'inscrit dans une approche communicationnelle de la patrimonialisation².

Il est porté par trois laboratoires de recherche, DeVisu, de l'Université polytechnique Hauts-de-France, GERiiCO, de l'université de Lille, et le PLIDAM de l'INaLCO, auquel est associé l'Institut national de l'audiovisuel. Les membres du projet s'appuient également sur l'expertise de la mission Bassin minier, du Centre historique minier de Lewarde et du site minier de Wallers-Arenberg.

La définition du patrimoine minier

La notion de patrimoine convoquée dans le cadre du projet Mémomines s'appuie sur les définitions fournies par le TICCIH³ et l'Unesco⁴. Sur le plan industriel, le bassin minier se caractérise par des lieux de production (fosses, chevalements, terrils), des voies de communication (canaux, chemins de fer et routes), des lieux de résidence (cités minières, corons...) et des lieux de service (écoles, salles de fêtes, églises...). Sur le plan culturel, le patrimoine « comprend les œuvres matérielles et non matérielles qui expriment la créativité de ce peuple : langue, rites, croyances, lieux et monuments historiques, littérature, œuvres d'art, archives et bibliothèques ». Le périmètre du patrimoine minier est précisé dans l'ouvrage dirigé par Stéphane Chaudiron⁵. En 2012, le bassin minier du Nord-Pas de Calais a été inscrit sur la Liste

du patrimoine mondial de l'Unesco au titre de « paysage culturel ». La mission Bassin minier⁶ estime que 25 % du patrimoine minier est compris dans cette inscription ; que faire alors des 75 % restants ? En effet, au-delà des éléments inscrits au patrimoine, c'est toute la culture d'une communauté d'acteurs qu'il convient de préserver, de rendre visible et de transmettre.

Pour ce faire, le projet a créé :

- deux systèmes d'organisation des connaissances (SOC) comme dispositifs de médiation du patrimoine,
- une plateforme web d'annotation et de diffusion des traces mémorielles,
- différents dispositifs de médiatisation des traces mémorielles.

Les systèmes d'organisation des connaissances comme dispositifs de médiation du patrimoine

L'objectif a été de formaliser l'héritage culturel du bassin minier afin de décrire l'univers de connaissance de la mine et rendre accessibles les ressources disponibles à travers le territoire. Deux systèmes d'organisation des connaissances ont ainsi été réalisés, un thésaurus et une ontologie (au sens de représentation formelle d'un univers de connaissances, ici le patrimoine minier) respectant les formats du web sémantique.

Le thésaurus du patrimoine minier (ThesoMines v1.0) comprend 558 descripteurs et 764 non-descripteurs ainsi que des notes d'application décrivant son utilisation. Disponible au format SKOS, il est diffusé en *open source* sur la plateforme HumaNum à l'adresse <https://opentheso.huma-num.fr/opentheso/>. La méthodologie de conception du thésaurus a fait l'objet d'une présentation⁷.

Une ontologie du patrimoine minier (OntoMines) est en cours de réalisation à partir du modèle *CIDOC Conceptual Reference Model (CRM) / ISO 21127:2014*. Ontomines utilise 47 classes (sur les 89 proposées par le modèle) et 50 propriétés (sur 149). Le

travail d'instanciation a été réalisé à partir de quelques entretiens avec d'anciens mineurs⁸.

Une plateforme web d'annotation et de diffusion des traces mémorielles

Le deuxième résultat est la plateforme logicielle OKAPI (*Open and Knowledge-based Annotation and Publishing Interface*) développée par le département Recherche et Innovation de l'Institut national de l'audiovisuel⁹. Elle intègre à la fois les fonctionnalités d'un outil de gestion de base de connaissances, d'un outil de documentation de contenus audiovisuels et d'un outil de génération de portail web. La plateforme utilise les langages de représentation des connaissances du web sémantique RDF, SKOS et OWL pour gérer l'ensemble des ressources. Elle offre notamment des mécanismes génériques qui facilitent l'édition de graphes sémantiques dans le cas d'utilisation de ressources (thésaurus SKOS ou ontologies OWL) de grande taille. L'utilisation native par Okapi des standards du web sémantique facilite la réutilisation de ressources existantes communément disponibles dans ces formats comme l'ontologie CIDOC-CRM. OKAPI offre également un ensemble d'interfaces disponibles au sein des navigateurs web pour à la fois décrire, annoter des collections de ressources multimédias.

Des dispositifs de médiatisation des traces mémorielles

Cinq dispositifs numériques innovants de médiation des traces mémorielles ont été réalisés. Ils sont intégrés à titre expérimental dans le parcours de visite guidée sur le site minier d'Arenberg. Les trois premiers sont des dispositifs numériques permettant de documenter les lieux :

- A- le vidéo-mapping sur maquette avec témoignages audio d'anciens mineurs,
- B- un livre augmenté,

C- un dispositif à réalité augmentée (jeu sérieux, VR casque dans une salle des pendus) avec la voix d'anciens mineurs.



Maquette du site de Wallers Arenberg (A)



Tablette permettant de visualiser un casque de mineur à partir d'un livre augmenté (B)



Visite virtuelle de la « salle des pendus » en tenant une lampe de mineur (C)

Figure 1. Trois dispositifs documentaires numériques

Deux autres dispositifs ont été conçus comme outils de médiation et de transmission :
D- la numérisation bâimentaire par photogrammétrie (prises de vues avec des drones) en vue d'exploitations diverses,
E- le théâtre holographique (technique *Pepper's Ghost*), versions témoignages documentaires ou dialogues pseudo-interactifs avec les spectateurs¹⁰ qui permet de sauvegarder les mémoires individuelles.



Reconstruction en 3D du chevalement du site de Wallers Arenberg (D)



Hologramme d'un ancien mineur (E)

Figure 2. Deux dispositifs de médiation

Une présentation complète des résultats du projet ainsi que les références aux articles scientifiques produits dans le cadre du projet sont accessibles sur le site :

<https://memomines.hypotheses.org>

¹: <https://memomines.hypotheses.org/>

² DAVALLON, Jean, « Penser le patrimoine selon une perspective communicationnelle », Sciences de la société, n°99, p. 15-29, DOI : 10.4000/sds.5257.

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⁸ KERGOSIEN, Éric, DALOZ, Amélie, CHAUDIRON, Stéphane, JACQUEMIN, Bernard, « Le CIDOC-CRM, un modèle ontologique pour représenter les connaissances du bassin minier des Hauts-de-France. Premiers résultats. », Actes du 6^e HyperHeritage International Symposium (HIS 6) – La fabrique du patrimoine à l'ère numérique, 13-14 novembre 2019, Institut d'études avancées de Paris, hôtel de Lauzun, Paris, Europa, 2020.

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La patrimonialisation des graffitis : de l'archéologie de la trace aux humanités numériques

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In tribute to Chiara Frugoni (1940-2022)

Abstract

Graffiti is now a research subject in its own right and is increasingly being promoted. As with any heritage process, this development raises three essential questions: what to preserve? Why? And how? Graffiti of yesterday and today are not only a historical source, sometimes associated with an artistic content, they are also a gesture to be read and questioned.

Mots-clés: graffiti, graffitologie, patrimoine, patrimonialisation, humanités numériques

Keywords: graffiti, graffitology, heritage, patrimonialisation, digital humanities

La « fabrique du patrimoine » au sein de nos sociétés engendre une diversification patrimoniale forte, qui va « de la cathédrale à la petite cuillère »¹. En résulte depuis plusieurs décennies une mise en valeur croissante des graffitis, tant sur le plan des études scientifiques que sur le plan de la patrimonialisation et de la médiation culturelle. Ces graffitis anciens et contemporains sont dorénavant à considérer comme un véritable patrimoine à valoriser.

Les graffitis : de la source historique à l'objet patrimonial

Le graffiti est un objet difficile à définir. Il désigne un fait pluriséculaire qui, de l'art pariétal au *Street Art*, consiste à laisser une trace². Si cette activité oscille encore entre reconnaissance artistique et accusation de vandalisme, elle reste dans tous les cas une forme d'expression. Le graffiti comme invariant anthropologique ouvre alors le dialogue entre les pratiques passées et présentes en révélant leurs variations et continuités³.

Pour apprécier la richesse des témoignages graffitologiques, il est nécessaire d'adopter une approche large. Ainsi, toute production graphique – en dépit de sa nature, de la technique utilisée, du support ou du contenu – peut être considérée comme graffiti à condition qu'elle soit réalisée sur une surface qui n'est pas conçue pour recevoir ce type de marques. Une inscription sur le tuffeau d'un château, le plâtre d'un clocher, la poutre d'une charpente, la marge d'un livre, l'écorce d'un arbre ou la paroi d'une cavité rocheuse est un graffiti. Abondants dans les régions à pierre tendre, les graffitis se caractérisent par une grande variété technique et thématique.

Face à ce patrimoine omniprésent et avec la reconnaissance de son intérêt scientifique, une nouvelle science émerge : la graffitologie, étudiant à la fois le « phénomène graffiti » général et ses manifestations particulières. Elle est la science de l'authentification des graffitis anciens grâce à trois étapes : l'interprétation, la

datation et la tentative d'attribution. Au carrefour des disciplines (histoire, histoire de l'art, archéologie, épigraphie, sémiologie, anthropologie, science des matériaux et du patrimoine), elle ouvre la voie à la patrimonialisation des traces qu'elle examine.



Figure 1. Décorum peint et gravé du XVI^{ème} siècle dans un cachot de la forteresse de Loches (Indre-et-Loire) © Aymeric Gaubert

Les enjeux de la patrimonialisation du graffiti

Le patrimoine est une notion complexe qui renvoie à ce qu'une société souhaite conserver et transmettre aux générations futures. Il est le résultat d'une sélection : le processus de patrimonialisation par lequel une société assigne à un bien une valeur symbolique, voire identitaire. S'intéresser à cette fabrique socio-culturelle permet de souligner l'évolution du regard porté sur le graffiti en posant la question du licite/illicite⁴. Pratique acceptée de l'Antiquité à l'Ancien Régime, le graffiti devient illégal à l'époque contemporaine avec les notions de vandalisme et de patrimoine. L'actuelle patrimonialisation des graffitis indique que le geste graffitologique n'est plus catégoriquement assimilé à un « lèse-patrimoine » ou à une production mineure sans intérêt.

Pour autant, la préservation d'un monument ne s'accompagne pas toujours de la protection des graffitis anciens qui s'y trouvent. Aussi ce véritable « patrimoine dans le patrimoine » reste-t-il particulièrement fragile et menacé de disparition. Le graffiti y est victime de sa propre logique palimpseste qui en occasionne d'autres. Il subit les altérations volontaires et involontaires liées au flux de visiteurs ou aux travaux de réfection, tout en restant sensible aux affres du temps et du climat. Il faut préserver au maximum ces traces pour leur valeur scientifique par des dispositifs de protection qui limitent ces dégradations.

Comme document, le graffiti constitue une source historique précieuse qui renseigne sur l'individualité, la psychologie et les modes de représentation de son scripteur mais aussi sur la culture visuelle de son époque. Le graffiti est le résultat d'un geste plus ou moins technique qu'il faut saisir en analysant le mécanisme d'appropriation du support, les conditions de réalisation et le contexte de production. Le travail de contextualisation et la réflexion anthropologique contribuent à déterminer les possibles motivations de l'auteur de l'inscription.

Vers une médiation scientifique et numérique

Les outils numériques peuvent être convoqués à différentes étapes du processus de patrimonialisation, d'abord comme instruments d'étude puis de médiation. Plusieurs logiciels de traitement d'image permettent d'améliorer la lecture des graffitis, en jouant sur le contraste des traits ou sur les couleurs disparues (Photoshop®, DStretch®⁵, RTI⁶). L'œil du chercheur reste cependant son premier et meilleur outil de travail qu'il doit exercer sur le terrain. Avec le relevé photographique, le dessin numérique et la photogrammétrie, une mémoire virtuelle est envisageable. La médiation numérique cherche ensuite à diffuser les données réunies auprès d'un public large sous la forme d'une visite virtuelle (« Exploration virtuelle du château de Selles de Cambrai : le graffiti révélé »), d'un parcours graffiti (application Visite à

Loches), d'une saison culturelle (« Sur les murs : histoire(s) de graffitis » en France en 2018)⁷ ou d'une exposition (« Gribouillage » à la villa Médicis en 2022).

Enfin, l'enjeu pour les sites abritant des graffitis anciens est de développer des dispositifs muséographiques – avec l'éventuelle collaboration de street artistes – qui lient préservation et sensibilisation à travers des moulages, des reproductions 3D ou des panneaux à graffiter. La ville de Florence a ainsi lancé en 2016 l'application « Autography » qui donne la possibilité aux visiteurs de laisser un graffiti numérique.

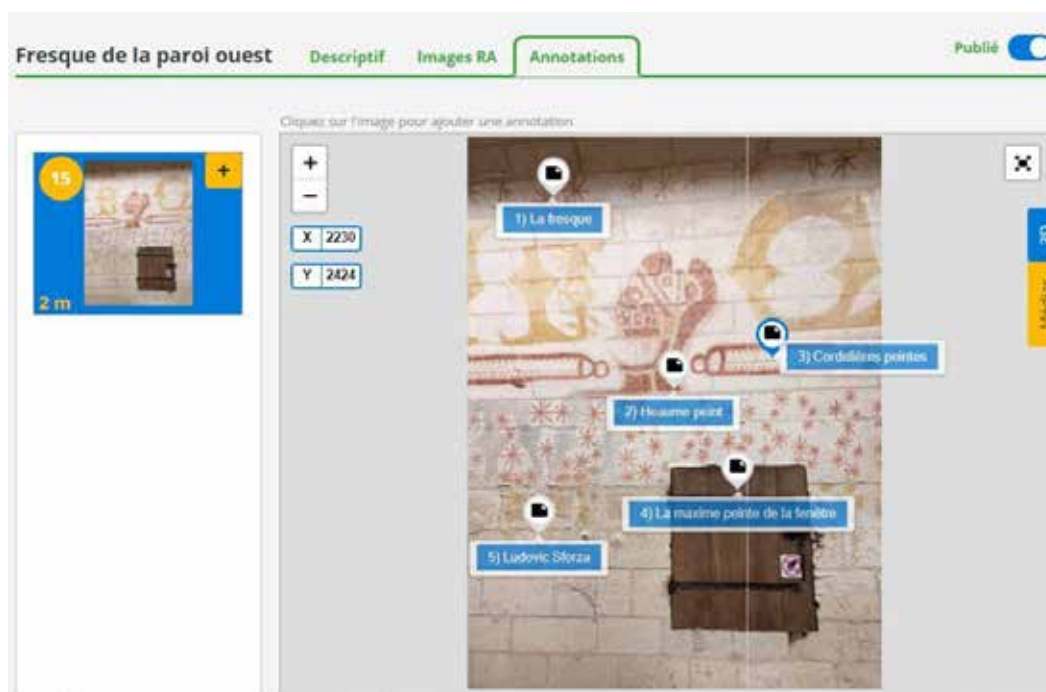


Figure 2. Interface web de l'application Visit en cours d'élaboration pour le parcours graffitis à Loches (Indre-et-Loire) (LIFAT, ILIAD3, CESR)

Le travail de terrain pousse le chercheur en graffitologie à dresser deux principaux constats. Le graffiti ne peut tout d'abord pas se réduire à une simple production spontanée et éphémère, ce pourquoi il doit intégrer une véritable archéologie de la trace qui reste à construire avec un protocole d'étude commun, la fédération des chercheurs et des acteurs du patrimoine et la mise en place de bases de données⁸.

Comme tout autre patrimoine matériel, les graffitis subissent ensuite les conséquences de la pollution et du changement climatique. Leur effacement accéléré depuis une trentaine d'années rend leur patrimonialisation urgente et impose une nouvelle réflexion sur les moyens de rendre le patrimoine résilient.

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Food on UNESCO Lists: Challenges of a Heritage Aporia

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Résumé

L'article analyse le processus de patrimonialisation à partir de candidatures d'inscription du patrimoine gastronomique à l'Unesco. L'auteur y expose, dans un premier temps, le processus de patrimonialisation de l'alimentation à l'Unesco au cours de la dernière décennie, dans un deuxième temps, les impacts sur le terrain de la patrimonialisation du régime méditerranéen, et énonce enfin les enjeux de l'officialisation culturelle de l'alimentation à l'Unesco mais aussi quelques pistes pour relever les défis que cette officialisation implique.

Mots-clés: diète méditerranéenne, patrimoine gastronomique, patrimoine culturel immatériel, patrimonialisation, Unesco

Keywords: Mediterranean diet, food heritage, intangible cultural heritage, heritagisation, UNESCO

Heritage is not something existing per se, but a 'negotiated social agreement' sector, the re-invention of a category at UNESCO (namely food practices), as well as the evaluation of the impact that the recognition of food had on cultural and tourism management to safeguard food practices in the heritagised communities. Divided into three parts, I start by exposing the process of heritagisation of food at UNESCO over the last decade, to continue with the impacts on the field of the heritagisation of the Mediterranean diet (these are the summarised preliminary results of my ethnographic fieldwork in two of the three countries visited, i.e. Italy and Spain), and finish by providing the major issues and some avenues to solve the challenge posed by the cultural officialisation of food at UNESCO.

Food Heritagisation

According to one of the founding fathers of the 2003 Convention, Chérif Khaznadar, intangible cultural heritage (ICH) would not have been supposed to be about food, diet or cuisines. This is easily extrapolated by the absence of a food domain among the five major domains exemplifying the definition of ICH. On the other hand, following a decisive meeting to discuss the role of culinary practices in the implementation of the 2003 Convention, experts stressed the need to give a central role to social and cultural processes associated with consumption patterns but without referring to the products themselves. Food has then become 'worthy' of heritage. This paradigmatic shift has not been exempt from several concerns that should be mentioned. In fact, considering the submitted files, the first applications related to gastronomy showed characteristics more focused on market development and international prestige. From the UNESCO perspective, the reluctance to inscribe elements related to gastronomy was due to: the high probability of a misinterpretation of food

heritage, the spatial-temporal and conceptual breadth of the food heritage category, and the possible race of nations to candidate their gastronomy in a sort of `domino effect`.

The Mediterranean Diet Heritagisation

The heritagisation of the Mediterranean diet at UNESCO corresponds to the nth point of completion of the romanticisation of the Mediterranean space. By representing an existing physical space, the use of its `human data` and the eating ritual – this lifestyle is often the result of a past strewn with deprivations which eventually becomes a memory lived nostalgically in present days – has contributed to turning the contemporary socio-food reality into the possibility of a fiction embodied by this immaterial element. Establishing it as an ideal-typical space of the Mediterranean, the inscription of this cultural element seems to refer to the fact that it is either dead (i.e., a memory) or in the process of socially disappearing to become nothing more than an imaginary referent. That being said, it seems that the heritagisation of this `way of life` (*díaita*) at UNESCO reveals a kind of `commemorative epigraph` about it. That is to say that this process risks potentially being deadly for the practice: heritagisation would have represented, it seems, its `heritage embalming`, as well as a hindrance making its evolution and change impossible.

Major Issues of and Avenues for Food Heritage

1. Stop proposing and officialising food culture at UNESCO since it could be an aporetical concept – an aporia being a *conundrum*, a problem whose possibilities of solution are cancelled from the start by the contradiction. Indeed, one might wonder whether such broadly defined culinary concepts – being a `diet`, a `meal`

or a 'cuisine' – are even formally qualified as ICH. The question is not trivial, even from a legal perspective.

2. If food heritagisation does not stop, then, at least at the UNESCO level, management enhancement and safeguarding measures are very much needed. This solution to this issue, relating to the safeguarding of the inscribed food practice, lies in the disposal of the practice's protective measures: the only instrument for evaluating the safeguarding plans proposed by the Member States and for updating the status of the elements inscribed on the UNESCO Representative List is limited to periodic reports to submit to the UNESCO Intergovernmental Committee by Member States.

3. More ethno-anthropological fieldwork and *in situ* evaluations are required. The periodic reports do not make up for the almost total absence of field studies (comparative and not) verifying the effects of heritagisation, and the mere documentation of activities organised within the heritage communities (which is provided by the periodic reports) is not enough either because it seems to be more of a task given to the Member States by 'the school of the immaterial' than an effective safeguard measure.

Food heritage is at a key moment: not only of officialisation and institutional labelling but also of identification, practice and safeguard of the element itself. Multiple food heritages are currently inscribed on the UNESCO Representative List (Japanese *washoku*, South Korean *kimjang*, Croatian gingerbread, etc.), some are in the process of being heritagised (French baguette, Italian *espresso* ritual, etc.), and many will probably abound in the future. The challenge would then be to provide food-based cultural elements with a more specific glossary

(e.g., an identifying terminology related to them) and a specific UNESCO *grand domaine* dedicated to them.

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**Une gestion pérenne
du patrimoine culturel**

**La modélisation numérique :
développement et application d'outils complexes.**

-

**Digital Modelling:
Development and Application of Complex Tools.**

A Methodology for Built Heritage Energy and Environmental Improvement : the BEEP Project

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Résumé

Le projet BEEP propose une Modélisation des Informations du Bâtiment (BIM) appliquée au patrimoine, ainsi qu'une méthode basée sur la simulation pour renforcer l'analyse et la conception d'interventions d'amélioration sur les bâtiments historiques publics. Après avoir mis en place une méthodologie, un mode d'emploi a été développé de la phase d'analyse à la conception des interventions, en passant par la phase de « performance énergétique contractée » afin de soutenir sa mise en œuvre.

Mots-clés: énergie du patrimoine bâti, amélioration environnementale, modélisation de l'information, simulation du rendement du bâti, mode d'emploi

Keywords: built heritage energy, environmental improvement, information modeling, building performance simulation, guideline

Despite the European Union being an early mover on the climate change adaptation and mitigation policies, and having strongly committed to the energy efficiency regarding the construction sector¹, coordinated action on built heritage is still lacking². Conservation and environmental design have always had many methodological aspects in common, from the transgenerational timeframe to the need to deal with strongly interdisciplinary, holistic and multidisciplinary approaches and to move into a space of uncertainty on the border between hard sciences and humanities³.

The international scientific debate, animated by research projects such as Sustainable Energy Communities in Historic Urban Areas (SECHURBA), 3ENCULT and the International Energy Agency Solar Heating and Cooling Programme (IEA SHC) task 59^{4,5,6} favouring the concept of environmental energy improvement of historic buildings over regulatory compliance (in line with a similar process faced by the built heritage scientific community in the structural field)⁷. Under the *momentum* of the European Green Deal⁸, the cultural heritage stakeholders, led by Europa Nostra, have developed the European Cultural Heritage Green Paper, where heritage is finally framed in its dimension as a key resource and driver for the fight against climate change⁹.

Within this framework, the ENI CBC Med Cross-Border Cooperation initiative is supporting cost-effective and innovative energy rehabilitations relevant to building types and climatic zones, with a focus on public buildings. Under this programme, the BEEP Project 'BIM for Energy Efficiency in the Public sector' is developing an advanced but still a pragmatic methodology to foster built heritage energy and environmental improvement within a joint multidisciplinary framework. BEEP proposes a Heritage Building Information Modelling (HBIM) approach to streamline a centralised, updated and consistent information system capable to support the whole process, from the building analysis (that involves historical and architectural analyses, geometric surveys - both traditional or advanced -, general conservation state evaluation and energy and environmental analyses), to the design of the interventions through a simulation-based approach. The final process regards the

development of the Energy Performance Contracting (EPC), a financing mechanism used to support this kind of intervention reducing the financial barriers of built heritage owners.

Thanks to a clear definition of model use and a data mapping of analysis input, the methodology organises the results to feed into a Common Data Environment (CDE), which is a central repository where the HBIM and the Building Performance Simulation (BPS) models are the focal points. To this end, BEEP also addressed a 'BIM to BP' interoperability workflow (a process still in the early stages of development), proposing best modelling practices for different combinations of software chosen by the consortium. BEEP promotes the use of dynamic BPS as one of the most efficient non-destructive tools to understand and analyse complex phenomena and provide feedback on the energy, environmental and conservation implication of the intervention strategies¹⁰.

For the simulation phase, the methodology requires a calibrated *ante-operam* energy model, based on the data available on the building (energy bills, indoor monitoring, tailored weather data). The whole analysis phase, integrated with *ante-operam* simulation results, informs the development of design solutions, that are also evaluated with *post-operam* simulations. The other criteria for designing the different solutions are the compatibility with the guiding principles of restoration, the technical and constructive compatibility with the existing structure and the environmental and economic sustainability. At the end of the process, design solutions and evaluations are incorporated into the CDE to support the development of Energy Performance Contracts, that can be based on a shared or guaranteed saving model.

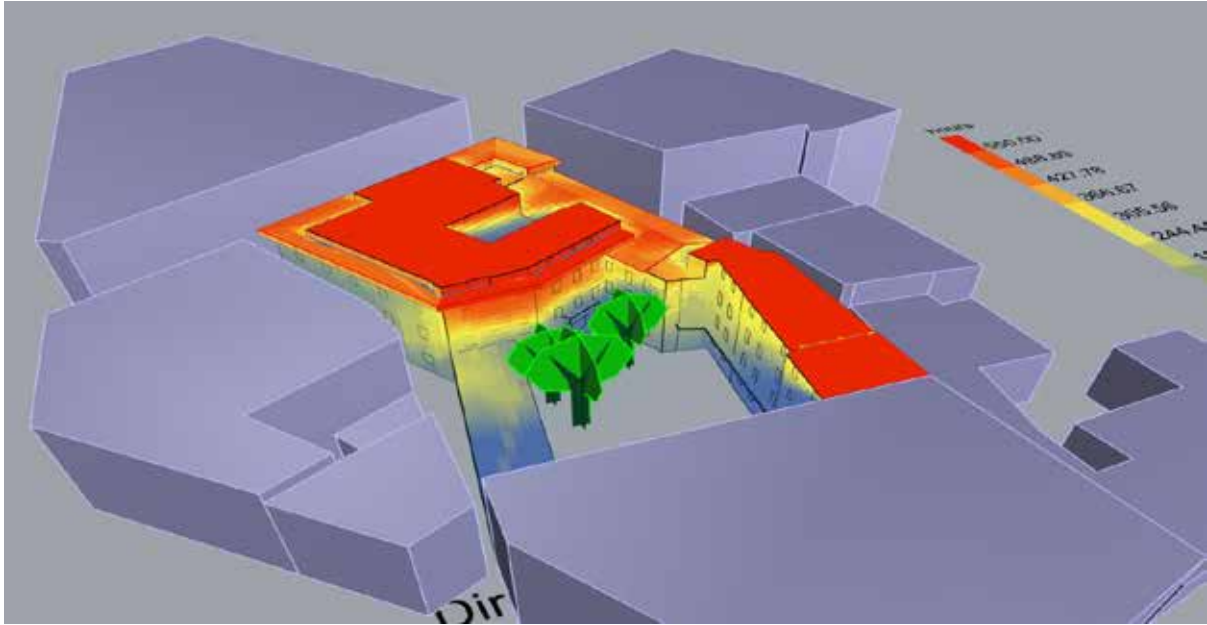


Figure 1. Palazzo Maffei Borghese, Rome. Numerical simulation of the sunshine hours during the winter months, performed for an optimised planning of the positioning of the measurements point of the heat flux meter analysis. A combination of Rhino software with Grasshopper and Ladybug environmental analysis plugin were used. © ISPC CNR | BHiLab



Figure 2. Palazzo Maffei Borghese, Rome. Render view of some of the energy efficiency improvement: photovoltaic panel system on the roof, the bioclimatic buffer space and the replacement of window shadings. © ISPC CNR | BHiLab

BEEP process was translated into a guideline¹¹ to provide support to AEC experts and stakeholders as a mean to foster the use of advanced technology capable to enhance transparency and reduce uncertainties in the construction sector. The guideline supports the stakeholder through the analyses and design steps in progressive levels of detail, according to the data available on the building, its complexity and the resources available. The workflow was tested and contextualized in nine case studies in Italy, Spain, Cyprus, Lebanon, Egypt, Palestine and Jordan.

The paper presented the framework and methodology proposed by the BEEP project on energy and environmental improvement of public-owned built heritage. The case study application proved the workflow flexible and sound to be scaled to a wide range of public historic buildings, and in different national contexts where either the availability of advanced analysis workflows, professional skills and market maturity of design solutions are lacking. BEEP guideline capitalisation can help fill the methodological gap when applying advanced digital workflows to complex historic buildings.

Acknowledgments

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Formal Representation of Heterogeneous Data for Interoperability and Collaborative Virtual Reconstruction in Cultural Heritage. The Case Study of the Roman Theatre of Catania

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Résumé

Une des meilleures manières d'aller au-delà de la réalisation et de la conservation d'un site archéologique est de pouvoir l'étudier à distance : cela est possible grâce à une « réplique numérique » et une reconstruction virtuelle subséquente. Le grand nombre de techniques nécessaires pour mener à bien cette reproduction numérique, impliquant de nombreux professionnels et chercheurs, rend la traçabilité du processus difficile. Dans cet article, nous montrons comment les principes FAIR sont garantis à travers l'utilisation combinée de la méthodologie *Extended Matrix* et l'outil d'inspection 4D EMviQ.

Mots-clés: patrimoine digital, graphiques de connaissance, reconstruction virtuelle, ATON3, matrice élargie

Keywords: digital heritage, knowledge graphs, virtual reconstruction, ATON3, extended matrix

Often in a virtual reconstruction process, the efforts are mainly addressed to obtain an excellent and photorealistic outcome, not taking care of the risk of dramatically losing all the intermediate data processed and the knowledge of the process itself, which we want to make consistent with the Findable, Accessible, Interoperable, and Re-usable (FAIR) principles¹. Thus, we need to consider and overcome some general issues inherent in the processes of the virtual reconstruction of a cultural object. For example, raw data collected during the survey campaign are often stored on various media without creating a proper data structure to preserve their logic and semantic meaning over time. Furthermore, the entire reasoning process is often described in a single scientific publication, which, although of value, describes the decisions taken in a narrative and non-specific way. Recently, these ambitious challenges have been addressed within the Social Sciences & Humanities Open Cloud (SSHOC) project² as a dedicated case study of the Roman Catania theatre, for which we made a new virtual reconstruction. Part of the data collected comes from earlier projects which provided a hypothetical reconstruction of the Roman theatre³.

The Methodology: Extended Matrix

To achieve this goal, the Extended Matrix⁴ approach was used. It is based on the stratigraphic reading approach aiming to create a common framework between archaeological documentation and virtual reconstruction. The relationships between the units found during an excavation result in a stratigraphic matrix (matrix of Harris). Stratigraphic units do not exclusively describe the information that derives from the excavation phase but also map elements above ground (such as wall structures, plasters, decorations, and frescoes). Through the population of the extended matrix, both objective information and interpretations derived from deductive, contextual or analogical information are documented. The Extended Matrix methodology has been standardised into five main steps⁵: 1) data collection, 2) data management and analysis, 3) implementation and virtual reconstruction, 4) creation of a representation

model, and 5) publication. The methodology helped maintain a coherent workflow within the Roman Theatre case study.

The Case Study: Roman Theatre in Catania

Within the SSHOC project, a virtual reconstruction of the Roman theatre in Catania was created as a case study to transition archaeological data to the cloud. This work has allowed us to fully test and validate the Extended Matrix scientific approach and the Digital Author Identifier (DAI) authority record systems and, more generally, allowed us to explore the challenges posed by FAIR policies. The Roman site in Catania was therefore chosen as a case study to describe a unified workflow that starts with archaeological documentation and results in a virtual reconstruction. With this workflow, data manually acquired during excavation and traditionally stored on paper can now be stored in the cloud and used for 3D visualisations of the site. This ancient monument was the subject of a first virtual reconstruction project in 2016, whose results are shown in **Figure 1**.

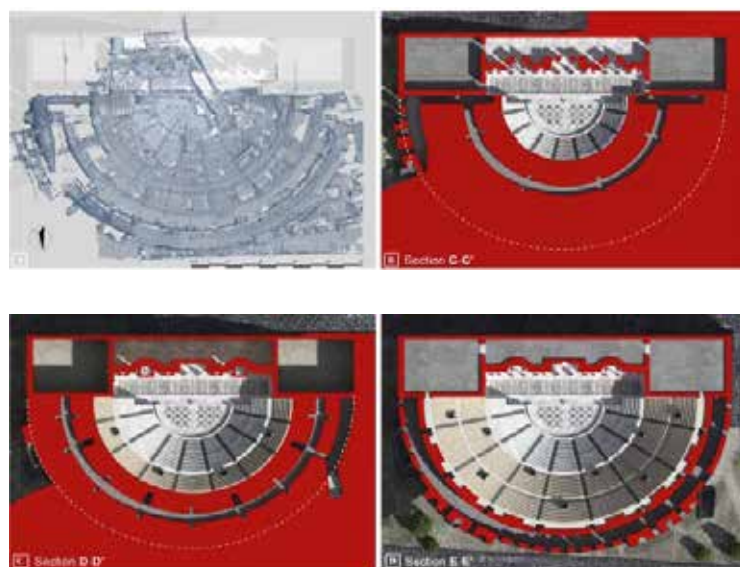


Figure 1. Orthographic views of the laser survey (A), planar sections of the Roman theatre 3D model (B, C, D)

To obtain the former virtual reconstruction, a complex workflow was adopted: existing material and measurable evidence on the site or in the museum was documented, and the information coming from interpretative studies based on literary, iconographic sources, proportion rules, and comparisons was analysed. This quantity and variety of heterogeneous data were integrated to make an exhaustive representation of architectural geometry and its specific materiality. Despite the high level of the results, the whole process was affected by a range of limits for making it FAIR. The raw data were stored on several supports without creating a data structure to preserve its logical and semantic meaning and without any specific label. The workflow was moreover not properly documented, and metadata was not created to contextualise the data collected and resulting from the various post-processing steps. Lastly, proprietary software and tools were used to achieve the goals.

Extended Matrix Applied to the Roman Theatre of Catania

We achieved FAIRNESS, on the one hand, by describing the scientific data in a structured way (EM) and, on the other hand, by using a custom 4D visualisation tool (EMviq, described in the next section) that allows access and rich exploration of the knowledge graph of the reconstruction process. The Extended Matrix, in the case of the Roman theatre of Catania, was applied to a previously completed project whose requirements did not include some of the aspects that characterise EM, in particular: a) tracing the scientific process leading from sources and material evidence to the reconstructive hypothesis; b) integral data publication approach: this requires the adoption of open data formats, both in terms of outputs and, where possible, source data; c) publication of scientific processes, formalised with the EM graph; d) separation between visualisation model (already present in the previous project) and semantic (proxy) model; the latter is connected to the database based on the stratigraphic element used as a unique identifier; d) visualisation and exploration of the integral dataset through a liquid web-app (EMviq). The modifications of the

source dataset produced in the previous project were thus: a) translation of the data from closed to open formats, unfortunately with a significant loss of quality and structural consistency of the 3D scene; b) organisation of sources into a single folder and their connection to the reconstructive hypothesis within the EM; c) modelling the proxies within Blender 3D and connecting them to the database (using the EMtools addon⁶; d) exporting the EM dataset (using EMtools) to EMviq tool.

EMviq Tool

EMviq (Extended Matrix Visual Inspector and Querier) is a complete, interactive 4D visualisation and runtime inspection and interrogation tool for Extended Matrices. Within the SSHOC European project, a web-based version of the tool was developed on top of the open-source ATON framework⁷ by the Institute of Heritage Science of the National Research Council of Italy (ISPC-CNR) (see **Figure 2**). The web tool consumes and automatically extracts linked information from graph DBs (Extended Matrices)⁸, with the intent to provide interactive, semantically enriched 4D environments for researchers. The main goal is to offer professionals interactive inspection of semantically enriched (through the EM formalism) virtual environments using a common web browser. The Web3D tool was designed with ease of use in mind with cloud-based integration⁹ in order to establish a flexible and robust pipeline within multi-disciplinary teams online.



Figure 2. View of the reconstruction of the Roman theatre with an example of a semantic query of the USM03 (Masonry Stratigraphic Unit) related to a base of a column. The floating image shows the EM graph with the corresponding stratigraphic unit.

The case study covered in our article shows how the practice of managing heterogeneous data involved in the virtual reconstruction process and keeping track of the operative details related to each step of the entire process is time-consuming, especially when the goal is to obtain and share reusable data according to FAIR principles. The effort is even greater when working on the results of a previously completed project that did not pose these challenges from the outset.

Using the Extended Matrix approach to describe data in a structured way and a custom 4D access and visualisation tool like EMviq has proven to be an excellent solution to address these problems. These choices allowed us to resolve several issues, particularly the 'data rot' of previous Roman theatre projects, the transition from proprietary data to open data and systems, and copyright issues for cultural heritage data.

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Adaptive Reuse as a Strategy Towards Conservation: Using HBIM Tools for a Contemporary Building in Iran

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Résumé

La nécessité de sauvegarder et de préserver le patrimoine architectural augmente de plus en plus en Iran où le nombre de bâtiments historiques est considérable. La planification de nouvelles utilisations adaptables et compatibles pour les structures abandonnées permet d'allonger leur cycle de vie et présente de nombreux avantages. Dans ce projet de recherche, l'approche *Heritage Building Information Modelling* (HBIM) est mise en pratique pour créer un modèle d'information homogène pour un bâtiment résidentiel contemporain de Téhéran. Les données basées sur la réalité ont été intégrées à une enquête sur site et à des données descriptives au sein d'une plateforme BIM. Les résultats expérimentaux de cette recherche contribuent aux étapes de la réutilisation adaptable telles que la modélisation, la pathologie, la gestion du cycle de vie et la planification.

Mots-clés: HBIM, réutilisation adaptable, modélisation paramétrique, photogrammétrie rapprochée, durabilité

Keywords: HBIM, adaptive reuse, parametric modeling, close-ranged photogrammetry, sustainability

Cultural heritage (CH) is the legacy from the past that assigns a duty for us to pass them down in a responsible way. In conserving the built heritage, the reuse of underused or abandoned assets is a practical substitute for the wasteful processes of demolition and new construction while prolonging the cultural heritage lifespan¹. Moreover, converting an existing building typically takes half to three-quarters of the time necessary to demolish and reconstruct the same floor area, the shorter time leads to fewer financial². In terms of social results, since these buildings are located within the city near existing markets and amenities, the pedestrian traffic increases in the neighbourhood, and it could support diverse activities within an area³. Accordingly, the sample merits of adaptive reuse refer to three pillars of sustainability (financial, social, and environmental)⁴.

Among academics, the necessity of documentation in CH interventions is undoubtedly acceptable. When the traditional documentation techniques give information on a certain level, advanced techniques like Heritage Building Information Modelling (HBIM) provide a solution. It can provide a complete survey and parametric modelling on the geometry aspect; attribute, material, and relationship information of the sub-elements; possible deformations, and changes over time⁵. Compared to the conventional geometric models, the HBIM model provides a unified environment for semantic/parametric, 2D/3D, and spatial/attribute databases⁶.

HBIM is suitable for the recreation of a historical building from the existing description data (such as historical documents, bibliographic references, photographs, drawings, etc.) and reality-based recording data (typically 3D point cloud from laser scanning and photogrammetry) with the descriptive data⁷. The outcome is used to understand and manage prior to the decision-making of the conservation process⁸. As BIM is basically

designed for new constructions, it would better fit contemporary assets than a complicated historical one because the shape of recent buildings is less complex and more typical. Therefore, the opportunity to use parametric models in other reuse projects is considerable.

In this investigation, a contemporary residential building in Tehran is selected as a case study. The site contains two main multistory blocks constructed in the first Pahlavi rein. Block A was built between 1939 and 1941 and, after twenty years, the second block appeared. Observing the rhythm of the façade, it shows that the architectural style was inspired by Art Deco. Nevertheless, the primary material (brick) is vernacular and follows the Iranian style.

Recording operations were conducted both manually and semi-automatically. For interior spaces and façades, the survey was undertaken by tape and laser measure. Next, the drawings were illustrated in Autodesk Autocad 2020. Besides, the descriptive data were acquired from the former written and drawing documents alongside the field studies. Valuable information was received through interviews with neighbours.

Besides, for the semi-automated phase, the reality-based data were captured by the photogrammetry method. The accurate photogrammetry was performed by Sony ILCE-7RM4 camera. During this process, a hydraulic lifter allows the photographer to have access to the upper levels of the façade. Then, in total, four hundred eighty-seven images were aligned and processed in Agisoft Matashape software. Finally, a dense point cloud was achieved in .psx format. However, this format is not importable to the desired platform, Autodesk Revit 2022, and we had to transform it to .rcp with the help

of Autodesk Recap. By assigning four benchmarks, the point cloud became scaled. The ultimate point cloud was dense, material included, accurate, and editable.

In the next step, in order to reach a plenteous information model, the drawings and point cloud were imported to Autodesk Revit 2022 and the parametric modelling operated semi-automatically alongside the added descriptive data (**Figure 2**). The final HBIM outcome had numerous characteristics to facilitate the process of asset management, pathology, conservation, restoration, adaptive reuse and act. In the following, some of these beneficial practices will be presented in the table.

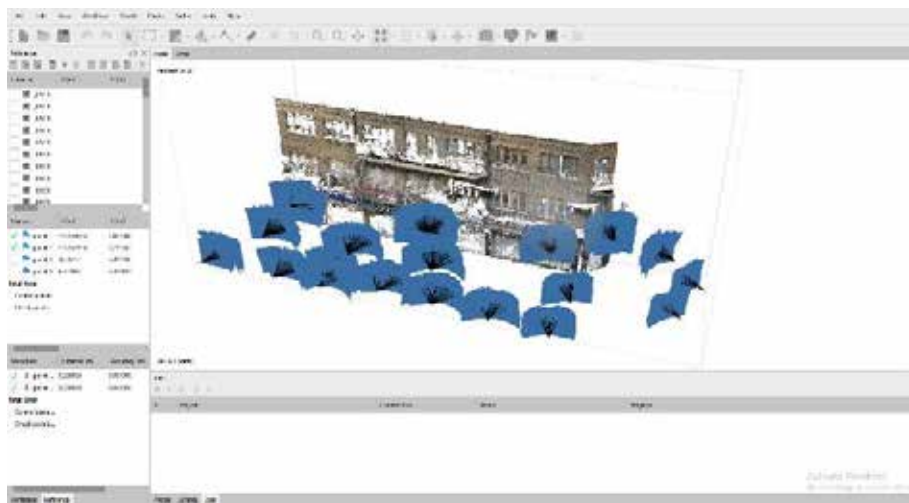


Figure 1. The positions of the camera during the point cloud processing in Agisoft Metashape

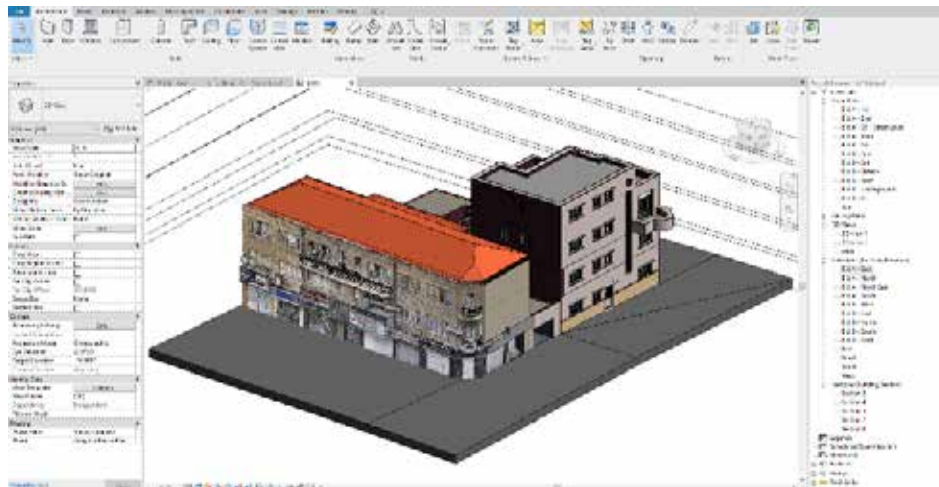


Figure 2. Final model containing the point cloud in Autodesk Revit 2022

N°	Feature	Practice in adaptive reuse	Note
1	Parametric Modelling	<ul style="list-style-type: none"> -Contributes in accurate as-built documentation, fast revision, automatic analysis, and easy planning. -Parametric elements can be regained in other projects with different characteristics. 	Architectural elements, including walls, doors, windows, floors, etc., have specific parameters and attribute tables that can be modified anytime. Even the repetitive decorating elements are parameter-based.
2	Pathology	<ul style="list-style-type: none"> -Damages can be analysed in an integrated model. -Repair details are designed within the reuse plan. 	Pathology can be undertaken with full description. A photo or point cloud can be imported or linked to the specific place of damage alongside the properties table that presents the dimensional and descriptive information.

3	Life cycle	Project phases are manageable in a single working file alongside with the new use perspective.	Every adaptive reuse project has several stages during its life cycle such as construction, additions and demolishes, as-built, reuse, etc.
4	Planning & Design	<ul style="list-style-type: none"> -The new function can be assigned and adjusted room by room. -The desired analytical tables, which are prepared automatically, brighten the way for the reuse construction phase. -Planning and design can be rendered and presented in satisfying graphics within the software or with the help of additional plug-ins. 	

Figure 3. Useful features of HBIM in the field of adaptive reuse

Adaptive reuse is a growing trend that has preserved the values of abandoned buildings in a multidisciplinary way. For this aim, homogeneous documentation is required to aid the stakeholders from the management phase to detailed restoration plans. Heritage Building Information Modelling is a state-of-art approach that fulfils these requirements to a satisfying level. In this paper the method was gotten into practice for a contemporary building in Tehran, Iran and the outcomes were discussed. By combining geomatics and semantic information, HBIM can facilitate the process of adaptive reuse in parametric modelling, pathology, monitoring the life-cycle, and planning phases.

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**Une gestion pérenne
du patrimoine culturel**

**Vers de nouvelles expériences du patrimoine :
réflexions sur des médiations innovantes.**

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**Towards New Experiences of Heritage:
Reflections on Innovative Mediations.**

Innovative Approaches for Audience Engagement: The Case of the Opera Escape Room

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Résumé

Cette recherche étudie le potentiel des *escape rooms* pour l'engagement du public par la création d'une salle d'évasion sur le thème de *La Traviata*. Les *escape rooms* ont gagné en intérêt dans le domaine du patrimoine pour offrir des expériences ludiques aux jeunes générations et ont le potentiel de promouvoir le patrimoine immatériel, l'opéra en étant un bon exemple. Les résultats fournissent des preuves de l'expérience des joueurs, des attitudes positives et des intentions comportementales envers l'opéra. La recherche est pertinente pour le développement d'approches innovantes pour l'engagement du public.

Mots-clés: escape room, expérience ludique, engagement du public, opéra, patrimoine immatériel

Keywords: escape room, playful experience, audience engagement, opera, intangible heritage

The application of games for knowledge, enhancement and promotion of cultural heritage is gaining momentum as a multidisciplinary challenge against the background of a growing video game market¹ and increasing attention is focused on the design, development and evaluation of serious games (i.e., games with educational purposes) in this context². Previous research emphasised the role of games for cultural awareness, contributing to intangible heritage preservation and communication³.

While studies primarily focused on digital serious games, recent experimentation highlights the potential of real-life escape rooms for cultural heritage⁴. In this live-action team-based games, a group of players locked in one or more rooms has a set amount of time to escape by discovering hidden clues and solving a series of puzzles. In recent years, these games gained popularity as recreational attractions and also as an educational approach. Escape rooms can be designed as themed rooms with a narrative, with puzzles being part of the storytelling and players taking a role in the story⁵. Based on flow theory⁶, research showed that escape rooms can facilitate group flow experiences and that theming and storytelling significantly influence participants' immersion in the game⁷. Some museums have adapted the real-life escape room game to provide a unique experience and attract a younger audience⁸.

This study aims to explore the potential of these playful experiences to promote the engagement of a wider and diversified audience with melodrama, based on the case study of an escape room designed for Italian Opera. Engaging tomorrow's audience is a key priority for the sustainability of Italian Opera, which is a candidate for inclusion in the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. Based on a previous analysis of the opera experience, an out of context escape room themed *La Traviata* was created and experimented to promote awareness and motivate players to discover more about it through their active experience of the stories and emotions at work in the Opera.

‘Enigma from the past’: Escape Room Design and Analysis

The game was designed to discover the main events in the story of Violetta Valéry and the associated emotions. The narrative was based on the interweaving between the lives of two women in a supernatural detective mission: Rosa Valeri, a medium who had just died, and Violetta, whom she was helping before her death. Taking the role of the medium, the players had one hour to discover the life and emotions of Violetta. The game, set up in a real escape room game venue in Naples, was developed through a path involving two rooms: the medium’s studio (**Figure 1**), which turned out to be a passage to a secret room (**Figure 2**), where it was possible to ‘solve the case’. To start the game, participants watched a video testament of the medium, inviting them to retrace the story of a woman who lived almost two centuries earlier and whom she was helping before her death.



Figure 1. The medium’s studio

After a series of puzzles which, for example, allowed them to discover the place where Violetta lived by matching letters and numbers on a map, the players found a secret passage in a wardrobe that let them enter the secret room. Here, they eventually found the key to escape by looking at a portrait of Alphonsine Plessis, the real woman who inspired *La Traviata*, with a head-mounted display showing a video mash-up of performances in

major theatres and revealing that the story of this woman is kept alive every time an audience attends this Opera.



Figure 2. The secret room

The escape room has been experimented in November 2018 with one hundred and five participants in groups of two to six players. About half of the groups managed to escape the room in one hour. After the game, a survey was administered on-site to investigate the players' experiences. The sample of responses used for the analysis includes ninety-eight participants from fourteen to seventy-three years old, with over a half (53%) being composed of players up to thirty-four years old. More than half of respondents had not previously played in an escape room (58%) and declared to already know the story, or plot, of *La Traviata* before playing (52%), but only 33% had previously attended a performance.

The findings indicate that the theme and storytelling contributed to an immersive, compelling experience: considering the sum of 'agree' and 'strongly agree' responses, a majority agreed that the story immersed them in the game (77%), the theme made it more compelling (82%) and the atmosphere made them feel in a different reality (81%). The study provides evidence of the flow experience in the game: participants agreed or strongly agreed to have experienced flow at both individual (95%) and group (91%) levels. It

supports the cognitive and affective attitudes created by the game toward the featured Opera; for instance, a large majority (83%) agreed that the experience stimulated their curiosity to learn more, with 43% of respondents strongly agreeing. Finally, it shows the potential of this experience to stimulate interest to find out more and to attend a performance of *La Traviata*, with 75% of respondents agreeing or strongly agreeing about these intentions.

The findings of the analysis of the game experience support the role of this approach in promoting audience engagement with melodrama. Future research will be oriented to improve the effectiveness of this new experience of heritage in relation to different audiences, also through the integration of co-design approaches involving audiences, creatives and experts from cultural institutions. In line with leading research on innovation in cultural institutions⁹, a perspective centered on an in-depth understanding of the audience experience is crucial for designing effective innovative mediations to promote awareness of heritage in contemporary society.

Acknowledgements

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À l'épreuve de l'anamorphose : l'artiste, le monument, l'habitant

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Abstract

To celebrate the twentieth anniversary of the registration of the Cité de Carcassonne on the World Heritage List, the Centre des monuments nationaux called on the visual artist Felice Varini in 2018. Consisting of strips of yellow paint applied directly to the ramparts, his installation, *Concentriques excentriques*, aimed to establish a dialogue between creation and heritage. Instead, it raised a controversy, in which the inhabitants took part to show their attachment to the image of the citadel, that part of the monument which they can still fully enjoy, at a time when overtourism is robbing them of their heritage.

Mots-clés: monument, art, « overtourisme », protestation, appropriation

Keywords: monument, art, overtourism, protest, appropriation

Au nombre des médiations innovantes du patrimoine, l'art apparaît de plus en plus mobilisé. Dans les monuments historiques, l'institution patrimoniale justifie cette intrusion *a priori* incongrue, jugeant qu'elle offre à l'art « un espace d'immanence et de transcendance », capable de « déplacer l'individualisme de l'artiste contemporain », et que le visiteur, de son côté, y trouve l'opportunité d'« un dépassement de la relation nostalgique au passé » et l'occasion d'endosser « un rôle nouveau par le renouvellement du contact direct et vivant avec le patrimoine »¹.

Aujourd'hui, si l'idée est bien admise, elle ne va pas si bien de soi pour le public. Se pose en effet la question de l'intelligibilité des installations et des performances proposées, étant donné qu'elles requièrent, pour être comprises, explicitation et donc médiation². Soit une nécessité que « l'art contemporain exposé au rejet »³ met bien en évidence. Les réactions négatives suscitées par l'intrusion de l'art contemporain dans l'environnement du monument sont en bonne part imputables à ce type de malentendu, mais ne s'agit-il que de cela ? La réponse appelle quelques nuances, du moins en ce qui concerne la réception de *Cercles concentriques excentriques*, œuvre de Felice Varini à Carcassonne.

Au printemps 2018, l'image que forme la Cité à l'horizon de la ville basse se voit modifiée. Les remparts se couvrent d'arcs de cercle d'un jaune « pétard », peints à même le monument. L'artiste, qui a fait de la diffraction et de l'anamorphose sa signature, joue du point de vue : les cercles concentriques qu'il dessine en choisissant pour point de vue initial la porte d'Aude se déstructurent dès lors que l'on se déplace, l'œuvre se démultipliant en autant de points de vue. L'histoire du monument n'est absolument pas convoquée. Il s'agit juste d'« inviter le public à découvrir une version différente de ce paysage remarquable ; très connu mais peut-être pas assez regardé à force d'être vu »⁴ et de l'engager à une « relation [...] active et déterminante quant à la perception de l'ensemble »⁵.



Figure 1. Felice Varini, *Cercles concentriques excentriques*, Cité de Carcassonne, 2018 © André Morin

Sur place, l'intention est diversement perçue. Les uns adhèrent et font leur miel des cercles jaunes pour nourrir leur propre création, comme Bruno Béghin, dont les compositions surréalistes sont autant de variations imaginaires sur la Cité. D'autres, telle l'équipe de rugby à XIII, font de l'œuvre leur emblème. Ce faisant, aux lendemains des attentats de Trèbes et Carcassonne, cette création aux allures de cible est jugée de mauvais goût. Puis, les critiques se diversifient : on s'inquiète de la détérioration de la pierre, du coût de l'opération, des réactions des touristes. Les protestations gagnent les réseaux sociaux quand, de son côté, le Centre des monuments nationaux, commanditaire de l'œuvre, reçoit des lettres d'insultes d'une rare violence. La polémique, aux accents de Clochemerle, a tout pour séduire et amuser les journalistes qui accourent de la capitale et de l'étranger, amplifiant l'écho

de la contestation. S'ensuivent des appels à l'arrachage, des dégradations et l'agression d'un médiateur posté porte d'Aude.

Le 5 avril 2018 est lancée une pétition en ligne dont l'auteur espère qu'elle va « atteindre des sommets et faire redescendre les perchés qui permettent ces immondices ». Elle recueille, au 15 juin, 2 500 signatures, accompagnées, pour la moitié, de commentaires, lesquels dénoncent l'atteinte portée à l'esthétique et à l'intégrité matérielle du monument, moralement condamnable, à en juger par la récurrence des termes honte, irrespect, scandale, offense, sacrilège.

Rapportées aux Carcassonnais, ces réactions n'ont rien de très surprenant, sachant que les habitants ne vivent pas de manière très sereine leur attachement à la Cité que le tourisme contrarie. On lui reproche d'avoir dénaturé la vie à l'intérieur des remparts pour en faire « un centre commercial », « une coquille vide », « un décor à la Walt Disney ». La Cité est « tellement envahie qu'elle est déserte ! » considère-t-on. « Elle est désertée de son âme ».

De fait, pour les Carcassonnais, la Cité se ramène à ses marges, les lices, arpentées de préférence hors-saison, et plus encore, à son image : « Quand tu la vois, du Pont neuf, c'est toujours un enchantement ! C'est un peu, comme quand tu regardes une peinture, que la peinture se lève pour que tu puisses bien la voir. » Ce mirage quotidien, les habitants ne se lassent pas de l'admirer, heure après heure, jour après jour, mois après mois, saison après saison, au gré des variations de la lumière, des couleurs du ciel, des points de vue. Soit une Cité changeante, vivante, dont ils ont l'exclusive, parce que présents, au quotidien.

Sans parler des images produites le 14 Juillet, à l'occasion de l'embrasement de la Cité. S'il, est dans l'année, un « tableau » de la Cité à ne pas manquer, c'est bien celui-là. Ce feu d'artifice émerveille et remplit de fierté les habitants, mais force est bien de constater qu'il attire de plus en plus de monde. En 2015, on estimait à 165 000 visiteurs la fréquentation touristique pour cette seule journée. Aussi, nombreux sont ceux qui cherchent à échapper à cette foule « insupportable », pour lui laisser la jouissance du spectacle.



Figure 2. Feu d'artifice, Cité de Carcassonne, 14 juillet 2015 © Julien Roche / Ville de Carcassonne
Tous droits réservés

Cet autre renoncement ne remet pourtant pas en cause le tourisme, et d'aucuns estiment que l'on pourrait améliorer l'offre de visite, avec « une relève de la garde comme à Buckingham Palace », « un musée de la chevalerie », « un week-end médiéval avec des banquets, des commerçants en tenues d'époque ». Non sans ambiguïté : « On s'en fout si c'est du faux, ce n'est pas grave ! L'essentiel c'est que le

client se retrouve un petit peu dans cette ambiance. » En somme, à abandonner la Cité au reste du monde, autant la lui céder en la plongeant plus encore dans cette « troisième espèce vivante de passé »⁶, qui n'est ni de l'histoire, ni de la mémoire, mais plutôt le produit d'un historicisme « non historique »⁷.

Les Carcassonnais, quant à eux, inscrivent dans le présent leur contemplation de la Cité, dans un temps qui, en fait, n'est pas si différent de celui qu'instaure Varini. Car l'artiste n'ambitionne rien d'autre, en effet, que d'inventer un présent au monument. Sauf qu'il s'y emploie abstraction faite des habitants, qui savent bien en exprimer le regret : « On ne nous a pas consultés ! »

Stimulée par la nostalgie ou le rêve d'un patrimoine qui serait « à soi » et seulement « à soi », l'hostilité à l'endroit de *Cercles concentriques excentriques* s'apparente à un réflexe de résistance et de défense. Et en même temps qu'elle trahit un sentiment de dépossession, elle révèle une certaine capacité à passer outre cette frustration et à se réapproprier, quoi qu'il en soit, la Cité. De sorte qu'au final, on peut dire qu'à défaut d'innover, au sens où l'entend l'ingénierie culturelle, l'habitant ne sait pas moins inventer des manières de reconquérir son patrimoine.

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La musique dans les patrimoines :

Enjeux et perspectives

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Abstract

Music is generally absent from heritage sites. How can its integration be envisaged in order to offer visitor experiences that allow certain musical repertoires to reach a new audience? The experiments carried out by the RicercarLab at the Centre de la Renaissance in Tours provide food for thought on the place to be given to music.

Mots clés: musique ; patrimoine

Keywords: music, heritage

Intégrer la musique dans les patrimoines en dehors des manifestations qui lui sont réservées (concerts, festivals, radios, streamings, etc.) constitue un défi. Elle possède une capacité d'action qui en fait un support idéal de danses, d'expressions profanes comme spirituelles : il y a de la corporalité dans l'expérience sonore qui lui confère de la force mais qui peut également susciter bien des interrogations lorsqu'elle est intégrée à la mise en scène des patrimoines. La musique envahit les espaces, détourne l'attention, provoque des émotions singulières, réveille des souvenirs, et bien d'autres choses encore avec une célérité qui la rend en fait peu malléable. Il en découle une sorte de mise à l'écart de la musique de toute expérience patrimoniale. Quiconque visite Versailles en perçoit la dimension patrimoniale, la force historique et l'intérêt artistique. Lully, comme d'ailleurs Racine, semblent absents de cette visite !

Ce type de constatation vaut pour Versailles et pour bien d'autres sites, pratiquement tous. La musique peine à y pénétrer. Certes, elle est présente dans des lieux de concerts, lors de festivals, elle peut parfois faire office de fond sonore dans l'un ou l'autre espace d'un site mais elle n'est qu'exceptionnellement intégrée de façon harmonieuse avec les autres aspects du site patrimonial. La nécessité de valoriser le patrimoine musical est cependant à l'œuvre dans de grands musées, qui préservent des collections d'instruments et de sources musicales, comme par exemple la Cité de la musique à Paris ou le musée des Instruments de musique à Bruxelles¹. Depuis des décennies, ces institutions recourent à des technologies audios pour donner vie à des objets musicaux qui resteraient autrement silencieux, et pour éduquer le public (le domaine de l'organologie est immense). La Cité de la musique, par exemple, utilise plusieurs supports multimédias à cette fin, depuis les audioguides, qui expliquent la conception et le fonctionnement des instruments et donnent l'occasion d'entendre leur sonorité, jusqu'aux jeux qui permettent de « sentir » le fonctionnement des instruments. En outre, la Cité de la musique utilise des

documentaires présentant des entretiens approfondis avec des musiciens, des luthiers et des interprètes, qui éclairent divers aspects de l'histoire de la musique. La musique n'est pas absente de ces musées !

En offrant la possibilité d'entendre, mais aussi de voir, les instruments, les images et les documents qu'ils conservent, les musées contribuent grandement à sensibiliser le public en lui offrant des rencontres émotionnelles, et pas seulement visuelles, avec le patrimoine musical. C'est la raison pour laquelle ces modes de communication se multiplient dans les musées, redonnant ainsi vie aux objets musicaux. Un exemple par excellence est le Victoria & Albert Museum, dont les galeries consacrées au Moyen Âge et à la Renaissance ont été créées avec les objectifs suivants : (i) permettre aux visiteurs « d'imaginer le monde de la Renaissance » ; (ii) compléter les présentations thématiques par des enregistrements musicaux ; et (iii) permettre aux visiteurs d'entendre le son des instruments exposés. Les porteurs de ce projet, Stuart Frost et Giulia Nuti, ont sélectionné des enregistrements déjà disponibles, et dans certains cas ont réalisé des enregistrements, en collaboration avec le Royal College of Music. Ils ont veillé à combiner trois types d'informations : la notation musicale, les instruments de musique et les sources figuratives sur des thèmes musicaux. Ils ont prévu des *hotspots* musicaux, où les visiteurs peuvent entendre une brève explication et un extrait musical au moyen d'un casque, et explorer les sources musicales via un écran tactile. Par ces moyens, le musée encourage l'interaction et la participation du public pour renforcer son impact éducatif.

Il s'agit d'exceptions. Et elles ne répondent que partiellement aux questions que l'on peut se poser aujourd'hui sur les relations entre musique et patrimoine. Au-delà des contraintes technologiques liées tant à la production sonore qu'à son contrôle pour éviter qu'elle ne devienne envahissante, la musique suscite des interrogations et des défis. Le premier défi consiste en la mise en œuvre d'une autre façon de vivre une

expérience musicale. Ne vont aux concerts que ceux qui y sont déjà sensibilisés : les nombreuses études le démontrent. Comment sortir du cadre formel du concert pour donner l'opportunité au public nombreux de sites d'enrichir ses perspectives en matière de patrimoine pour y intégrer la musique (et d'autres formes artistiques absentes) ? Une telle ambition exige de créer les conditions d'une expérience nouvelle de la matière musicale qui fasse comprendre ce que chacun peut entendre, peu importe le dispositif technologique utilisé. Se pose également le défi d'un décloisonnement disciplinaire pour permettre la réalisation de ces nouvelles expériences. Il ne s'agit en effet pas d'imposer une dimension supplémentaire qui pourrait être perçue comme optionnelle, mais plutôt de l'intégrer de la façon la plus pertinente dans un parcours de découverte, d'initiation.

Ce sont ces constats et ces défis que le RicercarLab (<https://ricercar-tours.fr/>) du Centre d'études supérieures de la Renaissance (Tours) a affrontés dans une série de réalisations. En effet, parmi les missions de Ricercar, la plus complexe est certainement celle de la valorisation. Il convient ici de dépasser la question de la médiation du patrimoine musical : cela s'effectue de façon continue à travers le travail conjoint de musicologues, d'interprètes et de diffuseurs. Dans le cas qui nous occupe, la valorisation concerne plutôt la façon de rendre compréhensible le travail musicologique pour permettre à un public croissant d'accéder à des œuvres, de les comprendre à travers un processus explicatif mais aussi grâce à une mise en scène patrimoniale qui résulte de la collaboration entre des acteurs qui communiquent certes régulièrement mais élaborent rarement un projet en commun. Ces projets sont visibles sur le site <https://virtual-music-heritage.fr/>

Les expériences menées par Ricercar au cours des dix dernières années en témoignent clairement : intégrer une dimension musicale dans un site patrimonial, dans un musée ou dans le cours d'une exposition soulève bien des défis, chaque fois

renouvelés. La question de la présence musicale dans des demeures (et pas seulement des maisons de compositeur par exemple) a été théorisée par Jeanice Brooks et ses collègues dans une publication récente². Un numéro de *Curator*³ a été consacré en 2019 à la question des approches pédagogiques à déployer lorsque la musique s'invite au musée ou dans une exposition. Et ces réflexions s'inscrivent dans la continuité de l'étude signée Constance Classen⁴ qui aborde de façon plus large la question du sensoriel. Il ne s'agit pas ici de reprendre leurs arguments qui croisent ceux que nous avons développés de façon empirique au cours des projets portés par Ricercar. Il semblerait plutôt utile ici de mentionner trois points sur lesquels porter une attention particulière afin de favoriser la multiplication d'expériences patrimoniales qui intègrent la musique.

Le premier est d'ordre disciplinaire. Nos cloisonnements en matière de patrimoine ont certes permis des expériences incroyables, et la musique ne doit soudainement pas être privée de ses lieux privilégiés que sont les salles de concert, les festivals, les studios d'enregistrement, tout comme un site architectural ne gagnerait rien à être pensé uniquement à l'aune de ses restitutions technologiques, virtuelles. Pour un musicologue, le travail direct avec les interprètes s'avère d'une grande richesse et contribue à élargir les horizons épistémologiques en permettant des approches empiriques essentielles à la compréhension des œuvres musicales. Et ces collaborations avec les interprètes supposent également un travail avec les diffuseurs et les publics. Mais une fois encore, dans un espace qui reste celui d'un groupe bien défini. L'archipélisation de la musique n'est pas que métaphore : elle est également réalité matérielle qui contraint les possibilités d'élargissement d'audiences. En revanche, élargir le réseau de collaborations scientifiques pour conduire des expériences hors des lieux habituellement dédiés semble ouvrir des perspectives nouvelles. La porosité des lieux entraîne la porosité des publics ! Le fait est bien connu, mais rarement mis en œuvre.

La difficulté du dialogue pluridisciplinaire ne doit cependant pas évacuer une autre dimension, politique et institutionnelle. Des expériences comme celles du *Cubiculum musicae* nécessitent une impulsion politique qui peut se traduire par des choix institutionnels. Le national, le régional, le départemental et le communal peuvent ne pas articuler leurs ambitions. Il n'est pas ici question d'un problème insoluble découlant d'un constat (la difficulté de la pluridisciplinarité) débouchant sur des choix politiques (chacun dans son périmètre patrimonial). Envisager des initiatives portées de façon pluridisciplinaire dans des sites relevant de dynamiques institutionnelles diverses pourrait contribuer à combler les fossés qui engloutissent parfois des projets originaux.

Le troisième et dernier point, enfin, se voudrait pragmatique : comment aller au-delà de recommandations aux décideurs, au-delà de suggestions aux historiens, conservateurs, musicologues et interprètes afin de cibler une action qui pourrait, à échelle européenne, constituer une expérience probante dont les résultats pourraient être mesurés de façon comparative sur une large échelle. Il s'agirait de partir d'une technologie simple, récente, accessible au plus grand nombre qui permettra des développements en connectant la musique aux arts visuels dont le public est moins captif d'archipels. Il conviendrait de coupler un QR Code avec une plateforme numérique spécifiquement dédiée à l'échelle européenne. Le QR Code serait déposé dans des musées ou des expositions, à côté de tableaux à sujet musical, avec quelques mots d'explication. Le visiteur aurait, par son smartphone, accès à un contenu musical associé selon des critères historiques précis et éditorialisés, évidemment. Les avantages seraient nombreux : accroître la curiosité, conférer une dimension de complémentarité aux émotions artistiques, créer un objet d'un genre nouveau spécifiquement européen sans recourir à des technologies à fort risque d'obsolescence, fournir une autre diffusion aux réalisations musicales en se calant sur les modes actuels d'écoute (quelques minutes et non plusieurs heures d'affilée),

imaginer une plateforme qui déploie ses ressources au-delà du moment de la visite par un contenu pédagogique et artistique dense, susciter auprès des musiciens des performances d'un genre inédit en lien avec des interlocuteurs nouveaux.

Il y a certes une certaine dose d'utopie dans un tel projet, mais il répond sans doute aux attentes des acteurs de la culture et des visiteurs, les premiers en quête de nouvelles formes d'expression, les seconds en recherche d'expériences inédites qui leur font découvrir toute la profondeur des patrimoines.

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Patrimoine et numérique : défis et limites
Regards croisés entre le Louvre et les Micro-Folies

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Abstract

This article explores the increasing use of digital technology in the way the museum is experimented and adapted to 'current standards'. Our main hypothesis is that the impossibility of building large museums in all territories and the desire for access to universal works of art contribute to the creation of a new space, the virtual space, which transcends the very idea of homogenising cultural codes. The cases of the Louvre and the Micro-Folies are in line with each other, since the Louvre is participating in the deployment of the Micro-Folies, which are becoming laboratories for rethinking the museum experience.

Mots-clés: patrimoine, technologie numérique, Louvre, Micro-Folies, réputation, nouvelles proximités

Keywords: heritage, digital technology, Louvre, Micro-Folies, reputation, new proximity

Discuter de l'usage du numérique pour les musées

L'objet de cette communication est d'analyser la montée en puissance de l'usage du numérique¹ dans les musées pour les promouvoir (Réseaux sociaux -RS- et médiations numériques) et déconstruire les « frontières symboliques »². L'intérêt est de discuter des nouvelles manières d'expérimenter le musée et de faire émerger les limites de ces usages. Nous mobiliserons deux cas d'étude pour mettre en avant deux cas de figures, le musée du Louvre et les Micro-Folies :

- la promotion et le « travail réputationnel »³ que permettent les réseaux sociaux ;
- une autre accessibilité à la culture via le numérique pour des territoires périphériques.

Les Micro-Folies sont des musées numériques (application, tablette et écrans) pensés par La Villette et le ministère de la Culture et de la Communication. Elles peuvent être déployées dans toutes structures préexistantes ou mobiles.

Questionnements et méthodes : comment allier patrimoine et numérique ?

Notre questionnement est de savoir comment l'usage du numérique pour promouvoir et démocratiser l'accès et la connaissance du patrimoine transforme l'expérience même du patrimoine. Nous considérons trois manières d'expérimenter les musées :

- connaître un lieu *in situ* : il s'agirait d'une expérience vécue dans un espace physique pratiqué ;
- réaliser des allers-retours entre l'espace physique et l'espace virtuel via une expérience vécue augmentée ;
- visiter et expérimenter un lieu via des représentations virtuelles : une expérience substituée.

	Musée du Louvre – 2017-2018	Micro-Folie (Sarrant et Caylus) – 2021
Source primaire	Analyse Twitter pendant 1 an : création d'une base de données photographiques; Entretiens	Entretiens exploratoires; Revue de presse sur Europresse et analyse lexicométrique
Source secondaire	Analyse de la presse nationale et régionale : corpus et traitement lexicométrique; Observations	Observations; Documents officiels
Source tertiaire	Cartes mentales	Analyse Twitter

Figure 1. Encadré méthodologique (M-A. Molinié-Andlauer, 2022)

Des représentations du Louvre

En nous intéressant à la présence du musée du Louvre sur les réseaux sociaux, nous avons observé que l'un des enjeux était bien de valider et travailler la bonne réputation du Louvre. Les images du corpus de Twitter laissaient apparaître une manière similaire de « se représenter » le Louvre que nous avons nommée « Louvre en anamorphose »⁴. Pour le public lointain (géographiquement parlant) et habitué des musées, le musée du Louvre est un passage obligé pour « certifier » sa présence sur le territoire parisien.

En contrebalançant cette représentation du musée, nous avons également observé à partir d'un travail d'enquête auprès d'un jeune public parisien la persistance de frontières symboliques entre la ville et le musée⁵. La présence du Louvre sur les réseaux sociaux, mais également l'implication de l'institution dans des politiques de démocratisation de la culture telles que le projet Micro-Folie permettent au musée de repenser son champ d'action et les publics visés. Le numérique devient un support d'une réalité pratiquée et accroît le désir de pratiquer le lieu et de

bénéficiaire de la réputation du Louvre pour rendre dynamiques les territoires (Lens, Abu Dhabi, Atlanta, Téhéran). C'est ce que nous avons nommé le « désir de lieux »⁶.

Le projet Micro-Folie : montrer des œuvres des musées partenaires et valoriser le territoire

Des lieux désirables aux lieux praticables, tel est l'enjeu des Micro-Folies : pouvoir montrer des collections du musée du Louvre mais également celles d'autres musées. C'est un projet qui offre une autre perception aux œuvres et qui s'apparente à un « musée imaginaire » présentant une version différente de l'histoire de l'art. Les expériences seraient alors augmentées et substituées.

Une Micro-Folie s'implante dans un lieu physique (médiathèque, mairie, bibliothèque, tiers-lieu) et propose tant des activités tangibles que des activités réalisées à partir de tablettes, réalité virtuelle. Dans les différents entretiens que nous avons eus, revenait l'importance de choisir une personne qui sache et propose une médiation attractive et en lien avec le territoire plus ou moins proche : enjeu de valorisation du patrimoine local. En réalité, la Micro-Folie est avant tout un outil, voire un support, plutôt qu'un projet, puisqu'elle s'insère dans un projet territorial plus vaste pour que les collectivités puissent nouer des partenariats institutionnels et associatifs dans le but d'obtenir des fonds suffisants pour son déploiement. Il s'agit également de s'insérer dans un maillage ancien et connu pour que cet outil serve à un public plus large.

Pourtant, ce projet rencontre quelques limites. À partir de nos constats, nous avons observé que les tensions entre les acteurs sont présentes : définition du projet, implication, coûts, etc. sont autant de sujets de crispations. Il y a également des problèmes intimement liés aux infrastructures (problème de connexion dans les villages éloignés).

En termes d'opportunités, on observe que malgré le modèle type de la Micro-Folie, chaque « territoire » peut se l'approprier à sa manière, créant ainsi un réseau hétérogène qui repense la notion d'universalité. Le modèle ne se veut pas vertical mais bien rhizomatique et surtout, semble améliorer l'attractivité des territoires et les conditions de vie en intégrant la culture aux enjeux de proximité.

Du projet Micro-Folie aux musées, quelle(s) réciprocité(s) ?

Les Micro-Folies rendent accessibles au plus grand nombre des représentations d'œuvres, des spectacles, des visites par un outil du quotidien et rassurant pour les jeunes générations (expérience de substitution). Pour certains, il s'agit d'une première étape avant de se rendre dans un musée (musée transitoire : aller vers le public éloigné pour que celui-ci aille vers les institutions culturelles) en utilisant un outil rassurant, la tablette numérique. De plus, cela permet de valoriser la culture locale et d'inciter les réseaux de patrimoine locaux, d'activités culturelles, à prendre part à ces activités et à les ancrer dans un espace tangible (expérience réelle). Enfin, il s'agit de proposer aux publics non seulement de voir, mais également de faire et d'être acteur à partir d'une activité contemplative (expérience augmentée). Ces différentes appropriations de l'histoire de l'art et de l'expérience muséale permettent également aux grandes institutions telles que le Louvre de repenser les approches en fonction des publics.

¹ : « Le terme « numérique » renvoie à l'ensemble des procédés et techniques qui permettent de transformer n'importe quel objet en ensemble de données binaires, les algorithmes informatiques qui traitent ces données [...] Le numérique déborde donc les seules technologies informatiques » (Vinck, 2016).

² : BOURDIEU, Pierre, « Sur le pouvoir symbolique », *Annales*, 32-3, 1977, p. 405-411 ; DI MEO, Guy, *Les murs invisibles. Femmes, genre et géographie sociale*, Paris, Armand Colin, coll. Recherches, 2011 ; EIDELMAN, Jacqueline, *Musées du XXI^e siècle*, ministère de la Culture et de la Communication, 2017 ; MOLINIE-ANDLAUER, Marie-Alix, *Du musée du Louvre au territoire Louvre ?*, *Géographie et cultures*, n°111, 2019, p. 135-156.

³ : Hiérarchisation et catégorisation et représentation sociale partagée, provisoire et localisée ; voir : CHAUVIN, Pierre-Marie, « La sociologie des réputations. Une définition et cinq questions », *Communications*, 2013/2, n°93, 2013.

⁴. Surreprésentation de l'aile Denon par rapport aux deux autres ailes (Richelieu et Sully). MOLINIE-ANDLAUER, Marie-Alix, art. cit.

⁵. *Ibid.*

⁶. *Ibid.*



**Une gestion pérenne
du patrimoine culturel**

**Préserver le patrimoine culturel :
nouveaux matériaux et technologies innovantes en perspective.**

-

**Preserving Cultural Heritage:
New Materials and Innovative Technologies in Perspective.**

Nouvelle approche du nettoyage : exemple des cadres du retable d'Issenheim, le laser en question.

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Abstract

During the restoration of Matthias Grünewald's Isenheim altarpiece, a campaign of analyses and tests was organised by the Centre for Research and Restoration of Museums of France (C2RMF) in collaboration with a team of restorers and Anna Brunetto, an Italian restorer specialising in the use of lasers, to evaluate the effectiveness and harmlessness of laser cleaning. This paper aims to present the laser as a tool likely to respond to the problems of cleaning-coloured layers.

Mots-clés: peinture, conservation-restauration, nettoyage au laser, retable d'Issenheim

Keywords: painting, conservation-restoration, laser cleaning, Isenheim altarpiece

Le nettoyage des peintures est une intervention de conservation-restauration particulièrement délicate qui consiste à alléger ou à éliminer des couches de vernis, de repeints ou de surpeints, sans altérer la matière originale. Depuis la seconde moitié du XX^e siècle les techniques de nettoyage, principalement chimiques, ont considérablement évolué tant au niveau des procédés que de la méthodologie.

L'exemple du dégagement de la polychromie originale de certains cadres du retable d'Issenheim au laser démontre que cet outil est également susceptible de répondre aux problématiques de nettoyage des couches colorées.

Exemple des cadres du retable d'Issenheim et problématique d'intervention

Le retable d'Issenheim aurait été réalisé à Strasbourg entre 1512 et 1516 par le peintre Matthias Grünewald et le sculpteur Nicolas de Haguenau. En 1793, il est envoyé à Colmar où il est aujourd'hui conservé au musée Unterlinden. Ce polyptyque monumental est constitué de 11 panneaux de bois peints à tempera et à l'huile, de cadres et de sculptures polychromes (**Figure 1**)¹.

L'œuvre a été restaurée à plusieurs reprises et, depuis 2017, une nouvelle campagne visant à améliorer sa cohésion structurelle et son aspect esthétique est menée par une équipe de 21 restaurateurs². Un comité scientifique constitué de spécialistes d'histoire de l'art, des techniques et des matériaux du patrimoine est chargé de valider les choix d'interventions.



Figure 1. inv. 88. RP. 139 pour les panneaux peints
et SB. 69 pour les sculptures.
© Musée Unterlinden, Colmar

La polychromie originale des cadres du retable d'Issenheim, dissimulée par des couches de surpeints non datés, se trouvait dans un état de conservation satisfaisant et sa remise au jour a été validée par le comité scientifique. Si les protocoles de dégagement chimique et/ou mécaniques établis par les conservateurs-restaurateurs ont permis d'éliminer les surpeints de la majorité des encadrements, la polychromie originale des cadres de la *Crucifixion*, de *Saint Antoine*, de *Saint Sébastien* et de la prédelle présentaient une fragilité aux solvants. Aussi, en 2019, le Centre de recherche et de restauration des musées de France (C2RMF) a organisé une campagne de tests de nettoyage laser en collaboration avec Anna Brunetto, restauratrice italienne spécialiste de l'utilisation du laser dans le domaine de la peinture, et l'équipe de restaurateurs.

Afin d'identifier de façon plus précise la nature des différentes strates à conserver et à éliminer, des prélèvements ont tout d'abord été réalisés, observés et analysés par spectrométrie infrarouge à transformée de Fourier.

Le décor de faux marbre des cadres de *Saint Antoine* et de *Saint Sébastien*, peints à *tempera* sur une couche de préparation à base de carbonate de calcium et de colle animale, est recouvert d'une seconde couche d'apprêt et d'un repeint à l'huile.

La polychromie de la prédelle, dont les traverses horizontales sont des pièces de réfection, a été réalisée sur une couche de préparation contenant du carbonate de calcium, de la colle animale et du sulfate de calcium. Le décor de faux marbre peint à l'huile est recouvert de deux couches de peinture également à l'huile qui dateraient de 1968 et de 1986³.

Le nettoyage laser : une innovation au service de la conservation-restauration

Le nettoyage par LASER (Light Amplification by Stimulated Emission of Radiation) est pratiqué dans le domaine du patrimoine depuis les 40 dernières années, notamment en architecture et en sculpture monumentale. L'emploi de lasers Nd: YAG en mode pulsé de longueur d'onde 1064 nm et d'impulsion nanoseconde est privilégié pour éliminer les salissures et les croutes noires⁴. Le rayonnement infrarouge de forte fluence (énergie /unité de surface) envoyé sur la surface est absorbé par les dépôts sombres et réfléchi par la pierre blanche, ce qui explique le caractère auto limitatif du nettoyage laser. L'interaction lumière/matière est en partie thermique car l'élévation localisée de la température conduit à la formation d'un plasma, mais aussi mécanique en raison de la propagation d'ondes de choc dans la matière⁵. Sur les peintures, constituées de systèmes multicouches et de composés plus hétérogènes que la pierre, l'emploi du laser reste marginal, surtout en France. En effet, les matériaux constitutifs des peintures, minéraux et/ou organiques, sont plus ou moins photosensibles et de même nature chimique que les couches de vernis (de faible point de fusion et de vaporisation), de repeints ou de surpeints qui doivent être éliminés. Néanmoins les recherches se poursuivent et les innovations technologiques permettent aujourd'hui de disposer de différents types de lasers, mieux contrôlés, donc plus adaptés aux problématiques de nettoyage des peintures⁶.

Les objectifs et l'approche méthodologique du nettoyage des peintures, qu'il soit chimique ou au laser, sont identiques même si les mécanismes de déstructuration de la matière varient. Dans le premier cas, il s'agit d'obtenir la dissolution ou le gonflement des matériaux à éliminer en ajustant les paramètres de solubilité des solvants, alors que dans le second, on modifie les paramètres du laser, longueur d'onde, énergie, mode d'impulsion, fréquence et fluence pour moduler les mécanismes photochimiques, thermiques et mécaniques.

L'évaluation de l'efficacité et de l'innocuité du nettoyage est indispensable et essentiellement visuelle. Elle consiste à observer l'aspect et la couleur de la surface nettoyée sous différents rayonnements ou à plus ou moins fort grossissement et à examiner les résidus présents sur les cotons de nettoyage. La tomographie en cohérence optique (OCT), une technique basée sur le principe physique d'interférence de la lumière avec la matière, est également utilisée depuis quelques années pour apprécier le niveau de nettoyage d'un point de vue stratigraphique⁷.

Deux lasers opérant dans l'infrarouge et mis à disposition par la société ECP-Elen ont été testés sur les cadres du retable d'Issenheim. Le Combo El. En. Spa, Nd:YAG, dont la longueur d'onde est située à 1064 nm, a été expérimenté en mode Short Free Running (SFR), dont l'action est plutôt photo-thermique en raison de durées d'impulsion allant de 30 à 110 microsecondes et d'une énergie comprise entre 200 et 2000 mJ. Le mode Long Q-Switch (LQS), dont les durées d'impulsions sont de 100 nanosecondes et les valeurs d'énergie de 150 mJ à 450 mJ (sur une surface de 2 mm à 8 mm), a également été utilisé pour d'obtenir un effet plutôt photo-mécanique. Enfin, un Light Brush 2 El.En. Spa, Er:YAG, dont la longueur d'onde située à 2940 nm permet de désagréger les liaisons hydroxyles par une action thermique et/ou chimiquement destructurante, a été testé en mode Very Short et Short .

Des tests de nettoyage laser ont tout d'abord été réalisés en amont du nettoyage chimique avec le laser Light Brush 2 El.En. Spa, Er:YAG, pour limiter la présence de les liaisons OH, très absorbantes à cette longueur d'onde, et limiter l'apport de solvants. Les images OCT qui permettent de visualiser le repeint et la couche picturale originale grâce à leur différence d'indice optique, montrent que la partie dégagée présente un aspect de surface irrégulier et une importante diffusion du rayonnement IR, due à la migration de solvant dans la couche colorée. Les images réalisées sous fort grossissement confirment que le nettoyage est incomplet.

L'action photo-mécanique du Combo, El. En. Spa, Nd:YAG utilisé en mode LQS permet, comme le montre l'image OCT (**Figure 2**), d'obtenir un clivage entre la couche originale et le repeint, même au-delà de la zone traitée. La surface dégagée est régulière même s'il subsiste quelques résidus qui seront éliminés au scalpel. Par ailleurs aucune modification de couleur n'a été observée à l'œil nu ou sous microscope numérique.

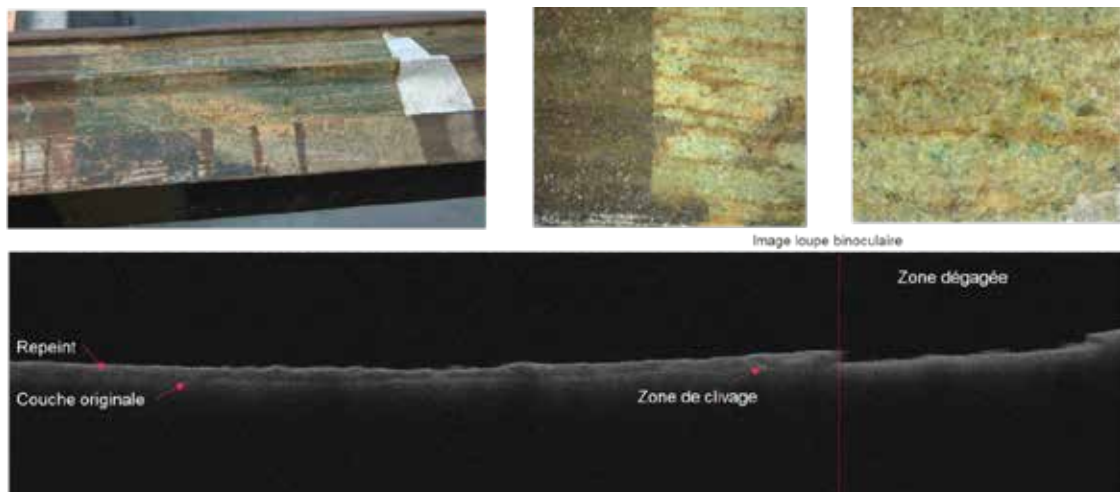


Figure 2. Nettoyage laser Nd:YAG : 1064 nm, LQS (120 ns), énergie : 150 mJ, fréquence : 2-3 Hz, \varnothing 5mm Filtre 50%. © C2RMF-Maxime Lopez, Vincent Detalle, Anna Brunetto.

La campagne menée sur les cadres du retable d'Issenheim a permis, grâce à la mise en place d'une méthodologie d'évaluation, de vérifier l'efficacité et l'innocuité du nettoyage laser, d'établir un protocole de traitement. Le laser constitue donc une alternative au nettoyage chimique.

Les recherches se poursuivent sur la compréhension des mécanismes de déstructuration de la matière induits par les lasers et pour développer une base de données sur leurs paramètres optimaux d'utilisation.

L'enjeu se situe aujourd'hui au niveau du transfert de compétences vers la communauté des restaurateurs notamment par le biais de la formation continue et initiale. L'assistance scientifique des laboratoires du patrimoine est également essentielle pour permettre aux professionnels de s'approprier le laser comme un outil de nettoyage complémentaire.

¹ MENU, Michel, EZRATI, Jean-Jacques, LAVAL, Éric, PAGÈS, Sandrine, PRINCIPAUD, Anna, RIOUX, Jean-Pierre, WALTER, Philippe, WELCOMME, Eléonore, NOWIK, Witold, *Analyse de la palette des couleurs du Retable d'Issenheim par Matthias Grünewald*, C2RMF, Colmar : Musée d'Unterlinden, 2007

² Anthony Pontabry est mandataire de l'équipe de restaurateurs de peinture et Juliette Levy de l'équipe de restaurateurs de sculpture.

³ Pantxika De Paepe directrice du musée Unterlinden. *Documents d'archives du musée Unterlinden*.

⁴ En 1970 John Asmus découvre que le laser à rubis dont la longueur d'onde est située à 694nm permet d'éliminer les croûtes noires sur la pierre. En 1990 un laser Nd:YAG Q-switched (1064, ~ns.) est développé par le laboratoire de recherche des monuments historiques et la société B. M. I. pour le nettoyage de la pierre et trouver une alternative au microsablage.

⁵ BROMBLET, Philippe, VIEWEGER, Thoms, « Le laser de nettoyage de la pierre et la restauration des sculptures », *Pierre actual*, n° 829, septembre 2005, pp. 86-94

⁶ LOPEZ, Maxime, *Évaluation et développement d'une technique de nettoyage des peintures par procédé d'interaction laser-matière*. Thèse de doctorat de CY Cergy Paris université, école doctorale sciences et ingénierie, 2020

⁷ KOCH DANDOLO, Corinna, LOPEZ, Maxime, BAI, Xueshi, DETALLE, Vincent, « Examen de la structure des objets de patrimoine culturel : tomographie à cohérence optique », *Photoniques*, n°95, janvier-février 2019, pp.24-28

The Original Appearance and Beauty of Ancient Paintings Virtually Reconstructed

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Résumé

Dans le cadre du questionnement sur les méthodes de conservation du patrimoine culturel, une recherche transdisciplinaire a été menée afin de développer un ensemble de processus analytiques permettant de reconstituer les apparences des peintures historiques à différents moments de leur histoire. Cette reconstruction s'appuie sur une connaissance détaillée de la matérialité des œuvres, de leur état de conservation et des conditions de conservation et de stockage. Ces analyses, nécessairement non ou micro-invasives pour les œuvres d'art précieuses, s'accompagnent d'une modélisation réelle et virtuelle de l'évolution de la composition des matériaux des œuvres. L'exemple d'un tableau français du XVI^{ème} siècle restauré illustre notre démarche.

Mots-clés: smalt, décoloration, balayage macro-XRF, imagerie hyper-spectrale, reconstruction virtuelle

Keywords: smalt, discolouration, macro-XRF scanning, hyperspectral imaging, virtual reconstruction

Although generally well exhibited or correctly stored, easel paintings can change over time. As complex works of art, the degradation processes can be variable depending on multiple factors. Therefore, preserving paintings over a long time represents a challenge. When the painting is already weathered, conservation-restoration measures are intended to maintain as much as possible the original material, restore an appearance as original as possible and prevent the painting from further degradation. Restoration generally needs a practical intervention into the materiality of the painting. The choice to be made is not always simple and straightforward. Virtually proposing different restoration solutions based on physicochemical analyses and imaging support the conservation decision-making. Models need to be developed for determining the original state of the studied painting on the basis of quantified physicochemical markers by comparing them to artificially aged mock-ups. Additionally, these mock-ups allow establishing criteria for the assessment of the state of preservation and identifying factors responsible for the alteration phenomena and explaining visible changes. The gained knowledge on the conservation state and the alteration mechanisms of the painting allows for creating a virtual reconstruction of the original state of the painting using mathematical tools.

The approach to achieve this goal is necessarily transdisciplinary and is based on analysis and imaging of the painting in its current state. Chemical, physical and mathematical tools are used to study the painting *in situ* or on cross-sections prepared from micro-samples. X-rays analyses and imaging as well as reflectance imaging spectroscopy or hyperspectral imaging (RIS) are carried out. The acquired data are combined and treated by statistical tools. The challenge is to be able to carry out these investigations and reconstructions in the less invasive way avoiding sampling. In a practical way and as the first step in this research, we want to set up an operational, analytical strategy for the study of paints when the question of the original appearance of the painted works is raised.

Recent Technological Development

In the last decade, much progress has been made in the instrumental development of analytical devices adapted to the non-invasive imaging of paintings. Above all, the set-up of macro-X-ray fluorescence imaging (MA-XRF) has to be cited^{1,2}. Besides, micro-analyses at synchrotron sources^{3,4} allowed important progress in combination with combined micro-analyses on cross-sections. To gain non-invasive insights into the paint stratigraphy, confocal micro-XRF was developed and applied to easel paintings^{5,6}. This technique allows minimizing sampling for cross-section analysis. Last but not least, hyperspectral imaging (RIS) was developed as a precious complementary imaging tool for studying the palette of paintings^{1,7,8}. In summary, there are available methods ranging from point analysis to multiscale and multimodal imaging at large-scale facilities, in the laboratory and using portable devices, allowing *in situ* studies. These methods need to be applied in the framework of an integrated interdisciplinary approach that fulfils the special requirements and challenges of studying precious easel paintings, and that is adapted to the research questions addressed in each special case.

Results of a Case Study

The steps of the process presented here are illustrated here through the following case study provided by a scientific examination at the C2RMF⁹ of the French painting *Woman (Artemise?) doing a Libation* from an anonymous painter from the Ecole de Fontainebleau, around 1570 (320 x 780 mm², inv. no. RFML.PE.2019.40.1), Louvre Museum, Paris, France (**Figure 1**).

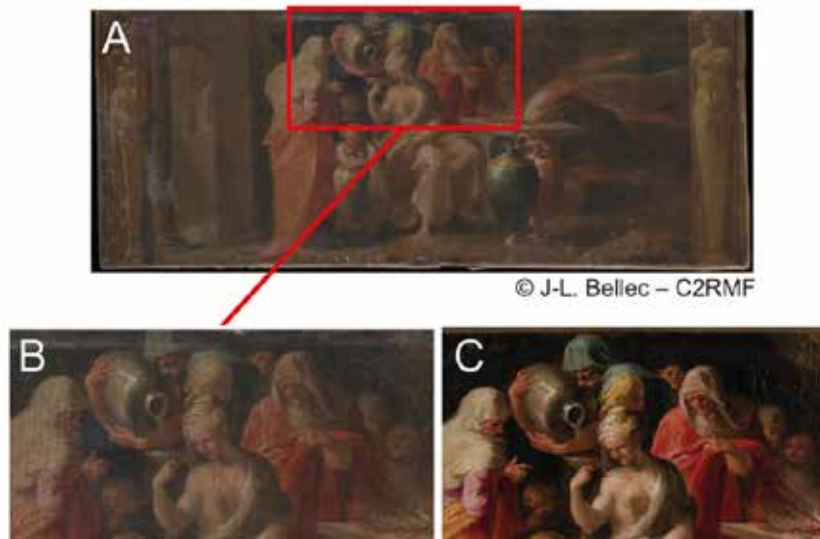


Figure 1. A) Woman doing a Libation (Artemise?) from an anonymous painter from the Ecole de Fontainebleau, around 1570, 320 x 780 mm², inv. no. RFML.PE.2019.40.1, Louvre Museum, before restoration, B) Detail of reflected light image before restoration and C) Detail of reflected light image after restoration.

We were especially interested in the discolouration of the smalt pigment inducing a colour change of the smalt-based paint layer. Smalt is corresponding to a crushed Cobalt-colored potassium-based blue glass. It turns grey and brown during ageing leading to an irreversible discolouration of the pigment and the paint layer. In this case, a virtual reconstruction of the original appearance is especially appreciable because no restoration treatment allows tuning back to the original aspect.

Figure 2 shows the characteristic chemical maps obtained by MA-XRF for smalt-containing paints and the corresponding RIS spectral angle maps obtained from the distribution of defined endmembers.

Interestingly, the chemical maps show that it is possible to divide the smalt-containing zones into two types of different smalt compositions or two different ways of using the pigment in the paint. Further work is in progress to clarify this issue and to provide a faithful reconstruction of the original state of the painting¹⁰.

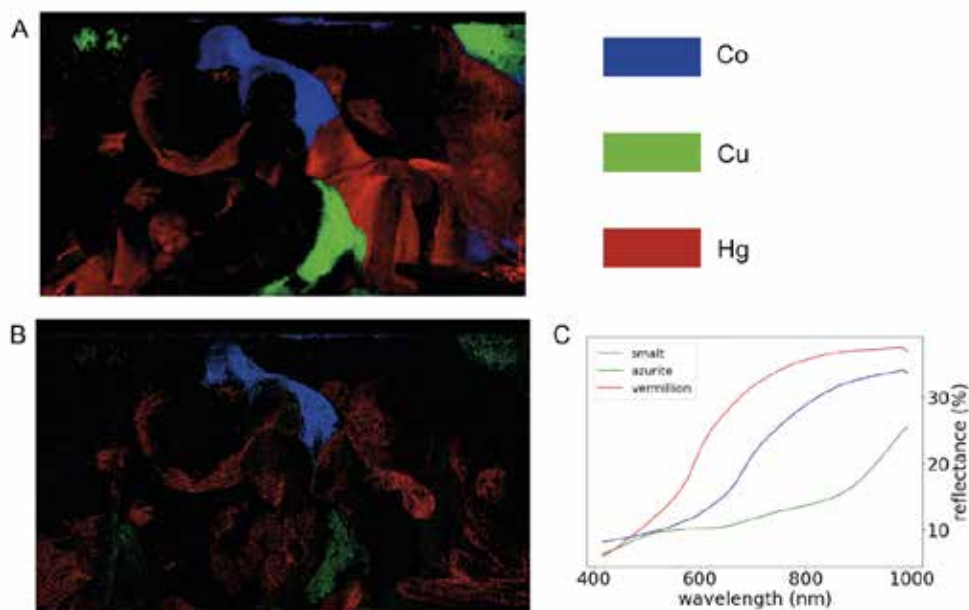


Figure 2. A) MA-XRF maps of Co, Cu and Hg, B) Map showing the pigment distribution obtained from RIS and C) Reflectance spectra of the end members used for the RIS distribution map.

Our work shows that the analytical tools are available for *in situ* non-invasive combined and multi-modal imaging of artworks such as easel paintings. The challenge relies on data evaluation, fusion and storage. Although established for isolated methods, progress needs to be made in data fusion to allow for integrated data interpretation and propose dedicated answers in the field of heritage sciences. For the presented case study, work is in progress. The digital tools are available for colour reconstruction based on combined data of MA-XRF, RIS and colour measurements. It is intended to apply machine learning methods in order to propose different hypotheses of the original appearance¹¹. Virtual reconstructions allow for the modelling of different states of the painting by providing new aesthetic projections. These reconstructions can help in a long perspective in the decision-making during conservation-restoration of paintings, the understanding of painters' techniques and the enrichment of the history of techniques. The history of art will thus benefit from new information and new elements of response to the reconstruction of the genesis and the history of the artworks. Ethical questions may also arise in conservation science, such as how and to

what extent can paintings be restored or what are the most important measures for preventive conservation.

Acknowledgements

We gratefully acknowledge the financial support of the *Fondation des Sciences du Patrimoine* in the framework of the PhD project entitled MARCS (2021-2024).

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**Un patrimoine réflexif
pour une société résiliente**

**Construire l'avenir à l'aune du passé : la valeur sociale, économique,
politique et éducative du patrimoine culturel.**

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**Building the Future in the Light of the Past: The Social, Economic,
Political and Educational Value of Cultural Heritage.**

Cultural Heritage in the 21st Century : Driver Towards What?

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Résumé

Cet article nourrit une réflexion critique sur le patrimoine culturel, en expliquant son évolution au fil du temps et en considérant son rôle contemporain, comme héritage façonnant les décisions d'aujourd'hui et de demain. L'analyse englobe le rôle social et participatif du patrimoine, la clarification de sa nature intérieure polysémique et l'évaluation des menaces sur sa conception actuelle, au sein du processus continu d'extension sémantique. L'objectif est de décortiquer les contradictions existantes concernant la conservation et l'exploitation du patrimoine, par l'étude de son utilisation comme moteur de l'industrie touristique mondiale et du système capitaliste dans son ensemble, tout en revendiquant ce dernier comme un « droit fondamental ».

Mots-clés: patrimoine, patrimoine culturel, capitalisme, tourisme, valeur

Keywords: heritage, cultural heritage, capitalism, tourism, value

Cultural heritage has always had a profound relationship with temporality: no heritage can be observed as 'timeless' or 'ahistorical' since it is profoundly rooted in the story of humanity and changes with society. As Hardy refers 'whatever form it appears, its very nature relates entirely to present circumstances'. In the last decades, it has been fostered, supported by the 'lack of any full, or even remotely accepted, the theorisation of the heritage concept', a constant process of concept boundaries enlargement that must be critically gazed.

Our perception of heritage is part of a social process of negotiation that widens its meaning and consideration within society. Nothing is indeed heritage by itself, it is us (human society) deciding what heritage is and what we want to be heritage. Heritage is profoundly linked with interpretation and selection since it attains its statute by attributing to it social, religious, cultural, economic or any kind of 'value' that proclaims somehow its 'right' to preservation. This is often justified by an 'appeal to the unborn' as observed by Byrne where 'the assumed value system of future generations is used to over-ride the expressed values of present-day communities.'

Recognising everything as heritage is a logical peril to avoid. The indiscriminate and indistinct production of heritage can foremost promote its overall industrialisation and commodification, as a new commercial category and product of consumption of which the global tourism industry is the first profiteer. Within the dominant mass tourism paradigm 'heritage is portrayed almost one-dimensionally, as just another aspect of a burgeoning leisure industry', in such a way that its manipulation becomes easier and its authenticity and values almost irrelevant. Tourism as a global industry, and not as a human phenomenon itself, plays a key role in the development of such issues.

Tourism, neoliberalism, neo-colonialism, capitalism and the overall affirmation of a society more and more focused on consumerism and images of it represent a serious menace to the cultural heritage in the 21st century since they elude cultural heritage's complexity. Both states and corporations commonly seek to co-opt heritage for political and economic ends, risking to reduce the 'processes of engagement with heritage [...] to simple consumption'. This is associated with an outdated and artificial vision of the world, where 'cultural heritage sites (and practices) were considered to be a form of national property to be managed and conserved by the state, by state authorised bodies [...] and by authorised professions.'

Such forces weaken the social functions of heritage, which acts as an essential source and resource for placemaking and community bounding, organically defining perceptions of the identity within specific settings and among individuals. And, as Byrne remarks 'this idea that heritage places may have a 'social significance' that should be taken account of in the conservation process is still weakly developed.'

Heritage and Globalisation

In the 20th century, post-World War II stimulated the formation of an international movement advancing the universality (of value) of the cultural heritage, magnifying interests around it, especially in Western societies.

Conservation sentiments are now increasingly alive and are marked by a renewed awareness of heritage that, as noted by De Silvey and Harrison 'underpins a commitment to protect it from damage, decay and destruction'.

The emergence of new values in society emphasises how the concept of 'value' itself, and our perception of it, is becoming central in heritage debates and practices, recalling the increasing need for negotiation between conflicting values, especially among 'past values' and 'present values'.

Understanding heritage as a value, as well as a system for finding and producing values, has broader consequences, affecting how cultural heritage is altered, but also how it alters its places. In this context, cultural heritage is not solely perceived as valuable in itself, but also as an essential 'driver' of change and development, earning a contemporary status of crucial territorial asset worldwide, shaping policies and practices that go beyond the heritage itself. This is particularly noticeable in continents, like Europe, where cultural heritage represents a strong economic asset and power tool.

Such condition is due to a wider awareness of the potential (namely political and economic) at the base of the 'heritagisation' process, which becomes challenging if prioritises the economisation of the cultural heritage and accepts interventions that could reduce, prejudice or reinvent its cultural and social values for a more 'advantageous', 'attractive' or even 'sellable' heritage.

This is significant considering the travel industry's transformative power, since, as remarked by Caust and Vecco 'everything becomes homogenised and individual differences in culture become absorbed or disappear to conform to the needs of the travelling mass'.

These threats are actual and worrying, and it is why 'a deeper understanding of the historically contingent and embedded nature of heritage is vital to enable us to engage with debates about the production of identity, power and authority throughout society'.

Heritage must be recognised as a 'pillar' of the social function, emerging and existing as a space for coexistence and confrontation in which social complicity and common values are expressed and manifested, as a central constituent of the identity. Here, it is key to consider heritage as a process, as done by Smith, Byrne and others, allowing organicity towards heritage development and management instead of imposing artificiality, and, prioritising endogenous over exogenous development.

Throughout this paper, it has been stressed how complex the cultural heritage is and how intricate the way towards its democratic and inclusive governance. In an era in which everything is endangered by processes of commodification, individualistic interests cannot prevail over the fundamental communitarian and universal instances of which the cultural heritage is constituted, and that grant its extraordinary value and significance.

Tourism-heritage relationship has presumably never been so problematic before, and the worldwide affirmation of mass tourism paradigms challenges a beneficial exchange between the two. If they can be allies for better heritage management and richer tourism experiences, risks of confounding processes of using and methods of abusing the cultural heritage are real and alarming.

When a community is powerless in the process of taking care of its heritage, is inevitably vulnerable and dependent on external factors and subjects. All actors must focus on recognising heritage complexities and interlinkages to promote their continuous affirmation and renewal. This cycle should always be negotiated, to avoid conflicts and ensure none is excluded from this elemental process of auto-definition and auto-determination.

Empirical research shows that no expert, group or coalition can define alone, from privileged positions of power, what heritage, culture or cultural heritage is within a community. If cultural heritage is conceived as a driver towards greater inequalities and dependencies within and among communities — achieving ever-increasing economic goals of a residual part of society, excluding those not fitting the dominant system — such top-down perspective, responsible for eroding essential communal resources, encouraging and facilitating bottom-up solutions, must be eradicated.

As Smith points out 'control is vital if the heritage process and the identities it constructs are to have real personal and cultural meaning'. This could be accomplished by promoting active (instead of passive) participation of the communities in heritage management or by implementing horizontal (instead of hierarchical) ways of organising and planning cultural initiatives and projects, for instance.

Cultural heritage commodification is a tricky topic and issue, also in terms of overall accessibility to the heritage, that should continue to exist as a fundamental human right 'that every person has a right to engage with'. This makes its management even more delicate since programs prioritising economic objectives can act as a detriment to other basic societal goals.

Thus, the administration of cultural heritage requires understanding and awareness of the resources' complexity on which it is based.

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Terror and the Process of Creating a Space for Memory

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Résumé

Le 22 juillet 2011, soixante-dix-sept personnes ont été assassinées dans l'attentat à la bombe contre le centre gouvernemental d'Oslo et le massacre qui a suivi dans le camp de la jeunesse travailliste sur l'île d'Utøya. Il s'agissait de la première attaque terroriste majeure de l'histoire de la Norvège et du premier acte de violence de masse en Norvège depuis la Seconde Guerre mondiale. Les attaques ont été perpétrées par un extrémiste de droite norvégien et ont constitué une attaque contre les institutions et les valeurs démocratiques norvégiennes. La reconstruction d'Utøya et du centre gouvernemental a été confrontée à de nombreux défis, mais a également été considérée comme des actes de résilience norvégienne et des moyens de lutter contre la terreur. En 2019, une équipe française désignée pour travailler sur un « musée mémorial du terrorisme en France » s'est rendue à Utøya et à Oslo pour élaborer une feuille de route afin de poursuivre la coopération entre la Norvège et la France sur ces questions. Cet article se penche, entre autres, sur l'apprentissage, la commémoration et la symbolique des espaces physiques.

Mots-clés: terreur, mémoire, apprentissage, commémorations

Keywords: terror, memory, learning, memorials

On 22 July 2011, a Norwegian-born right-wing extremist murdered seventy-seven innocent people. Eight in the bombing of the Government Centre in Oslo and sixty-nine children and the following massacre at the Labour Youth Summer Camp on the tiny Island of Utøya located outside Oslo. The attacks were regarded as an attack on Norwegian democratic institutions and values. The rebuildings of Utøya and the Government Centre have faced many challenges but have also been regarded as acts of Norwegian resilience and ways of fighting back terror. This paper reflects on the processes and dilemmas regarding rebuilding, learning and memory at physical sites of atrocities, the interplay between victims and other stakeholders, international cooperation (Norway, United States, and France), and the need to learn from the experiences of others.

Terror and Memory

Before the terror attacks of 2011, Norway was known as one of the most peaceful countries in the world. The brutality and scale of the attacks shocked Norway and shocked the world. The attacks did not come from the outside as many first believed. It came from within, from a Norwegian anti-immigrant fanatic who believed that Norway had been betrayed by the democratic political system, especially by the Labour Government.

The attacks came in two parts. First, a 950-kilo fertiliser bomb in the Government Centre in Oslo killed eight and destroyed a large part of the Government complex. The main target, M. Jens Stoltenberg, then Prime Minister in Norway and now General Secretary of NATO, survived. Thereafter, the terrorist travelled to the tiny island of Utøya, located one hour drive from Oslo, where he shot and murdered sixty-nine young people at the Labour Youth Party Summer Camp.

As a memorial historian, I became part of an international team (with members from the 9/11 Memorial Museum in New York City, among others) to work on a roadmap for a memorial process both on the island of Utøya and in Oslo. The needs to rebuild and renew were evident in both places, but so was the need to commemorate and tell the story of what happened and where it happened. In often « razor's edge » issues, we struggled for several years to balance the needs for renewal and remembrance of the victims collectively but also individually.

A key issue among the different stakeholders at Utøya was the Café Building, a large building located in the middle of the island. Since thirteen teenagers were murdered in the building, many believed that the building and the dark history it represented would make it intolerable for the Labour Youths to return to the island. They, therefore, argued that the building needed to be torn down. On the other hand, many families argued that the Café Building now had become a sacred commemorative space and that it should be preserved « as is » and used exclusively as a site of history and commemoration.

By slowly finding a way to both renew and commemorate, we removed most parts of the building while preserving the building elements directly affected by the terror attack. This made it possible to add new spaces for memory and learning. By transforming the Café Building into *Hegnhuset*, a Memorial and Learning Center, the processes of rebuilding and commemorating at Utøya were able to move forward.

Today, Utøya is a place of resilience and a reminder of what is at stake in today's Europe. Young people coming to Utøya will learn that we cannot take democracy for granted. In 2015, the camps could start again on the Island and Utøya is today visited by thousands of young people coming from different organisations and all over Europe to learn about dialogue and democracy and the impact of violence.

As a result of similar cooperation between stakeholders, we also opened The July 22 Centre in 2015, a twin project based on the same principles that guided us at Utøya, inside the bombed-out Main Government Building in Oslo. The Centre is now an essential place for learning and commemoration, and the Government decided in 2018 that it will be an integrated part of the New Government Centre.

Ten years have passed. We made many mistakes, but we also learned a lot. We learned about dilemmas and choices. We learned that the processes are just as important as the results. International cooperation has been at the core of our work from the start: we learned, for example, from those who had worked in Oklahoma City after the terror bombing in 1995 and from those who worked at 9/11 in New York after 2001.

And now, Norway is also working closely with France. No other country in Western Europe has suffered as much from terrorism as France over the past ten years. With more than fifty attacks, three hundred people have been killed, including dozens of children and teenagers. In 2019, France started working on a museum project that will trace the development of terrorism over the ages, including the Bataclan concert hall and others. The museum is planned to open in the Paris area by 2027. It will address how France and other terrorism-affected countries have reacted to attacks over the past fifty years, emphasising the resilience of their people. The French project is different in several ways. France, for instance, needs to find one site to represent a high number of sites that will allow them to tell the story of what happened at many different venues. Still, the French process faces many of the same challenges as Utøya and Oslo: they need to find a way to tell what happened, they need to find a way to remember the victims collectively and individually, and they need to turn their chosen site into a place of resilience, learning and commemoration. In 2019, the French Task Force visited Utøya and the July 22 Centre

in Oslo. Since then, we have stayed in close contact, and we are now in the process of developing a roadmap for future cooperation, including establishing an international network in Spain and the United States.

We do not believe in fixed answers, but we do believe that there are some principles, or at least some focal points, that always need to be addressed.

It is about giving priority to the victims, learning from others, the power of the place, and balancing memory and the need for new life.



Figure 1. The former Café Building, now *Hegnhuset*. Inside there are 69 pillars carrying the roof, one for each victim. The outer wall consists of 465 pillars, one for each survivor protecting the victims. And outside and in front, we see new generations of young people coming to the island, protecting memory, protecting each other and protecting democracy. Photo: Utøya Summer Camp 2016



Figure 2. Inside the Hegnhuset. Photo: Utøya Summer Camp 2016

Norway is not France. Utøya is not Paris, and terror attacks come in all shapes and forms. But still, there are some principles that we share :

1. We need to tell what happened. Preferably as close as you can get to where it happened. You cannot hide nor minimise what happened. If so, the process will most likely fail.
2. Some are always more affected than others. We need to take care of the inner circle of victims first.
3. We need to learn from others. It is a work in progress with no fixed solutions.
4. We need to balance memory and new life. We cannot have one and not the other. We need both.
5. Finally, we need to bear in mind that democracy cannot be taken for granted. To turn sites of terror into areas of resilience is one way of fighting back.

Prehistoric Vestiges in a Country Proud of its Antiquity: The Innovative and Federating Potential of an Unacknowledged European/World Heritage

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Résumé

En nous basant sur le cas de Philippi-Dikili Tash, un important site néolithique de l'âge du Bronze situé au nord de la Grèce, nous nous intéressons ici aux défis que représente la présentation des vestiges préhistoriques à un public plus large, nourri d'images et de discours faisant référence à un passé ancien plus monumental et glorieux. Nous proposons de nous concentrer sur : le caractère « international » des réalisations des populations préhistoriques ; le lien avec l'environnement et les ressources naturelles dont certaines sont actuellement menacées ou perdues ; le caractère a-temporel de certaines des solutions adoptées par les peuples préhistoriques et leur utilité en tant que sources d'inspiration pour les agriculteurs, les constructeurs ou les artistes modernes.

Mots-clés: Grèce, préhistoire tardive, présentation au public

Keywords: Greece, late Prehistory, presentation to the public

Dikili Tash is an important archaeological site in Northern Greece, not far from the present-day frontiers with Bulgaria and Turkey. It belongs to the type of 'tell', i.e., artificial hill formed by the progressive accumulation of remains from human activities over several centuries. Such sites are frequent in various parts of the world (Near East, Anatolia, Greece, Balkans) and represent the more-or-less monumental vestiges of settlements from the late prehistoric and early historic times. With a height of 17 meters at its top, Dikili Tash is one of the biggest tells in South-East Europe, featuring one of the longest sequences of occupation: from circa 6500 Before Christ (start of the Neolithic period) to 1100 Before Christ (BC) - end of Late Bronze Age. The upper part of the tell preserves also remains from later historical periods, down to the 19th century *Anno Domini* (AD).

The site has been excavated systematically for more than fifty years as part of a long-lasting Greek-French collaboration with partners also from other countries¹. Works have revealed substantial house remains from various phases of the Neolithic and Bronze Age periods and thousands of finds, some of them highly attractive or exceptionally rare. Dikili Tash is therefore well-known to the international academic community and has been the subject of a great number of publications. Since 2011, it also has had its own website². Its outstanding position in the archaeological landscape has been recently (2020) recognised with the Great Prize of Archaeology of the *Fondation Del Duca-Institut de France*.

Despite all that, the site, like many others of that kind, is not accessible to the public, and the discoveries made in it remain unknown to most Greeks or foreign visitors. This might seem even more astonishing considering that it stands only 2 kilometres away from the ancient city of Philippi, whose monumental ruins are amongst the most visited in Northern Greece, inscribed in UNESCO's list of World Cultural Heritage since 2016³. But Philippi and Dikili Tash, although historically connected, do not

represent the same type of heritage to the eyes of the public: the former clearly refers to the glorious ancient past with which the public has been nourished for more than two hundred years, whereas the latter has not, yet, found the narrative that would spur people's interest or curiosity. Here we introduce, precisely, some principles around which could be built such a narrative and propose some ways to concretise them.

Guiding Principles and Proposed Actions

We believe that, for their presentation to the public, sites like Dikili Tash would gain from putting forward :

1° The 'international' character of the achievements of prehistoric populations expressed through a wide range of techniques, tastes and practices shared over very large distances – neighbouring countries and even different continents. Few people know, indeed, that vessels or ornaments practically identical to those found in 5th millennium BC houses at Dikili Tash (**Figure 1**) are also found in Bulgaria, Romania, and beyond.

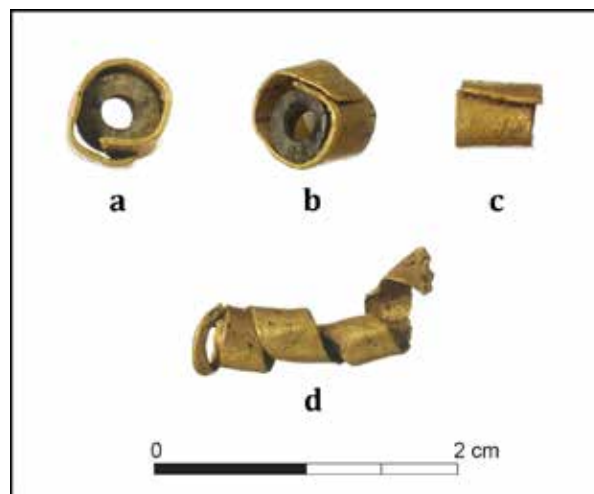


Figure 1. Gold and stone ornaments from House 1 at Dikili Tash (circa 4300 BC).
© EFA/Dikili Tash Research Program

2° The strong connection of the long-lived prehistoric settlements with the natural environment and resources, some of which are presently threatened or lost (e.g., dried swamps, deforested mountains). Evidence suggests that their inhabitants not only knew and managed their environment in a rational way but also showed great resilience and adaptation in times of Rapid Climate Changes, thus providing a positive example for today's populations.

3° The a-temporal character of some of the technical solutions adopted by prehistoric people and their utility as sources of inspiration for modern farmers, builders, or artists.

The actions we propose for Dikili Tash are deployed on different scales to be able to reach different kinds of audiences in terms of geographical proximity to the site, origin, educational level, or interests in general. Furthermore, our concern is to show not one but many aspects of the eight thousand years-long history of the site. This variety is, of course, an opportunity but also requests choices. The latter should be designed not only for today but also for the future in a way that is as sustainable and flexible as possible.

Actions at the Local Scale

We intend to provide access to the original remains but also inscribe the site in its natural environment and contribute to preserving and enhancing it. A key element in this relation is the big freshwater source immediately to the north of the present-day tell, giving birth to a small pond that has become over time a precious biotope for plants, birds, and animals. Historically, this is the place where it all started: research has established, indeed, that it is the source that attracted here the first settlers around 6500 BC. By a curious game of circumstances, this is also the spot that gave its name to the site in modern times⁴. A series of paths should connect the tell with its surroundings and allow circulation on it. The tell needs to be understood as a sort

of 'time machine', where, by definition, each meter upward brings the visitors a few centuries ahead (Figure 2).

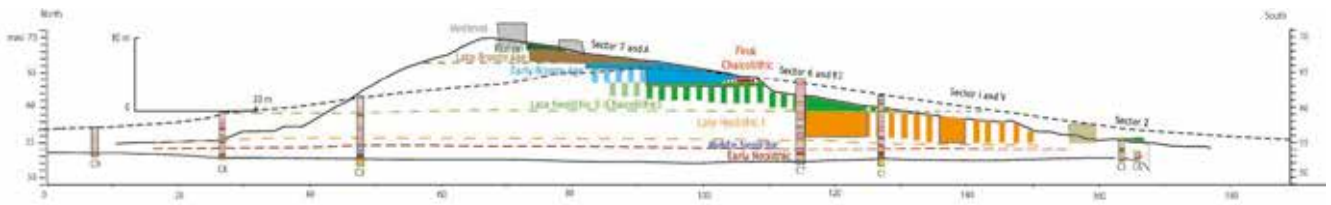


Figure 2. Schematic profile of the Dikili Tash tell. © Dikili Tash Research Program

Several stops would be planned at selected points, where the preserved architectural remains are easier to read. A protective dome should be built above a group of houses on the eastern slope destroyed around 4300 BC, offering the visitors a rare view of the building techniques, the layout, equipment, and everyday life of those times⁵. At the summit of the tell, visitors could admire ruins from the Late Bronze Age (15th c. BC) and the Byzantine times (14th c. AD) in a rare 'dialogue'. The construction of an on-site museum would provide access to finds in close connection with the original building remains and natural setting. There, we should be able to reconstruct in full size some of the buildings that could not be preserved on the spot and display the finds in their original context.

Finally, actions at a local scale should include experimental archaeology, proposed as an ongoing process where all the stages would be explained and shown. Ideally, visitors should have the possibility to participate and return to see the progress of works. Raw materials should be, of course, procured locally.

Actions at the Regional and European Scales

Based on the experience of the Dikili Tash website, we propose to create a network of websites for prehistoric tell sites across Europe. Our ambition is to show that this is a widely shared cultural heritage –oppose our similarities to the present frontiers–

and make data more readily available for research or educational purposes, accessible to as many people as possible.

¹: Host institutions are the Archaeological Society at Athens and the French School at Athens (EFA). Works are further supported on a regular basis by the French Ministry of Foreign Affairs and the American non-profit foundation *Institute for Aegean Prehistory*, whereas they have received additional funding from several national, European and USA schemes (Agence National de la Recherche, European Research Council, National Geographic Society) as part of larger programs. Members of the successive teams come from Greek, French and other European universities and research centres. The authors are two of the four co-directors of the current research program.

²: www.dikili-tash.fr and www.dikili-tash.gr: website in three languages (French, Greek, English). Complete up-to-date bibliography is provided there. A short presentation of the site can also be found in the website of the French Ministry of Culture, collection Archéomonde: <https://archeologie.culture.fr/fr/a-propos/dikili-tash>

³: <https://whc.unesco.org/fr/list/1517/>

⁴: Treuil R. (éd.), *Dikili Tash, village préhistorique de Macédoine orientale, I. Fouilles de Jean Deshayes (1961-1975)*, vol. 1, BCH Suppl. XXIV, Athènes: EFA, 1992, p. 8-9; and <http://www.dikili-tash.fr/content/presentation/presentation.htm>

⁵: Dome designed by the architects' office of M. George Stanishev (Projects GS) based in Sofia.

Les prud'homies des pêcheurs de Méditerranée peuvent-elles incarner un modèle pour une économie d'avenir ?

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Abstract

The prud'homies system of Mediterranean fishing constitutes an intangible cultural heritage. It implements an age-old form of magistracy, which shelters conflicts and regulates the fishing effort, and whose virtues are being rediscovered by modern economists. Heirs to an age-old political culture combining discipline, civic-mindedness and freedom, the prud'homies deserve our attention today in order to prepare the world of tomorrow¹.

Mots-clés: patrimoine culturel immatériel, citoyenneté, démocratie, communs

Keywords: intangible cultural heritage, citizenship, democracy, commons

Nous traitons ici d'institutions administratives et juridiques créées par les pêcheurs, pour les pêcheurs en Méditerranée, dès la fin du Moyen-Âge. Les sciences sociales nous permettent de penser que ce modèle ancien, appelé système prud'homal, est probablement un outil majeur pour réguler de façon équitable l'accès à une ressource commune et, par ailleurs, pour améliorer l'attractivité d'un métier.

La Méditerranée est une mer peu poissonneuse et fragile². Les produits de la mer constituent une ressource peu abondante mais variée, composée de nombreuses espèces, pour beaucoup territoriales, sur des surfaces de plateau continental très variables. Une pêche traditionnelle sélective y est pratiquée, recourant à de nombreux métiers, des engins de pêche différenciés adaptés à la capture de chaque espèce : filets à daurades ou à sardines, pots à poulpes, paniers à homards, gireliers, tout un arsenal dont la conception et la pratique constituent un capital de connaissances transmises de génération en génération³.

Ce savoir partagé est à considérer dans sa dimension temporelle, parce qu'il est le fruit d'observations étalées sur de très longues périodes qui permettent de comprendre les cycles de reproduction et d'interdépendances entre espèces. Cette science du concret offrant des lignes de conduite raisonnables pour le respect du renouvellement de la ressource n'est pas écrite mais transmise dans la pratique du métier. Elle constitue un premier élément, avec une gouvernance directe et une souveraineté démocratique⁴, le bien commun de la prud'homie.

Les conflits d'usage sont fréquents sur de petits espaces, entre les pêcheurs eux-mêmes, qui se disputent « les bons coins », les postes proches de leur port d'attache. L'effort de pêche même est mis en question : pour vivre une saison de la pêche, il faut être le meilleur. Mais pour espérer un revenu annuel pour tous, il faut laisser au poisson le temps de se reproduire, et ne pas accaparer toute sa nourriture.

Il existe aussi une réelle concurrence entre pêcheurs et braconniers. Un braconnier pratique une pêche hors des règles locales, faisant passer son intérêt personnel avant tout. Selon l'esprit actuel de régulation, un navire de pêche industrielle peut être en situation de braconnage lorsqu'il abuse de sa puissance technologique au détriment du respect du renouvellement de la ressource.

Dès le XIV^{ème} siècle, les prud'homies imposaient des règlements locaux dont la rédaction et la mise en pratique constituent encore aujourd'hui le deuxième élément de leurs biens communs : une gouvernance directe attentive au bien-être de la communauté et de la ressource, à l'origine immatérielle, puis écrite et mémorisée sur des registres. Une prud'homie est une petite république⁵. Cette institution est le troisième élément de ce qui s'appelle désormais un commun.



Figure 1. La prud'homie de pêche de Martigues au début du XIX^e siècle (Bouches-du-Rhône).

Il y a trente-trois prud'homies sur le littoral français de Méditerranée, Corse comprise. Leurs limites sont fixées par décret : une ou deux communes à terre, et, vers le large, la limite des eaux territoriales. « Sont membres des communautés de prud'hommes

les patrons pêcheurs titulaires d'un rôle d'équipage qui ont exercé leur profession pendant un an dans la circonscription de la prud'homie à laquelle ils demandent à appartenir⁶. »

Dans les prud'homies règne « la logique de l'honneur qui permet de travailler ensemble, même si on est loin de s'entendre⁷ ».

Les membres cotisent à la prud'homie. Trois à sept prud'hommes sont élus tous les trois ans par leurs pairs « ...afin de prévenir, autant que possible, les rixes, dommages ou accidents... » entre patrons-pêcheurs en exercice. Ils prêtent serment devant l'Autorité maritime. Leur mandat est d'instaurer et de faire respecter le partage de l'accès à la ressource, l'arbitrage des affrontements et la gestion du commun. Ils portent une toge au barreau. Les jugements sont rapides, sans appel et exécutoires immédiatement⁸.

Ils gèrent aussi les biens de la communauté nécessaires à l'exercice de la profession : grues de levage, etc. « qui n'appartiennent à personne et dont l'usage est commun à tous⁹ ». Il y a un proverbe qui dit : « Pour être prud'homme, il faut avoir des écailles sur les mains ». Un prud'homme ne peut pas être seulement magistrat. Son écoute prend en compte des dimensions sociales, sociétales et environnementales, afin que « chacun puisse vivre de son métier... en suivant une logique de répartition¹ ».

En résumé, la mosaïque des prud'homies de pêche de Méditerranée montre un modèle :

- Qui agit dans le sens de sa survie et de la satisfaction de sa clientèle,
- Dont l'ensemble des règles de gouvernance vise à l'équité entre les membres ainsi qu'à la régulation des prélèvements sur la ressource,
- Où réciprocité et confiance dans la parole des autres conditionnent le

fonctionnement,

- Où le partage du savoir est un enrichissement de ce savoir.

On peut parler d'un modèle de bonnes pratiques pour l'auto-organisation d'un commun¹¹. Il est recensé comme élément du patrimoine culturel immatériel en France. Malgré ces principes partagés d'organisation, chaque prud'homie garde son identité, suivant les espèces pêchées présentes ou de passage sur le biotope, le nombre de métiers utilisés, les traditions locales (*bouillabaisse, trobadas...*) ou encore la pression des autres activités économiques qui sont pratiquées à côté de la pêche artisanale (tourisme, navigation, etc.) et enfin, la personnalité des membres de chaque communauté.



Figure 2. Le barreau de la prud'homie de Martigues. © A. Blayo

Il semble dès lors important de soutenir les actions de sauvegarde des pratiques des prud'homies, par exemple par l'organisation de co-formations professionnelles ouvertes d'échanges de savoirs assurées par des prud'hommes, ou la diffusion et

l'extension d'application du modèle auprès d'un large public (publications, jeux...) ainsi que l'inscription des pratiques des prud'homies de pêche comme patrimoine transférable à sauvegarder sur les listes de l'Unesco.

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1. Pour une bibliographie plus complète, voir <https://culturemer.net/PR2020/prudhommes.php>
 2. Nous, femmes de pêcheurs en Méditerranée, Paris, Indigo, 1997.
 3. RAUCH, Delphine, Les prud'homies de pêche en Méditerranée française à l'époque contemporaine, Nice, Serre/ASPEAM, 2014.
 4. Relative, parce que toujours sous tutelle de l'administration de l'État.
 5. Voir l'article de Yannick BOSC (2018) in BUTI, Gilbert, Daniel, RAVEUX, Olivier, RIVOAL, Solène (dir.), Moissonner la mer, Économies, sociétés et pratiques halieutiques méditerranéennes, Paris/Aix-en-Provence, Karthala : Maison méditerranéenne des sciences de l'homme, 2018, ISBN : 9782811125141.
 6. Décret du 19 novembre 1859.
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 8. FÉRAL, François, Un hiatus dans l'administration et la politique des pêches maritimes : les prud'homies de pêcheurs en Méditerranée, Persée, 1987.
 9. Code civil, art. 714.
 10. Voir l'article d'Élisabeth TEMPIER in CORNU, Marie, ORSI, Fabienne, ROCHFELD, Judith (dir.), Dictionnaire des biens communs, Paris, PUF, 2017.
 11. OSTORM, Elinor, Discours de Stockholm, C&F, 2009.



**Le patrimoine culturel
dans un contexte changeant**

**Transformation urbaine et patrimoine au prisme
des enjeux politiques et sociétaux.**

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**Urban Transformation and Heritage in the Light
of Political and Societal Issues.**

Towards Sustainable New 'Urban Stories': Light Archaeology as a Tool to Map Historical Transformations Across Time and Space

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Résumé

La transformation par l'histoire est une valeur que nous devons maintenir au sein des processus d'aménagement urbain. Il s'agit du concept fondamental de la Programmation Conjointe (JPI) *Deep Cities* – CURBATHERI, projet international qui, par le biais d'une recherche transversale pour l'analyse comparable en Norvège, au Royaume-Uni, en Italie et en Espagne, permet le développement d'une boîte à outils de gestion pour « faciliter la conceptualisation des valeurs patrimoniales auprès des parties prenantes et pour la priorisation de meilleures solutions de planification ». Pour modéliser les changements matériels d'une zone urbaine à travers le temps et l'espace, l'équipe de l'université de Florence propose une méthode, « l'archéologie non invasive », comme un apport pour la compréhension et la modélisation de l'histoire profonde d'une ville.

Mots-clés: villes d'histoire, transformations urbaines, archéologie non invasive, archéologie du bâtiment stratigraphique, diagramme carré du millénaire

Keywords: deep cities, urban transformation, light archaeology, stratigraphic building archaeology, millennium square diagram

The urban landscape is a multi-layered reality. Its built environment is a dynamic element, which changes across time and space. Used by different communities, it has been modified, demolished, and adapted to different needs in a long process of making and re-making. Therefore, what has been observed today, and has been defined as built heritage, is a palimpsest of stories and values. Revealing these stories, these time-space changes, thus deeply understanding the historical continuity of the place, may help drive urban strategies for the heritage preservation and the sustainable addition of new layers to answer the progress and the future demands. Then, in this respect, historical transformation becomes a value to sustain, according to the Deep Cities approach² and its most recent developments in the framework of the Joint Programming Initiative on Cultural Heritage and Global Change (JPI CH) CURBATHERI³.

Methods and Aims

The Deep Cities team of the University of Florence explored the potential of 'Light Archaeology' at the urban level, a combined application of non-destructive archaeological stratigraphic and topographic methods⁴, as an efficient tool to model the historical transformations of an urban area. To this end, two distinct Light Archaeology applications were developed, respectively devoted to mapping the material transformation of an urban environment (Millennium Square Diagram or 'MSD') and of particularly relevant buildings or architectural complexes (Stratigraphic Observatory Analysis).

The MSD is an experimental methodology born in the Deep Cities framework with the aim of elaborating a comprehensive snapshot of material transformations in a given area (San Donato neighbourhood in our case) over a millennium.

The diagram is fed by direct (material/archaeological/cartographic) and indirect (written/iconographic) sources, elaborated through a Geographic Information System (GIS) to gather metric data on land use. The percentage of land used for specific

purposes (such as residential, commercial, industrial, rural, streets, etc.) is recorded on the horizontal axis, while the duration in time of recorded land uses is represented on the vertical axis. MSD uses Allen's intervals⁵ for modelling time, and each unit refers to a detailed description in a database connected to the diagram.

On the other hand, Stratigraphic Observatories are identified through stratigraphic building archaeology⁶ as buildings or architectural complexes whose material history parallels the transformations of the urban areas they are inserted into. They can be seen as new 'monument types' within a Deep City perspective where, instead of favouring contexts representative of a single particular cultural moment (according to current architecture-historical listing practices), we chose to highlight in the urban fabric 'palimpsest-buildings' as a means to give social value to urban transformation as a cultural process in itself.

Florence/San Donato Millennium Square Diagram

The San Donato Millennium Square Diagram highlights the trigger of this settlement-formation: the Roman road Via di Novoli. In terms of land use, the area was mainly utilised for agricultural purposes up until the middle of the 20th century, as also evidenced by the sources, both written and material. However, the real urbanisation of the area occurred in 1938-1939 with the establishment of the FIAT factory, the Italian automobile manufacturer (**Figure.1a**). This transformation into an industrial area unavoidably had an enduring impact on the whole settlement, and it activated further material changes, both in the short and long term. Workers' housing, new streets, and factories were built in the following years, and more transformations were observed mainly in the last two decades, turning the site into a fast-changing and intense urban development area. The only surviving remains of FIAT's impressive plant is the thermal power station, the so-called FIAT tower (**Figure.1b**).

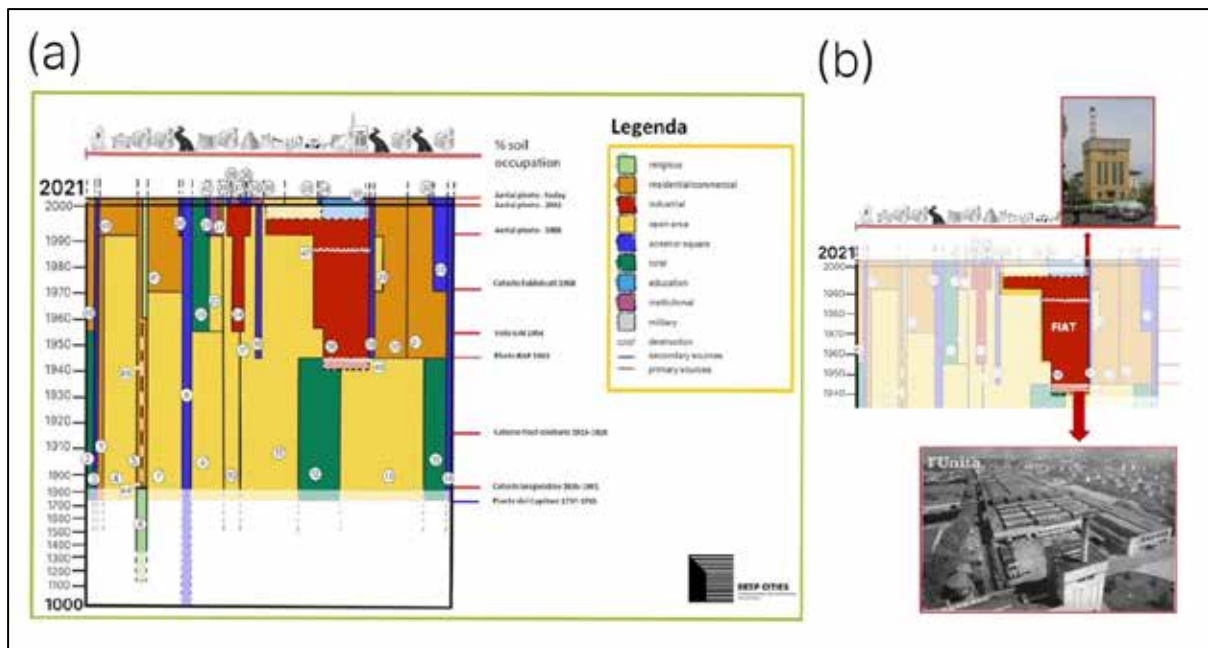


Figure 1. The MSD of San Donato in Florence. Diagram ©University of Florence, photograph © L'Unità

In this framework, MSD allowed to map, order and communicate the material changes of the urban context in time and space, showing the material temporalities embedded in today's urban environment.

San Donato in Polverosa: Stratigraphic Building Archaeology

The phases mapped in the Millennium Square for San Donato in Polverosa found a perfect match in the material traces recorded in the actual *façade* of the church, identified by the methodologies of stratigraphic building archaeology (Figure 2). A vertical section of a wall in the left limit of the *façade* dates back to the half of the 12th century when the complex belonged to the Augustinian order⁷. A masonry in horizontal rows of sandstone ashlar that probably divided an internal church from an external one is dated to the 13th century when the site passed to the cloistered Cistercian nuns, while the 15th and 16th centuries are materially marked by subsequently added windows and doors with brick frames. After the suppression of the convent in 1808 and its destruction in 1825-1827 by the Demidoffs, a noble Russian family, the church was converted into a library and kitchen of the newly built

neoclassical villa. In this phase, windows and doors were closed and the use of the church as a kitchen is confirmed by the trace of a chimney. In 1963, San Donato was eventually reopened for worship and was restored in 2010-2011 with the opening of the actual entrance gate. Another example of the application of Stratigraphic Building Archaeology is one of the churches of Santa Maria Maggiore in Florence, where it is possible to map a range of building phases dating between the 10th and the 17th centuries (Figure 2).

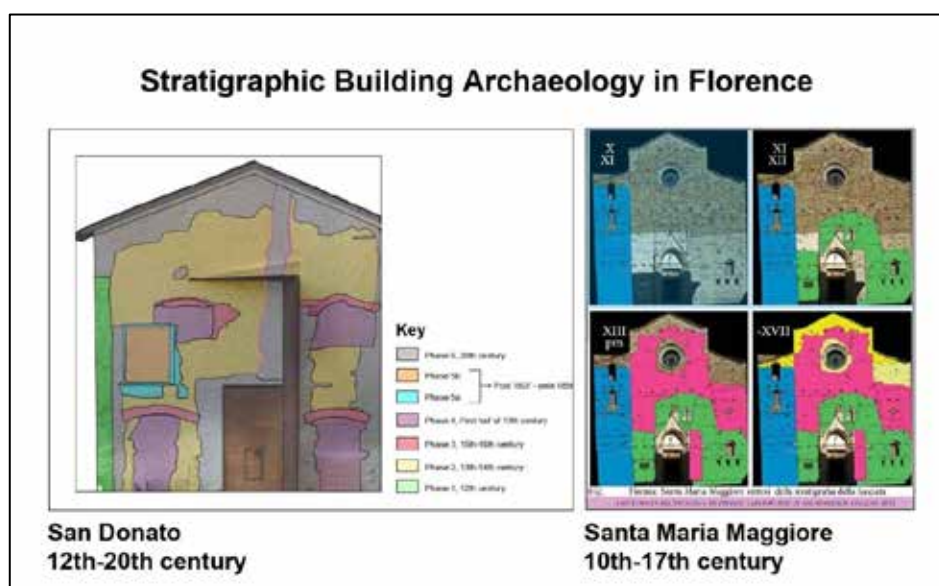


Figure 2. Stratigraphic Building Archaeology analysis in San Donato and Santa Maria Maggiore, Florence. © University of Florence

Following the experimentation of Light Archaeology as a tool to model urban transformation over time at neighbourhoods and buildings levels in Florence, Deep Cities applied the very same methods in different project contexts as London Royal Arsenal Gatehouse (Woolwich) and the Old Edinburgh Gasworks remains (Canongate), with promising and positive results. Given the tests performed so far, Light Archaeology can provide an efficient mapping strategy in order for urban planning to embed into 'new cities', the past communities' material values at large.

Acknowledgements

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¹ Quoted from JPI CH Curbatheri project proposal.

² FOUSEKI, Kalliopi, GUTTORMSEN, Torgrim, SWENSEN, Grete, (eds.), *Heritage and Sustainable Urban Transformations. Deep Cities*, London (UK), Routledge, 2020.

³ See <https://www.heritageresearch-hub.eu/project/curbatheri/> and www.deepcities.eu

⁴ NUCCIOTTI, Michele, VANNINI, Guido, 'Light Archaeology and Territorial Analysis: Perspectives and Experiences of the Florentine Medievalist School'. *Archaeologia Polona*, 50, 2019, p149-169.

⁵ For an in-depth discussion see: DRAP, Pierre, NUCCIOTTI, Michele, PRUNO, Elisa, et al., 'Ontology-based photogrammetry survey for medieval archaeology: Toward a 3D geographic information system' (GIS), *Geosciences*, 7, p1-34.

⁶ BROGIOLO, Gian Pietro, CAGNANA, Aurora, *Archeologia dell'Architettura*, Florence (Italy), Insegna del Giglio, 2012.

⁷ For all the historical information of San Donato the reference is MARINI Marino, 'Il monastero di San Donato in Polverosa (FI) fra Medioevo e Rinascimento: fonti storiche ed archeologiche', *Atti e memorie dell'Accademia Toscana di Scienze e Lettere 'La Colombaria'*, 62, 1997, p85-127.

A Methodology for a User Experience-Based Design of the Public Spaces: The Case of the V&D Haarlem

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Résumé

Les espaces publics urbains offrent à la communauté des opportunités d'interaction. Pour éviter que celles-ci ne soient perdues, l'accent doit être mis sur l'expérience totale de ses utilisateurs. Prenant comme terrain d'étude le bâtiment historique « V&D Haarlem », cet article étudie une méthodologie pour la conception d'espaces publics intégrant le patrimoine et basée sur l'expérience des individus. Cette méthode comprend une analyse historique et urbaine, ainsi que des observations directes des critères de qualité. Les résultats fournissent des lignes directrices qui intègrent l'expérience utilisateur dans la refonte des villes, en les préparant à un avenir durable et en préservant leur précieux patrimoine.

Mots-clés: espace public, Jan Gehl, expérience de l'utilisateur

Keywords: public space, Jan Gehl, user experience

The United Nations have established seventeen Sustainable Development Goals for 2030. One of these goals is 'Universal access to safe, inclusive and accessible green and public spaces, especially for women and children, the elderly and people with disabilities'¹. Public spaces are an important asset to our cities, as they provide many opportunities for people to meet each other and interact with the community. However, according to the 'Recommendation on the Historic Urban Landscape', 'Rapid and uncontrolled urbanisation often leads to the loss of public spaces'². As United Nations show the importance of these public spaces, it is crucial to reactivate them and give them back to the community since urbanisation could lead to a loss of public space. Therefore, it is necessary to emphasise the total experience of its users, including the routing and public spaces. The conditions of the urban quality can be improved by applying the twelve quality criteria concerning the pedestrian landscape developed by the Danish urbanist Jan Gehl (Figure 1). According to Gehl's explanation, the key to positive sensory experiences is an overarching theme of all criteria. However, it was not clear how to implement them to support design decisions.

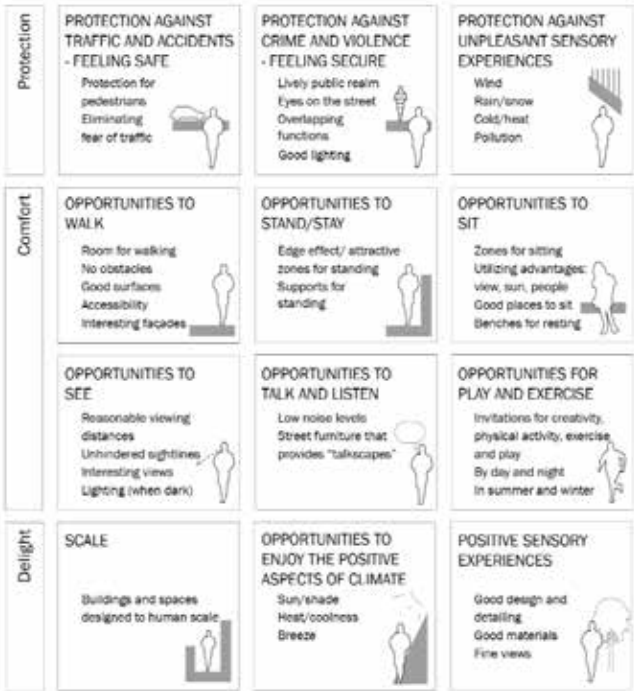


Figure 1. Adapted twelve quality criteria³

Due to the people-centric approach and critical observations of user behaviour, the chosen methodology focuses on integrating the urban experience into the design of public space. This methodology explains how those criteria can be applied to support design decisions of urban heritage spaces, and it was developed using a case study. The case study examines the city of Haarlem, located in the west Netherlands and has around two hundred thirty-five thousand inhabitants⁴. The former department store called V&D, built in 1934, is now vacant and listed as national heritage.

One historical interpretative research, realised by collecting drawings, photos, books and magazines (which gained insight into the historical context of V&D Haarlem), shows how the public space has been transformed from a canal to a square with monumental trees and eventually became a busy traffic intersection. To guide the fieldwork, literature analysis of Gehl's Architects project books *Downtown Seattle* (2009)⁵, *Sydney Public Spaces and Public Life* (2007)⁶ and *Towards a fine City for People London* (2004)⁷ were performed. Also, an analysis at the city level shows the importance of the traffic intersection in front of the case study where all public transport routes, cyclists, pedestrians and tourists come together.

The ethnographic research in the field allowed us to observe people in their cultural settings and write stories about how they move and interact with each other. Photography has been an essential means of recording interactions. We have made templates for all twelve quality criteria. Notes and tally marks about the observations of human behaviour can be written for all three surrounding streets. The traffic flows, for example, can be indicated in a map and a section of the street profile. Finally, we evaluated each criterion on a scale of zero to five. After the observation and filling processes for all twelve-quality criteria, we added the grades to the overview. The five lowest grades of zero, one and two are classified as the five challenges.

The observations of V&D Haarlem have been used as a case study to test developed observation templates. Since the case study concerned a historic city centre, several quality criteria already existed. The quality criterion of feeling secure is present due to the overlapping functions. The street provides opportunities to see using unhindered sightlines while the surrounding buildings of two or three storeys high are designed on a human scale. The existing canopy offers opportunities to enjoy the positive aspects of climate.

The result of this research shows the interrelated quality of Gehl's criteria (**Figure 2**). In the case of Haarlem, the focus was on the left part. The layers of the phases are clearer. Those quality criteria have to be completed in the sequence of the protection, comfort and delight phases.

The five challenges of V&D Haarlem are feeling safety and protection against unpleasant sensory experiences, creating opportunities to sit, play, and experience positive sensory experiences. The first step is to provide people protection against traffic and unpleasant sensory experiences. During field observations, pedestrians and cyclists have crossed the road at several points, which resulted in dangerous situations where people were standing in the middle of the road while a bus approached. One of the causes of the unsafe situation and unpleasant sensory experiences is the increasing number of buses (thirty-two per hour). Therefore, two bus lines go around the historic city centre. In addition, fast and slow traffic are separated by an elevated green avenue. An extended platform for human circulation provides protection against unpleasant sensory experiences. If people are protected, the next phase is offering comfort. The elevated green avenue creates two clear crossings that prevent people from crossing the road at several points. Besides that, it also creates space for opportunities to sit, play and exercise. Now, there are only outdoor serving areas providing secondary seating opportunities. Along the walking

route, traditional benches and temporary art and play invitations are added to the site. At last, the delight phase provides positive sensory experiences by adding trees, plants and water to the site.

The application to the case study of the V&D Haarlem shows that the consideration of the user experience is essential to redesign and reactivate historic urban centres and make citizens feel protected, comfortable, and delighted.

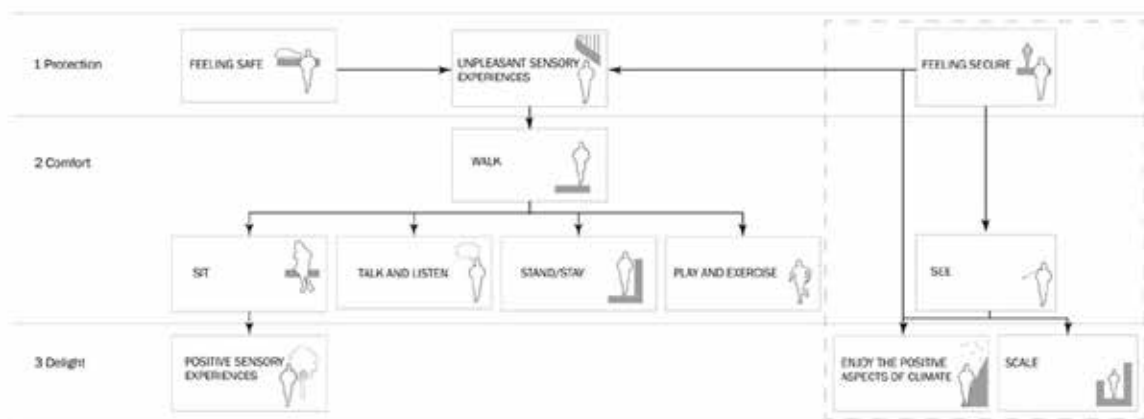


Figure 2. Table of interrelated quality criteria, 2021

¹ United Nations. (2015). Transforming our world: the 2030 Agenda for Sustainable Development, retrieved from A/RES/70/1: <https://sdgs.un.org/2030agenda>

² UNESCO. (2011). Recommendation on the Historic Urban Landscape, retrieved from <https://whc.unesco.org/uploads/activities/documents/activity-638-98.pdf>

³ GEHL, Jan, *Cities for People*, Washington: Island Press, 2010

⁴ Municipality Haarlem, Haarlem 2040: *Groen en Bereikbaar*. Haarlem: Municipality Haarlem, 2017

⁵ Gehl Architects, *Downtown Seattle Public Spaces and Public Life*, Copenhagen: Gehl Architects, 2009

⁷ Gehl Architects, *Sydney Public Spaces and Public Life*, Copenhagen: Gehl Architects, 2007

⁸ Gehl Architects, *Towards a fine City for People London Public Spaces and Public Life*, Copenhagen: Gehl Architects, 2004

Populist Distortion of the Cultural Heritage of Savski Square, Belgrade

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Résumé

La place Savski à Belgrade est un complexe architectural et urbain créé après la construction de la gare ferroviaire en 1884. Au lieu de revitaliser un quartier pauvre et longtemps négligé, en érigeant un monument surdimensionné à Stefan Nemanja, considéré comme le fondateur de l'État serbe, le populisme néo-traditionaliste a dénaturé l'harmonie et la structure du complexe urbain en introduisant des éléments historiques et idéologiques controversés dans l'aspect et l'esprit du centre-ville de Belgrade.

Mots-clés: patrimoine bâti, entité urbaine ambiante, populisme, place Savski, Belgrade

Keywords: built heritage, urban ambient entity, populism, Savski Square, Belgrade

Populists are opposing European unity in the Member States and strengthening opposition to European integration in the European Union candidate countries. Populism uses pseudo-historical manipulations to seduce and homogenise public opinion on the idea of a sovereign nation. Manipulations with personalities, ideas, and symbols from the real or fictional past should create beliefs in cultural uniqueness and goals for the future that are rooted in the mythical being of the nation. Distortion of the past has become a means of distorting public urban space such as in the cases of Skopje and Belgrade¹.

In Belgrade, the foundation of the monument of Stefan Nemanja, considered the founder of the Serbian medieval state, is a populist attempt to revive the Serbian national project from the late 1980s that ended in the violent disintegration of Yugoslavia. The monument was designed in visual and ideological interaction with the Temple of St. Sava, Nemanja's son, the founder of the Serbian Orthodox Church. The monument was erected on Savski square, in front of the former railway station building. The monument, however, disrupted the architectural harmony of Savski square.

We intended to dissect the populist distortion of the past and urban environment that took place with the foundation of the monument of Stefan Nemanja, and how the forgotten modernist square turned into a quasi-historical post-truth aberration.

Savski Square

Savski square is placed at the edge of Belgrade's central area, within the wider zone of the Sava coast. Its position could be seen as well as an element of the system of squares that belong to Belgrade's central area.

The site began to be used after the construction of the main railway station in 1884².

Its arrangement was generated by the influence of French engineers Alban Chambon, Charles Leroux and Eduard Leger³. The square originally emerged as Prince Milos Obrenović sought to develop an independent Serbian part of Belgrade with a strong merchant character⁴. After the establishment of the railway station and until World War I, Savski square was the most important Belgrade hub. In the new kingdom after 1918, this part of Belgrade experienced the first period of degradation and dereliction. After World War II, Savski square was becoming amongst the most degraded parts of Belgrade⁵. The peak of the decay overlapped with the violent disintegration of Yugoslavia and, until recently, the square was considered one of the least desired districts in Belgrade⁴. After 2012, the new political elite began to consider the Sava slope as a lucrative venture, and that resulted in reshaping the urban structure. The most obvious ideological landmark of the new ruling class became the new monument of Stefan Nemanja, oversized, and disturbing the content of the modern square (**Figure 1**).

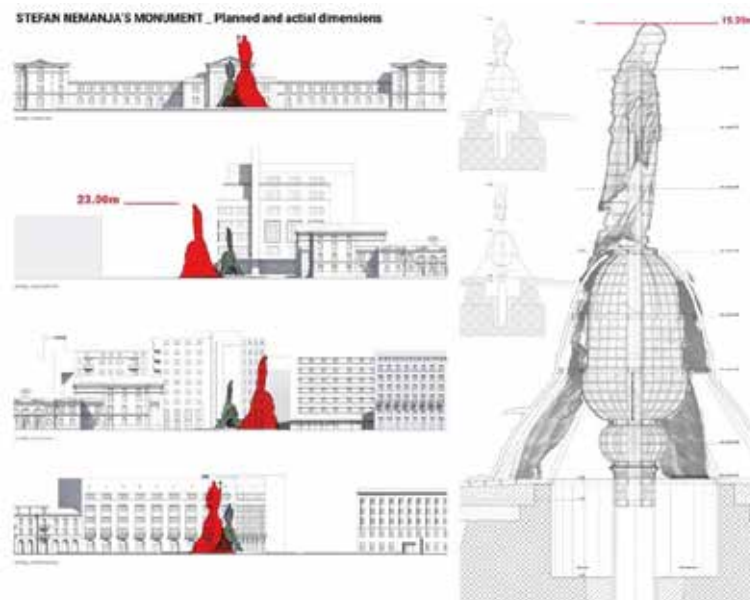


Figure 1. St Nemanja Monument. Planned and actual dimension

The monument of Stefan Nemanja was raised in late 2020 (after the competition in 2017). The distortion of a harmonious, urban unity was brutal and obvious. The sculptor of the monument was Alexander Rukavisnikov, a prominent official artist since the late Soviet era⁶. His choice confirmed the close relations between the Serbian political elite and Moscow. The grand opening of the square with the Stefan Nemanja monument took place on Saint Sava's Day, the 27 January 2021, and the central figure was the president of Serbia.

The populist government established in Serbia in 2012 reflected the weakness of the West and the European Union in South-Eastern Europe. The regime is relying primarily on the regional influences of Russia and its leader, but also matched the stabilitocratic agenda of Germany. Instead of reconstructing the controversial remnants of socialist heritage and the destruction from the last decade of the 20th century, Belgrade has become a landmark of urban distortion, including pseudo-historical memorabilia.

The monument represents the victory over the Byzantine Empire, alluding legitimacy of later Moscow as the Third Rome, thus establishing historical continuity between the founders of the first Serbian medieval dynasty and the forerunner of the first Serbian state and the imperial sphere of influence of modern Russia. The monument is also a representation of the state foundation of the religious cult of Saint Sava. The cult of Saint Sava was a symbol of the liberation movements against the Ottoman Empire. The cult was, however, re-invented in the second half of the 1930s, when Serbian intellectual, political, and clerical circles struggled to adapt to the influences of Italian fascism and German Nazism, implying the penetration of teachings of historicist imperialism or anti-Semitism, also under the influence of Russian tsarist emigration.

The cult of Stefan Nemanja and his son Saint Sava was established based on the Kosovo Covenant, the general memory of the Battle of Kosovo from 1389, and the perished heroes, although little is known about the event, and the Serbs participated in both sides, Ottoman and Christian. The ideological meaning of the Kosovo Covenant was deliberately embedded in official resistance to European integration after the fall of communism in 1989. When the 600 years since the Kosovo battle was celebrated at a monumental gathering in Gazimestan, the president of Serbia, Slobodan Milošević, addressed the gathered crowd with the threat that he would achieve national interests by armed struggle. Also, in 1989 was initiated the construction of the monumental temple of Saint Sava in Belgrade, in neo-Byzantine style, designed in 1935. The monument of his father Stefan Nemanja appears a reinterpretation of such aesthetic representation, as Stefan Nemanja is placed on the symbolic ruin of the same Byzantine Empire.

The latest revival of the cult coincided with the weakness of the West in relations with Russia. The cult established a new spiritual link with the rising Russian world and its idea of a new Russian empire, which inspired the concept of 'Serbian world', a new attempt to unite Serbian ethnic space on the ruins of Yugoslavia. The ideology of the Serbian world of modern Serbian politics, clearly subordinated to the ideology of the Russian world, seizing Kyiv and Ukraine by force, represents Stefan Nemanja as a Russian tsar rather than the founder of the Serbian medieval state. With the appearance of the monument, the Serbian state becomes the Balkan outpost of the Russian empire. Stefan Nemanja was also given a healing function of the recent traumas, as Serbia was clearly defeated during the Yugoslav wars, and Serbian society was isolated, poor, and pessimistic.

In the ultimate symbolic and ideological consequence of the sculptural and ambiantal representation, almost obvious, that the populism of the President of the Russian

Federation is reflected in the populism of Serbian government.

The populist distortion of urban areas and the historical heritage of Belgrade reflects personal, authoritarian political power, the ideological influence of Russia, and the weakness of institutions.

Populism is an autocratic and kleptocratic response to the crisis in European Union foreign and security policy while facing new strategic challenges in relations with Russia. Populism manipulates the real and imaginary past, introducing myths, cults, and historicism, destroying both historical and urban heritage.

The distortion of the past on Savski square began with the erection of the monument to the victims of war and defenders of the fatherland from 1990 to 1999, a silent relativisation of responsibility for war⁷. The monument to Stefan Nemanja is a return to the ideological guidelines from the same decade of 1990-1999, with an aesthetic and ideological reliance on contemporary Russia.

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**Un patrimoine réflexif
pour une société résiliente**

**Enjeux identitaires et sociétaux :
identifier, interpréter, transmettre.**

-

**Identity and Social Issues:
Identifying, Interpreting, Transmitting.**

L'Atelier de l'histoire.

Un musée d'université sur le campus de Paris Nanterre

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Abstract

La contemporaine (Paris Nanterre University) opened a university museum in 2021. 'L'Atelier de l'histoire', a permanent exhibition in this century-old institution, questions the way in which documents acquire the status of historical sources as well as the processes of collection and transmission co-constructed between citizens and researchers. How do some types of documents that have been given little attention become essential tools for understanding a society's relationship to its history and its complex identity? Today, in La contemporaine, citizens and researchers, students and archivists continue to contribute to the constitution and transmission of new sources, including digital ones.

Mots-clés: histoire contemporaine, musée d'histoire, médiation culturelle, art et société

Keywords: contemporary history, history museum, cultural mediation, art and society

« La contemporaine » est une institution patrimoniale singulière dans le paysage culturel français. Fondée pendant la Grande Guerre à partir d'une collection privée dont le but était de documenter tous les aspects du conflit, la bibliothèque-musée de la Guerre a rassemblé aussi bien des œuvres d'art que des objets, des photographies et des écrits, avec une attention particulière portée à la presse internationale et aux documents éphémères. Les deux historiens, Camille Bloch et Pierre Renouvin, qui la dirigent tout d'abord, obtiennent son rattachement à l'Université de Paris en même temps qu'ils infléchissent sa vocation en changeant son nom (Bibliothèque de documentation internationale contemporaine - BDIC) : davantage orientée vers les relations internationales, la BDIC s'intéresse à l'ensemble des conflits contemporains et à ce qui y est lié comme les migrations et les droits de l'homme. En l'installant sur le campus de l'université de Nanterre en 1972, l'historien René Rémond confirme cet ancrage scientifique, toujours d'actualité. L'institution rassemble plus de 4,5 millions de pièces, dont 1,5 million pour la partie musée, et continue à s'enrichir, y compris de documents nativement numériques.

À l'occasion de son centenaire en 2018, elle devient « La contemporaine, bibliothèque, archives, musée des mondes contemporains » et ouvre trois ans plus tard, en 2021, un nouveau bâtiment rassemblant des collections longtemps dispersées en différents lieux. Le choix de l'implantation et la réalisation architecturale remarquable de Bruno Gaudin et de son équipe mettent en valeur le projet scientifique et culturel caractérisé par l'ouverture de l'université sur la cité et par des missions réaffirmées de formation et de recherche.



Figure 1. Hall de La contemporaine avec la salle de lecture en rez-de chaussée et L'Atelier de l'histoire à l'étage. ©La contemporaine

« La contemporaine » est constituée de trois composantes indissociables : bibliothèque, archives, musée. La traduction dans l'espace en est une salle de lecture ouverte à tous publics, où tous types de documents sont consultables, reliée visuellement aux lieux de médiation : un musée permanent gratuit, « L'Atelier de l'histoire » ; des expositions temporaires ; des salles de formation. L'ambition pédagogique est de donner à comprendre la diversité et la complexité des sources de l'histoire contemporaine à partir des fonds de l'institution et des acquis récents de la recherche. Les premiers publics sont les étudiants, formés dans ce musée-laboratoire d'université et associés à des programmes de recherche-action (en humanités numériques, par exemple). Ils sont appelés à devenir eux-mêmes des médiateurs auprès de leur pairs ou du public des lycéens et des collégiens.

Le propos de L'Atelier de l'histoire est en effet une réflexion sur les usages de l'histoire, s'appuyant sur l'ensemble considérable de sources constitué depuis plus d'un siècle. À La contemporaine, le « patrimoine » est d'abord considéré comme un « document » pour écrire l'histoire. Une œuvre artistique (peinture, dessin, sculpture) est ainsi mise sur le même pied que des pièces d'archives ou un portefeuille d'affiches. Pourquoi s'intéresser à des pièces auxquelles on portait avant peu d'attention mais que l'on peut considérer comme de véritables sources ? Comment un « document » passe-t-il du statut de source d'information, de preuve, de trace d'un parcours de vie à celui d'archive historique ? Pourquoi vouloir transmettre ? Comment en est-on venu à écrire l'histoire de toutes les composantes de la société et qui plus est, à vouloir y participer ?

Cette alchimie résulte d'un consensus social entre acteurs des événements, témoins ou experts. Les usages de l'histoire ont certes évolué depuis l'idée initiale des fondateurs, même si des constantes sont toujours à l'œuvre. Les approches sont multiples, qu'il s'agisse d'une pratique historique ou d'enjeux de mémoire collective. Les notions d'héritage culturel ou de patrimoine sont désormais intégrées au nom d'une représentativité, car l'objectif du musée est de rendre compte de la complexité des usages.

Au fil du parcours, on voit ainsi des objets longtemps négligés et maintenant considérés comme des sources historiques à part entière : aux côtés des registres de la censure, les tubes lance-tracts de la Grande Guerre, collectionnés sans doute initialement par curiosité ou par piété patriotique, sont aussi des matériaux pour comprendre le fonctionnement de la propagande et la diversité des moyens matériels utilisés pour convaincre l'opinion. L'intérêt porté à ces objets n'allait pas de soi au lendemain du conflit. D'autres objets interpellent sur le processus de décantation des sources historiques. Témoignages d'un passé qu'on veut oublier, les

« séquestres » du maréchal Pétain (artisanat d'art en hommage au chef de l'État ou offert en son nom) ont été volontairement ignorés pendant des décennies, alors que le matériel d'imprimerie du mouvement de résistance Défense de la France était montré dans des expositions commémoratives dès la Libération.



Figure 2. Vitrine de L'Atelier de l'histoire, présentant les objets offerts par le maréchal Pétain ou en son nom, mis sous séquestre à la Libération. ©La contemporaine

Le graphisme politique témoigne, plus près de nous, des liens entre art et société. La contemporaine conserve une collection remarquable d'affiches de cette veine,

toujours enrichie par des collectionneurs ou les artistes eux-mêmes. Il ne s'agit plus de les utiliser à titre illustratif d'un propos historique mais de saisir ce qu'elles nous disent de l'engagement de ces graphistes dans la société. Il s'agit aussi de comprendre comment ces œuvres circulent, dans la rue, dans les galeries, dans les médias, désormais sur le Web. Il s'agit enfin de donner des repères aux plus jeunes qui abordent ces œuvres, en réalisant des entretiens avec les acteurs de l'écosystème du graphisme politique, des artistes aux commanditaires ou aux collectionneurs, en passant par les archivistes, confrontés également à la révolution numérique, comme les producteurs.

C'est en questionnant la diversité des usages de l'histoire et du rapport aux sources qu'entretient la société dans son ensemble que La contemporaine, adossée à une université et ancrée dans la recherche vivante, s'efforce de former et de sensibiliser son public, en premier lieu les étudiants appelés à transmettre une culture, si possible de manière réflexive, mais aussi celles et ceux qui dans la société contribuent à enrichir les sources de l'histoire contemporaine.

Les musées militaires en Grèce.

Recherches sur un patrimoine européen négatif

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Abstract

This research questions the scientific categories used to qualify conflict-related heritage and museums, in particular that of 'negative heritage'. It focuses on Greek military museums, questioning their dynamics, spatialities and museographies, between discourses and silences. Analysing the stability of a heritage model inherited from the dictatorships, which is increasingly out of step with social expectations, this research puts the Greek model into perspective in the light of contemporary European heritage dynamics. It opens research perspectives at the crossroads of critical heritage studies and critical military studies.

Mots-clés: musée militaire, musée de guerre, patrimoine négatif, patrimoine des dictatures

Keywords: military museum, war museum, negative heritage, heritage of dictatorships

La résurgence des nationalismes en Europe questionne le rôle des sites patrimoniaux et musées liés aux conflits ou aux massacres dans les sociétés contemporaines. Cette contribution s'appuie sur une recherche portant sur les musées militaires grecs.

L'étude s'inscrit dans un contexte scientifique marqué par l'intérêt croissant des sciences du patrimoine pour l'héritage des guerres, massacres ou catastrophes depuis les années 1980, en lien avec l'émergence des « *memory studies* ». Ces recherches s'inscrivent dans des traditions disciplinaires variées, enrichies par l'approche dite « critique » (*critical heritage studies*), et ont contribué à diversifier le corpus théorique pour penser et qualifier ces héritages : « *war heritage* », « *dark heritage* », « *dissonant heritage* », « *difficult heritage* », « *contested heritage* » ou encore « *negative heritage* » constituent ainsi les catégories scientifiques – parfois floues et contestées – en usage dans ce champ.

La notion de « patrimoine négatif » est mobilisée depuis le début des années 2000 dans les sciences du patrimoine, particulièrement dans le domaine anglo-saxon^{1,2}. En 2011, l'historienne française Sophie Wahnich évoque « la patrimonialisation du négatif qui habite les sociétés » associée aux « traces du négatif, violence, destruction, mort – la guerre, l'esclavage, le racisme, la Shoah ». Le négatif est ainsi défini comme « ce qui est voué au refoulement » et le patrimonialiser, c'est « rendre présent ce que la conscience humaine rejette et qui pourtant fait retour comme effectivité historique de la cruauté humaine »³

On peut alors se demander de quelle négativité, de quel traumatisme ou refoulement, de quelle violence les musées militaires grecs sont-ils le lieu de mise en scène dans l'espace public. Notre hypothèse est que les musées militaires grecs constituent un patrimoine négatif non seulement parce que ce sont en grande majorité des musées consacrés à la guerre mais surtout parce qu'ils constituent des

patrimoines de la dictature. En effet, le modèle du musée militaire grec moderne trouve son origine dans la succession des régimes autoritaires, et plus spécifiquement, dans la junte militaire des années 1960-1970 ; or ce modèle connaît une forme de reproduction, y compris dans certaines créations muséales contemporaines, tout en s'inscrivant dans un langage muséographique et « un art de faire » commun à d'autres musées militaires dans le monde, particulièrement en contexte autoritaire. De cet héritage-là, rien n'est pourtant dit, et cette histoire est rarement rappelée dans un discours muséal qui omet de déconstruire le contexte de création des musées. C'est tout l'enjeu de proposer un regard critique et réflexif sur ce qui, dans le patrimoine, peut être qualifié de « négatif ».

Les musées militaires ont été implantés par l'armée grecque principalement près des frontières, sur les champs de bataille des deux guerres et dans quelques grandes villes comme Athènes ou Thessalonique. Une première génération de musées apparaît durant les régimes autoritaires de l'entre-deux-guerres aux années 1970 (dictature et junte militaire) ; une seconde se constitue à partir des années 1990-2000, dans un contexte politique et géopolitique très différent (République grecque, appartenance à l'Union européenne).



Figure 1. Musée Emin Aga (1950), Épire, Guerres balkaniques (1912-1913), Guerre de 1914-1918, © Papaioannou, 2012

Montrant collections d'armes, uniformes et portraits de combattants, ces musées exposent l'héroïsme, le récit épique national et la vaillance militaire contre l'ennemi. Ils affectent finalement *positivement* l'héritage des deux guerres mondiales car la violence de guerre, le crime, la souffrance sont des éléments minorés au profit d'une muséographie orientée vers la commémoration des prouesses et succès guerriers dans une perspective d'histoire militaire. Gérées par l'armée, ces institutions publiques s'apparentent à des foyers d'éducation patriotique et de fierté nationale. Elles occultent certains pans de l'histoire comme la résistance communiste, la répression militaire, l'histoire des dictatures et la guerre civile (1946-1949).



Figure 2. Musée de Kalpaki (1975), Épire, Guerre 1939-1945, © Papaioannou, 2012

Les musées créés durant les périodes autoritaires demeurent aujourd’hui inchangés et incarnent un patrimoine des dictatures, dans sa matérialité et ses discours – même s’il n’est pas présenté comme tel. Or ce modèle muséographique militarisé et centralisé demeure hégémonique dans la muséographie du fait guerrier en Grèce. Certaines créations muséales contemporaines restent ainsi influencées par ce modèle, ne serait-ce que par l’existence de modes de gouvernance qui traduisent un contrôle de l’institution militaire.

La stabilité d’un tel modèle contraste avec les bouleversements du monde muséal depuis les années 1980 en Grèce et plus généralement en Europe. De plus, les processus de patrimonialisation du « négatif » ont conduit à des renouvellements muséographiques intenses, accompagnés de débats impliquant de nombreux acteurs (historiens, artistes...), tant l’exposition de la violence et du fait guerrier pose de réels défis sur le plan politique et social. On observe un processus de

démilitarisation des musées d'histoire de guerre au fur et à mesure que chercheurs et professionnels de la culture prennent le pas sur l'institution militaire dans les nouvelles politiques muséales. Les valeurs et le sens donné au patrimoine « négatif » ont corrélativement profondément évolué (paix, réconciliation, dénonciation de la guerre, mémoire partagée, outil de développement territorial et touristique) et font souvent l'objet de profondes controverses (voir le débat à l'Unesco sur la reconnaissance des sites associés aux conflits contemporains comme patrimoine mondial). Dans un contexte de circulation généralisée des nouveaux standards muséographiques globalisés, les musées militaires grecs apparaissent comme des reliques d'une autre époque.

La stabilité d'un modèle ne signifie pas une appropriation massive par l'ensemble de la société ; s'ils représentent un passage obligé pour nombre d'élèves, les musées militaires sont peu fréquentés par le public. Ils sont aussi relativement peu étudiés ou évoqués par les médias. Aussi, cette conservation du modèle par une institution militaire soucieuse de perpétuer et de transmettre ses propres valeurs et son identité semble se faire en décalage croissant avec les attentes de la société civile grecque. Depuis peu émerge un processus de patrimonialisation alternatif porté par des acteurs publics et privés de gauche, cherchant à sortir de l'oubli les lieux de répression politique et militaire (prisons, lieux d'exil, camps...); ces initiatives questionnent la division politique du pays, héritage de la violence qui a caractérisé son histoire depuis le début du XX^e siècle.

Dans ce contexte, la stabilité et l'hégémonie d'un modèle muséal peu ouvert et intouchable conduit à questionner la place de l'armée et des valeurs militaires dans la société grecque contemporaine, dans laquelle est maintenu le service militaire obligatoire, et où la question nationale est sensible (Balkans, question macédonienne, Turquie).

Le cas des musées militaires grecs questionne l'existence d'un modèle patrimonial hérité de la dictature et sa transmission. Élargir la recherche à une approche comparée des modèles muséographiques nationaux en termes de vision, de mission, de récits, de pratiques d'exposition et, *in fine*, de valeurs partagées, permettrait d'explorer ce que le patrimoine négatif dit de la relation des Européens à leur passé et à leur futur.

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Le patrimoine face aux changements climatiques et environnementaux

**Adapter le patrimoine culturel au changement climatique :
de l'évaluation des risques à la mise en œuvre de solutions.**

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**Adapting Cultural Heritage for Climate Change:
From Vulnerability Assessment to Climate Planning.**

Heritage Science Networks: Contribution to the Sustainable Development Agenda

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Résumé

Cet article aborde la notion de « sciences du patrimoine » et les contributions de la discipline aux Objectifs de Développement Durable des Nations Unies (ODD). En ce sens, cet article présente les institutions nationales et internationales ANTECIPA, ABENDI, WGS-ICOM et WGCCCH-ICOMOS qui fonctionnent comme réseau intégré. Ces réseaux d'infrastructures et de professionnels sont essentiels pour la consolidation du rôle des sciences du patrimoine pour la préservation du patrimoine naturel et culturel et permettent, ensemble, de contribuer aux ODD et de faire face aux problèmes sociétaux émergents.

Mots-clés: technologies habilitantes, exécution intégrée de projets, gouvernance, politique, coopération scientifique, patrimoine culturel

Keywords: enabling technologies, integrated project delivery, governance, policy, scientific cooperation, cultural heritage

There is a considerable concern related to the ability of our current scientific, intellectual, and governmental infrastructure to respond to the emergency issues generated by climate change associated with the demand for sustainable development through a policy of international, national, and local cooperation. Social justice, cultural identity, and environmental protection are interwoven units.

Today, in a highly interlocked political and economic system, it is no longer possible to believe that the ruin of one society - political, economic, or environmental - does not impact another society. Over the past sixty years, the global challenges to sustainable development have been driven by a broad set of institutions, reflected in an international debate¹. In this way, the trinomial preservation of culture, protection of the environment, and economic balance determine the quality of the reflection generated by these institutions. To achieve them, science, education, and government commitment are indispensable.

What is heritage science's role in the Sustainable Development Goals (SDGs) Agenda²? Recent advances in applied sciences show that transdisciplinary areas are more capable to face today's issues, mainly in the field of sustainability matters. Several discussions related to the introduction of new parameters of evaluation and management of museums, monuments and sites; the expansion of scientific support for the conservation science; the informational system revolution and big data analytics; the changes in the global geopolitical frame; and the process of rethink the cities as an integrated organism which involves economic, cultural, and social planning promoted a profound transformation in the international debate regarding the cultural heritage role.

To understand how the networks operate, it is essential to note that the notion of 'engaging' is a way of conceiving relations that enhance the idea of shared knowledge for the common benefit. According to Sewell³: 'Engaging means becoming involved or more involved in a continuing relationship'. Therefore, the considerations made in this article aim to discuss heritage science networks as qualified environments for sharing ideas, technologies, methodologies, human resources, and infrastructure to achieve the SDGs.

Cultural Heritage Contribution to the SDGs' Agenda

Numerous efforts have been undertaken to share the responsibility of culture in sustainable development with the international community. After 2010 was raised a stronger international agenda aimed at discussing the idea of cultural policies for sustainable development. Several resolutions have also reaffirmed the role of culture in achieving sustainable development in its three dimensions – economic, social, and environmental.

How could heritage science contribute to the SDGs? Numerous initiatives have sought to demonstrate the links between culture and environment and provide practical resources to support actions. Capacity building in sustainable heritage preservation enabled through a global system of scientific cooperation is one of the missions of the global heritage science research infrastructure. Its main objective is to develop cutting-edge knowledge. By following this strategy, it should be able to share knowledge with communities where sustainable development principles must be promoted and where heritage can be found.

Brazilian Networks and International Institutions

The Brazilian National Association of Research in Technology and Heritage Science (ANTECIPA) was established in Belo Horizonte, Brazil, in December 2015, during the First Meeting of Associated Laboratories for Heritage Science Research promoted by IPERION-BR. Its aims are a) to contribute to the promotion of research and preservation of cultural heritage, b) to foster academic exchange, technical cooperation and professional training, c) to support transdisciplinary research and a scientific approach in the field of heritage science, d) to represent the Brazilian scientific community involved with research and preservation of cultural heritage.

The Technical Committee on Cultural Heritage of the Brazilian Society for Non-Destructive Testing and Inspection (ABENDI-CTPC) aims to encourage discussion on protocols, methods and technologies aimed at the diagnosis and monitoring of cultural heritage. It was created in May 2020 and brought together researchers with relevant scientific expertise linked to universities and cutting-edge research centres. It is also an environment for integration among universities, industries, and governments, contributing to the improvement of the level of preservation of cultural heritage in Brazil and fostering the development of technical skills in research, innovation, and technologies for cultural heritage. In this way, the Committee defined thematic axes that guide its work: terminology; scientific documentation by image; investigation of materials, systems, and techniques; intervention, conservation, restoration and management of cultural heritage.

In 2017, the International Council of Museums (ICOM) created the Working Group on Sustainability (WGS) with the mission to discuss climate emergencies and the role of museums. Museums provide an existing global infrastructure; they can facilitate

collective action, build networks, raise public awareness, support research, and improve sustainability and climate change education. In 2019, at the thirty-fourth General Assembly of ICOM held in Kyoto, the resolution 'On sustainability and the implementation of Agenda 2030, Transforming our World'⁴ was adopted.

At the nineteenth General Assembly of the International Council on Museums and Sites (ICOMOS) held in New Delhi (2017), the Working Group on Climate Change and Heritage (WGCCH) was created with a vision to mobilise the cultural heritage community for climate action. In 2019 'The Future of Our Pasts: Engaging Cultural Heritage in Climate Action' was published, outlining the vision of the WGCCH⁵. Together, these associations make up an invaluable force of researchers, museum professionals, heritage agents, professors, and students capable of triggering, at a global level, necessary political actions and discussions in the fields of culture preservation, environment, social justice and sustainability.

Networks of infrastructures and professionals are vital for the consolidation of heritage science as an essential area of study in the realm of preservation of natural and cultural heritage. Brazilian and international networks can establish intellectual, scientific, and political cooperation links capable of facing emerging problems and contributing to the SDGs. Today, the lessons learned from institutions of intellectual cooperation for protecting cultural and natural heritage are still relevant: a local, national and international network is the best tool for shaping forces in a synergistic field. The idea of a common heritage for all humanity and a sustainable legacy for each community amplifies its meaning and promotes new evaluation criteria, management parameters, and protection tools. Heritage science must be integrated into the SDGs Agenda to achieve the quality of life for mankind.

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A Transversal Approach to Tackle Climate Change on Cultural Heritage

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Résumé

Le patrimoine naturel et culturel subit fortement les effets du changement climatique. Cependant, il peut aussi apporter des solutions car il offre tout un panel de ressources pour le développement durable à travers la réutilisation du patrimoine culturel ou la réactivation de savoir-faire traditionnels écologiquement vertueux. Le groupe français de l'ICOMOS propose de développer une méthodologie multi-échelle allant des paysages culturels et urbains à l'étude de l'empreinte carbone dans un contexte de rénovation, afin de guider les futurs développements ou interventions sur notre patrimoine.

Mots-clés: réhabilitation, empreinte carbone, savoir-faire, du paysage au bâtiment, innovation, solutions écosystémiques.

Keywords: reuse, carbon footprint, landscape to building, know-how, innovation, ecosystem-based solutions.

While climate change is considered by the Intergovernmental Panel on Climate Change¹ as 'any change in climate over time due to both natural variability and the result of human activity', the United Nations Framework Convention on Climate Change² and the UNESCO World Heritage Centre³ have focused solely on the consequences of human activities on climate. The young working group of ICOMOS France is interested in how heritage responds to the effects of climate change. Therefore, the main challenge is to make heritage evolve so that it adapts to climate change and participates positively in it while maintaining its heritage value. Our objective is to find and disseminate solutions to face the concrete needs of the local stakeholders through examples proposed and developed by the group members themselves. To produce a complete work, the group is working on three distinct scales- natural and cultural landscapes, urban landscapes, built environment, renovation, and eco-restoration - in order to define a methodology and bring common and transversal solutions among the three scales.

Needs and Actions, An Approach towards Resilience to Climate Change

For most of our natural heritage, it is no longer a question of facing risks in the face of climate change but of adapting to it and developing management strategies that allow it to evolve and sustain its heritage values. The notion of risk is no longer relevant, action and development are, and natural sites, whether anthropised or not, have often had to make choices in this management to save essential heritage values. They have noted through precise measurements the evolution of environmental factors in correlation with modifications of soil, vegetation, animal colonisation, and the ongoing effects of climate change. From these assessments, these sites have been able to model predictions, anticipate their future and identify vulnerabilities that can only increase over the next fifty years. The dialogue between science and heritage appears to be essential and is gradually established. The international symposium 'Heritage for the Future, Science for Heritage' organised by the

Fondation des Sciences du Patrimoine in March 2022 under the aegis of the French presidency of the Council of the European Union further emphasised the need for dialogue, in particular between digital sciences and site monitoring.

The actions to be taken and the responses that must be provided can only be developed from the identification of vulnerabilities, and the development of new digital tools can contribute to this. Therefore, it is essential today to be inspired by this scheme and to set up systematic measurement systems on a smaller scale of cultural assets identified as sensitive to various risks. Indeed, the rapid action of climatic factors will lead to different consequences depending on whether they are slow or extreme events, with the latter being more dramatic and devastating than the former⁴. These measurements can consider past and current data to model and predict future ones. Local vulnerabilities according to climatic factors can be extrapolated, and an action plan can be developed. It is then a matter of developing a management plan that can integrate protection or mitigation solutions and adaptation solutions that balance preservation and management. Where not all heritage values can necessarily be saved, the notion of prioritisation of values is also emerging.

Heritage is also a source of inspiration regarding materials, techniques, craftsmanship, and know-how. Tangible and intangible assets are also an opportunity, a tool for innovation to provide new solutions. By drawing inspiration from the past and the virtuous wealth of our heritage, solutions for preservation and better living are within reach. There is as much to do in identifying the effects as in determining the innovative potentialities that heritage offers.

The European movement of the New Bauhaus testifies to this, and heritage has an immense role to play in these actions for the reduction of our greenhouse gas

emissions. Heritage must be a showcase for innovation, listing all the materials and virtuous techniques that can help achieve the main objective of the European Green Deal - zero carbon emissions by 2050- and integrating past data to better build the future today. Two generations are needed to assess the effects of our actions. It is urgent to stop waiting.



Figure 1. A design approach towards resilience to climate change

The management plan must therefore integrate the essential notion of the impact of changes or solutions provided, the adaptation of the heritage and the contribution of techniques and know-how. Once again, digital measurement can complement this management plan as it is essential to assess the carbon footprint of our interventions in the long term and to integrate our actions into a life cycle analysis of restoration and preservation. The most obvious solution today is to stop thinking in silos but in a transversal way by breaking down the barriers between the actions carried out at the scale of the landscape, urban centre and the built environment and underlining how nature and culture intertwine at all levels.

Preserving is a green act in itself, but how best to do so in a sustainable manner, minimising and thoughtfully targeting our intervention while retaining essential heritage values? By measuring our impact to better assess its consequences, optimise it, and enhance it. Only after these steps towards adaptation and resilience will we

know what we have been able to save and transmit. By being exemplary, heritage can be considered as a vector of resilience to climate change, addressing all. It is the source of a universal diffusion.

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Heritage in Climate Planning (HiCLIP): Global Lessons from 10 Adaptation Plans across the World

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Résumé

Cet article présente certains des résultats du projet pilote Heritage in Climate Planning (HiCLIP) qui a évalué de manière systématique l'inclusion des ressources culturelles et du secteur culturel dans 10 plans climatiques mise en œuvre à l'échelle nationale, régionale et locale. Les résultats montrent que dix-sept activités thématiques incluent généralement les ressources culturelles pour l'adaptation au climat, plus particulièrement lors des études de vulnérabilité. Une évaluation comparative entre les plans révèle une dichotomie dans la pratique, lorsque le rôle des ressources culturelles pour trouver des solutions climatiques durables est reconnu mais pas opérationnalisé. Cela est dû au fait que le secteur culturel et son potentiel à soutenir d'autres secteurs en gérant les ressources ne sont pas pris en compte dans les actions climatiques.

Mots-clés: planification climatique, adaptation, étude comparative, inclusion du patrimoine culturel

Keywords: climate planning, adaptation, comparative study, cultural heritage inclusion

Climate action is implemented through planning at different scales requiring the participation and collaboration of all sectors of society toward sustainable solutions. However, sectorised governance still influences planning practice and divides into different scientific silos. The dominance of certain sectors prioritising economic development still defines climate strategies and priorities, leaving the administrative status quo unchallenged, and most likely perpetuating unsustainable development patterns. Breaking these patterns and producing innovative collaborations requires a deeper inclusion of cultural resources (CR) alongside technological innovations and institutional reforms¹. CR, provide societies with meaningful links to their urban, rural, and natural surroundings, localising climate action. Particularly, the increasing inclusion of heritage in the 2030 Sustainability Agenda evidences the recognition by other sectors of tangible and intangible heritage potential to orient different social practices, such as individual behaviour, and thus develop place-based solutions whilst legitimising climate policies². This paper presents the HiCLIP pilot project that assessed the governance treatment of cultural factors and the sector's role in 10 climate plans (including mitigation and adaptation). It was developed by the Working Group 4 (WG4) of the Climate Heritage Network (CHN) aiming to help mainstream arts, culture, and heritage into climate planning.

Climate plans are comprehensive roadmaps used by governments to implement global climate goals in local contexts. Plans pinpoint which sectors and actors are to take adaptation and mitigation actions, who -and what- is vulnerable to climate change, and in which spatial contexts actions should be enabled. Culture is seen as an independent administrative entity. In contrast, heritage, art, and indigenous knowledge are mentioned as resources for sustainability supporting education, innovation, and well-being. The role of CR in systemic problems, such as sustainability and climate change, is complex as it encompasses diverse value systems, nature-culture interfaces, ideologies³ and ways of living and organisation³.

HiCLIP considers this complexity in an innovative methodology based on three dimensions designed to systematically identify the dynamics between CR and climate actions across spatial contexts, managerial levels, and governance sectors⁴.

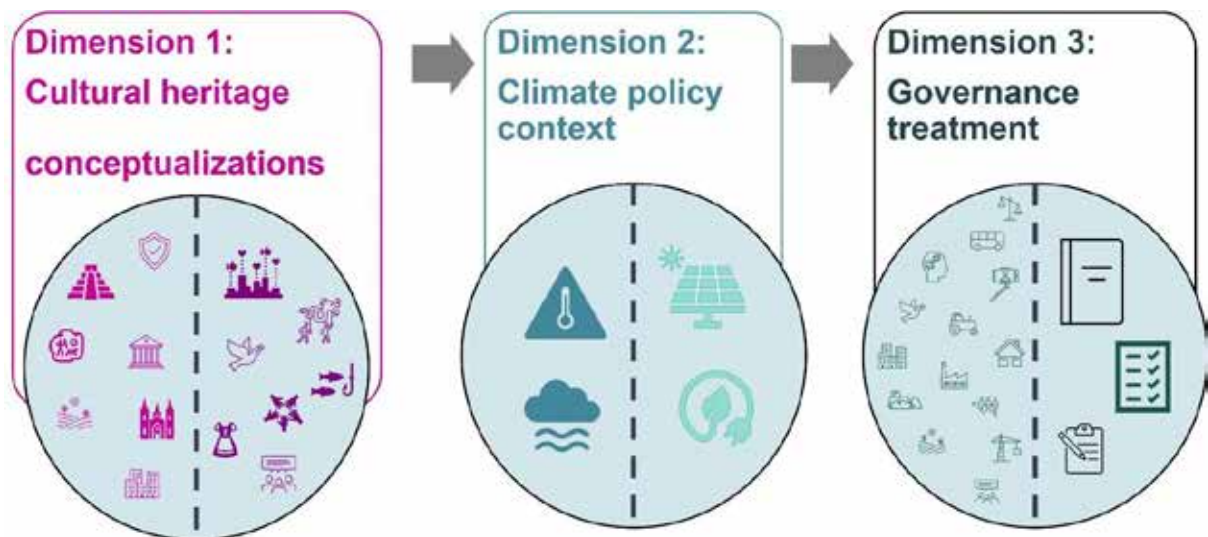


Figure 1. The HiCLIP analytical framework

1) CR in planning; identifies intangible and tangible CR as defined by UNESCO's categories of cultural objects, artefacts of material and intangible or immaterial attributes, as well as associative values⁵.

2) Climate Action Planning; refers to climate mitigation activities targeting the reduction of greenhouse gas emissions, whereas climate adaptation moderates and avoids harm or exploits opportunities that result from climate change and its impacts.

3) Governance and planning mechanisms; assesses the coordination of actions among different governmental sectors (horizontal organisation), and the implementation levels stated in plans according to the technical composition of plans (vertical coordination). These levels are future climate vision (strategies); their operationalisation in concrete steps; and the monitoring level where progress towards a given goal or desired impact is measured⁶.

By articulating the three dimensions (**Figure 1**), HiCLIP adheres to interdisciplinary approaches for descriptive state-of-practice⁷.

The project was undertaken by an international team of 20 volunteers from the WG4 of the CHN. The collaboration consisted of the identification of climate plans for analysis following an online questionnaire sent to ICOMOS climate change focal points and CHN members, and volunteers tested the transfer potential of the framework's accessibility to cultural heritage experts with different backgrounds.

We analysed the following climate national plans: New Zealand, Colombia, Cameroon, Scotland, St Vincent & Grenadines, and Norway. Regional plan: California (USA), and at the local level, plans from Yara (Australia), Lagos (Nigeria), and San Antonio (USA). Results show 17 thematic activities aligning with adaptation and mitigation actions consider CR⁸ (**Figure 2**). Particularly, cultural heritage is increasingly acknowledged as critical for achieving sustainable adaptation, most frequently included by environmental-related sectors. However, explicit definitions of heritage categories, social groups and cultural values are lacking. Moreover, museums, the arts (moveable heritage) and the institutions responsible for their management are absent.

The results point to a dichotomy in which broader administrative sectors increasingly recognise the role of cultural heritage in climate action. Yet, heritage knowledge and expertise are limited to technical considerations in mitigation actions. Despite acknowledging CR in visions for sustainable climate action, the lack of attribution of responsibilities for CR makes their full integration unlikely. Thus, there is an urgent need for more explicit inclusion of types of cultural heritage and the parallel identification of relevant stakeholders to ensure the implementation of integrated actions. The transversality of culture for sustainable climate action is visible in the 17

actions, which show the starting points in which some governments are stimulating collaborations among sectors for more coherent and meaningful climate actions.

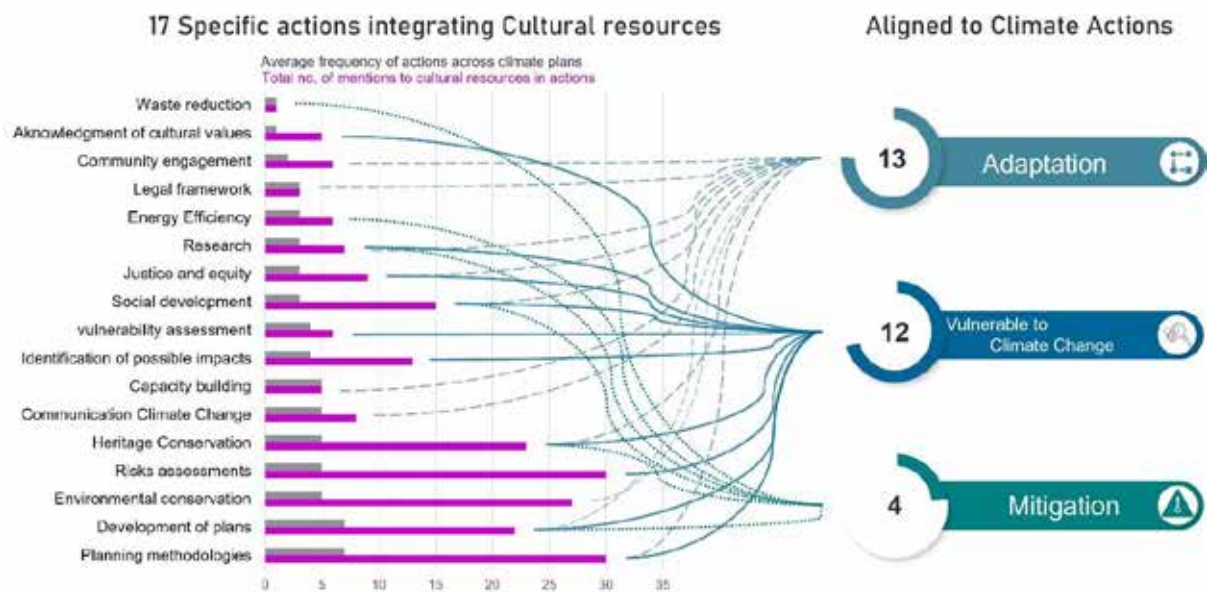


Figure 2. Seventeen thematic actions integrating CR in climate plans

This paper expanded the understanding of the inclusion of CR by different policy sectors in their quest for climate action. Results can help advance and coordinate sustainable action with the culture sector. However, it is necessary for the culture sector to take a proactive role in bringing their knowledge and expertise to coherently support actions, for example, by questioning the role of the sector and industries in unsustainable consumption patterns or widening the identification of cultural values in different contexts. The HiCLIP report⁹ further indicates entry points for transcending cognitive biases in sectorised planning and highlights the potential for more meaningful interdisciplinary collaborations. We hope it will help to support the inclusion of the different CR in climate planning while fostering the exploration of creative and relevant ways to impact society.

Acknowledgements

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Towards Climate Neutral and Resilient Historic Urban Districts

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Résumé

En réponse à la nécessité mondiale d'aborder la résilience et la reconstruction durable des zones historiques pour faire face au changement climatique et aux catastrophes naturelles, un groupe de travail européen de recherche et d'innovation a été créé par les projets Horizon 2020 ARCH, HYPERION, et SHELTER. L'objectif de ce groupe de travail est de combler le fossé entre le développement urbain, la planification de la résilience et la gestion du patrimoine et ainsi de stimuler la collaboration entre toutes les parties prenantes pour rendre nos villes plus neutres sur le plan climatique et plus résilientes. Outre les acteurs impliqués dans les projets de recherche, le groupe de travail invite les praticiens et les décideurs de tous les domaines pertinents à se joindre à la discussion, y compris les autorités européennes, les professionnels du patrimoine, et les organisations du secteur privé.

Mots-clés: quartiers historiques, résilience urbaine, patrimoine culturel, changement climatique

Keywords: historic areas, urban resilience, cultural heritage, climate change

Climate change is the biggest challenge that our planet is facing today. From seasonal shifts in climate to droughts, heatwaves, floods and storms, the impacts of climate change are global in scope and unprecedented in scale. Cities are heavily affected by the consequences of climate change, with most of Europe's population living in cities and urban areas and projections for 2050 predicting even larger shares¹. At the same time, cities generate up to 80% of a country's GDP² but also consume 75% of the natural resources and account for 60-80% of greenhouse gas emissions. That is, urbanisation and economic growth happening in cities are the biggest contributors to climate change. Sites of significant cultural and historical value and significance have an important role to play in fostering location-based identity and social cohesion. With the increased recognition of the threats heritage faces from climate change, but also the role heritage can play in driving climate actions, all those connected to heritage face both a profound opportunity and a challenging responsibility³.

European R&I Task Force Towards Climate Neutral and Resilient Historic Urban Districts: Objectives and Thematic Focus

This Task Force has been established by the Horizon 2020 projects ARCH, HYPERION, and SHELTER, following in the footsteps of earlier projects like STORM and HERACLES. The main objective of the Task Force is to foster the development and uptake of advanced solutions for resilient urban planning for historic urban districts, supporting their adaptation to climate change and making them climate neutral. In doing so, the Task Force aims to support European authorities and decision-makers in developing common evidence-based policies, strategies, and procedures.

It is structured around three thematic areas: strategy development, monitoring and solution, and knowledge co-production. The first thematic area examines necessary

changes and adjustments to existing planning processes to bridge the gap between climate change adaptation, disaster risk, and cultural heritage management. It also focuses on how these processes can be shaped in such a way that they recognise and make use of the intrinsic resilience of historic urban districts under the Historic Urban Landscape approach from UNESCO. The second thematic area deals with how to assess and monitor resilience and associated concepts like risks for historic urban districts and how to measure and monitor progress in resilience building. Finally, the objective of the third thematic is to develop equitable solutions for and with communities, identifying best practices and methods to (better) engage local communities and other actors.

The task force is collaborating with other initiatives, like the Urban Agenda and working jointly in harmonising the resilience thinking approach for historic urban districts, e.g., via CEN workshop agreements (CWA 17727).

Methodology

In the last year, two workshops have been held to identify the main challenges related:

- The Kick-off Meeting workshop (June 23, 2021), where the policy perspective for resilient historic urban districts, scientific gaps in achieving resilience for historic urban districts and on-the-ground challenges for resilient historic urban districts were analysed.
- A second workshop (December 14 and 15, 2021) where the problems, opportunities, and best practices from their daily practice, as well as methods and tools, were analysed through MIRO board exercises in the three thematic areas.



Figure 1. MIRO board exercise

Identified Challenges

The work on these two workshops gives as results the identification of the main challenges to enhance the resilience in historic areas related to the three thematic areas. It was identified that the challenges related to the assessment and monitoring are related to the difficulty of managing a large amount of data that is necessary for resilience and risk assessment. A large quantity of data exists but with different spatial and time resolutions, and it is not easy to balance the complexity of the approaches with the usability and reliability of the models. The inclusion and quantification of cultural heritage in its most comprehensive and inclusive meaning is a challenge still to be solved practically. The importance of community knowledge (including indigenous communities) in resilience assessment is accepted among academia and practitioners, but it is not easy to include it operationally. Starting from the knowledge of stakeholders regarding the way that adaptation to climate change is happening could be the first step. Storytelling is also a very useful way to gather local knowledge.

The challenge regarding how to engage these stakeholders and communities for co-creation is related to the third thematic area. It is important to make the stakeholders believe that they are part of the solution, but the related challenges are not only about lacking technical expertise but also about assigning specific responsibilities. It

is recommended to allow diverse stakeholders to indicate what they value about their place and how they would prioritise impacts and responses considering the different perceptions of risks.

The last identified challenge is related to the role of cultural heritage as a driver for adaptation and change. Although there is agreement about the concept that cultural heritage can function as a powerful contributor to the global resilience narrative, it is difficult getting from theoretical concepts to actionable strategies. Fragmentation and the silos mentality are predominant at the different governance levels, from local to national.

The work of the task force aims to stimulate and promote the development and wider adoption of solutions for climate change mitigation and adaptation in historic urban districts via constructive dialogue and exchange of best practices for integrating resilient urban planning and heritage management. In this way, it will increase the awareness of the role of those historic areas – with their unique value and importance – play in stimulating the general public to actively contribute to coordinated efforts on climate resilience under the protection and preservation of heritage both within local environments as well as nationally and internationally. To contribute to this, as the next step, the task force is currently preparing a policy paper with recommendations to address the identified challenges.

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Edoardo Gellner and the 'Invention' of the Landscape for the 'Former Eni Village'. A Further Vulnerability in Case of Extreme Weather Events

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Résumé

L'étude de l'ancien « village Eni » de Borca di Cadore (BL) en Italie du Nord, construit par Edoardo Gellner dans les années 50, permet une réflexion sur le changement climatique et les questions de préservation à l'échelle d'un bâtiment et du paysage. L'action anthropique de réaménagement du site– caractérisé par des glissements de terrain et un risque hydrogéologique - par Gellner doit maintenant faire face aux nouveaux défis du changement climatique. D'une part, les événements climatiques extrêmes de plus en plus fréquents, comme la tempête Vaia en 2018, ont mis en évidence des vulnérabilités supplémentaires et d'autre part, la variation des paramètres environnementaux modifie les conditions de conservation des matériaux.

Mots-clés: paysage, changement climatique, vulnérabilité

Keywords: Edoardo Gellner, landscape, Eni village, climate change, vulnerability

The Eni Village in Borca di Cadore was built between the late 50s and early 60s, thanks to the political capacity and ambition of Enrico Mattei, an Italian businessman, politician, and public manager. The village was designed by Edoardo Gellner (1909-2004), an Italian architect of Austrian origin who became known thanks to this great and complex architectural work. Moreover, Carlo Scarpa, an Italian architect, designer and academic among the most important of the twentieth century, also collaborated with Gellner on the church's design.

The village is a large compound - over 200.000 square meters - made of different structures, and built, according to innovative criteria, in a large, wooded area by Mount Antelao, about ten kilometres from Cortina d'Ampezzo. For almost a decade, from 1955 to 1963, Edoardo Gellner was engaged in the construction of the village of Borca on behalf of Enrico Mattei's *Ente Nazionale Idrocarburi* (Eni). However, in 1962, Mattei died after a plane crash: the impact of the event and the following lack of strength resulted in a partial realisation of the original plan. The village is an attempt to create an entirely new landscape, and Gellner planned not only the architecture but also the exterior spaces and the urban furnishings. It is an exceptional and unique site in Italy, where the relationship between the natural environment merges with the organic architecture, nowadays almost invaded by the vegetation.

After its abandonment in 1992, it was only in 2000 that a company, the Mi.no.ter S.p.a., which deals with the promotion and development of the real estate market, owned the village. In addition, due to the difficulty of reactivating functions and usage destinations of the site, Mi.no.ter S.p.a. started a collaboration with Dolomiti Contemporanee, founded in 2011, shortly after UNESCO declared the Dolomites a World Heritage site. Through art and its critical approach, Dolomiti Contemporanee aims to provide a new interpretation of those exceptional landscapes. In June 2014, it launched 'Progetto Borca', a specific cultural action on the site¹.

The village is also a case study for the clusterLAB HeModern² at Iuav University of Venice, an interdisciplinary research group that includes Dolomiti Contemporanee. among its partners

The Construction of the Landscape

The original site has been described by Gellner as a dry and rocky terrain with sparse and twisted trees. Despite this, the valley, in addition to a magnificent view, included a great variety of natural environments. Gellner's idea was to safeguard the exceptionally beautiful nature and develop and improve damaged areas, so he reshaped the bare slope into an inhabitable environment. When the buildings were finished, he decided to cover the bare rocky areas with clods of turf, carefully transplanted from the grassy areas on the other side of the valley. The replanted land covers 12% of the total surface area of the village. Another remarkable work is the construction of the retaining walls, built with a combination of concrete and stones. The layout of these walls is unusual: they are aligned with the buildings, not with the streets. It helps link these secondary structures to the landscape and the architecture so that they take on an architectural value in themselves, rather than looming over the road³.

Gellner was very satisfied with the results. What he had considered a point of arrival in the complicated process of generating an anthropic landscape soon turned out to be only the beginning of a phenomenon that led to a radical transformation of Borca from an architectural and site-planning event to a naturalistic one.

Climate Change and Extreme Weather Events

The important anthropic action of the redevelopment of the area - characterised by landslides and hydrogeological risk - implemented by Gellner is now facing the new challenges of climate change. The village continued to perform its tourist function until 1992, but it was then abandoned so that nature has covered many spaces without any

maintenance. Today it is only partially used by Dolomiti Contemporanee for artist residences and openings to the public.



Figure 1. View of the site (in particular the Holiday Camp building called 'Colonia') a few days before the Vaia storm (2018) © Arch. Ettore Focaccia

In October 2018, the territory of the Italian northeast was heavily damaged by the Vaia storm⁴, which also affected the site of the village Eni. The increasingly frequent extreme weather events, such as the Vaia storm, have highlighted further vulnerabilities of the site, causing more pronounced damages in the areas most transformed by the project and endangering many of the architectures⁵. A reference in the National (Italian) Plan of Adaptation to Climate Change (PNACC) shows that 'the climate change effects are in most cases only an exasperating factor of past criticality due in large part to short-sighted planning and management of resources'⁶. It is therefore clear that the planning of maintenance and monitoring activities is a priority at all scales: territorial, urban, and architectural.

Moreover, the variation of environmental parameters is changing the conditions of conservation of the materials, overlapping with the natural ageing and degradation of the buildings, accentuating pathologies, and altering phenomena in the constituent materials.



Figure 2. View of the site (Holiday Camp building called 'Colonia') after the Vaia storm (2018) © Arch. Angelo Paladin

The village is an emblematic case both of the 'invention' of the landscape and, on an architectural scale, of the interpretation of rural architecture located in the Veneto Dolomites, which Gellner had carefully studied⁷. In rural architectures, analysed in detail by Gellner to design new ones, an intrinsic resilience to climate change can be found with local construction techniques and materials. However, this is impossible for contemporary architectures where an adaptation action must be considered to preserve them.

The debate on the 'safe conservation' of built heritage, characterised by reflections on the occurrence of natural disasters, should reconsider the methods of vulnerability analysis (seismic, hydrogeological, etc.) due to the concomitance of several factors that cause phenomena of exaltation, such as the absence of maintenance and the presence of inconsistent transformations. As a starting point, it is clear that the study of the history of

architecture, from the project to its most recent transformations, is an indispensable tool for identifying vulnerabilities and strengths.

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**Le patrimoine culturel
dans un contexte changeant**

**Du déclin au renouveau :
patrimoine culturel et régénération urbaine.**

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**From Decline to Revival:
Cultural Heritage and Urban Regeneration.**

Building up the Integrated Approach for Heritage-Driven Urban Development and Regeneration

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Résumé

La façon dont le domaine du patrimoine a évolué au cours des dernières années, avec de nouveaux concepts tels que la valorisation du patrimoine et le paysage urbain historique, donne une excellente occasion à l'héritage culturel de travailler massivement en tant que moteur du développement durable en milieu urbain. Pour que cela se produise, c'est-à-dire pour que le développement et la régénération urbaine axés sur le patrimoine fonctionnent, il se doit de mettre en place et intégrer une approche intégrée dédiée. Dans le cadre du programme URBACT financé par l'Union Européenne, un certain nombre de villes de taille moyenne ont fait cette tentative en rassemblant cinq dimensions clés : l'espace, l'économie, la cohésion sociale, l'attractivité et la gouvernance. La question est de savoir comment une conception plus large du patrimoine bâti peut contribuer de manière significative à chacun de ces dimensions.

Mots-clés: patrimoine urbain, valorisation du patrimoine, régénération urbaine, développement durable, gestion de site culturel

Keywords: urban heritage, heritage valorisation, urban regeneration, sustainable development, site management

Change of Paradigm

Two major changes have affected the heritage field over the past years. The first one concerns a change of scale. Today, the spotlight is not only focused on the building and the monumental artefact but also on the urban fabric and the idea of 'historic urban landscape'. The second is a change of purpose, meaning that valorisation, and eventually adaptive reuse, are now as relevant as preservation. Thus, the best preservation policy is the one that re-connects heritage to the contemporary city in terms of use and function. Hence, more than just a stock of the past, heritage is now addressed as a history of transitions and should be managed as such. Such a transitional or dynamic approach understands heritage as a living memory and, therefore, is valuable to building the future. This idea fits that of circularity and sustainable development.

The Idea of Heritage-Driven Urban Development

Both changes above mentioned are leading to a change of method. In order to fully embrace the multi-faceted nature of heritage valorisation, within the complexity of today's urban space, an integrated approach is needed more than ever to spread the idea of heritage-driven urban development and regeneration work. However, such an integrated approach, which might lead to new ways of policymaking and planning figures, is not yet mainstream. The heritage management area is still mainly addressed from two poles, cultural policy, with an emphasis on conservation, and urban planning, biased toward land use and regulation.

At this point, there is a growing interest from cities, whatever their size is or if enlisted as World Heritage, in developing a more balanced and integrated approach to maximise the role of heritage in building the future. That is the case of the KAIRÓS five-pillar model (Space, Economy, Attractiveness, Social Cohesion and Governance) which is proving to be helpful in driving action-oriented planning in a variety of

circumstances and local needs. For instance, to revitalise the old town of Šibenik in Croatia, which is affected by depopulation, tourism-driven gentrification and lack of urban vitality during the low season, or for the town of Mula in Spain, to halt and revert the vicious circle of degradation that is affecting the so-called historic Barrios Altos.¹

The Right to Make the City

Out of the five pillars above mentioned, Space refers to urban planning and urban design (also the catalogue of carbon-neutral and smart urban solutions), and deals with the preservation and production of an urban form. Both preservation and valorisation of built heritage and production of new urban space may reinforce one another in a sort of dialectic relationship - others can refer to this as harmonic layering. Thus, regenerating Mula's Barrios Altos, with a badly degraded housing stock, does not entail preserving everything at any cost. New needs in terms of accessibility or public space may demand specific changes over the inherited fabric.

To reconnect with the contemporary, the heritage city has the right to redesign the city. That is the aforementioned transitional approach. However, this idea is not always well received. In this regard, a vivid discussion took place ten years ago between the Sevilla City Council and the International Council on Monuments and Sites (ICOMOS) because of the construction of the first skyscraper in the city (seven hundred thousand inhabitants, one million five hundred thousand in the metropolitan area) in a location outside the buffer zone and in the historic urban fabric which could impact the 'perception' of the World Heritage Site.²

A Social-Driven Approach to Heritage Valorisation

A major element arising from the work done in two large-scale transnational European projects (ROCK involving big cities³ and KAIRÓS smaller cities) is that promoting better social access to cultural heritage has the effect of expanding the portfolio of

heritage valorisation projects, and that is key to develop a city perspective to cultural heritage. Furthermore, this social-oriented approach leads to the concession of a primary role in heritage-driven urban regeneration to housing. In this regard, we need bolder schemes to retain the residential use in our historic quarters and face Airbnb-driven gentrification. That is the case of Porto in Portugal, which is delivering a disruptive housing policy specific for the historic centre aimed at stopping depopulation and the degradation of the housing stock in the area. The programme is called *Porto com Sentido* and runs as follows. On one side, the local public agency Porto Vivo engages homeowners with tax exemptions to pay their rents close to the market value, anticipating these rents for up to two years, and ensuring full maintenance during the whole contract period of five years. On the other side, Porto Vivo sublets those properties, in good conditions and excellent locations, at affordable rents, with values at least twenty per cent below the market prices.

Taking the Time to Experiment

This is the main lesson from Bologna, which is likely one of the most unprejudiced cities in giving heritage a new wider social accessibility. For instance, the Municipality of Bologna's decision to regenerate and give new life to Villa Aldini, an abandoned Napoleonic mansion on the city hills, is firm and has no way back, but they are not in a hurry. They are now in a sort of initial stage of experimentation to find out how the place can be appropriated and used at its best. In order to achieve this goal, the site has been offered for temporary cultural events and residence for artists and theatre companies. It is like a 'consultation to the market' that provides a more solid base for the adaptive reuse project.

Around Via Zamboni, at the heart of the World Heritage Site 'City of Porticoes', the Municipality also promoted a number of 'tactical urbanism' types of interventions with the aim of getting some historic squares free from the massive car occupation. The

pilots were so enthusiastically welcomed by the people and the local media that they turned into permanent and scaled up to other districts. Stakeholders like Bologna Opera House were also involved in experimental actions and proofs of concepts to broaden the social usability of heritage. It's worth noting that these initiatives came out from an Urban Lab specifically devoted to supporting a heritage-driven regeneration strategy in the area.

Approaching cultural heritage valorisation, in all its dimensions, as a policy concept is a way to fully realise the potential of heritage for sustainable urban development, along with building up a dedicated and sound integrated approach. The latter will demand a triple endeavour: a) policy mix, the five pillars above mentioned can offer a path which most likely will require organisational adjustments in the local government to break the common thinking and performance; b) stakeholder involvement, leading to a more relational style of policies implementation; c) and multi-level governance, meaning better alignment and funding orchestration since there is no urban regeneration or area development without a significant public investment mobilisation.

Back to Bologna and its way of engaging relevant stakeholders: to provide direction and back the Villa Aldini project, a working group has been set up, including the Municipality, the University of Bologna, Villa Ghigi Foundation, the Foundation for Urban Innovation, Cineteca Foundation, Teatro Comunale, the Metropolitan Authority, the Emilia-Romagna Region and the Italian Ministry of Culture, together with the contribution of the residents. One might say that this is an example of sophisticated governance, but it actually is the easiest way to make an impact, is not it?

¹: KAIRÓS is a URBACT Action Planning Network of cities joined by Mula (ES) as lead partner, Šibenik (HR) Heraklion (EL) Cesena (IT) Malbork (PL) Ukmergė (LT) and Belene (BG).

² This idea can also be posed as the need for better methodological frameworks to make preservation goals more compatible with the contemporary city or 'today's over-arching global priorities' in Dennis Rodwell's words. In this attempt, UN-Habitat and the New Urban Agenda can show a path, rather than only UNESCO. See RODWELL, Dennis, (2018) *The Historic Urban Landscape and the Geography of Urban Heritage*, *The Historic Environment: Policy & Practice*, 9:3-4, p180-206.

³ ROCK project - Regeneration and Optimization of Cultural heritage in creative and Knowledge cities. H2020-SC5-2016-2017 GA 730280. Ten cities were participating in ROCK: Bologna as lead partner, Lisbon, Skopje, Athens, Cluj-Napoca, Eindhoven, Liverpool, Lyon, Turin and Vilnius.

Défis et opportunités dans la préservation du patrimoine culturel industriel après l'ère de la désindustrialisation. La réintégration dans le tissu urbain de deux anciens sites industriels en France : l'île de Nantes et les Docks de Seine

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Abstract

This paper questions the meaning of 'industrial cultural heritage' in former industrial cities, both in terms of industrial heritage preservation and in relation to current urban planning and sustainable development policies. Our research proposes a critical examination of two industrial site transformation programmes, the 'Ile de Nantes' and 'Docks de Seine' (Saint-Ouen) projects. We conclude that the objective of urban growth in former industrial cities could be achieved through the preservation of the 'industrial cultural heritage' and the creative activities proposed by local authorities and developers, including research centres and museums.

Mots-clés: patrimoine industriel, désindustrialisation, développement durable, participation citoyenne, France

Keywords: industrial heritage, deindustrialisation, sustainable development, citizen participation, France

Le départ de l'industrie n'a pas que des conséquences économiques, politiques et sociales liées au chômage mais laisse aussi des marques profondes dans la société. Les conséquences de ce phénomène ont eu un impact différent sur les villes selon leur modèle de développement économique. Dans ce cadre, la question du renouvellement urbain fait suite à plusieurs tentatives de réhabilitation et de rénovation qui n'ont pas permis de modifier les caractéristiques sociales des villes industrielles. Selon l'urbaniste Agnès Berland-Berthon, un entretien insuffisant provoque une dégradation qui entraîne la paupérisation qui devient elle-même un motif de réhabilitation¹. L'historien Antoine Prost a exprimé à son tour, lors des rencontres de la Délégation interministérielle à la ville en 2004, son inquiétude face à la démarche de renouvellement urbain, trouvant dangereux de refaire des quartiers sans commencer par chercher à comprendre comment et pour quelles raisons ils ont été faits². La question qui émerge est comment les anciennes villes industrielles pourraient devenir durables tout en conservant les traces de leur passé industriel.

Cette recherche s'inscrit dans la thématique du patrimoine et en particulier, de la réintégration dans le tissu urbain des sites avec une identité spatiale et sociale particulière. La préservation de l'identité de ces sites spécifiques renvoie à la mémoire collective et concerne la forme et les groupes sociaux auxquels s'adressent ces espaces urbains³. La compréhension et l'interprétation des zones plus larges dans lesquelles les anciens sites industriels sont inclus permettent d'enregistrer des éléments structurants de l'espace qui, à leur tour, sont les axes principaux des programmes de renouvellement⁴. Dans ce contexte, nous pouvons identifier deux axes dans les programmes de renouvellement des anciens sites industriels que j'ai retenus pour ma recherche : la préservation de l'identité historique et les perspectives du futur développement des villes désindustrialisées.

La méthodologie de la recherche prend la forme d'enquêtes bibliographiques sur l'aménagement des sites industriels en France, les conséquences de la désindustrialisation sur l'organisation des villes et le réaménagement des sites industriels dans le cadre du développement durable. Nous avons également mené des enquêtes de terrain auprès des acteurs concernés par les cas de l'île de Nantes (Loire-Atlantique) et des Docks de Seine (Saint-Ouen, Seine-Saint-Denis), qui incluent l'analyse documentaire, l'analyse des sites et les entretiens semi-directifs.

La préservation de l'identité historique

Dans le cas nantais, on observe depuis le début des années 1990 un fort engagement des associations locales d'anciens ouvriers, des chercheurs, des élus locaux et de la première équipe de maîtrise d'œuvre, l'atelier Alexandre Chemetoff, dans les processus de préservation du patrimoine industriel local. Cet engagement a conduit à une culture de préservation du patrimoine industriel à travers la réhabilitation d'anciens bâtiments industriels, des publications et des expositions sur les conditions de travail et la vie sociale des anciens ouvriers.



Figure 1. Nantes, La Maison des hommes et des techniques réhabilitée © Varvara Toura, 2019

Dans le cas audonien, on observe depuis le début du projet, en 2005, un engagement fort des entreprises locales, des associations d'habitants, des élus locaux et des historiens qui travaillent à la direction du Patrimoine culturel de Seine-Saint-Denis dans le domaine de la préservation du patrimoine industriel local. Plusieurs politiques ont été mises en place comme la réhabilitation d'anciens bâtiments industriels et la publication d'ouvrages, tandis que dans le même temps, les jardins des anciens ouvriers industriels ont été intégrés dans le plan de renouvellement du quartier par l'atelier Makan Rafatdjou.



Figure 2. Saint-Ouen. Les jardins des anciens ouvriers industriels, © Varvara Toura, 2019

Les perspectives du futur développement des villes désindustrialisées

Les entretiens que j'ai menés à Nantes ont montré que le financement du programme de renouvellement de l'île de Nantes par des fonds de l'Union européenne a permis aux trois équipes de maîtrise d'œuvre d'expérimenter et de proposer de nouvelles politiques territoriales pour le renouvellement du site. Ces politiques incluaient la création d'écoquartiers, l'engagement des citoyens dans les processus de conception, notamment celle des espaces publics, ainsi que la croissance économique et sociale du quartier, après plusieurs années de récession, à travers la création d'instituts de recherche, d'industries et de musées industriels. Cette transition vers un nouveau modèle de développement économique s'est également traduite par l'augmentation de la population de la ville.

Dans le cas d'étude de Saint-Ouen, l'inscription des Docks au programme du ministère de l'Environnement pour la création d'écoquartiers a permis à l'équipe chargée de la maîtrise d'œuvre de faire l'expérience de nouvelles politiques territoriales. La ville de Saint-Ouen, et particulièrement le quartier des Docks, s'inscrit dans le périmètre du projet du « Grand Paris », ce qui se traduit par la création d'un pôle énergétique d'intérêt métropolitain sur le site des Docks. Les nouvelles politiques territoriales incluaient l'engagement des citoyens dans les processus de conception des espaces publics du quartier en même temps que la croissance économique du quartier avec la création du pôle énergétique et les visites guidées des monuments industriels locaux. La transition vers un nouveau modèle de développement économique a également entraîné l'augmentation de la population de la ville.

Les deux cas d'étude présentés nous montrent que l'implication active des acteurs locaux dans les projets de renouvellement urbain pourrait amener à

de nouveaux modèles en architecture et en urbanisme, centrés sur les besoins des usagers tout en préservant les traces du passé industriel. Notre recherche aboutit à la conclusion que l'objectif du développement économique et social des anciennes villes industrielles pourrait être atteint en appliquant un modèle d'aménagement durable qui combine activités créatives et préservation du patrimoine industriel.

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Toward a Post-Growth Heritage

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Résumé

Le rétrécissement des centres-villes historiques est un phénomène majeur en France. Ces dernières années, des programmes de revitalisation (Action Cœur-de-Ville et Petites villes de demain) ont mis ce phénomène à l'ordre du jour national. Cet article décrit les changements en matière de protection du patrimoine en France, un pays occidental en post-croissance. La méthode d'enquête choisie est mixte, basée sur une analyse quantitative à l'échelle nationale, trente-sept entretiens semi-structurés et une analyse de la littérature grise à l'échelle locale (Villefranche-de-Rouergue et Thiers). Le concept de patrimoine post-croissance nous amène à réfléchir à l'adaptation des outils et des méthodes pour conserver le patrimoine urbain dans nos sociétés post-croissance.

Mots-clés: centre-ville, rétrécissement urbain, gestion du patrimoine, marketing du patrimoine, Villefranche-de-Rouergue, Thiers

Keywords: city centre, urban shrinkage, heritage management, heritage marketing, Villefranche-de-Rouergue, Thiers

The French Paradox

Many of us have already experienced walking through a historic centre where there are no longer any shops, and the buildings are in poor condition. This outlines the major paradox about heritage protection in France and makes it an interesting case for studying heritage in a situation of shrinkage. On the one hand, France has been a leading country in cultural heritage protection since the 19th century (national identity construction). The cultural tourism sector is now worth fifteen billion euros and represents around 100,000 jobs in the country¹. On the other hand, France's urban and territorial shrinkage is still a process that leads national and local policies to ill-adapted solutions. As a systemic and 'glocal' phenomenon², urban shrinkage questions tools and methods of heritage conservation in France - considering they have been mainly developed with urban renewal programs³ during the *Trente Glorieuses*, a period of strong economic and demographic growth. This article attempts to outline the contours of post-growth heritage, understood as a new paradigm of reflection and action.

The mixed-method is based on both quantitative (uni-variate statistical analysis on the national scale) and qualitative analysis (thirty-seven semi-structured interviews and grey literature analysis on the two local-scaled cases of Villefranche-de-Rouergue and Thiers). Whether the analysis is on a national or local scale, the studied samples concern historic centres subject to the only urban heritage protection national regime in France, that of Remarkable Heritage Sites (RHS).

Urban heritage Shrinkage is a Growing Issue

On the scale of the metropolitan territory, the shrinkage of protected historical centres is a major phenomenon. The quantitative analysis of demographic trends shows that shrinking RHS historic centres have increased since 2006 (**Figure 1**). These centres now represent fifty-two per cent of the six hundred eighty-two RHS in France.

As a consequence of this shrinkage, the increase in residential vacancy questions the tools of urban heritage protection in France, as they are largely based on an incentive for rental investment through tax exemptions. Moreover, the abandonment of these centres leads to the ruin of their architectural and urban heritage. This is all the more worrying as heritage is proving to be a key resource in the sustainable transition of our productive system⁴.

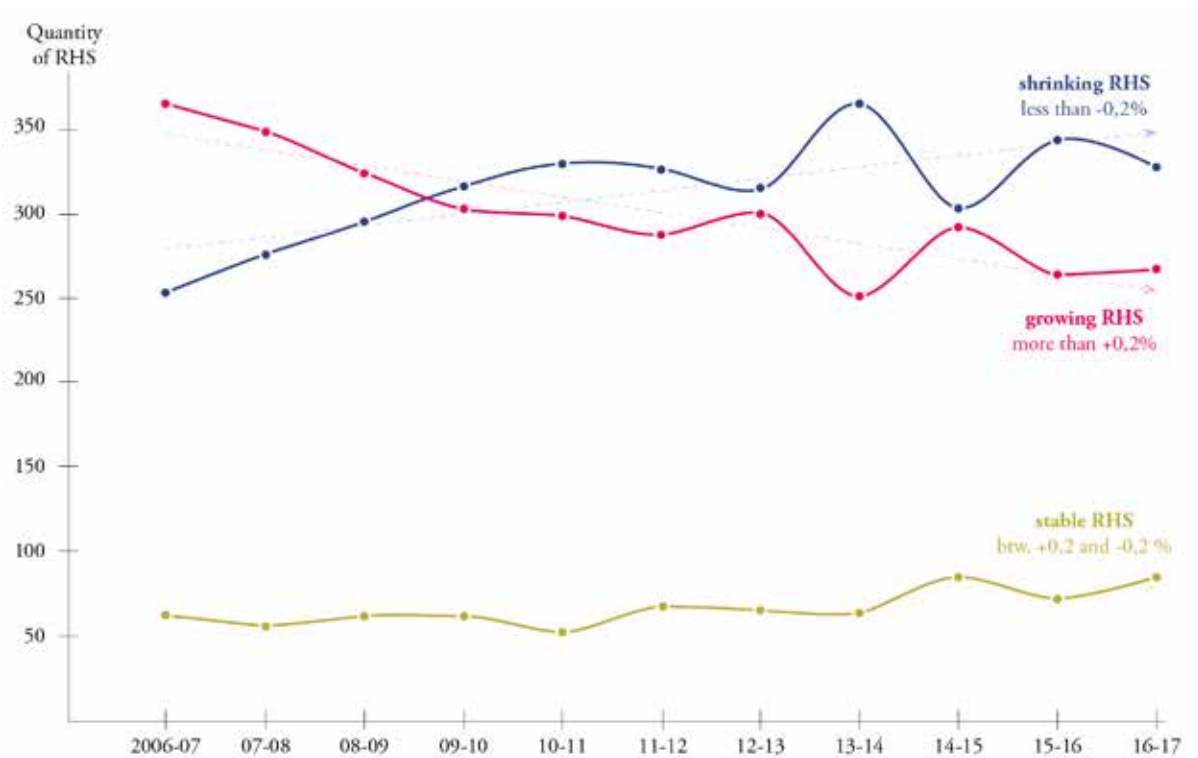


Figure 1. RHS categorisation following their annual demographic trend- Source: author (data: INSEE)

The Deterritorialization of Heritage: a Long-Term Process

The historic centres suffer from a deterritorialisation process⁵ that started in the 1950s. In Villefranche and Thiers, this phenomenon has been translated by a progressive externalisation of traditional city-centre functions and its specialisation in the tourism industry.

This process originates from applying modernist urban theories based on the International Congresses of Modern Architecture (CIAMs). These congresses

promoted an anti-urban system based on the disaggregation of the city through the creation of mono-functional areas. The first urban function to be outsourced from the historical centres was industry. The first zones were created as early as 1964 to move polluting activities away from residential activities. Housing is the second function that was outsourced. The 1960s and 1970s saw a massification of housing production, encouraged by successive national plans. At the same time, bypass roads were built to relieve the flow of vehicles in the old centres, which were not adapted to car traffic. The construction of these bypasses marginalised the historic centres a little more from the flows and, at the same time, favoured the creation of commercial zones in the early 1980s. The decentralisation process that started in 1982 led the State to reduce its allocations to the municipalities and transfer its competency in urban planning. Local authorities were, then, economically forced and legally allowed to develop their commercial, residential and industrial suburbs to increase municipal revenue thanks to professional and housing taxes. At the same time as this withdrawal from the budgets of the municipalities, the State also favours the reduction, or even the disappearance, of public services that were previously located in the city centre.

The current crisis in French historical centres results from a long-term process implemented by both national and local authorities. Deprived of their complex and traditional central functions, historical centres are now *de facto* reduced to their sole tourist function.

The Commodification of the Past

The abandonment of the State, whose human and financial resources are focused on metropolises, led French towns to develop heritage marketing strategies⁶ with more or less clear structures.

These strategies aim to promote an image of the town through its heritage which makes hypothetical visitors want to invest or even live in the historic centre. The targeted consumers are mainly people who can support local consumption and maintain their buildings, unlike the local population, often in a precarious situation. These strategies consider heritage no more as a common good to be preserved but as a resource anchored in the territory that can be exploited for economic purposes. These marketing strategies force local public actors to mobilise the maximum variety of tools at their disposal. These tools can be economical (tax exemption), symbolic (labels), engineered (help for investment project implementation) or cultural (festivals).

This commodification takes place in a long-term process which leads the dominant conservative paradigm toward transformative logic (**Figure 2**). Today, city centres witness the transformation of the role of heritage for the French State, from a part of the national identity (19th and 20th centuries) to a marketing tool for the global competition. But the very essence of marketing is to adapt a product to the demand; this approach questions the future of a heritage that is decorated with the uses of our present time by nature.

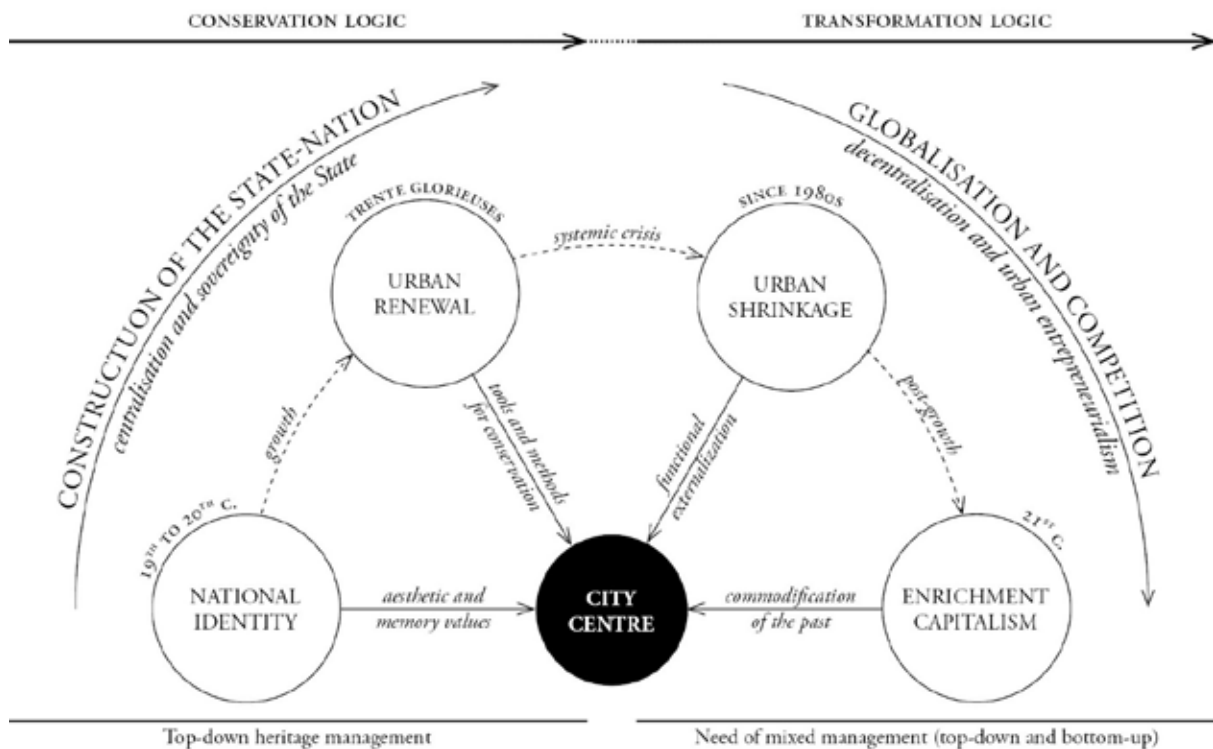


Figure 2. Post-growth heritage: a new paradigm of reflection and action - Source: author
A New Heritage Paradigm

National and local analysis reveals that the traditional tools of urban heritage protection are not relevant anymore in shrinking territories. These tools focus mainly on buildings instead of understanding the local social complexity. Furthermore, this focus seems inefficient as the real estate market is not sufficiently tight in shrinking towns for these tax incentives or exemptions to be of interest. Conservative approaches are also becoming less understood. Local actors and inhabitants increasingly question the legitimacy of the *Architecte des bâtiments de France*, whose role is to ensure the proper application of heritage regulations in RHS. The emerging transforming logic operates a physical and social selection in town centres, leading to a standardized 'town centre' product.

RHS centres of shrinking towns offer an interesting angle for analysing the evolution of our society and its relationship with its past. These changes witness the deep transformations of our economic model toward capitalism of enrichment⁷. This new

paradigm makes heritage a new territory for economic exploitation in a post-growth society still haunted by the ghosts of its past.

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A Micro-Museum Quarter in Sombor, Serbia, as a Sustainable Model for Managing Cultural Heritage in Small Shrinking Cities in Europe

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Résumé

Le quartier-musée est présenté comme un modèle efficace pour la régénération des grandes métropoles. Néanmoins, il n'a jamais été appliqué aux plus petites villes ou aux villes en décroissance dont les sites patrimoniaux sont pourtant d'une grande richesse. Ces villes deviennent une « nouvelle normalité » dans le paysage européen et font face à des restrictions institutionnelles, organisationnelles et économiques. Construire des quartiers-musées à une micro-échelle dans de telles villes pourrait être une solution pour surmonter ces restrictions. Cet article présente un micro quartier-musée émergeant dans la ville historique de Sombor en Serbie où l'initiative a pris racine au niveau local afin de lutter contre la rapide décroissance de la ville.

Mots-clés: quartier-musée, villes en décroissance, petites villes, régénération, urbanisme

Keywords: museum quarter, shrinking cities, small cities, regeneration, urbanism

Urban shrinkage is a new `normality' for Europe. Smaller and more remote cities which are losing population due to economic, institutional, and administrative constraints particularly dominate in the Eastern post-socialist half of Europe¹. Consequently, such cities had to plan their future in line with this challenge. This also includes the issue of cultural heritage, which is paradoxically well-preserved in many such cities, as they have not had recent intensive development. Hence, its sustainable protection and utilisation are imperative for the desired regeneration of these cities².

Forming a museum quarter is one of the sustainable models to regenerate cities with rich cultural heritage. Museum quarters are the areas that include (1) high-profile museums, (2) usually housed in the valuable historic buildings or complexes, (3) which are further located in inner urban cores with (4) extraordinary accessibility, and (5) surrounded by well-designed open public space³. By this definition, they are similar to the other culture-led models of urban regeneration, such as museum districts, museum clusters, and cultural or creative quarters.



Figure 1. Famous museum quarter in Vienna, © B. Antonić

Museum quarters are still a phenomenon in bigger cities (**Figure 1**). Therefore, the aim of this paper is to examine how this model can be customised to small heritage cities in a more rational approach to address the aforementioned local constraints. This is further exemplified by a micro-museum quarter in the city of Sombor in north-western Serbia.

This research is a single case study. A set of criteria to examine the case of the Sombor quarter is derived from two given theoretical discourses, by which a micro-museum quarter had to:

1. Include the museum of the highest significance at the local/regional level;
2. Be housed in the buildings which are officially cultural heritage;
3. Be located in a well-defined historic urban core;
4. Have an urban character – several buildings with intermediate open space;
5. Reuse old buildings and spaces;
6. Be formed and maintained in a strategic manner;
7. Be in an area of higher urban density;
8. Include at least one 'thematic museum';
9. Be a revitalising force for its urban surroundings; and
10. Be developed as a private-public partnership.

Sombor is one of twenty-eight official cities in Serbia. It is also a borderland city, close to Hungary and Croatia. This location has negatively impacted the city; Sombor has lost approximately fifteen per cent of the population since 2000.

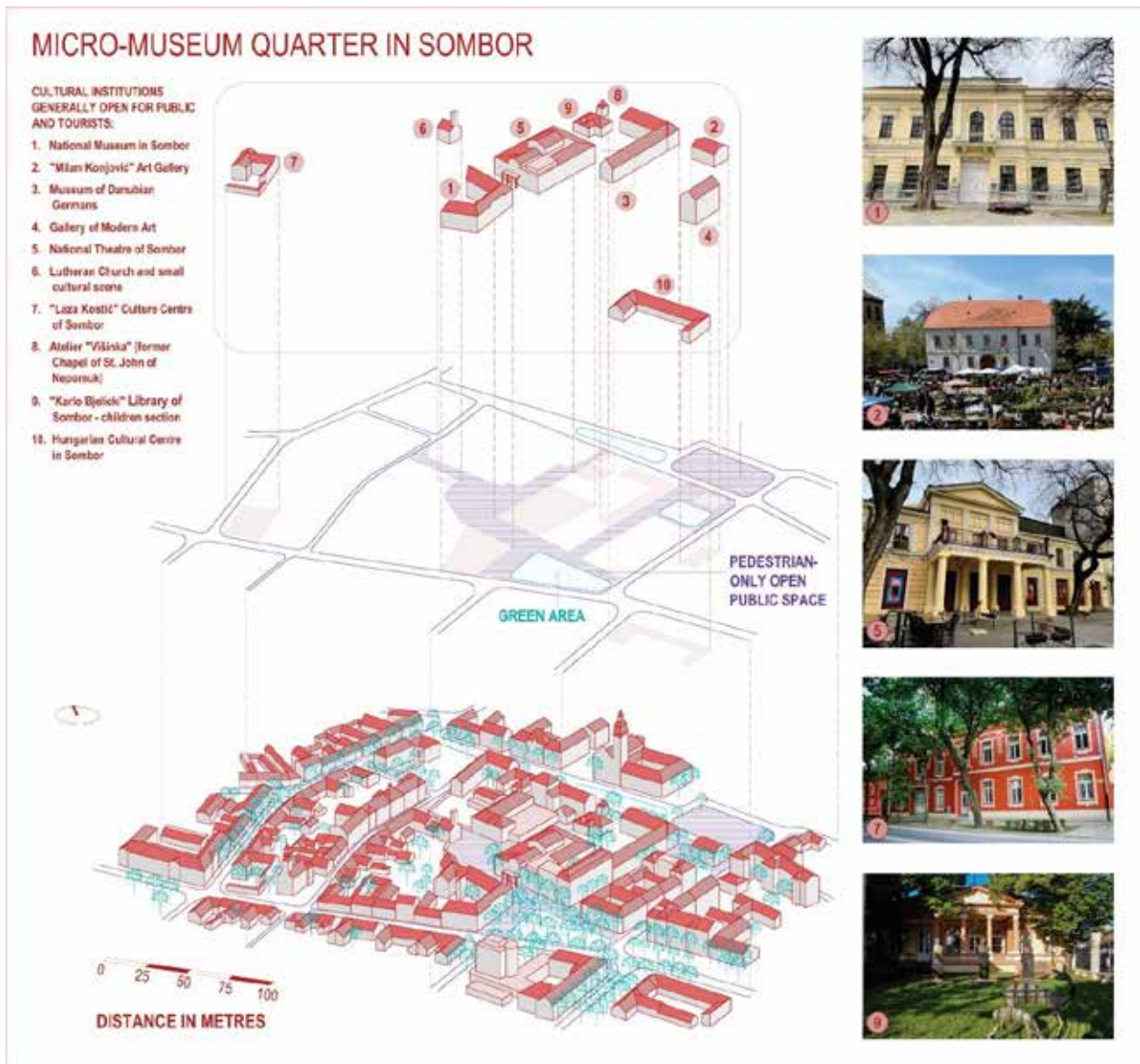


Figure 2. Micro-museum quarter in Sombor © B. Antonić

On the other side, Sombor has the best-preserved historic core among middle-size cities in Serbia, known as 'Venac' (Coronet), as it is surrounded by four boulevards with rich greenery. The city has been an important cultural hub in Southern Pannonia since 1749, when it gained free city status⁴.

The micro-museum quarter has been developed in an old administrative area in the western part of Sombor core, close to the main street. Many historic buildings in this area have already housed cultural institutions. However, city authorities started the new 'wave' of urban regeneration of the area in 2009, by adopting a new detailed plan, adding two new museums, and refurbishing and pedestrianising the entire open public space between the main buildings (**Figure 2**). They have opted for a more rational, microscale project. The project is currently entering the second phase, where the elements of creative industries and Small and Medium-sized Enterprises (SMEs) in the tourist sector are targeted in the form of private-public partnerships.

Considering the criteria, the micro-museum in Sombor completely satisfied five of them (1, 2, 3, 4 & 7). Four criteria are partly satisfied; (criteria 5) there are still empty or semiempty buildings, (6) the strategy needs an update, so a new plan is in preparation, (8) 'thematic museums' are small and still underrepresented, and (9) the revitalisation of urban surroundings is still slow due to a gap between private ownership and public interest. Criterion No 10 about private-public partnerships is the only which is not satisfactory, but it is planned for the future.

The analysis implies that the urban project in Sombor can be labelled as a micro-museum quarter. It thus shows that well-known concepts and models of culture-led urban regeneration, usually implemented in bigger cities, can also be successful in smaller shrinking cities. A key element is the use of a spatially rational approach – micro-scale – primarily initiated and strategically developed by the city itself, with a certain awareness regarding local constraints.

The research also emphasises the elements of micro-museum quarters that are crucial for the cities of similar size and historical value. The first one is that a museum quarter should be developed in the historic fabric that is not the main retail and shopping zone, so it can develop its own identity. Second, open public space in the quarter is not just one of its segments; it is important for the new identity, as it unifies all points of the quarter as a unity. Third, many small cities usually rely on general (regional or municipal) museums as a core of their culture scene; nevertheless, it seems that thematic museums are more appealing for prospective users. The last, although the public-private partnerships are an important and useful tool for project implementation, small shrinking cities are usually unprepared for this step, so they need the support of higher level – national, regional, international.

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**Le patrimoine culturel
dans un contexte changeant**

**Quand la culture rencontre la nature :
les paysages culturels en question.**

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**When Culture Meets Nature:
The Cultural Landscapes in Question.**

Penser l'avenir d'un site touristique :
le cas de la Fontaine de Vaucluse (Vaucluse, France)

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Abstract

Nestled in the heart of the Monts de Vaucluse, the 'Vaucluse Fountain' is an exceptional natural site with a mysterious resurgence, an object of worship, poetry and valorisation since antiquity. A former industrial site, this rehabilitated haven of peace, listed in 1922, is now facing a massive flow of tourists. The left bank of the Sorgue is, thus, concerned by one of the first management and conservation actions within the framework of an 'Opération Grand Site de France' to combine, around a common territorial project, mass tourism, sporting practices, protection of the landscape and biodiversity and cultural valorisation.

Mots-clés: patrimoine naturel, tourisme, environnement, valorisation, gestion du tourisme

Keywords: natural heritage, tourism, environment, valorisation, tourism management

Au cœur d'un village autrefois appelé « Vaucluse », au pied d'une falaise de 238 mètres de haut surgit une rivière mythique, vénérée et admirée depuis l'Antiquité, la Sorgue. Celle-ci dévale alors un paysage naturel exceptionnel qui forme la « vallée close ». Ce cadre pittoresque attire l'œil en quête d'un panorama sensible, voire poétique, depuis des siècles.

Néanmoins, c'est la « fontaine » de Vaucluse qui intrigue. Cette dernière est le principal exutoire des eaux souterraines d'un impluvium karstique de 1 200 km² qui comprend, entre autres, le mont Ventoux et le plateau de Sault. La réunion de ces multiples origines hydrauliques entraîne un débit annuel cumulé exceptionnel, plaçant la source de la fontaine de Vaucluse au premier rang européen. Cette particularité participe à sa renommée : en effet, le site accueille environ 800 000 visiteurs par an. Cet afflux de visiteurs pose de nombreux problèmes (omniprésence de voitures, pollutions, piétinement, etc.) alors que la gestion touristique n'est aujourd'hui pas optimale.

Dans ce contexte, le site de la « Fontaine de Vaucluse » et que l'on distingue de la commune de Fontaine-de-Vaucluse, fait actuellement l'objet d'une « Opération Grand Site » (OGS) ayant pour objectif de restaurer la qualité paysagère du site et d'offrir une meilleure gestion touristique des lieux.

Découvrir un site naturel d'exception

Au cœur du département de Vaucluse, le site touristique de la Fontaine de Vaucluse est situé dans une série de chaînons montagneux qui caractérise la géographie de cette région méditerranéenne. Les eaux de la Sorgue jaillissent du fond du gouffre de Fontaine-de-Vaucluse qui ferme la « vallée close », cirque taillé dans la roche calcaire et composé de falaises et de pitons rocheux. L'ensemble forme un paysage naturel monumental, entre omniprésence de l'eau et bordures rocheuses qui

donnent à la vallée toute sa poésie et sa majesté. Toutefois, la féerie des lieux fait place au mystère qui l'entoure. Cette source fut ainsi un lieu de légendes, de pèlerinages et de fascination depuis la plus haute Antiquité et durant tout le Moyen Âge. La nature du gouffre et ses secrets ont été progressivement étudiés et dévoilés lors des multiples explorations scientifiques qui y ont été conduites à partir du XIX^{ème} siècle. Ces campagnes participèrent également à la renommée et à la connaissance du site.



Figure 1. Le vallon de la Fontaine vu depuis l'éperon rocheux du château des Évêques de Cavillon /
© CAUE Vaucluse

Le séjour du poète et humaniste François Pétrarque, au XIV^{ème} siècle, contribua aussi grandement à la notoriété du site et instaura un véritable mythe littéraire. Le musée-bibliothèque François Pétrarque fut créé dès 1927 : il conserve de nombreuses représentations du site qui a inspiré nombre d'artistes après l'auteur florentin. Au milieu du XIX^{ème} siècle, la vallée close devient à la fois un haut lieu touristique et un important site industriel papetier. L'activité industrielle s'éteint dans les années 1970 et constitue aujourd'hui une part importante de l'histoire et du patrimoine culturel du site.

Le site naturel de la fontaine est un lieu aux histoires multiples où se mêlent patrimoines naturel, culturel, scientifique dont les usages sont pluriels mais peuvent présenter quelques écueils pour la préservation et la qualité paysagère du site.

Améliorer la gestion du flux touristique

La volonté de résoudre les difficultés du site remonte aux années 1990. L'actuelle Opération Grand Site a démarré en 2014 et fait suite à une première démarche initiée entre 2002 et 2007. Plusieurs conditions sont requises pour être éligible à l'Opération Grand Site : le territoire doit être un site classé (depuis 1922) et qualifié de « remarquable » mais il doit également connaître des difficultés de gestion touristique et que soit exprimée une volonté de préservation et de gestion partenariale pérenne. Le site de la Fontaine de Vaucluse répond à ces critères et une opération a donc été entamée, dont la démarche repose sur un programme d'action appuyé sur un ensemble d'études approfondies qui permet de répondre aux dysfonctionnements repérés. Ainsi, le programme d'action – décliné en 46 fiches-actions – tente de répondre à trois objectifs principaux. Ces derniers proposent, d'une part, de restaurer le paysage et l'accès au site naturel de la source, d'autre part, de développer les modes de circulation douce à travers la vallée close, et enfin, de promouvoir le patrimoine naturel et culturel du territoire.

Les études réalisées soulignent tout d'abord un problème d'engorgement routier dans la vallée close où la voiture est le principal mode de transport utilisé. De fait, les parkings sont saturés en haute saison et la cohabitation des divers usagers de la route est difficile. Ce problème est lié en partie à la morphologie du site, auquel seules deux petites routes départementales donnent accès. La solution réside dans la piétonnisation du centre du village et le retrait progressif des véhicules au cœur du village. En outre, le second problème souligné est celui de la forte présence de commerces le long du chemin piétonnier qui conduit au gouffre. Les multiples enseignes colorées contribuent à la dégradation visuelle du site alors que ce dernier est avant tout un espace naturel, fortement apprécié pour son cadre pittoresque. L'Opération Grand Site s'attachera à créer une limite franche entre le quartier urbain et l'espace naturel, voire à déménager certaines échoppes commerciales.

Enfin, d'autres désordres ont pu également être soulignés comme l'absence de visibilité de la Sorgue par endroits ou encore le manque de signalétique et de panneaux d'interprétation. En effet, les visiteurs sont livrés à eux-mêmes au sein du village de Fontaine-de-Vaucluse : aucune indication ne leur permet de découvrir autre chose que le chemin du gouffre. En cela, la promotion du patrimoine local est primordiale. Aboutissement de ce processus, le label « Grand Site » viendra reconnaître la bonne gestion durable du site et la qualité de la préservation de ce dernier.



Figure 2. Les visiteurs « au chevet » à la sortie de la source / © CAUE Vaucluse

Gérer l'avenir du site touristique

Pendant longtemps, cette démarche a souffert de l'absence d'un comité de pilotage fort. D'abord entre les mains de la commune de Fontaine-de-Vaucluse, c'est la Communauté de communes Pays des Sorgues Monts de Vaucluse qui a repris l'animation de l'OGS depuis 2018.

L'une des premières actions de l'OGS consiste à requalifier la rive gauche de la Sorgue. La rive droite, surfréquentée, est celle menant au gouffre tandis que la rive gauche est très peu visitée et présente un parcours en impasse. L'objectif est de valoriser cette rive afin d'améliorer le parcours de visite des touristes et la qualité de vie des habitants.

En outre, la rive gauche est un quartier associé à la fois à la création littéraire, de Pétrarque à René Char, et à la vie artisanale et industrielle : l'objectif est donc ici de valoriser ces histoires multiples. Elle est aussi un lieu de pratiques sportives avec la présence des kayakistes avec laquelle il faut composer. La rive gauche combine ainsi les problèmes liés à la diversité des usagers. En cela, les actions doivent être concertées pour satisfaire au mieux les vœux de tous. Le jardin Pétrarque se veut le lieu d'une promenade poétique, historique, méditative marquée par la déambulation

au sein d'un paysage boisé évocateur de l'époque médiévale et florentine. Dans ce contexte, le stade d'eau vive des kayakistes devra être intégré au mieux dans cette toile de verdure afin d'éviter de transformer la rive gauche en un véritable parc aquatique qui se heurterait à l'environnement contemplatif voulu pour le jardin.

La mise en place de l'Opération Grand Site à la Fontaine de Vaucluse souligne la volonté de tous de préserver une merveille naturelle, de la valoriser et d'offrir une certaine qualité de visite, un cadre de vie agréable et une émotion toute particulière. Le site bénéficie pour cela d'un riche patrimoine, pour l'instant mal valorisé, qui repose sur une stratigraphie d'histoires. Malgré une faible communication à l'échelle locale pour le moment, ce projet vise également à améliorer la qualité de vie des habitants. L'OGS représente une belle opportunité pour fonder un projet territorial commun, bien que chaque acteur projette sa vision du site, dans la conciliation et la réponse aux besoins de chacun.

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The Paradox of the Aestheticisation of the Alto Douro Wine Region Landscape: Vernacular Languages in Contemporary Architecture

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Résumé

La région viticole du Haut Douro (ADWR) fait partie du territoire de la Région Délimitée du Douro (DDR) reconnu par l'UNESCO en 2001. La construction du patrimoine paysager de l'ADWR est un exemple d'action anthropique sur le territoire au vaste patrimoine vernaculaire. Après 2011, de nouveaux vignobles contemporains ont été créés dans l'ADWR et son périmètre de protection. La conception et les formes architecturales des vignobles contemporains conjuguent lecture du territoire et dimension humaine. Ces vignobles et leurs périmètres de protection ont un modèle de gestion complémentaire à l'activité principale : la production et la commercialisation de vins de Porto et de Douro (AOP, Appellation d'Origine Protégée et AOC, Appellation d'Origine Contrôlée). Il s'agit de vignobles ouverts au public, où divers domaines sociaux et commerciaux complémentaires s'unissent, et dont le programme architectural allie fonctionnalisme, esthétique, et symbolisme, en renforçant la culture viticole au travers d'activités et de loisirs.

Mots-clés: région viticole du Haut-Douro, architecture vigneronne contemporaine, patrimoine paysager

Keywords: Alto Douro wine region, contemporary wine architecture, landscape heritage

The landscape of the Alto Douro Wine Region (ADWR) was inscribed on the UNESCO World Heritage List in 2001 in the category of Cultural Landscape. It is in this context that we use the composite term 'landscape heritage' to refer to the act of patrimonialisation of the landscape, the act of legitimisation and definition of 'common good', based on the identification of a social collective whose sharing of values, rights and duties is implicit¹.

The recognition of the ADWR by UNESCO contributes to the increase of tourism activities. The values of identity and authenticity, generally associated with the rural world, as in the case of ADWR, are validated in the reinterpretation of vernacular architectures, which, in the context of the touristic offer, are sometimes mimics that aim to recreate a supposed postmodern typicality. At the same time, a correlation is developing in the ADWR between the wine and tourism industries. This has contributed to the development of new architectural programmes, both in wine tourism with the construction of hotel equipment and in wine production through the refurbishment or construction of new wineries².

Viticultural landscapes are spaces interconnected with material and immaterial culture, with cultural heritage - built structures (vernacular or erudite architectures, villages, etc.) - and immaterial heritage (Mitchell et. Al., 2009). Wine landscapes fall into the category of cultural landscapes. They are evolutionary landscapes when there are processes of evolutionary transformation, both in form and composition, depending on land use. They are living landscapes because they maintain an active role in contemporary societies, which inhabit and work in them, in a continuous evolutionary process like a palimpsest, with the marks of time manifesting themselves³. Landscapes exist, to begin with, due to the variation of land uses, a gradient of intensity in

land use and its continuous transformation and improvement for agricultural practice: they are anthropogenic landscapes^{4,2}.

Vineyard landscapes are recognised as a specific type of agricultural landscape whose land-use and processing system represent its entire production. These landscapes reflect an ancient human presence in the territory and are the result of a long process of adaptation and interaction of communities with the biophysical environment. They are landscapes interconnected with the material and immaterial heritage^{5,2}.

Tourism and the ADWR's Heritage Landscape

The ADWR's inclusion on the UNESCO World Heritage List promotes international recognition of the region and thus boosts the tourism economy. The landscape heritage at the service of business. The awarding of a globally recognised value, through UNESCO, contributes to an increase in tourism revenues².

Some statistical data reveal a profound demographic change, with a population decrease between 2001 and 2019. The depopulation of rural areas and the changing way of life in the countryside require a change in the paradigm of analysis of cultural heritage.

Throughout the national territory, there are modern and properly equipped facilities for wine production, as well as for the offer of other services and products related to wine tourism, from the perspective of regional development. The paradigm of management and preservation of cultural heritage must consider the people and associated uses. The management of the landscape heritage of the ADWR must consider the profound changes that

have occurred in the region under study³. What is the impact of the patrimonialisation of the landscape in the Alto Douro Demarcated Region?

Contemporary Architecture in the ADWR Landscape-Heritage

Since 2001, several contemporary architecture projects have emerged linked to wine production. Is there a cause-and-effect relationship between the inscription of landscapes on the UNESCO World Heritage list and the development of new contemporary architecture projects?

The architectural programme of these production units presents various concerns, such as the relationship with the landscape, considering the topography of the land, the scale of the building and the quality of the materials. The architectural programme now fulfils a double function: on the one hand, it renovates and adapts the spaces to the new wine production methods; on the other hand, a circuit developed so that visitors can get to know the whole production process is integrated into the architectural programme².

The relationship of the building with the landscape becomes essential in the analysis of architecture in the landscape-heritage. However, this relationship with the landscape and, consequently, with the orography, conditions the development of the architectural programme itself and, in this sense, the orography shapes the location of the winery. As a characteristic of this type of construction, we highlight the use of gravity for the development of the work in the winery. Thus, the architecture is a mechanised structure which participates in the production of wines².

The wine industry intersects with the tourism industry. In this sense, even with pre-existing built structures with heritage value, the owners, motivated by the tourism industry, seek in contemporary architecture a form of expansion.

Architecture has played a fundamental role in the region's tourism offer and wine production. The wineries inserted in the ADWR present a business model that complements the main business – wine production. They are wineries open to the public, where several social and complementary commercial areas combine, whose architectural programme combines functionalism, aesthetics and symbolism, enhancing the wine culture through leisure activities. In the case studies presented, the influence of vernacular architectures on the production processes, but also on the materials used in the covering, can be seen.

Nevertheless, there are two trends in the architectural programmes:

- The architectural programmes that present themselves as an element of rupture.
- The architectural programmes of the wineries that present an architectural language of continuity, taking vernacular architecture as a reference.

The architectures whose programme is presented as a rupture element are characterised by the geometry of forms. A complementarity with pre-existing buildings and landscape integration is sought.

The architecture of contemporary wineries, whose programme adopts a language of continuity, does not stand out for its forms or volume. In this context, serenity is valued in the combination of the different volumes. It is important to note, however, that the architectural programmes with a language of continuity are not a pastiche or a mimic of vernacular architecture.

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Les habitants non humains des monuments historiques.

Le cas du château de La Chapelle-Gauthier (Seine-et-Marne, France)

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Abstract

The Chapelle-Gauthier's castle is a historical monument situated in Seine-et-Marne, far from tourists' routes and neglected through history. It can be considered a burden for its owner: maintaining such a castle is expensive for a small town like La Chapelle-Gauthier. The consequence of such a situation is the partially abandoned state of the building. It can seem to be a catastrophic situation considering the traditional heritage values, but it can also be an opportunity for animals to settle in such places, adding another value – biodiversity – to the historical monument.

Mots-clés: monument historique, château, animaux, insectes, valeur patrimoniale, biodiversité

Keywords: historical monument, castle, animals, insects, heritage value, biodiversity

Le château de La Chapelle-Gauthier fut construit au Moyen Âge puis remanié à différentes périodes, en particulier au XVII^e siècle, dans une petite ville de Seine-et-Marne (1 500 habitants), loin des réseaux du tourisme de masse¹. Il fut classé au titre des monuments historiques en 1990², quatre ans après son achat par la mairie (en 1986). Le château est aujourd'hui partiellement occupé par les bureaux de la mairie, la bibliothèque municipale et la permanence de la gendarmerie. En 2016, la municipalité lança un diagnostic du château : certaines parties étaient en mauvais état, faisant craindre des dégradations irréversibles.

Le diagnostic d'un monument historique fournit une lecture stratifiée du monument dont les deux angles de lecture principaux sont l'histoire et l'état sanitaire, c'est-à-dire l'identification de la chronologie du bâtiment dans sa matérialité et l'état des différentes parties du bâtiment. Ce sont ces deux calques qui conditionnent la planification et les types d'interventions imaginables afin de répondre à l'urgence de la possible disparition d'éléments dont la valeur patrimoniale est souvent déterminée par l'histoire.

Un nouvel habitant

À La Chapelle-Gauthier, en superposant le calque historique et l'état sanitaire, un point « chaud » émergea : le pavillon nord-est avec, au rez-de-chaussée, une chambre de tir et à l'étage, des salons ornés de boiseries, une partie du château non utilisée. Ce pavillon est à la fois la partie la plus ancienne du château (valeur d'ancienneté), la moins modifiée (authenticité) et la plus menacée. Des interventions d'urgence étaient nécessaires : le pavillon était fissuré dans son angle nord-est, qui se détachait doucement du reste du château³. Sa valeur patrimoniale déterminée d'après les critères habituels de la conservation résidait dans son ancienneté, son authenticité et la menace de disparition. Mais ce que le diagnostic patrimonial ne dit pas, c'est que dans cette partie du château non utilisée par les humains depuis les

années 1980, un autre occupant s'était installé dans la chambre de tir, le coléoptère *Blaps mucronata*, une espèce endémique qu'on pensait disparue dans cette région et qui est réapparue dans le château.

La municipalité était sensible à la préservation de la biodiversité, au point que l'adjointe au maire ne concevait pas le patrimoine autrement que dans une convergence entre bâti et non bâti. Elle fit donc appel (en dehors du diagnostic patrimonial) à un entomologiste afin d'identifier le coléoptère : le *Blaps mucronata* « est inféodé aux vieilles caves, aux vieux bâtiments et pigeonniers. Il semble se nourrir des déjections des oiseaux et de leurs cadavres desséchés ». En effet, des oiseaux (majoritairement des pigeons) avaient niché dans la chambre de tir où leurs déjections et cadavres ont créé, dans cet espace peu ouvert et non fréquenté par les humains, un environnement favorable à l'installation du coléoptère. En somme, le retrait des humains a permis la création d'un biotope favorable par l'interaction entre différentes espèces. Il semble ici y avoir une convergence : un animal fragile, rare, qu'on peut doter d'une valeur patrimoniale s'installe dans la partie la plus fragile du bâtiment ; le monument historique semble ici devenir un refuge propice au développement de la biodiversité et la mairie n'envisage pas les choses différemment.

Pour autant, dans la réalité de la préservation du bâti, la valeur patrimoniale du bâtiment et celle du coléoptère se retrouvent mises face à face dans un conflit où la préservation du monument prime sur celle de l'insecte. Entre août et décembre 2018 s'achevèrent les « interventions d'urgence » de stabilisation du pavillon qui ont consisté à la mise en œuvre d'étais à tous les niveaux du pavillon, y compris dans la chambre de tir. Ce chantier a nécessité le déblaiement de la couche supérieure du sol – soit le biotope des coléoptères – et son piétinement. Résultat, les coléoptères ont disparu, probablement tués, et ceux qui ont survécu à cette

intervention sont probablement partis chercher ailleurs des conditions d'accueil plus clémentes. Cependant, cela a sans doute fragilisé cette espèce protégée. L'ancienne adjointe au maire me confia même : « Après la pose des étalements, je n'en ai plus croisé aucun dans le château, ils ont été exterminés. » Le coléoptère, tout patrimonial soit-il, n'a finalement pas pesé grand chose face au poids lourd du patrimoine qu'est un monument classé.

Valeur patrimoniale du coléoptère

J'ai dit précédemment que la valeur patrimoniale du pavillon résidait dans son ancienneté, son authenticité et sa vulnérabilité. Le coléoptère est lui aussi vulnérable, en plus d'être rare. Pavillon et coléoptère partagent également une relative inutilité : le château est obsolète d'un point de vue quotidien, difficile à entretenir pour une petite ville ; le coléoptère, s'il ne fait aucun doute qu'il joue un rôle dans le fonctionnement de l'écosystème local, n'a pas d'utilité directe (ou du moins facilement perceptible) pour nous humains. L'inutilité les met tous deux en danger et c'est cette menace qui les place dans un régime d'exceptionnalité nécessitant des investissements lourds. Si les monuments historiques ont acquis ce régime d'exceptionnalité, la biodiversité l'acquiert progressivement.

Et si, dans nos diagnostics patrimoniaux, le vivant qui peuple les monuments historiques n'était pas considéré comme une nuisance ? Si le coléoptère pouvait être inclus dans les « calques » qui déterminent la valeur patrimoniale ? Nous aurions été contraints d'imaginer des solutions qui ménagent à la fois la partie la plus fragile du vénérable château et de son tout aussi vénérable habitant. Une valeur biodiversitaire viendrait s'ajouter au système des valeurs d'Aloïs Riegl⁴, qui ne serait pas sans conséquences sur la pratique de la restauration.

Car le *Blaps mucronata* n'est pas le seul animal à avoir considéré ce château comme un refuge : des chauves-souris, un essaim d'abeilles sauvages, des choucas des tours, des hirondelles, etc. habitent ses anfractuosités et son environnement. Dans l'immédiat, la prochaine restauration du château et en particulier de ses menuiseries, menace l'habitat des hirondelles : datant du XVII^e siècle pour la plupart, les menuiseries sont considérées comme ayant une forte valeur patrimoniale. L'oiseau migrateur est lui aussi protégé, mais fera-t-il le poids face à la valeur patrimoniale du monument ? Des solutions existent pourtant : il s'agirait d'intervenir pendant la période de migration des hirondelles et d'installer des nids artificiels dotés de récupérateurs de déjections. Bref, une question de planification et de design pour que soient ménagés l'oiseau et la menuiserie.

Remerciements

L'autrice remercie Jean-Paul Mauduit, architecte du patrimoine.

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². Base Mérimée, notice PA00086862 (château de la Chapelle-Gauthier) [en ligne : https://www.pop.culture.gouv.fr/notice/merimee/PA00086862?base=%5B%22Patrimoine%20architectural%20%28Mérimée%29%22%5D&mainSearch=%22La%20Chapelle%20gauthier%22&last_view=%22list%22&idQuery=%222527abb-0d8c-cf56-823-58e4c3acffc%22]

³. A&M Patrimoine (Jean-Paul Mauduit, architecte du patrimoine), Étude préalable. Château de La Chapelle-Gauthier, mars 2017.

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Le patrimoine face aux changements climatiques et environnementaux

Défis et perspectives de la réhabilitation et de la rénovation durable du patrimoine bâti.

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Challenges and Perspectives for the Sustainable Rehabilitation and Renovation of Built Heritage.

Ordinary Buildings, a Majority Heritage to be Rehabilitated: A Cultural and Creative Positioning Beyond Energy Sobriety

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Résumé

Nous considérons les bâtiments d'habitation existants comme le principal patrimoine à réhabiliter en combinant la préservation, la révélation des qualités architecturales et la performance thermique. Cet article définit le patrimoine ordinaire à partir de ses composantes et du potentiel de l'habitat contemporain qu'il offre. Il considère le passage du diagnostic à la conception comme un processus capable d'atteindre les objectifs de performance en révélant les qualités de l'existant. Enfin, il valorise l'expérience du chantier en milieu habité, ses expérimentations techniques, et les enseignements tirés du dialogue avec les habitants.

Mots-clés: bâtiments ordinaires, réhabilitation, performance thermique, qualité architecturale, sobriété énergétique

Keywords: ordinary buildings, rehabilitation, thermal performance, architectural quality, energy sobriety

De Jean-Marin architecture office considers existing housing buildings as the main heritage to be rehabilitated by combining architectural enhancement and thermal performance. They call it 'ordinary heritage', a minor production built without architects until the nineteenth century. De Jean-Marin's positioning wants to question the assessment of Cesare Brandi¹ who considered the ordinary buildings only destined to be repaired and would exclude them from the heritage field deserving restoration. This paper focuses on the rehabilitation of the ordinary heritage, understood as the re-establishment of a building in the esteem of its inhabitants and the public, by highlighting its qualities and uses. The presentation is based on the analysis of six projects by de Jean-Marin.

The first part explains how the office works from the structural and heritage components of existing buildings de Jean-Marin rehabilitates and the potential that it offers. It then considers the transition from diagnosis to design and the ability to go beyond the quantitative objectives of energy sobriety. Finally, it exposes what can be learned from worksites in an inhabited environment.

The Components and Qualities of Ordinary Buildings

The first example analyses two projects of small Parisian buildings that have undergone heavy rehabilitation, which strongly implies the structural component, the spatial qualities, and the potential of this type of building. A group of buildings constructed on a medieval plot of rue Saint-Denis² forms a whole organised in a bayonet shape around a central courtyard and secondary courtyards. The composition is typologically complex, with successive additions making the central courtyard inaccessible. The first approach of de Jean-Marin is to develop a structure diagnosis.

The various alterations that can be observed lead to detailed analytical exploration. The building can be understood precisely from its logic of constructive assemblies on which the project is based. A model and a planar catalogue are made to show the potential volumes the structure can carry. The propositions are adjusted to form a coherent and specific composition mode between serving and served spaces. The project brings a maximum of light into the rooms of the eleven dwellings through the liberation of the structural voids of the building.

The second example is an L-shaped small faubourg building of fourteen dwellings in rue Boulay³, made of load-bearing brick façades with metal floors. In this case, the existing plan shows the structural logic that determines a domestic scale. The starting point of the reflection is the *ex-nihilo* research of the most compact serving spaces. In parallel with this exercise, the study highlights the existing structural volumes free of all secondary works. The insulation and the elevator are integrated, focusing on spatial and use efficiency. This work, therefore, leads to the composition of a new plan offering fluidity and specific dimensioning of the rooms. The main façade keeps its beautiful urban qualities, punctuated by louvred bays like the ones we find in Boulay street.

From Diagnosis to Rehabilitation Design

The third project includes the rehabilitation of a 1920-1930s Parisian low-cost housing or *Habitation à bon marché* (HBM)⁴ complex comprising four hundred sixty-eight dwellings. The analysis of the typological distribution shows an absence of large apartment types and the grouping of the water rooms because of the existence of a single duct in each apartment. The structural diagnosis and the survey allow us to

understand and intentionalise the project aiming at the concordance between structural logic and spatiality. The possible modifications to improve an apartment consist in rationalising the organisation of the service rooms and the distribution of the bedrooms by enlarging the living room. It is proposed to insulate from the inside to not alter the materiality of the exterior façades and improve thermal and acoustic comfort. The landscaping project aims to increase the proportion of permeable and vegetated open ground. Trees are planted to provide shade in the summer, and vegetated strips preserve the privacy of the ground floor units.

The fourth project involves the thermal rehabilitation of a 1968 *grand ensemble* of three hundred forty-four occupied dwellings in Sevrans⁵. The residence comprises a set of three to four story bars in L and U shapes and seven story towers. Partition walls bear the building, and the façades constitute a plastically strong envelope. The diagnosis surveyed the different materials of the façade and catalogued its different typical spans. Models were used to study the principles of the insulating envelope. Insulating from the outside aims to respect the original drawing and emphasise the various depths of the façades. Their unitary aspect is preserved, and their plasticity is reinforced by thicker reliefs whose light reveals the rhythms.

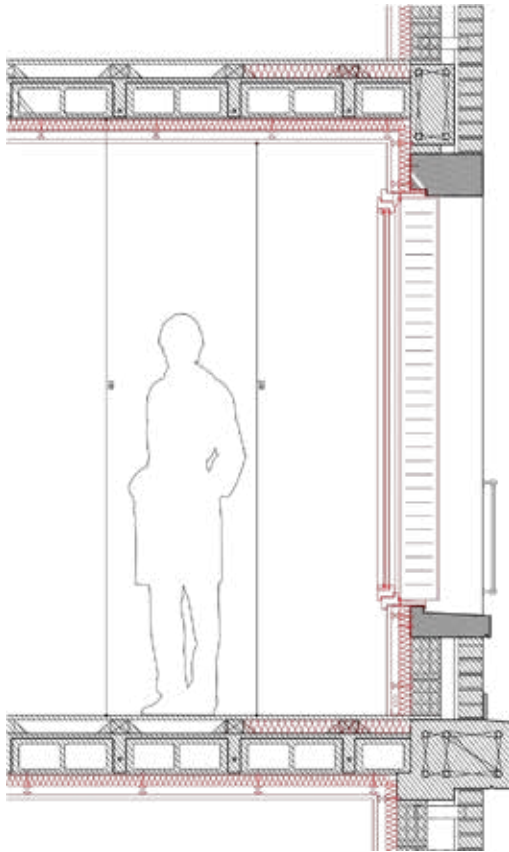


Figure 1. Detail section showing the insulating system for the HBM located on rue des Chaufourniers in Paris. © de Jean-Marine Architecture

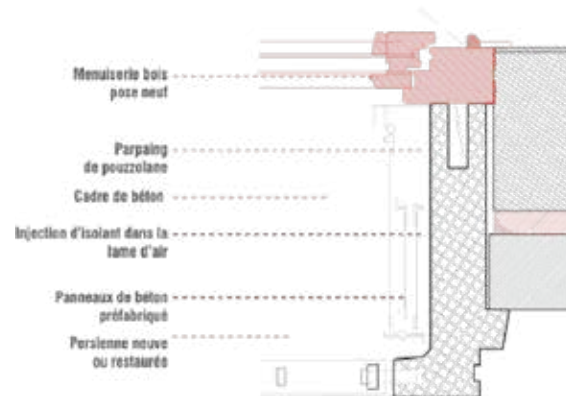


Figure 2. Detail section showing the insulating system for the HBM located on rue de Meaux in Paris. © de Jean-Marine Architecture

The Worksite as an Occupied Environment

The objectives of the fifth dwellings project in the south of Paris are the energetic rehabilitation of a 1980 building and the creation of four new apartments. Since the dwellings were occupied, the office worked with each inhabitant to solve inside specific problems. The project aimed at imagining a light but complete intervention, including exterior insulation and elevation. The main issue was to link the existing and the elevation with the new envelope and its coating materiality. The new façade project includes the framing of bays introducing a new and more harmonious design

while affirming the horizontals distinguishing each level of the housing. This materiality accounts for the superposition of the added envelopes and the recessed elevated part.

As the last of the six projects presented, a Parisian *grand ensemble* of 1957 designed by Denis Honegger, encompasses four hundred twenty-four dwellings⁶ built in the spirit of constructive rationalism. In this case, it was necessary to find an innovative solution to the thermal bridges to preserve the original appearance of the building without disturbing the residents. With the diagnosis is understood the interference of the framework on spatiality. The analysis of the constructive system allowed the technical and architectural resolution of the thermal bridges and the discovery of unsuspected project potentials in the thickness of the façade. Its composition is maintained and should not change; only the slight disorders are treated punctually. The main intervention in inhabited dwellings involves the injection of insulation in the wall air gap, insulating cornice, baseboard, and new wood joinery.

Consultation with the tenants is fundamental to doing the project with their approval since the inhabitants have the living experience of the whole buildings and dwellings. The exchanges showed them that it was not known what to do *a priori* but that solutions were looked for. Thermography allowed the de Jean-Marin's office to target the major thermal bridges as a scientific and convincing proof to justify insulation from the dwellings. This operation has increased the performance of the buildings without altering the envelope and by intervening only in a targeted and fast way inside the dwellings whose inhabitants appreciate a significant gain in comfort.

These various interventions highlight that the rehabilitation project of ordinary buildings implies a rather fine part of creativity which sometimes fades away but always places in the foreground the highlighting of the existing. De Jean-Marin hopes that the knowledge and the principles resulting from this practice will be able to develop quickly by privileging bio-sourced materials to answer as qualitatively as possible to the challenges raised by the urgency of the climatic crisis.

1. BRANDI, Cesare, *Théorie de la restauration*, Paris, Allia, (1963), 2021, p. 9.

2. <https://www.dejeanmarinarchitectes.com/saint-denis-02>

3. <https://www.dejeanmarinarchitectes.com/boulay-02>

4. <https://www.dejeanmarinarchitectes.com/chaufourniers>

5. <https://www.dejeanmarinarchitectes.com/armandcarrel>

20th Century Architectural Heritage and Thermal Rehabilitation of Buildings: Irreconcilable Issue or New Frontier?

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Résumé

Le futur du patrimoine d'après-guerre est aujourd'hui confronté à de nouveaux défis de décarbonisation. Depuis 1990, les rapports du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) ont établi un consensus scientifique sur les liens entre le réchauffement climatique et les émissions de CO₂ résultant d'activités humaines. Cet article vise à étudier les différentes méthodes mises en place pour la réhabilitation thermique du patrimoine bâti du XX^{ème} siècle.

Mots-clés : réhabilitation thermique, transition écologique, patrimoine d'après-guerre, Fernand Pouillon, écologie humaine.

Keywords: thermal rehabilitation, ecological transition, post-war heritage, Fernand Pouillon, human ecology.

In France, the logic of mass building during the post-war period left a broad range of built heritage. The necessity of rebuilding devastated cities from the war, the demographic boom from the 1950s and the subsequent improvements in living standards triggered mass planning of housing and infrastructures that led to the gradual adoption of prefabrication to reduce building costs.

Since the first oil crisis (1973), energy savings have become a new challenge, pointing out the many thermal defects of the post-war built environment. Industrialisation was held responsible for the downturn of building qualities, associated with a rejection of a so-called monotonous architecture embodied by the *Grands ensembles*.

The future of post-war heritage faces today the new challenge of decarbonisation. Since 1990, the reports filed by the Intergovernmental Panel on Climate Change¹ have established a scientific consensus around global warming caused by the CO₂ emissions of human activities. Technical answers to prevent their further effects are known as the ecological transition, aiming at withdrawing those carbon emissions. Within environmental and urban planning, such a finding has recently introduced a new political ecology² that differs profoundly from previous ecological thoughts. From the organic city praised by Patrick Geddes, the Howardian garden-city, until the notion of *milieu de vie* of the French human geography, ecology was understood as a reconciliation between men and their environmental surroundings. Such ecology was aimed at the protection of the environment conceived as human ecology: for Benton McKaye or Lewis Mumford, it dealt with forest preservation and heritage protection, for instance³.

The new political ecology pursues a different goal of withdrawing all CO₂ emissions in order to decarbonise human activities. Calling for a set of public policies, we could call it a functionalist ecology in that every policy is a function of decarbonisation. Its

systematic solutions imply the thermal rehabilitation of buildings, seeking an improvement of thermal performances to get energy savings not only by removing high-carbon heating systems but also by reducing energy consumption to avoid the upstream use of fossil fuels in electricity generation.

In France, the methods of *rénovation thermique globale* (the 'global thermal renovation') supported by engineers like Olivier Sidler (former president of *Association négaWatt*) or Jean-Marc Jancovici (The Shift Project) recently met approval by governmental bodies like *Agence de l'environnement et de la maîtrise de l'énergie* (ADEME) and several ecological parties and movements. Instead of carrying out case-to-case and separated operations of thermal improvements, the global method defines a holistic method of insulation to reach the highest possible thermal performance (BBC, *Bâtiment Basse Consommation*) not just by changing the heating system but also by substituting the finishing works (windows, doors) and insulating walls with weather-proofing materials on facades (ITE, *Isolation Thermique de l'Extérieur*) that eliminates the permanence of thermal bridges. The top-down political support of this method highlights the formation of an ecological technostructure⁴.

The global method seeks the highest thermal efficiency without investigating buildings' architectural and historical values, triggering a clash of renovation approaches with heritage-based ones. The social housing *La Montagnette* (1955-1957, **Figure 1**) in Avignon displays the typical vocabulary of Fernand Pouillon of semi-prefabricated principles of buildings merged with Southern-French traditional features: stone cladding on facades and low-rise Mediterranean tiles on the roofs. In 2013, external insulation was carried out with the complete substitution of finishing works removing all those architectural features and volumetry, expressing a lack of consideration of architectural heritage. The generalisation of such renovation for

twenty million dwellings in France as the *scénario negaWatt* supports would radically change the architectural features of broad parts of our heritage and make disappear the regional vernacular features expressing the diversity of cultural landscapes. In the case of post-war buildings, two points challenge the preservation of their architectural features: firstly, the aesthetic judgement that post-war architecture would be unsightly, eluding the possibility of saving and preserving unrecognised architectural values; secondly, the absence of mouldings on facades that easily allows external insulation.

The lack of heritage protection points out the necessity to carry out preventive investigations on buildings and list them as historical monuments. The ordinary post-war built heritage bears even more precarity. Entire periods of architectural history could lose their architectural features. The post-war reconstruction of Le Portel (Pas-de-Calais) displays a very coherent ensemble of two-storey townhouses with typical post-war structural articulation (*modénature*) in concrete, rustic *bossage*, and traditional Flemish-like tiles. Individual external renovation from one house to another can bring disharmony to the urban landscape (**Figure 2**).

Due to an increase in energy prices and the prevention of fossil fuels uses, thermal improvements constitute an absolute necessity, and the technical effectiveness of the global approach brings a huge dilemma to preservationists: can we conciliate the protection of architectural integrity with thermal rehabilitations? Several technical paradoxes must be observed:

1. Insulating twenty million dwellings implies substituting the case-by-case investigation of buildings with the use of prefabricated components for outdoor insulation, leading to the industrialisation of renovation processes like in the post-war period.

2. The global approach needs a lot of materials for external insulation: joists, infill, cladding, the substitution of finishing works (doors, windows, railings), but also an artificial system of ventilation (*VMC double flux*) because insulation downgrades ventilation. Such a process brings a lot of materials within the construction work: large-scale use of water-repellent and transformed materials (such as PVC) adds to the final carbon footprint, as well as large-scale use of vegetable-based materials (such as hempcrete) could risk depletion of natural resources. The carbon footprint of the overall life cycle of buildings remains underestimated.

3. Contrary to the traditional restoration of facades, we lack perspective on the durability of external prefabricated components: how many years can such insulation last? Will we need to change more often highly efficient insulating components than less efficient traditional materials?

Necessary to decarbonise housing, energy savings could paradoxically maintain the high carbon footprint of the construction work.

The global approach is based on an objectivist bias exemplified by the ignorance of the rebound effect (*Effet rebond*), reflecting the subjective behaviours of inhabitants. By reducing the cost of heating, energy savings allows inhabitants to warm up their houses even more, turning down the expected energy savings as modelled by theoretical scenarios of thermal rehabilitation. Inherent to the contemporary withdrawal of architects and the emphasis on engineers, such objectivism neglects the notion of *habitat* that points out the cultural and human dimension of housing. On the contrary, a human ecology calls for a case-to-case investigation of buildings that integrates the diversity of social needs and architectural values before thermal renovation works beyond the functionalist goal that sees thermal rehabilitation only

as a technical tool of decarbonisation. Rather than systematically carrying on the global approach, we need to adapt renovation to heritage preservation:

1. Substitution of carbon-intensive heating system based on low-carbon energy sources like nuclear and hydraulic energy
2. Substitution of the fittings characterised by poor isolation with durable finishing pieces with identical design
3. Wall insulation (internal or external) only with the agreement of inhabitants and heritage architects, preferably with vegetal materials because they are recyclable and low-carbon

Such careful renovation implies ending the silo thinking by closer cooperation between heritage services and governmental bodies in charge of the energetical transition, notably by strengthening the role of the *Architecte des Bâtiments de France*. Rather than bringing ecology into culture, thermal rehabilitations illuminate the urgency to introduce a cultural and human dimension into ecological policies.



Figure 1. La Montagnette, in *La transition énergétique et le bâtiment ancien : Un paradoxe insoluble* ? Gerhard Scheller, *La Pierre d'Angle*, décembre 2016, © Gerhard Scheller.



Figure 2. External wall insulation in PVC, Le Portel, © Google Street maps.

¹ Climate Change, The IPCC Scientific Assessment, IPCC First Assessment Report, 1990.

² The study of socio-political implications of environmental issues and their governance. See BRYANT, Raymond L., *The International Handbook of Political Ecology*, Edward Elgar Publishing Limited, 2015.

³ MAUMI, Catherine, « Pour une écologie humaine, de Patrick Geddes à Benton MacKaye », *Espaces et sociétés*, vol. 167, no. 4, 2016, p27-42.

⁴ John Kenneth Galbraith defines the technostructure as the use of engineering expertise in management.

Every Little Helps! Research-Based Policy Measures to Reduce CO₂ Emissions of Protected Houses in Flanders

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Résumé

Cet article présente les actions de l'Agence flamande du patrimoine afin de faciliter la rénovation des bâtiments protégés sans endommager leurs valeurs patrimoniales. Trois types d'instruments ont été développés pour faire face au défi climatique : des instruments financiers, la recherche et le développement de bons usages, et des instruments d'orientation.

Mots-clés: rendement énergétique, patrimoine bâti, politique climatique, stratégie de rénovation

Keywords: energy efficiency, built heritage, climate policy, retrofit strategy

In 2020, the Flemish Long Term Renovation Strategy for Buildings (FLTSB) was approved.¹ The Flemish housing stock contains a large proportion of old buildings. Nearly all buildings (ninety-six-point five per cent) need to be renovated to meet the residual energy needs in a sustainable, low-carbon way. The objective for existing non-residential buildings is to realise carbon neutrality by 2050. Existing residential buildings must achieve, by 2050, a comparable energy performance level to newly constructed dwellings for which permit applications were submitted in 2015 (EPC figure 100 or label A). Even if protected buildings represent less than one per cent of all buildings in Flanders, and exemptions are in place, they can still contribute to the reduction of CO₂ emissions. The FLTSB foresees to determine a long-term energy objective for protected buildings that is achievable and that respects heritage values. To realise this, adapted tools need to be developed.

The paper presents the efforts of Flanders Heritage Agency (FHA)², the regional authority in Flanders in charge of immovable heritage, to facilitate the retrofit of protected buildings without damaging heritage values.

To realise the FLTSB for heritage buildings, three types of instruments are developed by FHA: financial instruments, research and best practices, and guidance instruments. Two financial instruments are installed to encourage and help owners to retrofit their heritage properties. A heritage loan with a low-interest rate under certain conditions (interest rate of one per cent, amount between twenty-five thousand and two hundred fifty thousand euros) was launched for interventions to improve the sustainability and energy performance of protected buildings and buildings included in the established inventory. Also, two types of heritage grants are available for owners of heritage buildings: one grant is intended for the development of a specialised energy audit for heritage buildings and another grant is aimed at energy-

saving adaptations to windows (such as secondary windows or special replacement glazing) and to cover the extra cost of retrofit adaptations in heritage buildings.

Research and best practices are essential instruments in the pathway towards less energy-consuming monuments. In 2016, FHA studied seven residential monuments from different styles and periods before, during and after retrofit to find out if and how protected houses can meet the Energy Performance of Buildings Directive (EPBD).³ One of the main conclusions was that owners, as well as conservation professionals, need more guidance when retrofitting a protected house.

As a response to this need, FHA developed a series of guidance instruments. The 'retrofit assessment frameworks'⁴ are there to help owners with the selection of appropriate retrofit measures. The instrument offers a decision tree and best practice examples.



Figure 1. Publication of the retrofit assessment framework on historic windows - FHA

Next to this, a specific 'energy audit for protected buildings' was installed based on the European Standard EN 16883: 2017 Conservation of cultural heritage – Guidelines for improving the energy performance of historic buildings. FHA also participated in the project 'Deep renovation of historic buildings towards New Zero-Energy Buildings (NZEB) -Task 59' (2017- 2021) of the International Energy Agency, led by Eurac. In this project, a handbook⁵ was realised that follows the systematic approach of the European standard EN 16883:2017 and demonstrates how it can be used in practice. In the framework of the Belgian national climate fund, the project 'energy consultants for immovable heritage' (2014-2021)⁶ was set up to expand the limited knowledge of architects about heritage-friendly retrofit measures. A specialised five-days training course and a question portal were developed for conservation architects who want to improve the sustainability and energy performance of heritage buildings. Also, a database was set up with data from ten monitored retrofit cases.



Figure 2. 3D reconstruction of the case 'House Billiet' monitored in the project 'energy consultants for immovable heritage' ©WTCB

An ongoing project focuses on the development of tailored heritage energy advice, following the standard energy performance certificate, for the owners of protected heritage houses. The service will be available in the second half of 2023.

With all these measures, the FHA prepares the heritage sector to deal with the causes and effects of climate change and helps it acknowledge that this has become an unavoidable part of its work.

We can conclude that adapted policy measures are more than needed in order to help owners to retrofit our built heritage and transmit heritage values to the next generations. We also have to continue the search for technical solutions to retrofit historical structures with respect for heritage value and for effective and simple tools to support owners in the greening of their heritage buildings. It will be useful to upscale and exchange best practices and innovative research results on an (inter)national level. And last but not least: more focus is still needed on the sustainable use and reuse of heritage (elements) and historical materials, as well as responsible recycling of materials.

¹ Long-term strategy for the renovation of Flemish Buildings. - Further to Article 2a concerning long-term renovation strategies under the Energy Performance of Buildings Directive (EPBD) (2010/31/EU) VR 2020 2905 DOC.0517/4BIS. Online available at the energy site of the European Commission. https://ec.europa.eu/energy/sites/ener/files/beflanders_ltrs_2020_en.pdf (consulted on 7/04/2022).

² Info (in Dutch) can be found on the official website of the Flanders Heritage Agency <https://www.onroerenderfgoed.be/> (consulted on 7/04/2022).

³ VERDONCK P., BEEL R., VERMEIREN E., GRIETEN B., Energiezuinige maatregelen in monumenten met woonfunctie, Onderzoeksrapporten agentschap Onroerend Erfgoed 70/1, 2017. <https://oar.onroerenderfgoed.be/publicaties/OAOE/70/OAOE070-001.pdf> (consulted on 7/04/2022)

⁴ The following retrofit assessment frameworks are developed: 'insulating roofs in historic buildings' (<https://oar.onroerenderfgoed.be/publicaties/AKOE/4/AKOE004-001.pdf>), insulating windows and doors in historic buildings' (<https://oar.onroerenderfgoed.be/publicaties/AKOE/3/AKOE003-001.pdf>) and 'placing solar photovoltaic panels on historic buildings and sites' (<https://oar.onroerenderfgoed.be/publicaties/AKOE/5/AKOE005-001.pdf>); (all were consulted on 7/04/2022).

⁵ LEIJONHUFVUD, Gustaf, BROSTRÖM, Tor, BUDA, Alessia, HERRERA, Daniel, HAAS, Franziska, TROI, Alexandra, EXNER, Dagmar, MAURI, Sara, DE PLACE HANSEN, Ernest Jan, MARIONCINI, Valentina, VERNIMME, Nathalie, Planning energy retrofits of historic buildings, 2021, EN16883:2017 in practice. SHC Task 59- report DB3, 49 p. <https://www.iea-shc.org/Data/Sites/1/publications/D.B3--Handbook.pdf> (consulted on 7/04/2022).

⁶ The Flemish climate fund is a financial framework that draws on revenues from the auction of European emission allowances under the EU- ETS- The fund makes it possible to implement climate policy measures in order to reach greenhouse gas emission reduction targets. The website of the project 'energy consultants for immovable heritage' (in Dutch): <https://www.erfgoedenergieloket.be/> (consulted on 7/04/2022).

Exploring Architecture Students' Perceptions of Sustainable Heritage by Using Generative Techniques

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Résumé

L'objectif de ce projet de recherche est d'examiner la manière dont les connaissances tacites influencent la perception des architectes du « patrimoine durable » et contribuent à façonner leur attitude lors des décisions de conservation. Cette recherche s'intéresse aux décisions prises par des étudiants en Master d'architecture travaillant à la réhabilitation de bâtiments patrimoniaux au sein des studios du Master d'architecture et de patrimoine de l'université de technologie de Delft (TU Delft). Elle s'appuie sur des techniques génératives pour étudier leurs « connaissances inconscientes » et leur perception du concept de patrimoine durable.

Mots-clés: attitudes, collage, décisions de design, patrimoine, durabilité

Keywords: attitudes, collage, design decision, heritage, sustainability

Recent literature shows that both concepts of heritage and sustainability have become more inclusive over time¹. The notion that heritage must be seen as a driver of sustainable development is reinforced by a common goal: conserve valuable ecosystems for future generations. However, despite the growing attention to the integration of heritage and sustainability, previous studies demonstrate that these are still perceived as incompatible concepts in practice, with sustainability being pointed out by designers as a reason to not conserve valuable heritage attributes. An earlier study applied the theory of planned behaviour² with architecture students, demonstrating that attitudes, both cognitive and affective, toward building attributes have an important correlation with the actual conservation behaviours³.

The purpose of this study is to investigate how tacit knowledge mediates architects' perceptions of 'sustainable heritage' and contributes to shaping attitudes towards conservation decisions. It focuses on the design decisions made by Architecture Master's students working on redesigning heritage buildings within the Heritage and Architecture Master's Studios at TU Delft. It uses generative techniques to access students' unconscious knowledge⁴ of the concept of 'sustainable heritage'.

Through the creation of collages, participants can visually express their priorities, emotions, and subjective attitudes toward heritage and sustainability while allowing them to bypass conscious defences and gather tacit knowledge of the decision-making process⁵. The findings of this study are expected to contribute to a better understanding of the role of conscious and unconscious mechanisms in design decisions. By identifying key themes on sustainable heritage, as perceived by designers, this method offers support for existing definitions and frameworks with insights from practice, contributing

to substantiating a common language that considers sustainability in well-founded decisions in heritage conservation.

Three main themes emerged in the narratives of students: heritage and sustainability, as separate topics; sustainable heritage, referring to the two concepts together; and reuse being the last theme most frequently mentioned. For participants, sustainable heritage is about reusing 'over and over again'.

As the concepts of heritage and sustainability are often referred to separately, they also expressed different ideas. On the one hand, heritage was perceived as something old and frequently associated with museums, churches, old materials, and old buildings. On the other hand, sustainability is perceived as something new, associated with development, function, and nature. There are, thus, contrasting perceptions of heritage and sustainability: while heritage is about people, values, traditions, and memories, sustainability is about the world, technology, future and artificial intelligence. Students who took part in the study showed awareness of this disconnection and defined sustainable heritage as 'trying to connect old and new', as symbolised in the collages by using band-aids connecting an endangered monument to a technological green future (Figure 1).

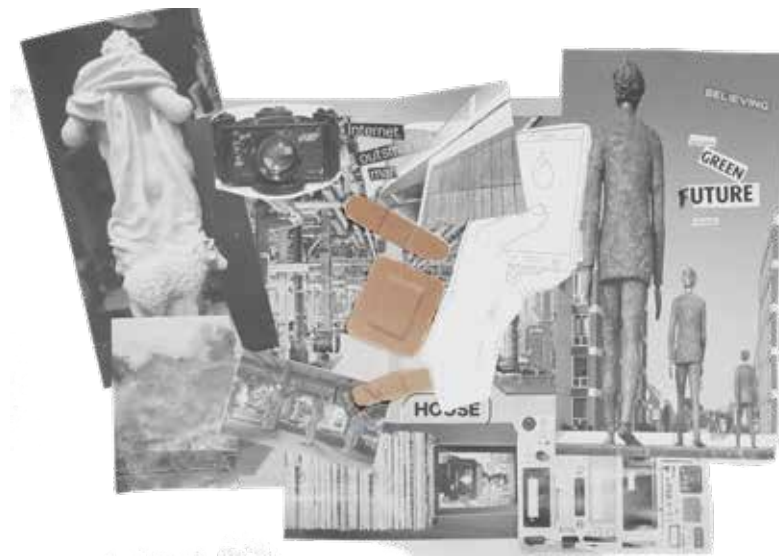


Figure 1. Example of collages produced by the participants, connecting heritage and sustainability

The concept of value is the key to participants' narratives since 'sustainable heritage creates new values'. There is an extension from the traditional heritage values, such as age, history, or aesthetics, to embrace sustainable values, such as ecological (relation to nature), economic (new functions, production, and consumption activities), and social (relation to community, identity, sense of belonging) ones. Age is the value that has been more often pointed out to describe heritage, but sustainable heritage values represent almost half of the reasons highlighted for the significance of heritage, with some participants even expressing a shift to prioritise ecological values over historical ones.

Reuse is the most mentioned action when referring to sustainable heritage, referring to durability brought by the repeated use over time. Sustainable heritage is also perceived as being about change, the freedom to transform the inheritance from the past that comes together with a necessary sense of awareness.

One participant refers: 'thinking of sustainable heritage I started with the void (represented by a black image) – because sometimes we are not aware of our heritage'. This awareness is reflected in the identification of the attributes to preserve: what is heritage? For the participants, it can be about the site, in its relationship with the city and the environment or the building as a whole (e.g., a church or a castle), but also building parts (e.g., walls, structures), building materials (e.g., brick, wood) or intangible attributes such as memories, ideas or experiences. By being able to 'really see what is there', opportunities for transformation emerge, and from materials and buildings that otherwise would be wasted, 'we can create something new'. Thus, the action of disassembling becomes a key to avoiding waste and contributing to a 'sustainable heritage that is circular'.

Exploring students' perceptions with the use of generative techniques opens the discussion to new meanings of sustainable heritage. While in architectural heritage, policies are often focused on energy efficiency strategies, architecture students – the future practitioners – seem to understand the need to connect heritage and sustainability to a deeper level. Five principles for the future of sustainable heritage can be summarised from the results:

- 1) Extending traditional heritage values: social, ecological, and economic values need to be included in heritage discourses;
- 2) Embracing new technologies to empower heritage buildings and contribute to a more sustainable management;
- 3) Valuing existing buildings, parts, and materials so that their life cycle is extended;
- 4) Disassembling building parts so that they can be reused for a long time: circularity starts before recycling, disassemble allows to create something new while preserving cultural values;

- 5) Generating value through new functions: society changes and our heritage changes with it, reprogramming to keep providing a good quality of life and wellbeing.

A previous study with architecture students³ suggests that, despite the importance of policies and regulations, deeper behavioural change is more likely to be achieved by targeting attitudes and internal beliefs. This pilot study shows that the use of collages has the potential to inform new policies and guidelines by looking for opportunities in the existing beliefs of stakeholders.

Acknowledgements

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¹ GONÇALVES, Joana, MATEUS, Ricardo, SILVESTRE, José Dinis, & RODERS, Ana P., Contributions to a Revised Definition of Sustainable Conservation, Heritage and the Sustainable Development Goals, TU Delft, 2019.

² AJZEN, Icek, From intentions to actions: A theory of planned behavior, *Action control*, 1985, pp.11-39

³ GONÇALVES, Joana, MATEUS, Ricardo, Silvestre, José Dinis, RODERS, Ana P., & BRAGANÇA, Luís, 'Attitudes matter: Measuring the intention-behaviour gap in built heritage conservation', *Sustainable Cities and Society*, Vol. 70, 2021.

⁴ SCHACTER, D. L., Implicit knowledge: new perspectives on unconscious processes. Proceedings of the National Academy of Sciences, U.S.A., 1992.

⁵ SANDERS, Elizabeth, WILLIAM, Colin, *Harnessing people's creativity: ideation and expression through visual communication*. Focus Groups: CRC Press. 2003.



**Une gestion pérenne
du patrimoine culturel**

**Patrimoine matériel et conservation verte :
des pratiques en question.**

-

**Tangible Heritage and Green Conservation:
Practices in Question.**

Restauration, développement durable et écologie. Pour un nouveau contrat

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Abstract

The conservation and restoration of heritage objects and buildings are in themselves practices that can be considered ecological. Attached to the preservation of the original materials as the main mark of authenticity, restoration in historic monuments applies itself to conserving the latter by means of consolidation techniques, treatments that ensure their survival or products that attack their enemies, such as biocides against microorganisms that can affect all types of materials. These chemical treatments are now a matter of public concern and, in some cases, are prohibited or in the process of being prohibited by European regulations. New means have therefore been developed and alternative methods implemented to fight against microorganisms, knowing that the latter can be unsightly but also dangerous for the support they colonise.

Mots-clés: conservation, restauration, matériaux, produits chimiques, écologie

Keywords: conservation, restoration, materials, chemicals, ecology

Le Laboratoire de recherche des monuments historiques (LRMH) a pour mission d'apporter son aide à ceux qui, maîtres d'ouvrage ou maîtres d'œuvre, s'attachent à restaurer et conserver le patrimoine mobilier ou immobilier protégé au titre des monuments historiques. Il lui appartient aussi de mener une politique de recherche pour améliorer les techniques de sauvegarde ; or, ces dernières évoluent en fonction du contexte, des avancées scientifiques mais aussi des réflexions en cours dans la société sur l'articulation entre nature et culture, entre l'acceptable ou non, en matière d'esthétique, de décence, au sens propre du terme, et de risques humains ou environnementaux.

La conservation et la restauration des objets et immeubles patrimoniaux constituent en elles-mêmes des pratiques que l'on peut considérer comme écologiques. Attachée à la préservation des matériaux originaux comme marque principale de l'authenticité, la restauration dans les monuments historiques s'applique à conserver ces derniers par des techniques de consolidation, par des traitements qui en assurent la survie ou des produits qui s'attaquent à leurs ennemis, comme les biocides contre les microorganismes qui peuvent toucher tous les types de matériaux.

Ces traitements chimiques heurtent aujourd'hui la conscience collective et, dans certains cas, sont interdits ou en voie d'interdiction par la réglementation européenne. L'European Chemicals Agency (ECHA) (2006), par le biais du règlement européen REACH (2007), par exemple, légifère régulièrement dans ce domaine et incite à chercher des produits ou des procédés de substitution. Des moyens nouveaux ont donc été développés – la recherche dans ce domaine est cruciale – et des méthodes alternatives mises en œuvre pour lutter contre les microorganismes, sachant que ces derniers peuvent être inesthétiques mais aussi dangereux pour le support qu'ils colonisent. On citera la méthode des UVc au premier chef (**Figure 1**), les recherches menées sur les huiles essentielles qui, bien que chimiques, ont pour

elles d'être naturelles, l'utilisation des rayons gamma (dangereux lorsqu'ils sont mal maîtrisés et dont les effets sur les œuvres exigent un contrôle strict), des chambres sans produits, pour assainir par la chaleur, ou encore des vitrines à membranes en polymère poreux. Ces dernières permettent de réguler les climats des vitrines sans produit chimique¹.



Figure 1. Cabrerets, grotte de Pech-Merle, Thermohygromètre placé entre la frise et la boîte UVC, 2019 © Alexandre François, LRMH

Les traitements sans produits chimiques, par le froid, des bois atteints par des insectes peuvent aussi être mis en œuvre, même s'ils ne sont pas neutres sur le plan énergétique, et dans ce domaine, une véritable pédagogie est à développer car on voit encore trop de traitements violents et d'application de produits en réalité inutiles. On sait que, concernant les champignons en général et la mэрule en particulier, le changement de climat et la lutte contre l'humidité peuvent suffire à stopper et à éradiquer *Serpula lacrymans*.

Le béton étant un matériau fluide dont le remplacement est particulièrement difficile, contrairement à la pierre, des techniques conservatoires sont aussi étudiées à travers des programmes de recherche sur les patches de réparation, menée en partenariat avec le Getty et Historic England. Le retour sur expérience des méthodes utilisées permet ainsi de mieux orienter les choix futurs.

Des positions plus écologiques en matière de patrimoine passent aussi par la revalorisation de matériaux anciens comme le plâtre, matériau naturel, de proximité, dont les techniques de mise en œuvre garantissent une certaine pérennité, ou la terre sur laquelle de nombreuses recherches sont en cours, avec l'utilisation de biopolymères comme produits surfactants ou les possibilités de recyclage des terres d'excavation. L'on peut également retourner, en quelque sorte, contre la nature ses propres armes avec la bio-minéralisation qui utilise les ressources de certaines bactéries, productrices de calcite, pour réparer les fissures et autres faiblesses matérielles.

On peut aussi s'interroger sur la position théorique qui implique l'éradication des nuisibles, la lutte contre la nature opposée, par définition rapide, à la culture, et ce d'autant plus que l'agressivité de cette « nature » est souvent renforcée par l'action humaine. Cette dernière est abondamment productrice de pollution, chlorures ou nitrates. La lutte contre les microorganismes repose sur ce postulat ou ce constat que ces derniers détruisent à terme les objets patrimoniaux qu'ils colonisent. Il est exact que leur action (dans les grottes ornées, par exemple, sur les peintures pariétales) est, à terme, destructrice. Mais peut-être faut-il penser autrement et s'interroger sur la nécessité absolue, dans certains cas, de détruire ces mousses et ces lichens qui, dans d'autres civilisations, font l'objet d'une véritable admiration esthétique et signent, au contraire, l'authenticité.



Figure 2. Coucy-Le-Château, Mur de rempart végétalisé côté ouest, 2012, © LRMH

Sans aller jusqu'à laisser envahir nos monuments nationaux par des arbres et des fromagers comme à Angkor, la tolérance à l'égard de certains de ces organismes ou microorganismes repose sur la conviction que leur présence est peut-être plus un atout à préserver qu'un inconvénient à éradiquer. Les lichens anciens dorment les façades anciennes d'une belle lumière à laquelle, souvent, les habitants sont attachés ; leur ancienneté peut être une garantie de non-agressivité, contrairement aux organismes jeunes qui tendent à provoquer plus de dégâts. Je conclurai sur la question de ce que nous sommes capables de supporter visuellement, de notre seuil de tolérance en matière de cohabitation du végétal et de l'architecture, du micro-organisme et des bâtiments, bref du degré d'acceptabilité de cette vision.

La végétalisation des arases ou *soft capping* a été développée en Grande-Bretagne mais son usage pour la préservation des ruines est attesté au château de Coucy

(Aisne) au moins jusque dans les années 1935². Elle reprend un phénomène naturel pour lui donner des fondements plus réfléchis par le choix des végétaux dont certaines arases sont ainsi volontairement surmontées. Les racines fasciculées courent sous la surface et n'endommagent pas les pierres ; elles absorbent l'eau de pluie, et le mur ne présente donc aucune trace d'écoulement ni aucun développement biologique. On évite ainsi le besoin de traiter les pierres elles-mêmes.

Les ruines constituent un cas particulier où le romantisme du XVIII^{ème} siècle a admis et même prôné la cohabitation du végétal et du bâti. Dans certains cas, cette tendance se retrouve aujourd'hui comme à l'abbaye de Beauport (Côtes-d'Armor), ou dans le cas des Folies Siffait (Loire-Atlantique), où l'on ne sait ce qu'il est le plus important de conserver, les ruines factices installées par Maximilien Siffait entre 1816 et 1830 ou les plantes rares de son fils Oswald Siffait, botaniste.

Ces questionnements et ces réponses impliquent cependant que l'on privilégie la conservation préventive et le suivi pour limiter l'utilisation de produits et de techniques nuisibles à l'environnement. Cette notion, mise en œuvre de façon efficace, pourrait éviter dans bien des cas de recourir à la restauration ou en retarder le moment. La pose de verrières de protection, parfois encore mal acceptée en France, réduit de façon déterminante les risques pour les verrières anciennes ; des bâtiments dont les chéneaux sont entretenus, les charpentes dépoussiérées de façon régulière, sont moins sujets aux altérations, voire aux graves accidents de parcours comme les incendies. La conservation préventive et écologique du bâti porte aussi tout simplement le nom d'entretien. Or, ce dernier passe trop souvent au second plan, au profit de travaux de restauration plus visibles, plus producteurs d'emplois, plus clairement consommateurs de crédits, débloqués d'un coup, et non pas à gérer dans le temps. Ces actions d'entretien sont aussi à la charge de propriétaires plus démunis et moins aidés par l'État. Il faudrait pourtant réhabiliter ce processus et lui

redonner les moyens nécessaires, ne serait-ce qu'en rendant obligatoires des visites d'entretien annuelles par les corps de métier concernés, surtout, par le clos et le couvert. Comme souvent, il ne s'agit pas là d'un choix scientifique ou technique mais politique.

¹: Tous les exemples cités dans ce texte sont accessibles sous une forme développée sur le site du LRMH à l'adresse suivante : [https://www.lrmh.fr/Default/search.aspx?SC=DEFAULT&QUERY_LABEL=#/Search/\(query:\(InitialSearch:!,Page:0,PageRange:3,QueryString:'*:*','ResultSize:'50',ScenarioCode:DEFAULT,SearchContext:0,SearchLabel:'\)\)](https://www.lrmh.fr/Default/search.aspx?SC=DEFAULT&QUERY_LABEL=#/Search/(query:(InitialSearch:!,Page:0,PageRange:3,QueryString:'*:*','ResultSize:'50',ScenarioCode:DEFAULT,SearchContext:0,SearchLabel:')))

² Le LRMH a travaillé sur ces questions avec le Centre des monuments nationaux sur le château de Coucy, et en 2021, une étudiante de l'École du Louvre, Maryse Méchineau, a soutenu en 2021 un travail sur le sujet sous la direction du professeur Bruno Phalip.

Adapter l'architecture du XX^{ème} siècle aux nouveaux enjeux climatiques : approches méthodologiques pour une intervention plus raisonnée

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Abstract

Since the end of the 1990s, 20th century architecture has been at the convergence of remarkable efforts by the actors of the planning industry, regarding its conservation and its adaptation to the current societal and climatic imperatives. If technological advances offer devices that meet the needs of energy upgrading of our building stock, their implementation does not necessarily guarantee a respectful consideration. Within the framework of a transdisciplinary research project in the Nouvelle-Aquitaine region, research teams and innovation actors are combining their expertise to consider the acceptability and feasibility of the energy renovation of a group of remarkable buildings, taking as an example the use of 'ventilated double skin', with the aim of developing a methodology for reasoned intervention.

Mots-clés: architecture du XX^{ème} siècle, « architecture contemporaine remarquable », rénovation énergétique, enjeux climatiques, double peau ventilée

Keywords: 20th century architecture, 'remarkable contemporary architecture', energy retrofitting, climate issues, ventilated double skin

Depuis la fin des années 1990, l'architecture du XX^{ème} siècle bénéficie d'un intérêt grandissant. Si elle ne se conforme pas aux formes monumentale et classique du patrimoine architectural, elle est pourtant un monument de l'industrialisation de notre société contemporaine et un reflet de la transformation de nos modes d'habiter. La création des labels « Patrimoine du XX^{ème} siècle », devenu récemment « Architecture contemporaine remarquable » (ACR), permet de reconnaître cette singularité, en mettant en avant le caractère exemplaire et innovant d'ensembles architecturaux et d'ouvrages d'art de moins de cent ans. Leur reconnaissance présente aujourd'hui un double enjeu : d'un côté, leur préservation en tant qu'héritage civilisationnel, de l'autre, leur adaptation aux impératifs de transition énergétique.

Si les avancées technologiques actuelles offrent des dispositifs performants pour pallier les déficiences de confort, leur mise en œuvre ne garantit pas toujours une intervention raisonnée. C'est dans ce cadre qu'est né notre projet de recherche en Nouvelle-Aquitaine. Les laboratoires « Groupe Recherche Environnement, Confort, Conception Architecturale et Urbaine » (GRECCAU) et « Profession Architecture Ville Environnement » (PAVE) de l'École nationale supérieure d'architecture et de paysage de Bordeaux (ENSAPBX), et l'Institut de mécanique et d'ingénierie de l'université de Bordeaux se sont joints à des acteurs de l'industrie et de l'innovation pour penser l'acceptabilité et la faisabilité de la rénovation énergétique d'un ensemble de bâtiments remarquables, avec comme étude de cas l'intégration de la « double peau ventilée ».

Le but est d'élaborer une méthodologie renseignant la rénovation du patrimoine architectural du XX^e siècle et de l'« architecture contemporaine remarquable » par ce dispositif. Il s'agit d'accompagner les objectifs de transition énergétique d'une lecture des attributs architecturaux, constructifs et culturels.

Rénover et conserver avec la « double peau ventilée » (DPV)

La DPV est un dispositif d'épaississement de l'enveloppe architecturale qui a pour but d'améliorer l'isolation thermique du bâtiment par un système essentiellement passif. L'idée est de créer un coussin d'air permettant l'hiver de créer un effet de serre pour réchauffer le bâtiment, et l'été un effet de cheminée pour le rafraîchir naturellement.

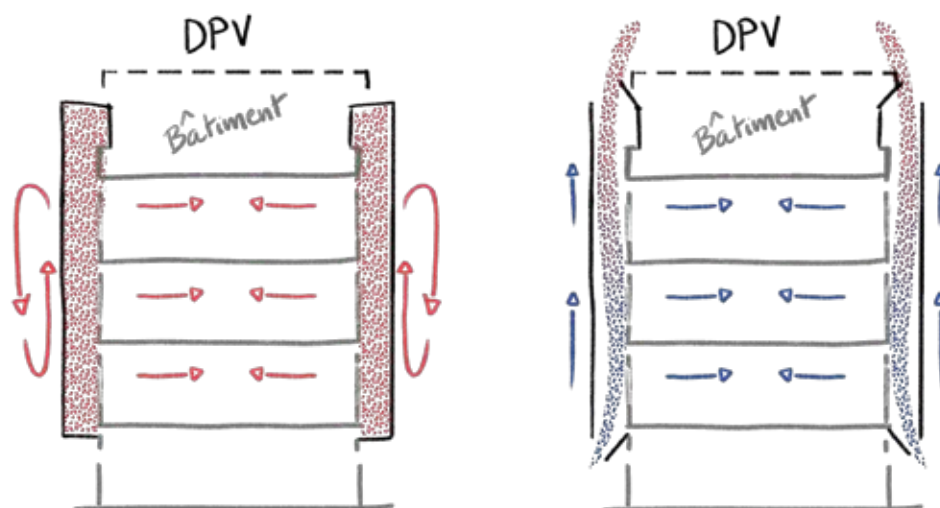


Figure 1. À gauche, création de l'effet de serre l'hiver. À droite, ouverture et création de l'effet cheminée l'été. © Myriame Ali-Oualla

Approches méthodologiques pour étudier la faisabilité et l'acceptabilité de la rénovation par DPV

À partir de là, nous avons entamé une étude double, à la fois de faisabilité et d'acceptabilité de l'intégration d'un tel dispositif grâce à une diversité de méthodes. D'un côté, nous avons élaboré un état de l'art de la rénovation par DPV aux échelles nationale et internationale pour identifier un nombre de paramètres de comparaison. Il s'agit d'identifier dans quels types d'environnement, de programme et de bâtiment s'applique le dispositif, et d'évaluer son apport réel en performance et son dialogue avec l'existant.

Parallèlement, nous menons en Nouvelle-Aquitaine une analyse architecturale d'un panel d'édifices réalisés au XX^{ème} siècle afin d'évaluer la faisabilité de leur rénovation par DPV. Grâce à cette étude prospective, l'idée est de recenser des typo-morphologies, des écritures et des architectoniques susceptibles ou non de recevoir une DPV.

Enfin, en partant d'études de cas de rénovations par DPV en Nouvelle-Aquitaine, il s'agit de comprendre le discours des acteurs de telles interventions. À partir d'entretiens et de monographies de projets, nous analysons les arguments mobilisés quant au recours à ce dispositif, de la genèse du projet jusqu'à sa livraison en passant par le dialogue souhaité avec l'existant. Un éclairage supplémentaire est recueilli auprès de la conseillère pour l'architecture de la direction régionale des Affaires culturelles (DRAC) de Nouvelle-Aquitaine pour situer la rénovation par DPV parmi les stratégies globales d'intervention sur ce patrimoine.

Le cas de l'université de Bordeaux

Afin d'illustrer l'investigation des récits d'acteurs, nous présentons le cas de la rénovation par DPV du campus de la faculté des sciences de l'université de Bordeaux. Cette faculté a été bâtie dès 1963 sous la direction de René Coulon. Selon l'historien de l'architecture Franck Delorme, l'architecte a voulu une nouvelle centralité universitaire, à l'architecture rationaliste, qui se manifeste aussi bien dans les rythmes de façade que dans l'organisation des bâtiments autour d'un large cœur vert le long du domaine.

L'ampleur du projet n'a pas empêché Coulon de porter un soin particulier au travail d'enveloppe. Les façades principales sont soulignées par un bas-relief central et rythmées par des percements qui accentuent leurs lignes horizontales. Les cages d'escalier sont marquées par des claustras en béton qui épousent le pignon. Et l'austérité des orthogonales est adoucie par la couleur rosée des panneaux de béton lavé à gravillons concassés.

Les bâtiments formant le campus ont subi progressivement l'évolution des conditions climatiques de notre époque. Selon la maîtrise d'ouvrage, l'université a affiché de façon marquée dès le début du projet de rénovation l'ambition de s'inscrire dans le cadre du développement durable, souhaitant obtenir du partenaire privé des engagements sur la

future consommation énergétique. C'est ainsi que le projet porté par l'entreprise Bouygues, l'atelier Paul Chemetov et Franck Boutté Consultants (BET) a été retenu.

Si la rénovation par DPV ne figurait pas dans l'expression des besoins de l'Université, le dispositif était néanmoins le seul à promettre des performances énergétiques inédites, en même temps qu'une préservation de l'identité architecturale du campus. Idée initiée par le groupement comme une mise sous verre de l'existant, la peau transparente a été augmentée par l'apport technique du BET pour en faire une machine thermique.



Figure 2. Faculté des sciences, université de Bordeaux, René Coulon années 1950, rénovée par AUA Paul Chemetov & Co. 2012-2016 © AUA Paul Chemetov

Le choix de la rénovation par DPV s'est fait unanimement. Au-delà de l'objectif de protection et des promesses de performance, sa mise en place pouvait se faire en milieu occupé, ce qui amortissait partiellement son prix élevé.

Cependant, selon la maîtrise d'ouvrage, la DPV n'a pas été tout à fait à la hauteur des performances attendues. La technologie n'ayant pas été assez éprouvée jusque-là sur de la rénovation, des pannes techniques ont révélé que le dispositif n'était pas beaucoup plus performant qu'une isolation par l'extérieur, tout en coûtant plus cher. Mais elle restait

l'option la plus adéquate car offrant un compromis entre les objectifs de transition énergétique et de conservation patrimoniale.

Questionnée comme référente de l'ACR, la conseillère pour l'architecture de la DRAC Nouvelle-Aquitaine a un avis plus mitigé quant à l'argument de « transparence » qui supposerait un effacement du dispositif. Pour elle, la rénovation par DPV a changé l'écriture du bâti, avec une solution plus technique qu'architecturale. Cependant, celle-ci a l'avantage d'être réversible, ce qui permet à terme d'en éprouver la technologie, et à l'architecture existante de ne pas souffrir de l'éventuelle obsolescence du dispositif.

L'étude en cours a l'ambition de révéler les subtilités d'une appréciation qualitative de l'architecture du XX^{ème} siècle et de l'ACR, qui devrait toujours accompagner les solutions de mise à niveau énergétique. L'analyse des récits autour de la rénovation par des dispositifs voulus innovants met en évidence aussi bien la volonté de préservation de cet héritage et les ambitions de transition que le chemin qui reste à parcourir pour arriver à un dialogue optimal avec l'existant.

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Sustainable Conservation and Restoration of Built Cultural Heritage: Introduction to the SCORE Project

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Résumé

Le projet « Sustainable COnservation and REstoration of built cultural heritage » (SCORE) vise à rassembler un groupe intersectoriel, international et multidisciplinaire qui comprend un large éventail d'acteurs - y compris des scientifiques de différentes disciplines, des sociétés de conseil, des organismes de formation et des organisations non gouvernementales. – afin de renforcer la recherche collaborative et l'innovation dans la conservation, la restauration et la réhabilitation respectueuses de l'environnement. Intégrer les exigences du patrimoine culturel dans les éléments économiques et sociaux du développement durable devient essentiel et nécessite une main-d'œuvre hautement qualifiée pour la conception, l'exécution et les travaux de conservation. L'objectif du projet SCORE est de réduire l'empreinte écologique des matériaux et méthodes employés dans la conservation du patrimoine culturel bâti.

Mots clés : patrimoine culturel bâti, restauration verte, changement climatique, économie circulaire

Keywords: built cultural heritage, green restoration, climate change, circular economy

Extensive research and innovation efforts have been made worldwide to conserve Built Cultural Heritage (BCH), but a lot more must be done to estimate the ecological footprint of the materials and methods employed during conservation works. Matching cultural heritage requirements with ecological, economic, and social aspects¹ becomes essential. We should combine the needs of society with the obligation to protect environmental and natural resources while contributing to sustainable future development: circular economy principles.

The SCORE project aims to bring together an intersectoral, international and multidisciplinary group that includes materials scientists, biology and civil engineering researchers, restorers, archaeologists, art historians, Life Cycle Assessment specialists, climatologists, practitioners, consulting companies, training organisations, decision-makers and non-governmental organisations in order to strengthen collaborative research and innovation in eco-friendly conservation, restoration, and rehabilitation. It aims to support the development of a series of innovative materials and methods dedicated to BCH conservation, integrating the circular economy concept, climate change and ecological footprint constraints.

Objectives and Actions

The SCORE project pursues three main actions of sustainable development:

- 1) Development of 'green' innovations: materials and methods for the conservation of ancient buildings based on a circular economy philosophy.
- 2) Two-way assessment of impacts of the environment on materials and of materials on the environment: climate conditions and atmosphere composition determine BCH materials' behaviour, and, at the same time, the BCH conservation impacts greenhouse gas emissions and then climate change.
- 3) Transfer to society: training and knowledge transfer on both innovative and traditional materials and methods with a low environmental impact.

The research and innovation action rely on two kinds of built cultural heritage in two geographical and climatic areas: vernacular built cultural heritage in Europe and archaeological sites in Yucatan (Mexico). Although different, these two kinds of built heritage use similar materials and construction techniques that can be transmitted and adapted from one to another. In both cases, BCH faces the same environmental constraints:

- Climate change, which threatens the protection of both monuments and vernacular buildings, in the light of current and future climate conditions^{2 3};
- The ecological footprint of the restoration (monuments) and rehabilitation (vernacular) materials and methods, which must be minimised.

The main climate types of the selected areas are extremely different, according to the Köppen-Geiger climate classification⁴: equatorial in Latin America (A) and several different warm temperate climates (C) in Europe. This allows us to study the behaviour and durability of BCH conservation materials and techniques in different climate conditions, generating different weathering processes such as biological colonisation in climate A, salt crystallisation in climate C, etc., to extend the results obtained to other world regions.

Built heritage conservation materials should meet three criteria: innocuity, compatibility and retractability^{5 6}. Even if restoration methods for monuments are subjected to more constraints than vernacular cultural heritage, sustainability aspects must not be neglected. Research on traditional building techniques and new inorganic materials will help to reduce the environmental impact of restoration campaigns. Practitioners and the environment are potentially exposed to risk factors during restoration works; a circular economy model must minimise those risks⁷.

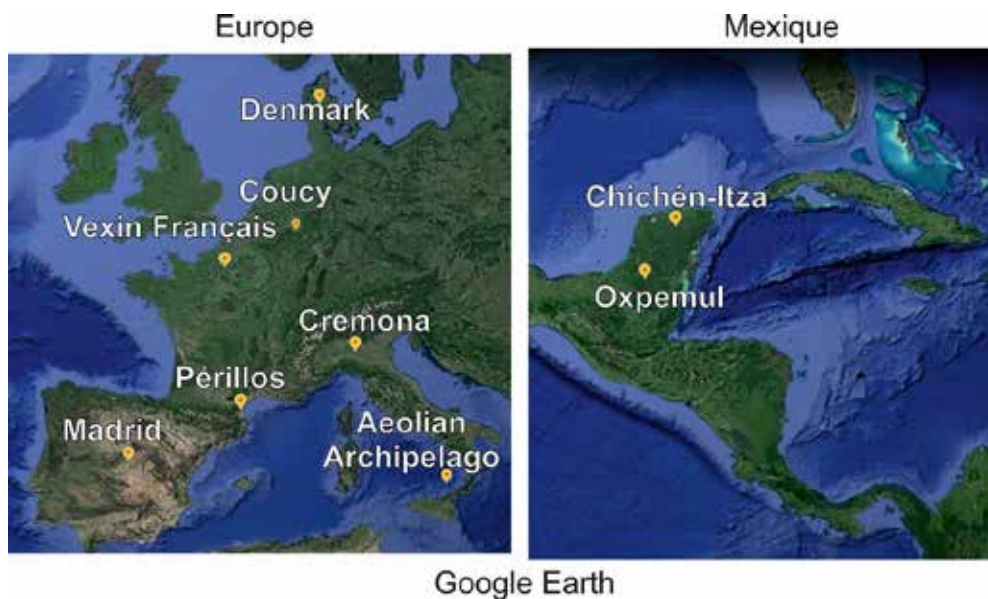


Figure 1. SCORE case studies

The selection of case study (**Figure 1**) sites was based on several criteria: (i) historical and architectural interest, (ii) geographical proximity and accessibility by research groups, (iii) research groups' previous experience in the employment of material and building techniques, (iv) a wide range of climatic conditions. More details about the case studies can be found at www.score-project.net.

To achieve its objectives, the SCORE project implements a designed bespoke methodology which consists in working through 'implementation loops', as detailed below and in **Figure 2**.

- 1) Bibliographic review, documentary and 'in-situ' study of sites.
- 2) Laboratory and 'in-situ' studies to characterise ancient materials, their conservation degree, composition, and physical properties.
- 3) Design of new materials: mortars and renders, bricks, consolidators, water repellents, biocides, etc.
- 4) Durability tests in the laboratory and 'in-situ' to determine the long-term behaviour of ancient and new materials in different environmental conditions. According to the obtained results, formulations may be reviewed.

- 5) Environmental performance and eco-friendly characteristics of materials and conservation methods. Life Cycle Assessment methodology will be used. The results will be used to review the proposed formulations.
- 6) Durability test results will be used to establish new dose-response functions for different weathering effects under continuous climate changes or extreme events on BCH conservation.
- 7) Past climate data and simulations of climate models for future periods will allow us to predict future climate conditions and identify their differences from past ones.
- 8) Past, current, and future weathering material will be determined using dose-response functions and climate model 'predictions'. Formulations will be approved or redesigned based on the obtained results.
- 9) Validation of new materials and methods if they fulfil all the required conditions: compatible with real case materials, eco-friendly and durable in the present and future conditions.

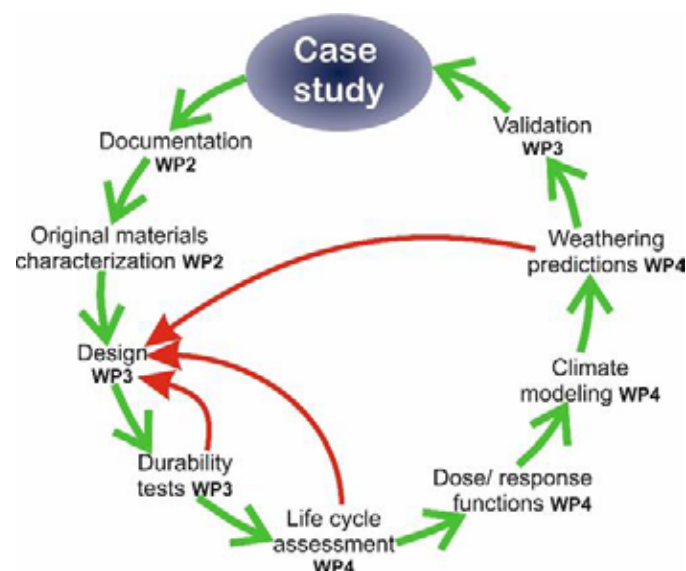


Figure 2. SCORE working methodology.

The SCORE project's expected results are:

- 1) Green restoration and rehabilitation products and methods: new products and methods proposed to practitioners, project managers, public and private owners.
- 2) Research contributions: a) new dose-response functions to estimate the effect of continuous processes (temperature rise, relative humidity changes, mean rain, etc.), b) critical threshold for extreme events (heatwave, rainstorms, dry seasons, etc.), c) future weathering maps in selected areas based on climate model simulations.
- 3) Training and academic actions, and dissemination of results.
- 4) Development of a large international and multidisciplinary network dedicated to green restoration and rehabilitation projects.

Acknowledgements



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Bio-Preservation of Waterlogged Archaeological Wood

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Résumé

Depuis 2016, le projet présenté ci-après propose des méthodes d'extraction vertes alternatives et innovantes pour le fer et le soufre présents dans le bois archéologique gorgé d'eau. Cette approche écologique a montré des résultats prometteurs lorsque appliquée à des espèces de bois d'eau douce et marine, avec des taux d'extraction aussi efficaces que les méthodes d'extraction actuelles en termes d'élimination du fer, et plus performants pour l'élimination du soufre. L'objectif est de normaliser ce traitement alternatif afin qu'il soit perçu comme une méthode facile à utiliser par les restaurateurs du bois.

Mots-clés: bio-technologies, bio extraction, bois gorgés d'eau

Keywords: bio-technologies, bio extraction, waterlogged wood

MICMAC, and its follow-up project entitled 'Get On Board', is a multidisciplinary project that gathers experts from microbiology, chemistry, and wood conservation. It focuses on the development of an innovative biological method to extract iron and sulfur to preserve waterlogged archaeological wood suffering from salts efflorescence and acidification¹. In recent years, the bio-extraction approach has proved to be as efficient as current extraction methods when applied to waterlogged archaeological freshwater wood samples. The work plan of this study aims to optimise the proposed bio-extraction method by assessing its performance on different wood species from freshwater and marine environments and focusing on a versatile and easy method to be handled by end-users.

Poles of freshwater oak, pine, lime and beech, and marine oak and pine wood were provided by the Swiss National Museum, the Archaeological Service of Bern Canton and the laboratory of conservation and research Arc'Antique. Cubes of 2x2x2 cm³ were shaped in the outermost layer of each pole. For each wood species, the samples were randomly distributed to form a set of eighteen samples: six untreated, six biologically treated, and six chemically treated.

The biological extraction (BT) method was defined according to the unique properties of selected microorganisms able to oxidise sulfur or to complex iron^{2,3}. In particular, *Thiobacillus denitrificans* were studied to metabolise sulfur compounds present in wood. They demonstrated that they did not induce any further degradation of the wood structure². Commercial Desferoxamine (DFO) (i.e., a natural iron chelator) presented the highest affinity to iron (III) among different iron complexing agents tested and investigation of iron uptake from mineral phases showed the highest extraction yield³. It resulted in a two-step extraction method with a) ten days immersion in DFO (84 mM) followed by b) twenty days immersion with a preculture of *T. denitrificans*. In parallel, a two-step chemical approach (CT) was

defined according to extraction protocols commonly used in wood conservation departments: a) one-day immersion in sodium persulfate 0.1 M followed by b) seven days immersion in ethylenediaminetetraacetic acid (EDTA) 0.125 M.

After the extraction phase, all samples were rinsed prior to being consolidated with polyethylene glycol 2000 and lyophilised to assess the compatibility of preliminary extraction methods with following procedures usually applied in wood conservation departments. This allows evaluation of the effectiveness and stability of the proposed method from the long-term perspective.

After extraction, no wood degradation was observed for neither BT nor CT samples according to Attenuated Total Reflectance-Fourier Transformed Infrared spectroscopy and Maximum Water Content measurements. Both of the studied extraction methods proved to be innocuous for the wood materials, despite the highly acidic pH measured for CT solutions. Yet, some visual alterations were observed.

If treated samples generally conserved a similar appearance to untreated samples, some wood species seems more altered than other, in particular freshwater pine and beech wood. It was reported that freshwater pine presented significant modifications after extraction with respect to freshwater oak (p -value < 0.05)². The visual appearance was altered for both types of treatment, implying that the wood species has an impact on the extraction performance (**Figure 1**). Though more discrete, a light discoloration was also observed on marine pine wood. The burial environment may be an important criterion to be considered regarding the definition of the extraction parameters.

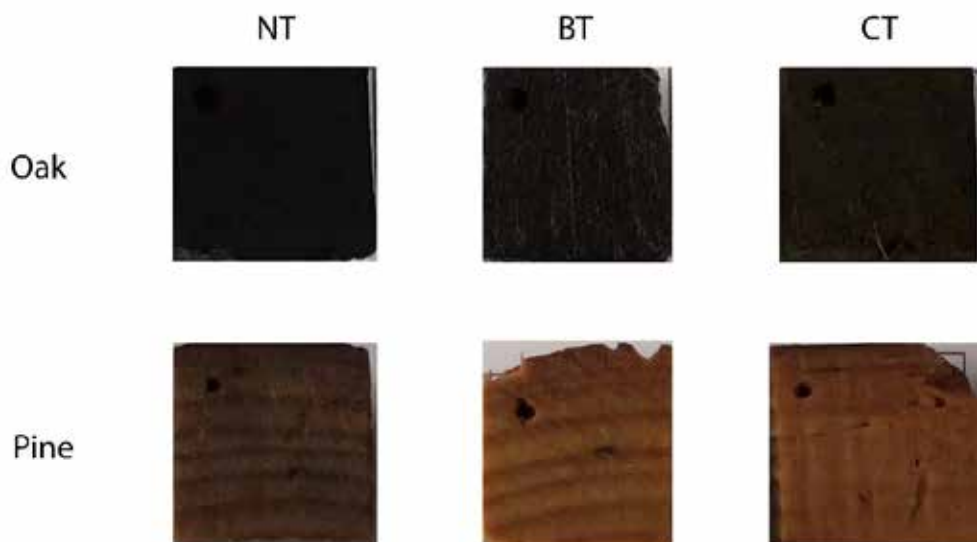


Figure 1. Pictures of freshwater oak and pine wood biologically (BT) and chemically (CT) treated, compared with untreated (NT) samples

Regardless of the wood species and the burial environment, BT samples all presented surfaces free of iron and sulfur phases while elemental sulfur was still identified at the surface of CT samples (**Figure 2**). Therefore, the biological approach proved to be more efficient in the extraction of harmful elements, as validated by Inductively Coupled Plasma-Optical Emission Spectroscopy. The ratio of elements present after/before extraction was calculated and it resulted that the iron extraction rates on BT and CT samples were in the same range. However, when it came to the extraction of sulfur phases, BT method was more promising. In addition to no sulfur compounds identified by Raman spectroscopy after extraction, the extraction rates were more important with BT than CT.

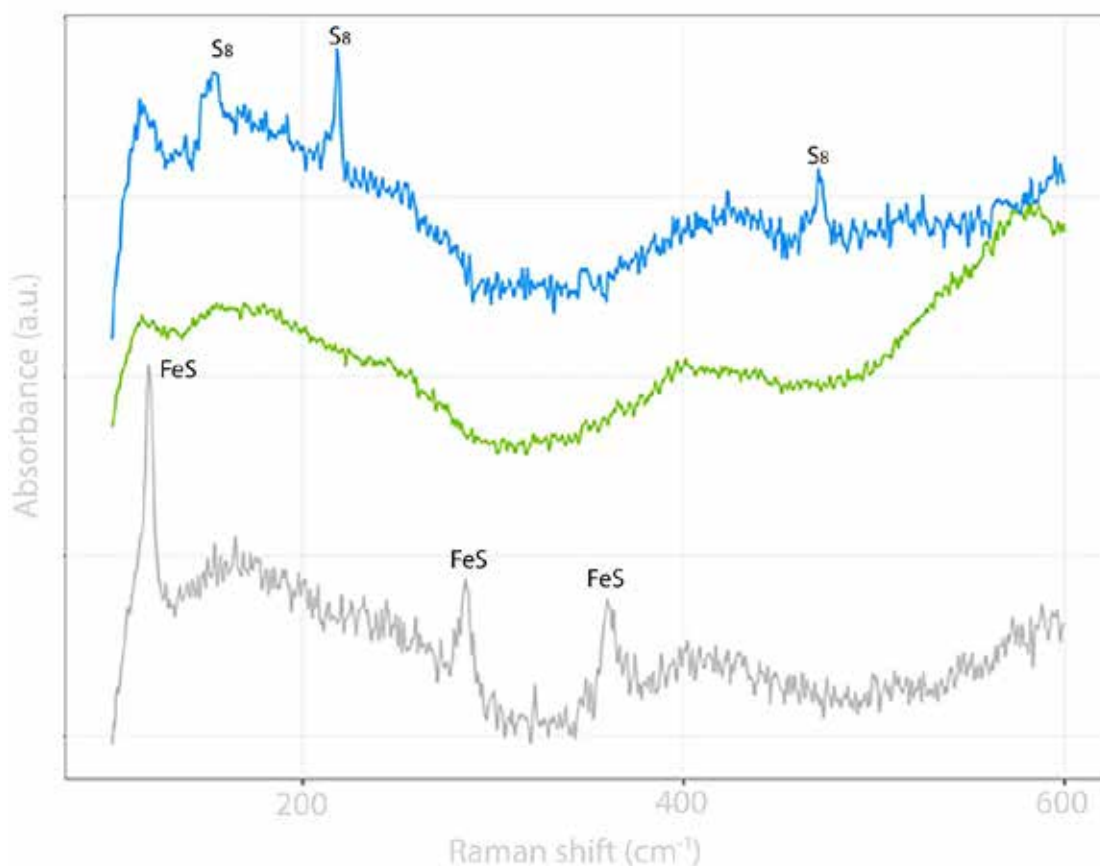


Figure 2. Representative Raman spectra for biologically (green line) and chemically (blue line) treated samples compared with untreated (grey line) samples. FeS: iron sulfide compounds. S₈: elemental sulfur.

No incompatibility was noticed between BT and the conservation protocols applied afterwards. The treated wood samples showed an appearance close to untreated samples without any salt efflorescence. To ascertain the long-term stability of the treated samples, some samples were placed in a climatic chamber under harsh conditions⁴. No shrinkage or salt efflorescence was observed after this accelerating ageing, and these results are encouraging concerning the proposed green extraction method for harmful iron and sulfur phases.

The proposed green extraction method proved to be a promising alternative to current extraction methods. In addition to the results obtained, this bio-based approach fulfils the green criteria stated during the different editions of the 'Green

Conservation of Cultural Heritage'. Indeed, BT avoids the use of toxic solvents and chemicals (i.e., sodium persulfate and EDTA are both classified as health hazards). While DFO is not reported hazardous, *T. denitrificans* is a non-pathogenic and naturally occurring bacteria. The use of these substances and bacteria within the proposed green extraction method is then innocuous to end-users. In addition, the microorganisms employed grow at ambient temperature and pressure and at neutral pH and, therefore, their use is an environmentally friendly process⁵.

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**Un patrimoine réflexif
pour une société résiliente**

**Vers des pratiques patrimoniales inclusives
et socialement engagées.**

-

**Towards Inclusive
and Socially Engaged Heritage Practices**

Culture Kaleidoscoop and More Inclusive, Participatory, and (self)- Reflective Publishing Practices

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Résumé

Culture Kaleidoscoop est une nouvelle plateforme en ligne, internationale et interdisciplinaire destinée à partager des recherches sur les pratiques socialement engagées dans les secteurs des arts, de la culture et du patrimoine. Grâce à la promotion de la pratique réflexive et du partage horizontal des connaissances dans le secteur, Culture Kaleidoscoop cherche à pallier certaines des inégalités concernant les expériences et les connaissances publiées, ainsi que l'accès à ces publications. La résolution de certains de ces défis et la création d'un espace plus équitable pour la publication nécessitent une nouvelle façon de travailler elle-même plus inclusive, participative et (auto)-réflexive.

Mots-clés: accès libre, pratique réflexive, pratiques inclusives, engagement social

Keywords: open-access, reflective practice, inclusive practices, socially engaged

Culture Kaleidoscope is a new online, international, interdisciplinary, peer-reviewed platform for sharing research on socially engaged practices across the arts, cultural, and heritage sectors. In the spirit of the 'Heritage for the Future, Science for Heritage' symposium, Culture Kaleidoscope promotes reflective practice in the heritage sector. We encourage professionals, communities, and researchers to consider their role and that of arts, culture, and heritage more broadly in a changing world. Culture Kaleidoscope reflects and examines the ongoing shift towards more inclusive, socially engaged heritage practices.

We believe that learning from one another and incorporating reflective practices into our daily work is essential to socially engaged practice, the platform's main focus. The platform is also intended to address some of the inequalities that exist in academic publishing today. Creating a fairer space for publishing, and being more inclusive and thoughtful about our processes of sharing knowledge, requires a reimagined way of working – one that is itself more inclusive, participatory, and (self)-reflective.

The Culture Kaleidoscope manifesto outlines the platform's most important ambitions and holds us accountable. We want to make our values public, so we can continue the conversation about how best to do our work. This paper will outline three of our manifesto points to show how we are reimagining publication and knowledge-sharing processes.

Whose Voices Are Heard?

We promote voices, perspectives, and ways of knowing that have traditionally been excluded or marginalised from the debate. We address the imbalance in what gets published, and we hope to represent the sector's diversity from different disciplines and across the globe.

Culture Kaleidoscope seeks to address some of the inequalities in whose experiences and what knowledge is published, as well as who has access to these publications. To achieve this goal, we have set up Culture Kaleidoscope as a diamond open-access publication, meaning that all our content is free to read and publish. We charge neither contributors nor readers a fee.

Furthermore, we have a limited fund for contributor grants to help reduce the barriers to publication. For those whose work doesn't expect publication or those with tenuous employment, it can be difficult to find the time or resources to contribute to an academic publication.

We have also revised the traditional peer review process to be more personal and constructive. Instead of double-blind peer review, we encourage contributors and reviewers to get to know each other and to talk about how best to improve a contribution.

Valuing Different Types of Knowledge

We value different types of knowledge and research. We encourage contributors to share their knowledge, thoughts, experiences, and research in various languages and various forms, such as interviews, collaboratively written articles, or visual contributions.

At Culture Kaleidoscope, we have a broad understanding of research, which ties in with our focus on reflective practice. We understand reflective practitioners as professionals, volunteers, academics, or community members who are thinking about and researching their own methods and ways of thinking about their work. This broad interpretation of research allows for a wider array of perspectives on socially engaged practice in arts, culture, and heritage.

In addition to these various viewpoints, we also encourage different media and formats for contributions. Academic, research-based articles are welcome, as are video or photo essays, podcast episodes, interviews, and thought pieces. We want contributors to produce knowledge in the way that feels the most comfortable and the most effective way for them to express their idea.

We also aim to publish in multiple languages in the future. We recognise that producing content only in English is a barrier for many people working in arts, culture, and heritage worldwide. In the future, we would like to welcome proposals in multiple languages, and we would like to publish those contributions both in the original language and in English.

Collaborative Approach

Culture Kaleidoscope is developed by, with, and for the sector so that we can stay relevant, representative, and of use. The platform is an independent initiative: we are not embedded at a university or cultural institution. We did this intentionally so that our missions, vision, and values would not be affected by any one funder. Culture Kaleidoscope is, in that sense, a collaborative project funded by multiple, more minor sponsors who believe in our mission.

We are also a collaboratively run platform. The two founding co-editors, Danielle N. Carter and Lorna Cruickshanks, are supported by an Editorial and Advisory Collective. The Editorial Collective is actively involved in editorial decisions and processes, and the Advisory Collective ensures Culture Kaleidoscope works to achieve its ambitions and remains value-driven. Both groups are comprised of researchers and reflective practitioners actively involved in this field of work within the global culture and heritage sectors. They work at academic institutions, heritage organisations, and cultural or arts centres.

Finally, at Culture Kaleidoscoop, we want to live our values as much as possible. Not only do we expect contributors to share their mistakes and learning processes, but we also want to do the same. Through our manifesto, for example, we show what our ambitions are – even if we haven't yet been able to achieve all of our goals. We want to make the process of setting up Culture Kaleidoscoop as transparent as possible.

To contribute to a more resilient heritage sector, Culture Kaleidoscoop provides space for professionals, community members, and researchers to experiment, learn by doing, and reflect on their own practices, positions, and roles. We promote reflective practice and horizontal knowledge sharing in the sector.

Culture Kaleidoscoop envisions an idealistic, resilient heritage sector in which participants in the sector can learn and grow together into the future. As Roberto Scopigno from the Italian National Research Council said during the symposium, the 'single-scholar model is dead'. We must collaborate on our approaches to our work, create common spaces where we can learn together and from one another, and share our knowledge and experiences more openly.

To know more about Culture Kaleidoscoop, visit our website: <https://www.culturekaleidoscoop.com>.

Acknowledgements

We would like to thank the symposium organisers for the opportunity to present Culture Kaleidoscoop to a wider audience. We are also grateful to our Advisory and Editorial Collectives, who have guided and supported us throughout the process of setting up Culture Kaleidoscoop.

Digital Storytelling for an Inclusive Access to Cultural Heritage: The MEMEX Project

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Résumé

L'objectif du projet Horizon 2020 MEMEX est de développer des outils de narration numérique inclusive. Cet article décrit le concept du projet et la méthodologie de co-création nécessaire pour promouvoir l'inclusion sociale par l'utilisation de la technologie. MEMEX se concentre sur trois projets pilotes distincts impliquant différentes communautés de migrants : les habitants du XIX^{ème} arrondissement de Paris (qui abrite l'une des plus grandes communautés d'immigrés de la ville), les femmes migrantes de Barcelone et les migrants portugais de deuxième et troisième générations à Lisbonne.

Mots-clés: inclusion sociale, narration numérique, patrimoine culturel, participation culturelle, réalité augmentée

Keywords: social inclusion, digital storytelling, cultural heritage, cultural participation, augmented reality

Social cohesion is the ongoing process of developing a community of shared values and challenges and equal opportunities, based on a sense of trust, hope and reciprocity. Accordingly, achieving social cohesion involves reducing disparities, enabling people to have a sense that they are members of the same group or community and face shared challenges. Inclusion of social groups at risk of exclusion has been a running theme in European cultural heritage discussions. Several initiatives in the cultural heritage domain have explored the power of storytelling and crowdsourcing in promoting increased awareness and engagement from the general public. Both techniques are known to significantly increase audience engagement with cultural heritage enabling it to be easily shared, recommended and embedded in other media.

Despite the number of proposed projects targeting inclusion through cultural heritage, in this domain as well as in others, the ability to effectively measure social inclusion remains a challenging problem. Therefore, the strategy used in the MEMEX European projects is to clearly define and analyse the degree of the limitations and barriers that marginalised groups find to access culture and participate in the cultural life of their communities.

The MEMEX project encourages cohesion through collaborative tools that provide inclusive access to tangible and intangible cultural heritage and, at the same time, facilitate encounters, discussions and interactions between communities at risk of social exclusion. These tools will empower communities of people with the possibility of welding together their fragmented experiences and memories into compelling and geolocalised storylines using new personalised digital content linked to the pre-existent European cultural heritage. To this end, MEMEX will nurture actions that contribute to practices of recognition of differences by giving voice to individuals for promoting cultural diversity.

MEMEX uses digital storytelling as its main strategy, as a manageable and effective tool to creatively engage people at risk of marginalisation or exclusion in the creative narration and reinterpretation of cultural heritage, to promote creativity and personal expression, social and cultural participation and empowerment, the expression and recognition of cultural diversity and multiple skills and competences. The technological embodiment of MEMEX is an app installed on a smartphone allowing non-expert users to create and visualise stories related to their personal memories and experiences digitally linked to the geographical locations of either intangible or tangible cultural places/objects. The interface will allow users to annotate using augmented reality any physical object or location with their memories in the form of digital images, videos, audio recordings or textual input using a smartphone. Effectively, the users of MEMEX will be active actors shaping contemporary and historical content, including new material from their experiences and memories, and personalising cultural heritage and creative media content in a meaningful and socially inclusive manner.

The target communities of MEMEX are socially fragile targets that are systematically excluded from various cultural opportunities and resources that are normally available to members of a different group, and which are fundamental to social integration. As a heterogeneous sample of these communities, MEMEX is deploying three distinct pilots to analyse different expectations from communities located across the European territory:

- migrant women in Barcelona (Spain);
- communities from former Portuguese colonies in Europe (Portugal);
- priority neighborhood from Paris' Northern suburbs (France).

MEMEX overall technology goal is to create easy-to-use Information and Communications Technologies (ICT) tools for the communities at risk of exclusion and, to a larger extent, for European citizens to create and engage in stories linked to our cultural heritage. The tool will be shaped over the user's needs and it will allow for collaboration in the input of content and in the creative process of storytelling while encouraging social cohesion and recognition of differences with effective instruments to combat social exclusion.

The policies procedures and technology of the collaborative tools developed in MEMEX aim to promote an innovative vision for creating digital stories that will reach different targets of stakeholders in the field of culture and education.

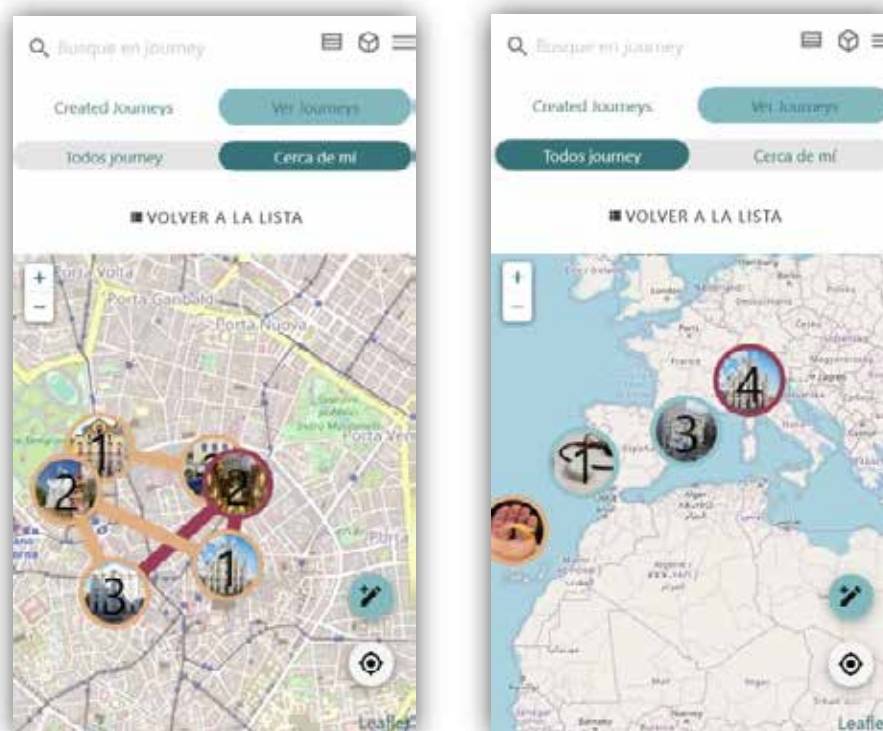


Figure 1. The MEMEX app is a digital storytelling prototype tool on a smartphone that enables the creation of content and their linking to European cultural heritage assets. Source: MEMEX Project



Figure 2. The MEMEX app is used to create the augmented reality scene localising the cultural heritage that can then be visualised together with the stories created by the participants. Source: MEMEX Project

Acknowledgements

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**La plateforme numérique immersive PATRIMINDIAOCEA :
Intégrer le patrimoine culturel de l'Indiacéanie dans le processus de
résilience des territoires européens**

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Abstract

The *Patrimindiaocea* project is a digital platform on the cultural heritage of Indiaocéania that aims to increase its visibility in the cultural construction of Europe. Through an immersive and inclusive digital application, the project seeks to offer new perspectives on the post-colonial societies of Indiaocéania, whose process of 'creolisation' could be an example of a 'resilient' society that should participate in the current European debate on 'intercultural dialogue', 'living together' or the construction of a 'human community'.

Mots-clés: patrimoine culturel, Indiaocéanie, épistémologie du Sud, résilience, inclusion numérique

Keywords: cultural heritage, Indiaocéania, epistemology of the South, resilience, digital inclusion

Le projet de plateforme numérique, immersive et éducative *Patrimindiaocea* traite de la question de la valorisation du patrimoine culturel des sociétés postcoloniales de l'Indiaocéanie dont le processus de « créolisation » pourrait les ériger comme des exemples de sociétés « résilientes », foyers du « vivre-ensemble » pouvant enrichir la réflexion sur « l'identité européenne »¹. Expression des traditions, valeurs, croyances et véhicule de perceptions, le patrimoine matériel et immatériel de l'Indiaocéanie est actuellement l'objet de travaux de recherches situés dans les pays de la région et leurs (anciennes) métropoles européennes (France, Portugal, Angleterre, etc.). La posture épistémologique de la recherche que nous proposons est socialement engagée dans un regard croisé Nord/Sud au cœur d'un dialogue entre les acteurs locaux et internationaux.

Avec l'évolution du numérique comme dispositif de plus en plus inclusif, la mise en place du projet *Patrimindiaocea* pose la question de la technologie au service de la médiation culturelle.

Comment dépasser les conflits d'acteurs autour de la reconnaissance et des productions discursives sur les patrimoines culturels relayant bien souvent la participation des citoyens à la marge de cette écriture et, de ce fait, rendant parfois difficile l'appropriation du patrimoine culturel « officiellement reconnu » ?

Rendre visible le patrimoine de l'Indiaocéanie en Europe : une approche critique guidée par les « épistémologies du Sud »

Définie comme une aire géographique et politique par la Commission de l'océan Indien, l'Indiaocéanie peut être aussi envisagée comme une sphère culturelle regroupant dans l'océan Indien Madagascar, l'archipel des Comores, l'archipel des Seychelles, l'île Maurice, l'île Rodrigue et l'île de La Réunion. Jean-Michel Jauze² parle d'« Indianocéanie carrefour des civilisations », d'« héritage culturel commun » qui s'étend de son histoire (esclavage, colonisation, engagement, etc.) aux influences

culturelles de l’Afrique, de l’Inde, de l’Asie, de l’Australie, du Yémen, de l’Europe. À la différence des sociétés postcoloniales des Caraïbes ou d’Amérique latine, celles de l’Indiaocéanie manquent d’une historiographie centrée sur les enjeux géopolitiques et symboliques des processus de patrimonialisation (reconnaissance, réparation, restitution) promues par l’Union européenne à l’échelle régionale.

La réflexion sur cette invisibilité et ce manque de (re)connaissance nous amène à problématiser la question de la patrimonialisation sous l’angle de la production et de la circulation des connaissances dans un axe Nord-Sud reconfiguré par le contexte postcolonial normatif, par une approche des épistémologies du Sud pour l’enrichir. Cette perspective critique, inscrite dans un champ interdisciplinaire qui englobe les études postcoloniales, décoloniales propose de problématiser la question de la « colonialité du savoir-pouvoir »³ à travers le temps et sur la base d’une « écologie des savoirs » et d’une « traduction interculturelle »⁴. Dans ce sens, avec le projet *Patrimindiocea*, il s’agit de promouvoir les savoirs localement situés (histoire orale, anecdotes, expériences et récits de vie) dans le processus (institutionnel ou non) de patrimonialisation des pratiques, objets et paysages des îles de l’océan Indien⁵.

Inscrire l’écriture des patrimoines culturels dans une démarche inclusive : les Technologies de l’Information et de la Communication (TIC) au service de la médiation culturelle

Le projet *Patrimindiocea* est une plateforme numérique proposant un espace de discours scientifiques collectés par des spécialistes de l’inventaire du patrimoine culturel, immatériel (de services régionaux, musées, etc.) intégrant l’équipe de projet. Le scénario est piloté par l’expertise de la médiation culturelle et ses techniques de fabrication de discours pour différentes typologies de publics⁶, dans la démarche consistant à associer la découverte des richesses patrimoniales à la logique de visiteurs devenus, aussi, des usagers numériques⁷.

Ainsi le numérique permet d'inscrire le patrimoine culturel dans une logique communicationnelle qui, selon Jean Davallon⁸, est essentielle à son appropriation par les citoyens, dans la mesure où sa mise en récit s'inscrit dans un temps présent. L'élaboration de la plateforme demande donc à penser des procédés permettant à l'utilisateur de se construire une histoire en lien avec son présent autorisant, selon les termes de Henri-Pierre Jeudy⁹, « l'accident de la transmission » en réponse à l'organisation du sens autour du patrimoine culturel par les spécialistes laissant, bien souvent, à la marge la participation citoyenne dans cette écriture.

Dans ce sens, le projet *Patrimindiocea* questionne l'inclusion par l'écriture des patrimoines culturels grâce au numérique. La plateforme propose des parcours permettant de (re)contextualiser, dans une spatialité propre aux routes historiques étudiées (celles de l'Inde, de la soie, de l'esclavage et des mouvements sociaux contemporains), l'histoire de l'objet patrimonial identifié. Les visites virtuelles immersives proposent une dynamique participative d'inscription du patrimoine¹⁰ par une logique de géolocalisation¹¹ et de témoignages, intégrant le point de vue des citoyens.



Figure 1. Exposition virtuelle *Boutik Chinoise* : <https://storage.net-fs.com/hosting/7381827/0/>

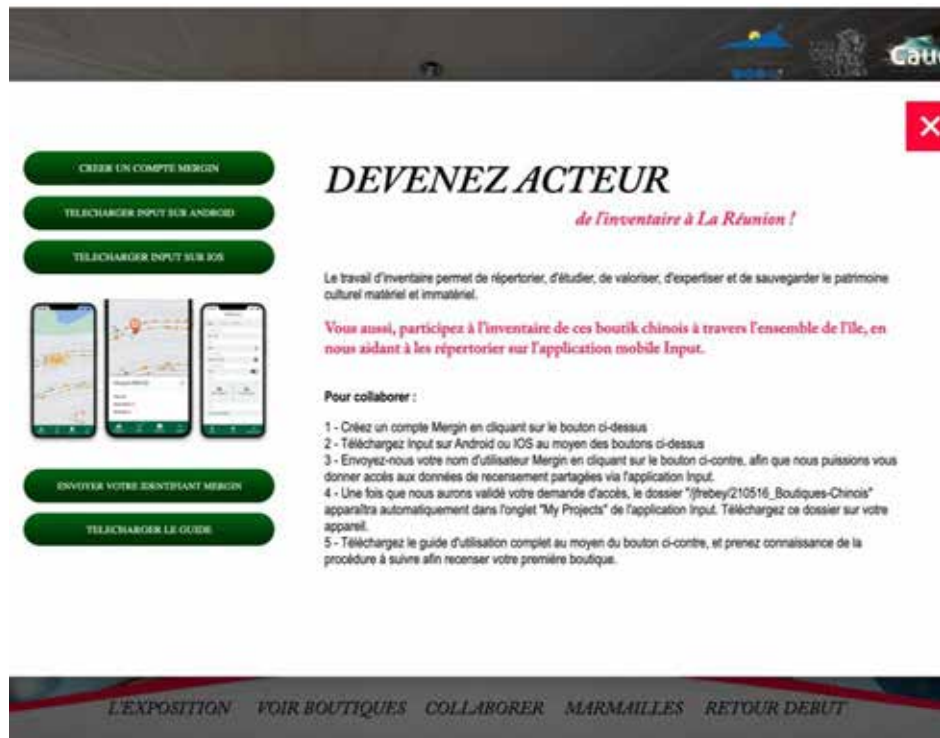


Figure 2. Dispositif de dynamique participative d'enregistrement du patrimoine

Ainsi, le projet *Patrimindiocea* traite les médias et les TIC comme des outils qui participent à la construction des territoires et des images/imaginaires qui leur sont ainsi associés. Le concept de « territoire » est ici saisi sous une double approche sémiotique et philosophique qui permet de problématiser l'idée d'une « construction territoriale des TIC »¹². Dans cette optique, il s'agit d'assumer comme postulat méthodologique que les dispositifs médiatiques représentant les territoires et les îles de l'océan Indien, et permettant de les voir et d'y accéder virtuellement, contribuent par là à reconfigurer ces lieux par la construction de sens et des valeurs associées aux pratiques, aux acteurs et aux objets culturels ou naturels qui habitent ces espaces. En d'autres mots, la construction territoriale des TIC est ici saisi comme une opération symbolique, comme une structuration identitaire et un développement collectif bousculant les représentations des frontières Nord/Sud.

¹. Projet ECHOES

[https://cordis.europa.eu/search/fr?q=contenttype%3D%27project%27%20AND%20\(programme%2Fcode%3D%27H2020%27\)%20AND%20\(%27cultural%20heritage%27%20AND%20%27%20natural%20heritage%27\)&p=1&num=10&srt=Relevance:decreasing](https://cordis.europa.eu/search/fr?q=contenttype%3D%27project%27%20AND%20(programme%2Fcode%3D%27H2020%27)%20AND%20(%27cultural%20heritage%27%20AND%20%27%20natural%20heritage%27)&p=1&num=10&srt=Relevance:decreasing)

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Une gestion pérenne du patrimoine culturel

Patrimoine et numérique : cadres et pratiques d'une gestion durable

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Digital Heritage: Frameworks and Practices for a Sustainable Management

Cultural Heritage 3D Data on the Web: Issues and Perspectives

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Résumé

Les modèles numériques 3D sont unanimement considérés comme un atout inestimable pour l'étude, la gestion et la promotion du patrimoine culturel. L'urgence de COVID-19 a accéléré la tendance commune à travailler à distance et, pour le patrimoine culturel, la présentation, le partage et l'accès aux données 3D en ligne sont désormais perçus comme une nécessité. Malheureusement, l'absence de méthodologies, d'outils et d'infrastructures standard rend difficile le passage du stockage local à la gestion en ligne de données 3D complexes. Dans cette contribution, nous souhaitons évaluer l'état de l'art de l'utilisation avancée de la 3D sur le web, en soulignant les besoins actuels, en présentant quelques études de cas et en explorant les perspectives futures.

Mots-clés: 3D, web, patrimoine culturel, infographie, état des lieux

Keywords: 3D, web, cultural heritage, computer graphics, state of the art

3D data are nowadays a key asset for the cultural heritage domain. This is particularly true if one thinks of 3D as a metric digital replica for supporting study, analysis, and restoration, but that is also true if one thinks of 3D as an important resource for learning, dissemination, and promotion. However, exploiting these resources only locally is no longer enough. Accessing, working, and sharing everything online is an important trend in the last few years, and COVID-19 has accelerated this trend. Also, the cultural heritage sector has been involved in this change, as the evolution in the online digital offer of cultural institutions all around the world can confirm¹. Still, despite cultural heritage, the management of 3D data online is nowadays perceived as a necessity. Today, 3D is the less represented data in the cultural heritage web repositories, data science platforms, and infrastructures.

The results of a recent survey² investigating the online digital offer of the Galleries, Libraries, Archives, Museums (GLAM) sector in the United States of America and United-Kingdom (two of the most digitally advanced countries) show that 3D data are present in just one per cent of their offering, while images cover the seventy-six per cent, videos are at twenty-six per cent, and even 360° images count the two per cent. The results are quite impressive and confirm that despite all the advancements of the last twenty years, it is still difficult to jump from local storage to web management of complex 3D data.

Issues and Needs

The use of 3D models on the web platform is somehow limited by different factors. First of all, there are technical limiting factors. If we look at software tools provided to web3D content creators the panorama of solutions is split into two halves. On one side there are 'high-level' solutions for the simple visualisation of a single 3D model, while, on the other side, there are 'low-level' development libraries that can be used to create complex 3Dweb apps. The firsts do not scale with complexity and are mostly limited to just 'visualising it', while, for the latter, writing from scratch a complex web app for the management of a specific 3D interaction often presents

steep learning curves and prohibitive development costs. Unfortunately, there is little or nothing in the middle. In addition to technical limiting factors, there are methodological limiting factors, which refer to how solutions aimed at handling 3D data on the web are designed and developed.

The web is currently full of interesting web3D applications and services. Unfortunately, these solutions are often not able to talk to each other because they are based on closed or different standards. Sometimes they have relevant maintenance costs because of the huge scale of infrastructures, and sometimes they have uncertain futures because they are dependent on temporary funds or the work of a small research group (or even the work of a single researcher). It is clear that solutions developed in such a way are not sustainable in the long term and risk having a short life.

Case Studies

To better understand these limiting factors, some case studies can be analysed. Starting from the technical limiting factor, several examples that represent well the split panorama of web3D tools. For instance, libraries like Three.js or Babilon.js can be considered perfect representants for the 'low-level' solutions, while the well-known Sketchfab could ideally be placed as a 'high-level' solution. Intermediate solutions are missing for creating Web3D applications with complex features but easy to use and with the capacity to make the development, deployment, and maintenance of these applications sustainable.

In the last years, this middle ground has been explored by developing a solution called 3D Heritage Online Presenter³ (3DHOP). 3DHOP is an open-source framework for the creation of interactive web presentations of high-resolution 3D models, oriented to the cultural heritage field. It has been designed to be easy to use, still providing advanced features for developing quite complex web3D applications (**Figure 1**).



Figure 1. 3DHOP web3D application developed for the exhibition 'ALCHEMY BY JACKSON POLLOCK. Discovering the Artist at Work'. Peggy Guggenheim Collection, Venice, Italy, 2015⁴

The experience gained with this framework and officially released in 2014, has shown that it is not easy to stay in the middle ground because the design choice made to be simple often prevents from offering complex features, and *vice versa*. However, the feedback gathered over the years⁵ indicates that the middle ground perspective is right, and, since there is still room for improvements, that is worth continuing to work on it.

Moving to the methodologic limiting factors, and as previously said, the web ecosystem is populated by many brilliant examples of web services hosting cultural heritage 3D data: Europeana, Archaeology Data Service, Digitizing Early Farming Cultures (DEFC) Database, and Edition Topoi Repository, just to mention a few of them. These platforms have many pros, but also some cons. They all propose different ways to access 3D data, represent them, archive metadata and paradata, and export information - when possible. The result of this scattered

panorama is that none of these resources can be universally recognised as a reference platform or a standard to follow.

Also, in this case, we explored the research space, thanks to the development of the Visual Media Service⁶, in the context of the ARIADNE European project⁷. The Visual Media Service is a platform for creating a web presentation starting from different complex media such as 3D, RTI and highresolution images. It has not been designed to be a repository, but to give the cultural heritage audience the possibility to experiment with web publishing by playing with some lower-level libraries exposed in a shared environment with simple web interfaces (**Figure 2**).



Figure 2. Step-by-step configuration wizard assisting the setup of the web presentations of 3D content in the Visual Media Service

The lesson learned working on the Visual Media Service is that these kinds of solutions cannot be lonely islands. Providing non-integrated services is sustainable only for atomic and simple tasks: data uploading, interface customisation, and so on. But things change with more complex actions, for instance, data enrichment. In this case, the way to structure, reference, and export annotations, metadata, and paradata is fundamental and has to be coordinated with other services. Otherwise, the risk is to have non-sharable - and so quite useless - data information.

Future Perspectives

The polarisation of the technical landscape, and the lack of standard methodologies, are critical issues for the advanced use of cultural heritage 3D data on the web. Nevertheless, nowadays Web3D is a quite mature domain able to offer a lot of possibilities. Future perspectives for cultural heritage in this field are, therefore, still promising, provided that the efforts of those who design solutions for this community will be oriented in the right direction.

From the technical point of view, this means exploiting in a better way the great amount of valid basic solutions (such as libraries, application programming interface (API), viewers) produced by the last decades of research and combining these basic 'bricks' to cover the empty spots and neglected needs, providing more specialised solutions.

At the same time, to ensure that these specialised solutions do not turn to be lonely islands and last over time, it will be necessary to take care of the methodological aspect. One shall keep in mind that technical accessibility, interoperability, use of open standards, long-term support, and sustainability of maintenance will be the keys so that these solutions could be cornerstones for the next generation of digital humanists.

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Aïoli, a Reality-Based 3D Annotation Cloud Platform for the Collaborative Documentation of Cultural Heritage Artefacts

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Résumé

Malgré leurs différentes approches et leurs différents outils d'observation, de description et d'analyse, les acteurs de la documentation du patrimoine culturel partagent tous un même intérêt et une même préoccupation : l'objet patrimonial, celui qui est matériel, qu'il soit un lieu, un bâtiment, une sculpture, un tableau, une œuvre d'art ou un fragment archéologique. Ce dénominateur commun est le point de départ pour le projet « Aïoli », une plateforme d'annotation 3D basée sur la réalité, qui permet à une communauté multidisciplinaire de construire des descriptions 3D enrichies sémantiquement d'objets patrimoniaux à partir de simples images et d'annotations spatialisées couplées à d'autres ressources.

Mots-clés: annotation, documentation, collaboratif, patrimoine culturel

Keywords: annotation, documentation, collaborative, cultural heritage

Moving from a data-driven to a semantic-driven digital documentation approach is an essential challenge today, especially in cultural heritage, where knowledge is always the result of a combination of complementary skills and disciplinary profiles. However, when considering the current state of the art, reality-based 3D reconstruction and 3D information systems are generally considered distinct topics when they each prove to have potential in cultural heritage documentation.

From this context, a question emerges: how to merge geometry, visual appearance, and semantics within an integrated documentation approach? The only stable denominator remains the object itself, which must therefore be at the heart of the structuring, analysis and storage system.

This corresponds to three major gaps:

- The semantic gap underlines an essential need for innovative methods for assisting data processing, sorting and analysis toward effective knowledge-enhancement scenarios;
- The communication gap underlines the need for an effective solution for collecting, storing and sharing data and extracted information, while it is still difficult to bring together (physically or digitally) the multiple actors of this continuous documentation process;
- Lastly, the interoperability gap underlines an essential need for a flexible solution allowing to manage several acquisitions, levels of details, geometry segmentation, annotation layers and data properties according to very heterogeneous observation and analysis scenarios.

Aïoli: An Innovative Approach

That is why our approach puts the heritage object (the physical one) at the heart of the documentation process by considering reality-based 3D and semantic description in a strongly integrated way.

Our solution is to create an informative continuum at all phases of the documentation process, from the acquisition of images and spatial data to semantically enriched 3D representation based on three fundamental features (**Figure 1**):

- The first part is to create a bridge between the real object and its digital representation by introducing a solution for memorising spatialised annotations made by different actors by including photogrammetric 3D reconstruction and a bijective relation between 2D and 3D representations of the object.
- Once this is established, we built a multilayer description model to structure the analysis, the geometry and the correlation of the annotations made on different supports by all the users working on the same object through a flexible data model, allowing us to organise semantic information with a set of freely structured user descriptors and the automatic extraction of geo-visual descriptors.
- To ensure the accessibility to the application, even from *in situ* remote areas, our platform is built on a cloud computing service allowing the gathering, processing and sharing of 3D data.

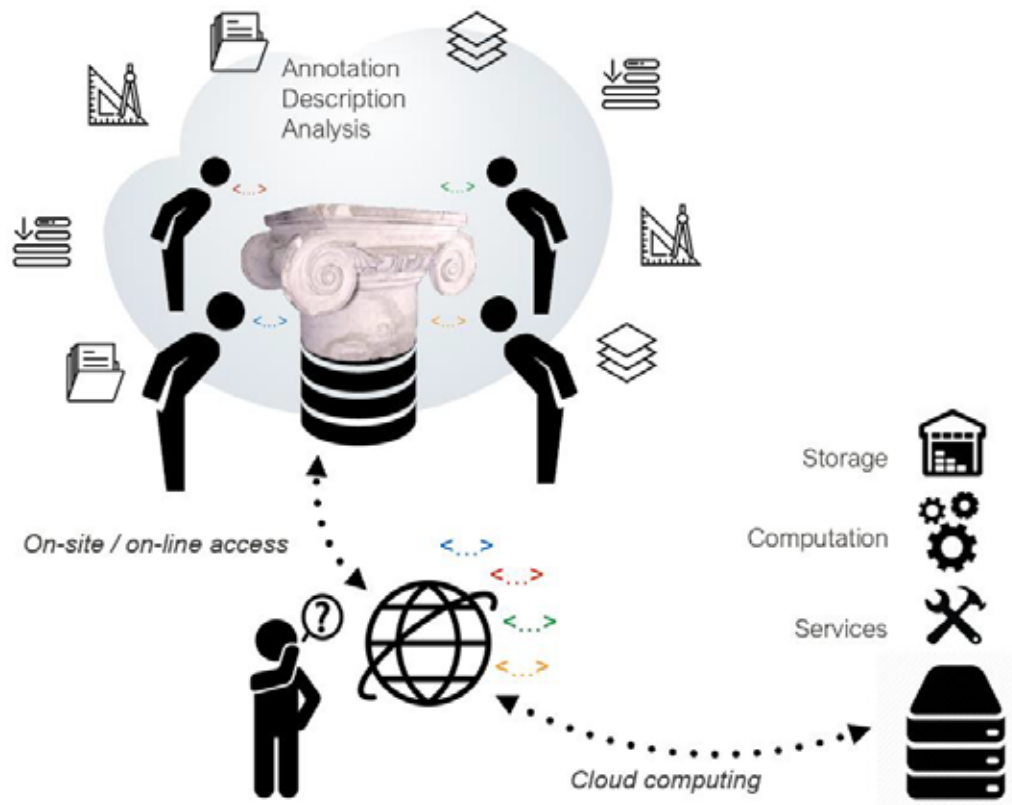


Figure 1. The framework introduced by the Aioli platform

Aioli introduces an original, informative linkage between the physical object space and its digital representation by integrating different features¹ :

- An incremental image-based 3D spatialisation process to manage the geometric merging of several images coming from different actors at different temporal states;
- A 2D/3D annotation framework enabling users to draw, visualise and register relevant surface regions by handling simple 2D images spatially oriented around dynamic 3D representation;
- A multi-layered morphology-based data structuring model to accurately describe real objects in all their geometric complexity and according to multidisciplinary observations.

Users access Aioli through a web interface where they have access to their personal spaces and where their projects as well as collaborators are listed. To create a project,

they load a dataset which is then sent to the server to be processed to reconstruct the 3D model of the object and to create the necessary indexing for propagation. Once the processing is complete, they have access to the project, where they can view both the images used and the generated 3D model. By selecting an image, users can then begin to annotate it by drawing a region. The propagation process starts in the background once the region is validated. Finally, users can describe the region by constructing their own description sheet and by defining fields of various types (free text, number, date, URL, list of values, controlled vocabularies, etc.). Controlled vocabularies are implemented in Aïoli through an already existing web-based multilingual thesaurus management tool dedicated to the management of vocabularies called OpenTheso, which offers interface elements to create, insert and manage lists of concepts. Users can consult and complete annotated projects by viewing the annotations on the images and a point cloud. Each project can be shared with one or more collaborators who can consult and but also annotate the project.

From a technical point of view, Aïoli relies on a thin client, which assures the cross-compatibility of services, on a web server that dispatches requests to the application server and finally, an application server relying on Docker technology which contains all the calculation processes (**Figure 2**).

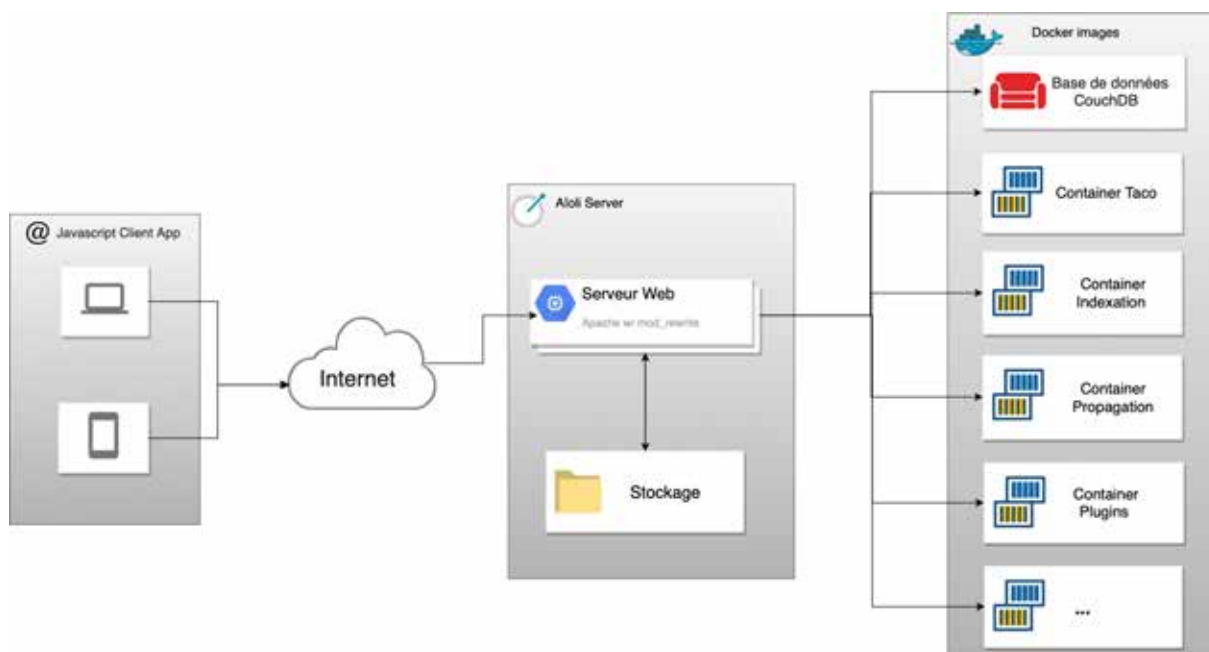


Figure 2. Aioli's architecture

The development of Aioli started in 2016 based on the results of Adeline Manuel's thesis². The platform has since received funding for its development from several national (DGA RAPID BIG 3D, ANR SUMUM) and international (H2020 SSHOC, ERC n_Dame Heritage) projects.

Beta Testing Campaign

From our first prototype of the application, we opened a beta testing campaign that gave us the chance to have real-world issues and users coming from many different usages. During this program, a wide range of heritage artefacts belonging to different scales (archaeological sites, buildings, archaeological artefacts, archaeological fragments and parietal art) have been used for experimenting with the implemented features (**Figure 3**).

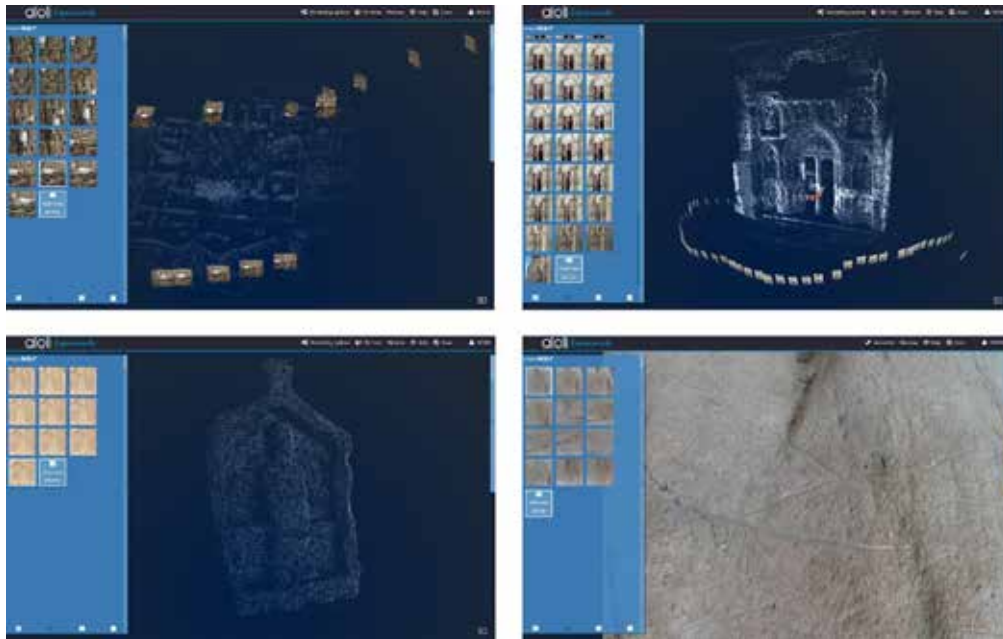


Figure 3. Screen captures of the case studies carried out within the beta testing program

One of the biggest projects was the reporting of the complete diagnosis of the outside of the cathedral of Notre Dame after the fire in Aioli. As it is a huge object, the cathedral has been divided into different projects, and each part has been documented according to a report by experts. The inside of the cathedral is currently in processing.

The sharing and dissemination of an annotated project within a community is a crucial issue for the Aioli project. Collaboration modalities already allow several actors to work on the same project through the management of rights on a project. Each project owner can define a set of collaborators who can integrate their own annotations on a project. However, opening up a project to a community means that it is not necessary to create an account on Aioli for each person who simply wants to consult the results.

Spritz, a specific online viewer, is therefore being developed to allow the sharing and dissemination of Aioli projects on a wider scale. This viewer aims to embed Aioli scenes within a web page. This viewer allows anyone to only visualise and manipulate

the images, the point cloud and all annotations (2D and 3D regions and linked description).

Perspectives

We are today exploring several scenarios in order to start the diffusion of Aioli within the cultural heritage community on a national and international scale. In parallel, we planned to develop new functionalities to offer users a large panel of possibilities in terms of multitemporal monitoring, interoperability and multidimensional correlation.

Some experiments that seem promising concerning multitemporal monitoring, which makes it possible to compare the evolution of the object over time, have been carried out³. This result could lead to a complete process of quantitative change monitoring on a multitemporal data set. Theoretically, all compatibles' images with the photogrammetry pipeline can be used in Aioli and become annotations support. That is why we are now interested in the integration of images from different kinds of sensors like UV, IR, RTI, etc.

The last point is about the multidimensional correlation where the spatial overlapping of annotations would allow the generation of hundred relationships in a spontaneous way. The correlation of qualitative (user descriptors) and quantitative (computed geo-visual descriptors) attributes belonging to overlapped annotations generates a rich environment for analysing the co-occurrence of factors.

Further information about the Aioli project (including demonstration videos, case studies, and a beta testing program) is available on the platform website: www.aioli.cloud.

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ESPADON: The Dynamic Analysis of Ancient and Digital Objects in Heritage Science

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Résumé

Le projet ESPADON (2021-2028) a été conçu pour renforcer considérablement les capacités de recherche (interdisciplinaires) dans le domaine des sciences du patrimoine. Dans cet article, nous proposons dans un premier temps un schéma des principaux enjeux et acteurs des sciences du patrimoine. Les deux principaux objectifs d'ESPADON sont ensuite présentés, un objectif instrumental et un objectif informationnel. Le premier est lié aux développements récents des outils d'analyse 2D/3D. Le second s'appuie sur un nouveau concept de modèle d'objet patrimonial augmenté visant à organiser et visualiser les données relatives à tout objet patrimonial (qu'il s'agisse, par exemple, d'un objet de musée, d'un bâtiment historique ou d'un site archéologique). Nous concluons en décrivant la structure organisationnelle du projet conçue pour atteindre ces objectifs.

Mots-clés: sciences du patrimoine, objet patrimonial augmenté, numérisation, patrimoine culturel

Keywords: heritage science, augmented heritage object, digitisation, cultural heritage



The ESPADON project (2021-2028) is funded (8,4M€) in the framework of the Agence Nationale de la Recherche PIA3 (*Projets d'investissement d'avenir* – 21-ESRE-0050) launched by the French Ministry of Research. It aims to enrich the developing interdisciplinary domain coined as 'Heritage Science'. Its reference institution is the Foundation for Heritage Science (FSP), which for a decade has brought together a large number of French cultural institutions and the best research laboratories dedicated to the study and conservation of tangible heritage. Over the same period, European States and heritage institutions have embarked on a major digital transformation. While the objective of facilitating the use of resources on a European scale in a multicultural and multilingual context has largely been achieved, the digital archiving of research and the dematerialisation of cultural heritage must be constantly revisited due to new technological developments, new paradigms, and new economic models.

Heritage Science : Transdisciplinary Science

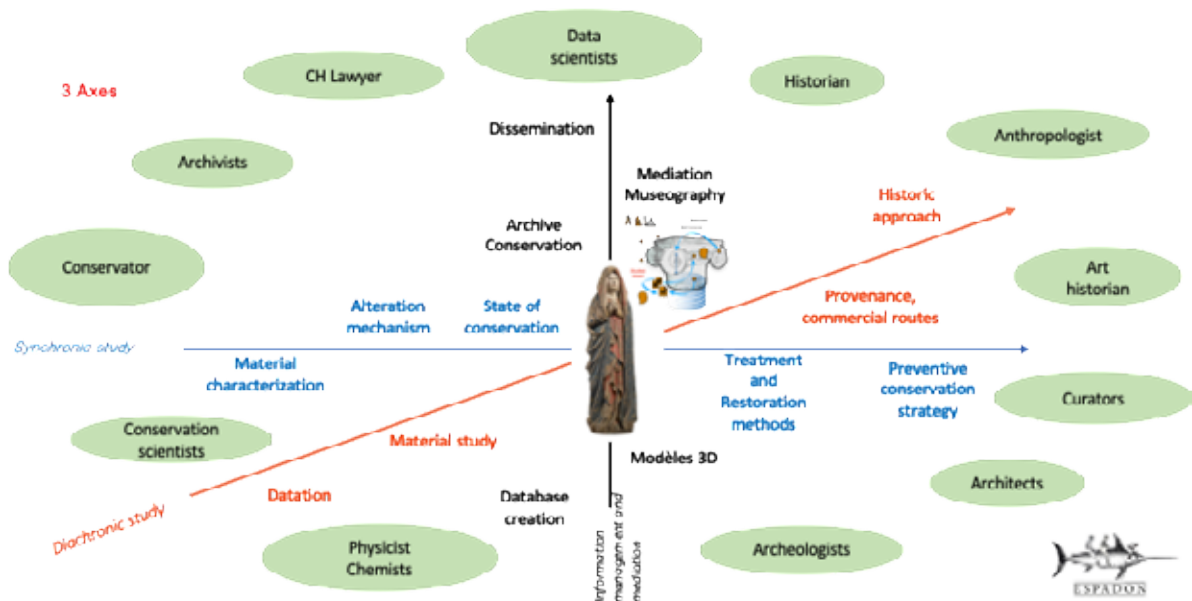


Figure 1. Proposition for an object-based conceptual scheme of Heritage Science –
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Heritage science issues and actors may be described using an object-based conceptual scheme (Figure 1). The main questions revolve around three axes:

- Issues relative to the synchronic study of the object, i.e, the object considered in its present state: today-materials characterisation of the object and all conservation issues;
- Diachronic research about the object, i.e., the history of the object at different scales (microscopic to macroscopic) and from its creation to today;
- Management of data related to the object, curation and dissemination issues.

A diversity of actors, be they academics or professionals, be they individual or institutional, contribute to these issues and may interact with each other. As far as academics are concerned, and without being exhaustive, these are anthropologists, archaeologists, art historians, data scientists, historians, lawyers (cultural heritage lawyers), physical chemists, physicists, etc. A number of professionals are involved,

too, including archivists, conservators, curators, librarians, mediators, and so on. In order to be as inclusive as possible, ESPADON has been built by gathering a number of educative and cultural institutions and research units pertaining to these domains and more.

ESPADON Strategic Objectives: Instrumental and Informational

ESPADON's first objective is to address an instrumental challenge. The strong evolution experienced in the past decade allows now to enhance the characterisation of a heritage object from localised analysis using sampling of artworks or point analysis techniques to 2D or 3D analytical approaches. Time has gone to ensure its implementation towards heritage objects. In addition, coupling analytical and structural instrumentation, time has gone too to ensure multi-dimensional, multi-scale and multitemporal capabilities in order to get a multimodal approach. That means merging heterogeneous data in order to treat it and extract new data and new information that are not visible considering each approach separately.

The informational objective is to increase data processing capabilities to address the challenge of massive data management and storage. ESPADON will, then, have to offer solutions related to data processing, data storage and data exchange. This is in coherence with the digital transition occurring in the different institutions and ministries at the French level. These actions will federate the academic and professional communities in France and will be the opportunity to implement training actions. At the European level, the project is in line with the European Research Infrastructure Heritage Science (E-RIHS) DIGILAB initiative. ESPADON will allow the heritage science community to dramatically enhance access to information, e.g., via data mining. One of the key issues is the interoperability in data creation.

Compared to other research domains, cultural heritage is peculiar due to the variety (in materials, shapes, scale, etc.) of studied objects and their unicity. Furthermore, at the institutional level, habits are quite diverse too. This makes it more challenging (but needy) the aim to collect all kinds of information or knowledge generated around a single tangible heritage object. ESPADON will set up a digital ecosystem and model to ensure the representation of and access to this information in one dataspace. For that purpose, we develop the concept of an 'Augmented Heritage Object' model. Based on a distributed, interoperable storage architecture, it will not be a mere aggregator but a new media for Heritage Science.

Towards an 'Augmented Heritage Object'

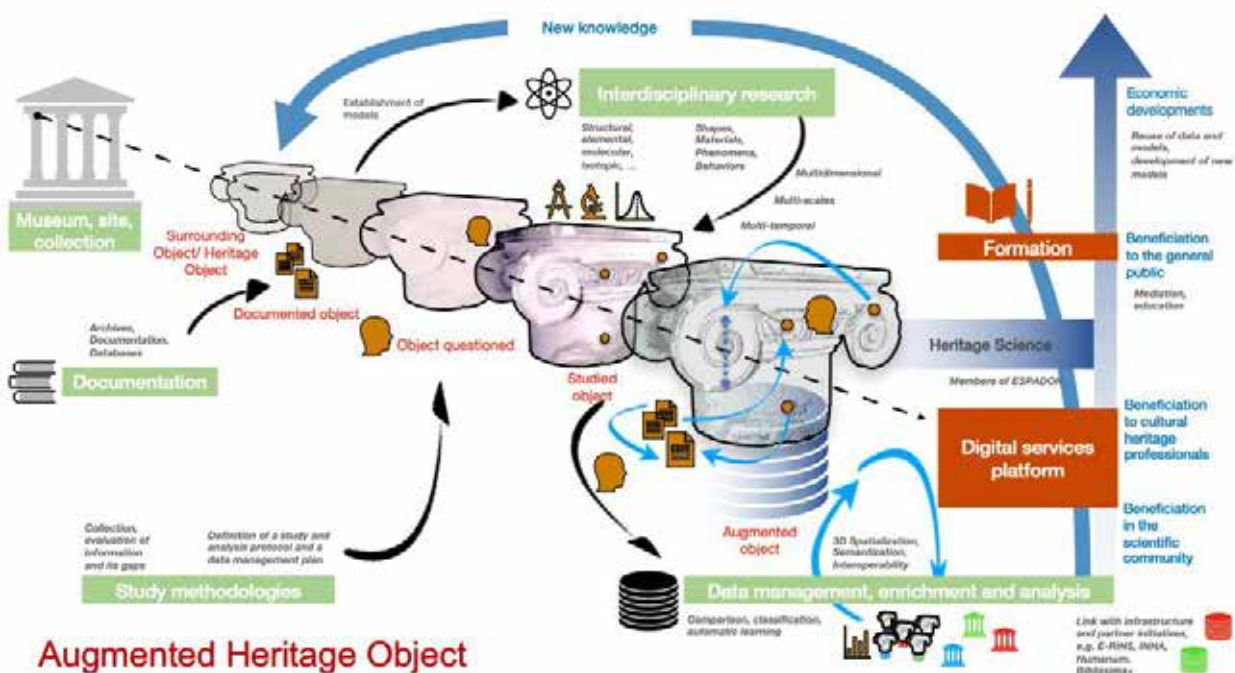


Figure 2. Concept of augmented heritage object –

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'Heritage objects' are very diverse, ranging from museum artefacts to historical buildings to archaeological sites. Their patrimonialisation implies the existence of

related documentation forged by curation professionals, but possibly also archives, scientific reports, and historical and art historical studies. Considering knowledge gaps in this documentation, the object may be enquired via diverse methodologies and be submitted to (interdisciplinary) research concerning, e.g., elemental, molecular, structural phenomena, climate change monitoring for the preservation of the object, or the field of humanities, at a different scale.

The challenge will be to find the best way to merge all this heterogeneous data related to the object and to organize and visualise it. Indeed, ESPADON will offer a digital service platform ensuring digitalisation, semantisation and interoperability of data. Such a platform will enable, e.g., comparison, classification, and automatic learning. It will be a new media shared by the heritage science academic community, as well as the professionals. The educative and socio-economic worlds will get access to part of that information according to the rules of the institutions' housing data depositories.

The ESPADON project is based on some 2D/3D analytical developments of new instrumentation, climate change monitoring for the preservation of cultural heritage, humanities and social sciences integration of information, and digital development. Its aim is also to ensure training for all actors of heritage science, be they academics, professionals, students or any new actors in the domain.

These goals will be achieved thanks to an organisational structure including work packages, as well as a series of transverse and interdisciplinary actions called 'missions'. The first mission (so-called 'The Augmented Heritage Object' through the lens of disciplines and professions') aims at taking stock of the management habits of heritage data in France, whatever the academic discipline or heritage-related professional domain. It will allow defining a comprehensive mapping of the data or

knowledge created in the field of heritage science. Among the following missions, the ESPADON consortium will set up protocols to ensure interoperability with the already existing information, which means proceeding to the alignment of existing data. A third specific action will occur, dedicated to the multimodal implementation of mixed data and analytical strategy to relocate physicochemical and structural information on the digital model. One of the main challenges will be the link between humanities and social sciences knowledge and the main model in order to create this new media for our community. All these developments will respect the FAIR principles thanks to a fourth specific mission dedicated to the data life cycle, and a special effort will be dedicated to the dissemination and mediation of this new media for heritage science.

Workflow for a User-Driven Access to Digitalised Culture Heritage

Collection Data

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Résumé

Les chercheurs et le grand public n'ont pas souvent significativement accès aux collections du patrimoine culturel. Malgré une croissance de la numérisation, il est difficile d'avoir accès à d'autres éléments, au-delà de ceux disponibles sur les plateformes créées à cet effet. Cela empêche de mieux comprendre les données des collections du patrimoine culturel et de s'y engager. En ce sens, cet article décrit un cadre de travail pour la création d'un flux de fusion de données basé sur le contexte relatifs aux données des collections du patrimoine culturel et pour lequel un méta-apprentissage distribué est nécessaire. Notre objectif est de promouvoir une approche axée sur l'utilisateur et d'améliorer l'accès au patrimoine culturel par le biais d'infrastructures dans lesquelles les objets, le contexte et les biens immatériels sont connectés.

Mots-clés: patrimoine culturel, création de contenu par l'utilisateur, méta-apprentissage distribué, contextualisation, fusion de données

Keywords: cultural heritage, user-driven content creation, distributed meta-learning, contextualisation, data fusion

Cultural heritage institutions have, during the past twenty years, created several databases with vast amounts of digital data in the form of images, texts, audio/video files, Geometric Information System data, or 3D scans, all in a quality that has become better and better over the years¹. Furthermore, cultural heritage institutions use common metadata standards such as Machine-Readable Cataloging (MARC) or Metadata Encoding and Transmission Standard (METS) and provide linked open data to national aggregators, delivering to aggregators on an international level, e.g., Europeana².

Despite these efforts, other users than curators or developers, such as humanist scholars and the general public, still face many difficulties when searching digital cultural heritage collections, as metadata is primarily created from an object-centred point of view, leaving out wide parts of the context, content, and thus both the historical and the contemporary meaning of cultural heritage objects that they had and have for humans³. We argue that the primary focus on preservation, restoring, and administration concerns tend to neglect the users' perspective and the full potential of digitisation. Cultural heritage data has to be structured around the FAIR principles to meet users' needs, which means that cultural heritage data have to be findable, accessible, interoperable, and reusable⁴. Metadata needs to be organised and synchronised to make it usable and useful for different users.

The purpose of this paper is to propose a workflow for real-time access to digitalised cultural heritage collection data. We aim to promote a user-driven approach and at enabling meaningful access to cultural heritage through an infrastructure in which objects, context, and intangible assets are connected.

Workflow for User-Driven Access to Digitalised Culture Heritage Collection Data

As a recent study has pointed out, several models for the aggregation of cultural heritage data on the internet have been developed, all of which comprise at least the harvesting and mapping of data. Further steps recommended are the ingestion, indexing, storing, and monitoring of data (interface for possible human interference) as well as the enriching of the metadata through other existing data on the web, the display in suitable formats and the publication in linked open data⁵. In the following sections, we will refine and complement these steps.

Dataflow Layers

A central task in the proposed workflow is to support the creation of knowledge from new and existing data and metadata. We implement thus a process for creating structured data out of unstructured data in the workflow, i.e., selecting and contextualising pictures, texts, and local contexts.

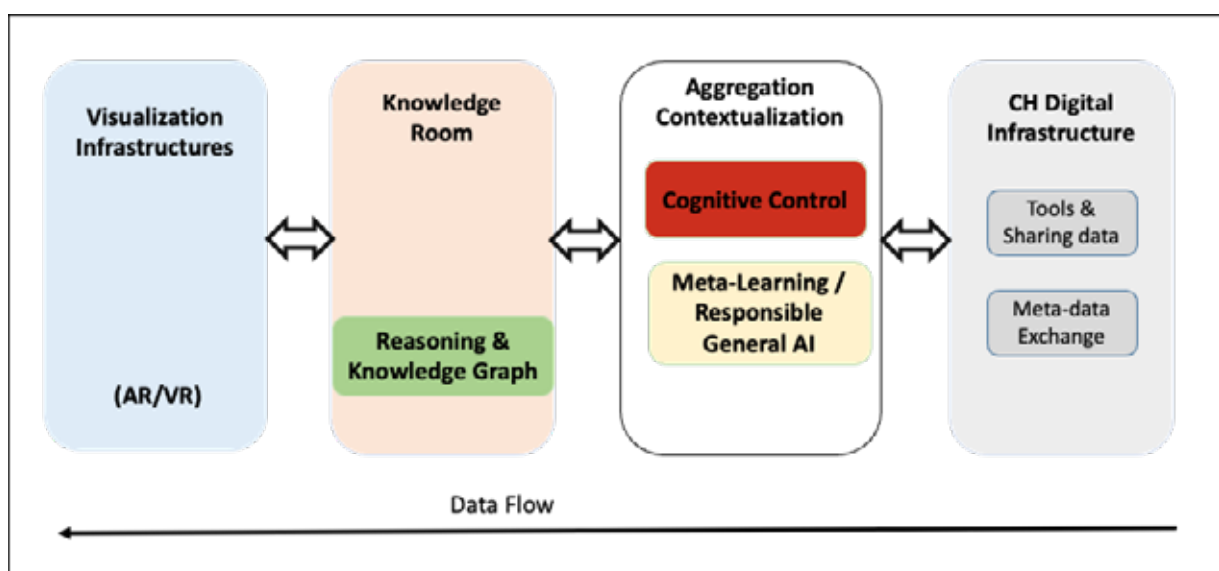


Figure 1. Key issues of the workflow

Figure 1 shows 1) the layer of a cultural heritage digital infrastructure, providing tools such as web services, sharing data, and metadata exchange, enabling the interconnection of digital objects. The next layer is 2) the aggregation of contextualisation data, i.e., contexts and contents associated with cultural heritage objects. Another layer is 3) the creation of digital knowledge rooms where (research) data about historical remains, people, and spaces are connected to digital objects in the virtual world. The data flow comprises the harvesting and the aggregation of the data, but also knowledge formation by using different I-tools such as deep learning and reasoning. By this, we lay the ground for the last layer of the data flow, which is 4) visualisation infrastructures. The first three layers will be described in more detail in the section below.

Pipeline for Unified Data

Figure 2 shows – from the bottom to the top – four layers, namely 1) the unified data layer, 2) the organised data layer, 3) the contextualisation layer, and 4) the intelligence layer, altogether providing a pipeline for unified data. Data and metadata contexts are collected from different sources, both external object information systems such as research databases, Europeana or Time Machine Europe, and metadata made available by cultural heritage institutions. This information concerns context information such as time, places, or people, but it also reflects further relevant content such as social and political circumstances, environmental issues, or the materiality of the objects. Unification and organisation of these different types of data are needed⁶. The organised data layer is based on query engineering and the data log of the users' profiles, ensuring the users' perspective in the workflow⁷.

The data contextualisation layer enables processes of context filtering, aggregating and dissemination operations of unified data. The contextual filter filtrates the data from users providing keywords or predefined context keywords. The contextual

aggregation combines potentially filtered unified data based on 1) the contextual similarity and 2) the significance defined by relevant methodologies. Finally, the contextual dissemination operation of the unified data shares the context unified data to the Intelligence layer to modify the context for the target service.

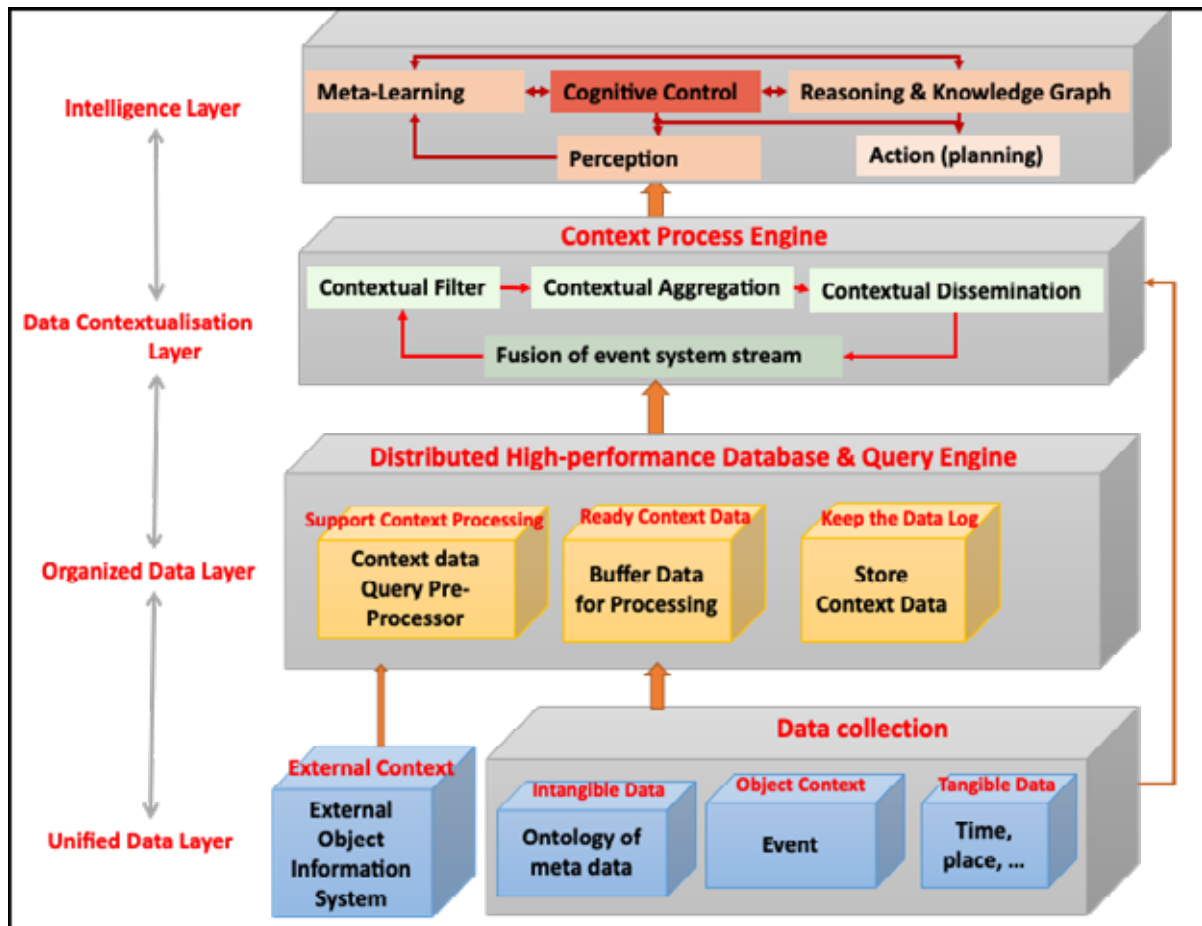


Figure 2. Detailed view of the workflow

In the intelligence layer, a learning technologies system is implemented to ubiquitously collect and process data from the contextualisation layer to enhance learning abilities. This is achieved by sensing context data aggregation and perception, meta-learning, reasoning, or planning, and results in the association of cultural heritage objects with people, actions, time, or places. As we have to consider the several modalities of cultural heritage data such as written and spoken language,

pictures, sound etc., multimodal multitask learning with a unified transformer is essential. The UniT model, as proposed by Hu and Singh⁸, allows the simultaneous handling of seven tasks on eight datasets ranging from object detection to vision- and language reasoning and natural language understanding. Two different Bidirectional Encoder Representations from Transformers (BERT) models are used to generate text embeddings from the cultural heritage dataset⁹. To close the gap of missing data, the machine learning method Generative Adversarial Imputation Nets (GAIN) is implemented¹⁰.

Creating infrastructures for digital cultural heritage collection data from the users' perspective and promoting it across the outlined levels of the workflow will enable scholars and the general public to go beyond isolated objects and thus access cultural heritage collections in a more meaningful way according to the FAIR principles. Users will be able to pursue various activities that will be facilitated by a different user interface interaction design that supports finding and accessing cultural heritage collection data as well as the interoperability and the reuse for vertical immersion or storytelling.

Acknowledgements

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**Le patrimoine face aux changements
climatiques et environnementaux**

**Apprendre du passé : mobiliser le patrimoine
culturel pour un avenir durable**

-

**Learning from the Past: Mobilising Cultural
Heritage for a Sustainable Future**

Learning from the Past to Plan the Future for Material Science: The Case of Ancient Mortars

Emma CANTISANI¹, Tommaso ISMAELLI¹, Silvia VETTORI¹

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Résumé

Cet article présente une approche pluridisciplinaire combinant les méthodologies de la science des matériaux et la recherche archéologique et architecturale pour étudier les mortiers anciens. Les mortiers anciens sont des matériaux complexes en termes de composition et de microstructure, obtenus à partir de matières premières disponibles localement, mélangées et appliquées selon des techniques traditionnelles et souvent caractéristiques de différents pays et cultures. Outre leur importance culturelle, certains de ces matériaux, qui présentent une durabilité et une résilience exceptionnelles face aux changements climatiques et aux événements catastrophiques, pourraient inspirer la conception d'une nouvelle génération de mortiers durables.

Mots-clés : sciences des matériaux, archéologie, architecture, mortiers anciens.

Keywords: material science, archaeology, architecture, ancient mortars

Ancient mortars are composed of inorganic or organic binder, aggregate, water, and additives, mixed in a proportion able to confer to the mixture, in the fresh state, suitable workability and, in the hardened state, physico-mechanical properties ensuring good durability. Mortars are used in traditional masonries in archaeological sites and historical architecture in urban and rural contexts with different roles:

- To join stones and bricks in structural masonry walls,
- As bedding mortars,
- As renders and plasters,
- As stuccos, for decorative elements,
- And as a support for mural paintings.

According to their composition, ancient mortars were able to set in different environmental conditions, and they come down to us in different conditions of conservation.

While calcium (Ca) and magnesium (Mg) air-hardening limes are obtained by burning pure limestones, natural hydraulic limes are produced by calcination of marly limestone with five to twenty per cent of clay or cherty limestone at relatively low temperature (900-1000°C. In ancient times, in order to produce mortars with hydraulic characteristics, able to set in condition of high humidity or even underwater, hydraulic compounds rich in reactive silica as volcanic material (i.e., *pozzolana*) or crushed ceramic (*cocciopesto*) were added to lime, as also reported by ancient writers as Vitruvius and Plinius. In the last years, a great interest has been devoted to lime-based and natural hydraulic-based mortars since they can be considered 'green' products, characterised by lower carbon and energy footprint, intrinsic self-healing properties, and based on recycled materials.

The Research at the Institute of Heritage Science of the Italian National Research Council (ISPC)

Due to the strong interdisciplinarity within the ISPC, we perform a holistic approach across conventional boundaries: material science methodologies, archaeological and architectural research, as well as the study of ancient texts are combined to deepen our understanding of past composite materials, which proved to be highly performative in terms of sustainability and durability in relation to different climatic conditions, climate changes and also catastrophic events. In addition to their cultural significance, some of these materials exhibit exceptional characteristics of durability and could provide inspiration to design a new generation of durable and sustainable mortars, which can be used not only for restoration.

A multimethodological approach, performed through microchemical, mineralogical and petrographic approach and on-site physico-mechanical tests has been applied to different archaeological and architectural contexts in order to evaluate the relationship between the composition of the mortars (aggregates, binder types and additives), their physico-mechanical properties and their performances in terms of resistance and durability.

In recent years, it has been clearly demonstrated that comprehensive studies of the chemical mechanisms of Roman concretes are essential to understand the behaviour of materials that are able to generate new phases over time, which may prove to be crucial in the design of new sustainable and durable construction materials¹. For instance, the data obtained from an archaeometric study on mortars of the Augustus Bridge at Narni (Italy, 27 B.C.) have provided unprecedented information on the ability of the Romans to prepare mortars with specific properties and great durability, which came down to us

in relatively good condition, despite the passing of centuries and catastrophic events such as earthquakes² and floods³. Another promising research line is devoted to the use of organic additives in ancient mortars in order to improve their properties. Indeed, an increasing interest in testing natural organic substances as additives is evidenced by the high number of papers dedicated to this subject in international peer-review journals in the last five years. However, it is not well known how exactly such additives improve the properties of lime mortars and plasters, and this missing information hinders the widespread use of organic additives and their optimisation for the preparation of conservation mortars and plasters.

Even if the use of organic additives dates back to the Greek and Roman periods (Plinius the Elder; Vitruvius), none of the recipes and prescriptions provides exact details on the number of raw materials to be used and how to mix and apply the mortars. Since both the preparation method and the processing times of mixtures produce large differences in the artefacts, only an integrated examination of archaeological data, literary testimonies and archaeometric results allows us to advance some remarks: 1) on the ingredients mentioned in the ancient recipes and their combinations for the preparation of mortars, 2) on the concrete strategies for their use.

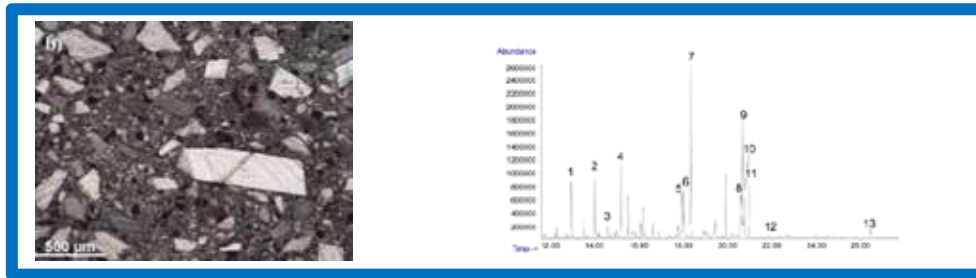
In particular, we studied the role of organic additives in the ancient repair mortars used in the ancient city of Hierapolis in Phrygia (Turkey) in order to understand their exceptional resistance to the strong environmental condition of the site, which is affected by extreme weather conditions and was struck by many disastrous earthquakes. Many ancient binders used in the restoration of Roman Imperial-era buildings (Sanctuary of Apollo, Theatre, North Agora and Ploutonion) have been analysed. Thanks to the good state of conservation of these materials, we obtained data on the role of organic

additives used in the ancient bonding mortars and about the technologies adopted in the architectural restoration, supported by research on ancient text (**Figure 1**). In particular, chemical, mineralogical and petrographic analyses demonstrated a clear strategy in the selection of materials (spathic calcite) and a combination of different organic materials (casein, beeswax, pitch, vegetal oils, etc.)^{4 5}. The reproduction of these ancient recipes and the development of protocols of experimental archaeology will be the next step to understanding the good performance of these ancient mortars with organic additives.


1



2



3



(VIII) *Confectio lithocollon Marmoris albi aridum pulverem sume et tolles hichyocollon unciam I, taurocollon unciam I et mitte cum aqua comixta et coque. Dum bullieris mitte pulverem marmoris et facis gluten marmoris: lithocolla* (Preparation for the glue for stone materials: take dry powder of white marble and 1 oz of fish glue, 1 oz of bull's-hide glue, mix the latter with water and heat the mixture. Once boiling, add the marble powder and you obtain the glue for marble: lithocolla).
V (f. 80r,6); S (f.18r,1); L (f.227r,6); ACVs: (f.213r,19)

(IX) *Item alia: petrae gluten*
Ichyocollon unciam II, casei gluten unciam II et mitte ex ipso pulvere marmoris sicut superius (A second similar recipe: take 2 oz of fish glue, 2 oz of cheese glue, and mix with them the same marble powder as already described).
V (f. 80r, sup.1); S (f.18r,4); L (f.227r,8); ACVs: (f.213r,22)
 (from: S: Sélestat, Bibliothèque Humaniste, 17; V: Vatican City, BAV, Reg. Lat. 2079; L: Lucca, Biblioteca Capitolare, 490; ACV: "Vitruvii de architectura libri decem", edited by Valentin Rose, Leipzig, 1899; §, *Appendicula codicum Vitruvii* (Harleiani, Leidensis (Escorialensis), Sclatstatensis))

4



Figure 1. The approach to the study of ancient repair mortars: 1) identification of ancient repairs; 2) acquisition of data of inorganic and organic fractions (petrographic observation, chromatographic analyses); 3) study of ancient texts; 4) the reproduction of test samples following the ancient recipes.

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Heritage Compatibility Assessment for the Energetic Reuse of Water Mills

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Résumé

La réutilisation énergétique des moulins à eau historiques est actuellement proposée en Europe. La question se pose de savoir quel type de bien patrimonial hydraulique serait privilégié par son implantation. Pour y répondre, une méthode permettant d'évaluer la compatibilité patrimoniale est développée et appliquée dans un cas espagnol : parmi les résultats des biens incompatibles, il a été identifié que trente-neuf pour cent sont compatibles. Cette estimation basée sur le respect de l'intérêt culturel est un outil pertinent pour sélectionner les biens les plus compatibles. Ce nouvel instrument vérifie que le lieu a une utilisation compatible, permettant l'avancement d'une première étape dans la planification d'un lieu d'importance culturelle.

Mots-clés: compatibilité, moulin à eau, réutilisation de l'énergie, conservation, patrimoine

Keywords: compatibility, water mil, energetic reuse, conservation, heritage

The reuse of historical heritage assets, as in the case of the proposal for the energetic reuse of water mills, is presented as a way of conserving such assets while recognising the need to verify heritage compatibility and to ensure respect for cultural significance. In the hydraulic heritage context, this problem is more serious given that it concerns a type of heritage that is traditional, industrial and cultural areas in which the social recognition is still pending. Frequently unvalued and unprotected, these assets are particularly at risk. Most water mills undergo a loss of their traditional function that eventually transforms them into ruins. This lack of esteem places them at high risk of patrimonial damage in the course of proposed interventions.

Recently, in Europe, a promising proposal emerged from the small hydroelectric industry: the reuse of historical water mills to contribute to renewable energy production^{1,2,3}. This proposal is generating research in the scientific community in different fields: technological⁴, environmental⁵ and energetic⁶. However, despite being singled out as a benefit of the proposal, the heritage aspect has not been addressed. As an opportunity to conserve highly threatened assets, this proposal for energetic reuse has adopted a heritage viewpoint based on compatible reuse criteria as the means to ensure the conservation of cultural significance⁷.

The research aims to assess the compatibility between a use proposal and a historical asset. This objective emerges from the need to respond to the question: Does the rebirth of water mills as electricity producers favour the conservation of this historical heritage? The objective of this article is to present a method developed to assess compatibility between a sample of the historic water mill and an energetic reuse proposal.

Assessment of the Heritage Compatibility of a Reuse Proposal

The presented heritage evaluation method is based on the definition of compatible heritage use as that which respects cultural significance. This is synthesized in the Burra Charter's definition of compatible use: 'A use which respects the cultural significance of a place. Such use involves no, or minimal, impact on cultural significance'⁸. Thus, the starting principle: a heritage asset and a use proposal are compatible whenever the asset conserves or increases its initial patrimonial value and enables the use proposal to develop.

The assessment method has two phases. In Phase I, the compatibility criteria are defined, and the evaluation method is developed. Subsequently, in Phase II, the method is applied to evaluate a reuse proposal for a specific heritage sample located along a Spanish river.

The first step was to establish compatibility and incompatibility criteria. The goal was to select the compatible assets while rejecting the incompatible assets as not meeting functional needs or not respecting the principles of historical heritage conservation like authenticity or integrity.

The second step is the compatibility assessment which consists of a group of variables and indicators. Its purpose is to assess each asset's heritage attributes, which are heritage values recognised by the community. Table 1 presents the adopted variables and indicators. To quantify the variables, numeric values were assigned to the indicators using three valuation parameters: high (5), medium (3) and low (1).

Variables: values	Indicators	Qualitative and quantitative valuation
Memorial value	Aged, demonstrated representation, oral tradition	High: 5 Average:3 Low:1
Singularity value	Rarity	High: 5 Average:3 Low:1
Representativeness value	For a particular period , for particular area, related object or context	High: 5 Average:3 Low:1
Authenticity value	Design, materials, architecture environment, use, technology	High: 5 Average:3 Low:1
Integrity value	Intactness, degree of deterioration, functional features	High: 5 Average:3 Low:1
Historical value	Aged, author, historic event, historic person or cultural group, functional landmark,	High: 5 Average:3 Low:1
Social value	Community value, Communal value meanings identity, association, function value	High: 5 Average:3 Low:1
Artistic value	Aesthetic, authorship, beautiful, evocative qualities, expressive attributes	High: 5 Average:3 Low:1
Technological value	Distinctiveness, related object landmark, technical achievement	High: 5 Average:3 Low:1
Architectural value	Distinctiveness Related object: types, materials, techniques, plan forms or design, decoration	High: 5 Average:3 Low:1
Environmental value	Generation landscape, setting landmark, related place fabric	High: 5 Average:3 Low:1
Cultural value	Sense of continuity of use , endangered activity materials intactness, distinctiveness, exceptionality	High: 5 Average:3 Low:1
Scientific value	Earliness, intactness, rarity, extensiveness Representativeness of evolution,	High: 5 Average:3 Low:1

Figure 1. Variables and indicators adopted to assess heritage compatibility. © Vila (2021)

Through this method, each patrimonial asset can be evaluated, and a numeric value for each variable or attribute can be obtained. With the objective of assessing heritage compatibility, two scenarios are presented. In each scenario, an asset is assessed, and the degree of heritage compatibility is measured through comparison. In the case study, the heritage values are quantified in the initial state in which they are presently found and in a final, hypothetical state once the proposal of use has been executed. **Figure 2** shows the evaluation obtained for a specific asset of the study area: the Santalla de Abajo water mill.

QUANTIFICATION OF HERITAGE COMPATIBILITY OF A CASE STUDY

Santalla Abojo Case	M.V	S.V	R.V	A.V	I.V	H.V	So.V	Ar.V	Te.V	Aq.V	E.V	Et.V	Sc.V	GLOBAL VALUE
The initial value	4.7	5.0	5.0	5.0	5.0	3.2	4.3	2.2	2.5	4.7	5.0	3.4	3.5	4.12
The final value	5.0	5.0	5.0	4.7	4.3	3.2	5.0	2.2	2.5	4.7	5.0	3.8	3	4.11
SCALE OF COMPATIBILITY DEGREE Incompatibility: <0 - Low: 0 A 0,3 - Medium: 0,3 A 0,6 - High: 0,6-0,8 - Very high: 0,8 A 1														-0.01



KEY:	
M.V: Memorial value	The value increases
S.V: Singularity value	
R.V: Representativeness value	
A.V: Authenticity value	
I.V: Integrity value	The value decreases
H.V: Historical value	
So.V: Social value	
Ar.V: Artistic value	
Te.V: Technological value	
Aq.V: Architectural value	
E.V: Environmental value	
Et.V: Ethnological value	
Sc.V: Scientific value	

Figure 1. Example of individual valuation of the patrimonial values of an incompatible asset in the case study area. © Vila (2021)

The difference between the values reflects the degree of compatibility or incompatibility. The results show the assets that present very high compatibility, like historical light mill factories; in these cases, the proposal of energetic reuse is appropriate and should be considered preferable. The described method was useful for assessing heritage compatibility in the case study area. *A priori*, a use proposal, such as energetic use, that appeared to equally benefit this patrimonial group, which was in disuse, shows that thirty-nine per cent of the inventoried assets would increase their value with this reuse proposal, while the rest would be incompatible.

Regarding the posed question, the results indicate that the energetic proposal does not benefit all historical water mills equally and could damage certain assets. It is necessary for a heritage compatibility assessment to conserve cultural significance. The main contribution in the heritage field is that a new instrument to assess heritage compatibility is presented. The impact of the

proposed use is assessed. When damaged values are detected, corrective measures can be taken. Its strengths are the applications like a tool to check if a use is compatible or the impact of functional proposals. It could be a new step in the Burra Charter Process, opening the door for new methods.

Regarding the proposal for the energetic reuse of water mills presented by the hydroelectric industry, this research enabled a heritage approach to be used for the first time. Thus, generalized reuse without prior assessment can endanger the historical heritage. The energetic reuse of the water mills could play a role in energy transition; moreover, it allows conserving this heritage that in Europe represents more than three hundred fifty thousand historical assets. Thirty-nine in Spain would translate into more than seven thousand compatible water mills for the production of renewable energy, reducing CO₂, helping to prevent climate change, revitalizing rural areas with local socioeconomic benefits and representing a chance for the renaissance of the endangered water mills.

¹ MÜLLER, Gerald, KAUPPERT, Klemens, 'Old water mills: Britains new source of energy?', Proceedings of the Institution of Civil Engineers: Civil Engineering, vol. 150, Issue 200, p178-186, <https://doi.org/10.1680/cien.2002.150.4.178>

² RESTOR, Hydro, European Small Hydropower Association (ESHA) coord, Small and micro hydropower restoration handbook-the all-inclusive replicable model, 2014. <https://www.restor-hydro.eu>

³ GOV. UK, Department of energy & climate change. Baker calls for watermill renaissance, 2010. <https://www.gov.uk/government/news/baker-calls-for-water-mill-renaissance>

⁴ HESCHUNG, Michel, Guide pour la réhabilitation des moulins hydrauliques en vue de la production d'électricité. <https://www.industrie.gouv.fr/energie>

⁵ VOWLES, Andrew, Experimental quantification of the response of fish to conditions associated with low-head hydropower and fish passage facilities, University of Southampton, Engineering and the Environment, Doctoral Thesis, 2012, p218.

⁶ REDPATH, David, WARD, Michael J., 'An investigation into the potential of low head hydro power in Northern Ireland for the production of electricity.' International Journal of Sustainable Energy 36, 2017, p517-530. <https://doi.org/10.1080/14786451.2015.1050395>

⁷ VILA, Maria Paloma, Heritage compatibility assessment for the energetic renaissance of water mills in Lóuzara Valley, Polytechnic University of Madrid (Spain), Architecture, Doctoral Thesis. 2021 <https://doi.org/10.20868/UPM.thesis.69318>

⁸ Australia ICOMOS, The Charter for Places of Cultural Significance, The Burra Charter, 2013.

Wind Against Mud

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President of the Moulin de l'Arsenal de Rochefort Association

Résumé

Depuis sa création en 2016, l'Association du Moulin de l'Arsenal de Rochefort souhaite redonner vie à la réalisation de l'ingénieur Jean-Baptiste Hubert qui fit ériger au XIX^{ème} siècle un moulin à vent pour lutter contre l'envasement des formes de radoub. Aujourd'hui en cours d'étude et de développement, la reconstruction du moulin s'appuie sur des considérations historiques mais également économiques, touristiques et écologiques.

Mots-clés: moulin à vent, apprendre du passé, étude de cas, reconstruction

Keywords: windmill, learning from the past, case study

The Moulin de l'Arsenal de Rochefort Association (AMAR) carries out a reconstruction project of a windmill that operated in the 19th century and fuelled a system of de-sludging within the arsenal of Rochefort. This project combines heritage objectives and the production of green energy, making it a unique carbon-conscious tourist and cultural experience.

Within the framework of the 'Heritage for the Future, Science for Heritage' symposium, a video was presented showing the images of this arsenal on the banks of the Charente with its hostile environment, the mud.

In 1665, along the Charente, at Rochefort, under the instruction of King Louis XIV, a new arsenal was created to satisfy the greatness of the Royal Navy, its main characteristic being its great capacity for innovation in the face of a hostile environment, the mud, which presence persists to this day.

On his arrival in the Rochefort arsenal in 1805, Jean-Baptiste Hubert, a pupil of the fourth class of the École Polytechnique, noted the enormous expense involved in cleaning the edges of the basin – the double dry dock - when it came to bringing a vessel in or out. The dredging was done with fifty-six oxen pulling large wood shovels for four to five months, only every three years. The double dry dock was therefore underutilised.

At that time, Jean-Baptiste Hubert proposed an original solution to prevent the deposit of mud in front of the dry dock and conceived a scraper boat powered by a windmill. With this system, twenty-five days of activity per year were sufficient to prevent the deposit of mud and the energy surplus produced during low tide was reused to operate a machine to grind colour pigments for painting ships, a lead mill, and a lathe for drilling pulleys.



Figure 1. Photograph of the windmill from the collections of the Service Historique de la Défense dated November 3, 1866

It has not been established with certainty when the mill was destroyed, probably around 1870, when steam became a more efficient energy. In 1861, the construction of the Napoleon III dry dock was completed to accommodate the great warships and the Rochefort arsenal eventually ceased all activities in 1927. In 1994, the construction of the frigate Hermione began in the double dry dock before being pursued in the Napoleon III dry dock, which was more adapted for the continuation of the reconstruction project.

However, siltation in front of the double dry dock necessitated the intervention of a dredge to allow the passage of the vessel from one dock to another. This required knowing both the availability of the dredge and the duration of dredging, knowing that this operation was very expensive. When the AMAR was founded in 2016, the idea was to draw inspiration from the innovative idea of Jean-Baptiste Hubert in 1806. The purpose of the association is to rebuild, in the Arsenal of Rochefort, a windmill designed to power a dredge to combat siltation in front of a double dry dock. To conduct the historical studies needed to rebuild the windmill, the association was able

to consult, at the Service Historique de la Défense in Rochefort, the archives related to Jean-Baptiste Hubert and the construction of the mill. A 1:10 model is also available on display at the National Marine Museum, which currently hosts the association.

Regarding the technical studies, the association benefited from the support of the Arts et Métiers Foundation with the presence of engineering students from the École Nationale des Arts et Métiers (ENSAM) of Cluny who participated in the summer internships of 2017 and 2018. The Fédération des Moulins de France also provided valuable information on the technical evolution of the mills and the association sought advice on the technical, administrative, and legal constraints to be respected since the desired location for the mill was in a classified site.

Having demonstrated the theoretical feasibility of the project and two conditions are necessary to conduct the project: the agreement of the local authorities and the building permit. A call for tenders for a group of companies has been published and the jury chose the Asselin SAS group. On 26 November 2021, Frederic Didier, architect, presented the first mill sketch, which was approved by the members of the association. The next step will consist in meeting the State services to ensure the overall viability of the mill and scraper boat project, knowing that it is up to the Sites Commission to give the building permit.

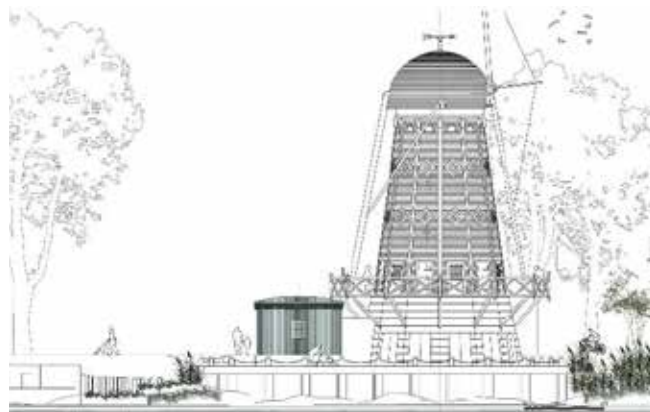


Figure 2. Sketch of the new windmill by architect Frédéric Didier

Once the project is approved, the association will begin the search for funding, draft the Detailed Preliminary Project and then pursue the realization and the imagining of a construction totally open onto the city, thus responding to the tourism, economic, cultural and environmental stakes, whether in the construction phase or in the operational phase.

The project has several advantages:

- It is an economic project, based on the innovative idea of Jean-Baptiste Hubert which would considerably reduce the dredging costs, provides electricity to power the scraper boat and address the needs of the arsenal.
- It is a green project, using wind to obtain electrical energy, but also an ecological project since it would allow the return of silt in the Charente without disturbing its ecosystem, unlike the current situation.
- It is a historic project, by taking up this signal anchored in the particular history of Rochefort that testifies to the city's capacity for innovation, to overcome the constraints of its hostile environment.
- It is a tourist project, by the presence of the mill, a permanently animated object, and the scraper boat working at ebb tides.

This project of restoration of the Hubert windmill takes into account the respect for historicity while accepting a contribution of modernity. It demonstrates the great know-how of engineers from another time. This site will be open to the public and will host school classes to initiate them to woodworking. It requires a large capacity of skilled labour and it seems interesting to propose apprenticeship contracts.

The President of the Community of Agglomeration of Rochefort Ocean supports this project which is integrated into the Grand Site of the Charente Estuary and for environmental reasons, economic, and tourist attraction within the arsenal community. As

recalled by Frederique Tufnell, member of parliament for Charente-Maritime, this project is a perfect illustration of what we can find in the past and in ancient knowledge to build the present with contemporary materials.





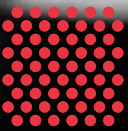
EXPLORER LES QUATRE THÈMES DU COLLOQUE

EXPLORE THE FOUR THEMES OF THE SYMPOSIUM

Afin de préparer le programme du colloque « Un patrimoine pour l'avenir, une science pour la patrimoine », un appel à communications international a été lancé de juin à octobre 2021. Les communications proposées ont été évaluées par un comité scientifique international, donnant lieu à la constitution des tables rondes mais également à la préparation de courts articles présentés dans cette section. Ces travaux n'ont pas été présentés lors du colloque mais ils ont été publiés sur le site internet pour illustrer la diversité des sujets proposés lors de l'appel.

An international call for papers was launched from June to October 2021 to prepare the programme of the 'Heritage for the Future, Science for Heritage' symposium. An international scientific committee peer-reviewed the proposed papers leading to the constitution of the round tables and the preparation of short articles presented in this section. These research papers were not presented at the symposium but were published on the website to illustrate the diversity of topics proposed for the call.





Un patrimoine réflexif pour une société résiliente



Community In/Ex-clusiveness in the 2003 UNESCO Convention

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Résumé

Le dispositif pour la protection du patrimoine vivant des peuples en vertu du droit international et établi par la Convention de 2003 de l'Unesco pour la sauvegarde du patrimoine culturel immatériel est, en principe, perçu comme inclusif, soulignant le rôle central des communautés, des groupes et des individus concernés. Cependant, sa mise en œuvre par les États peut conduire à l'instrumentalisation du patrimoine pour des raisons politiques, ou autres, voire à l'exclusion des peuples au nom duquel le dispositif a été mis en place. Cet article s'interroge sur les possibles garanties juridiques qui permettraient d'éviter cette exclusion ou, tout du moins, d'en atténuer les conséquences.

Mots-clés: patrimoine culturel immatériel, Unesco, communautés, inclusion

Keywords: intangible cultural heritage, UNESCO, communities, inclusiveness



The 2003 UNESCO Convention¹ reasserts, at least in principle, a conceptual paradigm shift in the international cultural heritage law field, initiating a more participatory approach. It positions the bearers of the intangible cultural heritage (ICH) –communities, groups and individuals - in the heart of its mechanism, recognising their important role and inherent connection with ICH². However, this recognition has not always been respected until today whenever ICH-related state policies have tended to disregard them at a national or international level³.

In this regard, state parties' commitments in relation to the bearers' broadest possible participation in the Convention's implementation and active involvement in their ICH's management are reflected in a series of provisions within and beyond the conventional text.⁴ Nevertheless, these obligations are justifiably characterised as weak and promote a best-effort approach as states 'shall endeavour' or 'are encouraged' to take the necessary measures to fulfil them. Additionally, the absence of any enforcement tool ensuring their compliance with these loose obligations, apart from the periodic reporting process⁵, attests to the criticism that 'strategic' aspects of the safeguarding mechanism are state-centred rather than community-oriented.⁶

As a step further, one would need to examine whether communities are at all invited or encouraged to participate in state actions for their ICH's safeguarding, if they or their ICH are misrepresented, if their involvement is full, direct, limited or canalised, as well as according to which ways their participation prior and informed consent are measured. In this context, identifying elements and their communities⁷ is fundamental when it comes to which and whose ICH can reach 'the protection status, something left at states' discretion. The aforementioned matters, especially apparent during the nomination procedure for ICH National Inventories or International Lists⁸, seem to gain more and more ground in experts⁹ and intergovernmental discussions.¹⁰



Under this prism, does UNESCO's safeguarding mechanism, supposed to be a rather inclusive one, end up being itself a driver of exclusion for certain living heritage expressions and/or their bearers? Is this problematic tendency based on political grounds? Well, it certainly is. However, the role that legal guarantees could play in favour of the respect for communities' enhanced role within the evolution of the Convention's future implementation should not be underestimated.¹¹ The demand for meaningful community participation seems more effective when accompanied by proposals aiming at a creative filling of the systemic gaps, taking into account progressive developments in the field, such as the debate on the recognition of a right - also collective - of access to and enjoyment of ICH.

¹ [UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage](#), adopted on 17.10.2003, entered into force on 20.04.2006, with 180 States Parties (as of 27.07.2020).

² *Ibid*, preamble, para. 6 and art. 2, para. 1.

³ See some relevant State practice in: P.L. Petrillo (ed), *The Legal Protection of the Intangible Cultural Heritage: A Comparative Perspective*, Springer, 2019.

⁴ 2003 UNESCO Convention, arts. 11(b), 15; [UNESCO Operational Directives for the Implementation of the Convention for the Safeguarding of the ICH](#), as amended (2020), paras. 24, 79-99, 157(e), 160, 171, 176, 185, 186, 189; [Ethical Principles for Safeguarding ICH](#) adopted by the ICH Intergovernmental Committee by [Decision 10.COM 15.a](#) (2015).

⁵ <https://ich.unesco.org/en/periodic-reporting-00460> (last accessed 15.02.2022).

⁶ GKANA, Aliko, 'Peoples' Heritage or States' Heritage? Sovereignty in the UNESCO Mechanism for the Safeguarding of Intangible Cultural Heritage', *ESIL Papers Series*, 2020, available at [SSRN](#)

⁷ NÉGRI, Vincent, 'Receiving in domestic law concepts born by the 2003 Convention: focus on the notion of community' in CORNU, Marie, et al. (eds), *Intangible Cultural Heritage under National and International Law*, Edward Elgar Publishing, 2020, pp. 44-53.

⁸ <https://ich.unesco.org/en/lists> (last accessed 15.02.2022).

⁹ Report of the Evaluation Body on its work in 2020, [UN Doc. LHE/20/15.COM/8](#) (2020), paras. 41, 42, 71, 73; Report of the Evaluation Body on its work in 2021, UN Doc. [LHE/21/16.COM/8](#) (2021), paras. 46, 56, 63(ii), 66(iv), 69-71.

¹⁰ Committee's [Decision 11.COM 10](#) (2016), para. 19, [Decision 13.COM 10](#) (2018), para. 12, [Decision 14.COM 10](#) (2019), para. 15; See also the Committee's encouragement for changes in the listing system 'in order to ensure inclusivity and a broader involvement' with [Decision 16.COM 14](#) (2021), para. 8, as a result of the [ongoing global reflection on the Convention's listing mechanisms](#), which may soon lead to the Operational Directives' revision.

¹¹ BLAKE, Janet, LIXINSKI, Lucas, 'Conclusions: Tightropes of the Intangible Cultural Heritage Convention' in J. Blake, L. Lixinski (eds), *The 2003 UNESCO Intangible Heritage Convention: A Commentary*, Oxford University Press, 2020, pp. 494-504.



Unclaimed Heritage:

The Historical Urban Landscapes of Residential Areas in Estonia

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Résumé

Cet article présente une étude expliquant les raisons pour lesquelles le patrimoine urbain de quartiers résidentiels historiques dans les villes estoniennes est souvent perçu comme distant, ou même contesté, par les communautés qui les habitent. Dans le débat se mêlent des idées contradictoires sur le patrimoine national et local, l'histoire politique du pays et d'autres changements que la société a subis. Pour permettre la conservation du patrimoine urbain, il est essentiel que soit développée une meilleure compréhension des besoins et des valeurs des communautés actuelles concernant leur espace de vie.

Mots-clés: paysages urbains historiques, patrimoine distant, patrimoine contesté

Keywords: historical urban landscapes, distant heritage, contested heritage



In Estonia, preservation of the urban heritage of residential districts is problematic. The historic buildings are often renovated with modern materials and their exteriors altered with new details (e.g., replacing detailed wooden windows with simple plastic ones or replacing handmade decorated front doors with simplistic factory products), or demolished altogether. Undoubtedly, the cost factor plays a role in the homeowners' decision when choosing a renovation strategy. Yet, it is arguable that this could be overcome in most cases if the motivation for preferring traditional restoration methods was higher. The alteration of historical buildings is ongoing, including in the urban areas listed as local heritage areas with strict regulations for restoration and construction. Many of the inhabitants either do not acknowledge these urban landscapes as cultural heritage at all or that the historical architectural ideas and details embedded there are not perceived as an important part of the area's heritage. Some of the reasons could be¹:

- 1) Alienation from building traditions: the public's lack of knowledge about the benefits of using traditional building materials combined with the globalised market of modern construction materials.
- 2) The political history of the buildings: Estonia's historical urban architecture is influenced mainly by German, Polish, Swedish and Russian cultures. This can cause the urban architecture to be perceived as the 'Other's' and not as 'Ours'.
- 3) Post-Soviet trauma: as in many states during the 20th century, the totalitarian period caused an interruption also in the Estonian society's 'normal' continuity, weakened social trust and the sense of community, causing local heritage to become contested and dissonant. Rather than uniting the community heritage can deepen the feeling of exclusion^{2,3}. It figures that in societies that have undergone political regimes that forced changes in the physical environment and people's living conditions, once liberated, the people's will to reorganise their environment



is particularly strong, as is their sense of ownership. The restrictions regarding one's property (as in the case of heritage preservation) are often unwelcome or even ignored.

- 4) Conflicting ideas of architectural heritage: the general idea of architectural heritage is shaped by the monuments and town centres enlisted as national heritage, which represent great architectural styles, unique architecture and details, and ties to historical events and persona. In contrast, what we can see in the locally enlisted heritage of the residential districts built in the late 19th and early 20th centuries are mainly wooden apartment buildings, many built following very similar blueprints and repeating decorative elements. Furthermore, the wood-built dwelling areas were often considered cheap and temporary when they were built, and this perspective has not entirely perished.
- 5) Lack of personal histories related to the environment: as elsewhere, several economic and social factors cause the resettlement of individuals and families to other towns or town districts so that a large part of the community does not have family histories tied to the house and plot that they inhabit.

To preserve historic environments, an essential source of cultural memory, and to do so without solely relying on building restrictions, its inhabitants should recognise it as a meaningful and valuable part of their life and identity. Much work has been put into researching the historic urban landscapes and establishing local heritage protection areas. Still, much is yet to be done regarding the communication of cultural values to the communities. The tricky part is that if we wish for the community to embrace the heritage, the statements concerning values should also originate from them and not only from the heritage experts⁴. Especially in a case of distant and contested heritage, it is crucial to focus on creating new ties between heritage and the community, as founding the heritage discourse on historical values can lead to failure. Communities



should be encouraged to work on their collective identity, celebrate their neighbourhoods, (re-)discover their treasures, and find meaning and value in the environment from their own perspectives.

¹ KALLAST, Kadri, 'So Close and Yet So Far: The Distant Heritage of the Historical Urban Landscapes of Residential Districts of Tartu', Estonia, *International Journal of the Semiotics of Law*, Vol.34, 2021, pp. 907–928.

² CRIȘAN, Rodica et al. *Conservation/ Regeneration: The modernist neighbourhood*, European Association for Architectural Education (EAAE), University Press, 2013, p290

³ BANDARIN, Francesco, VAN OERS, Ron. *The Historic Urban Landscape: Managing Heritage in an Urban Century*, Chichester, Wiley-Blackwell, 2012, p. 68

⁴ MURZYN-KUPISZ, Monika, DZIAŁEK, Jaroslaw, 'Cultural heritage in building and enhancing social capital', *Journal of Cultural Heritage Management and Sustainable Development*, Vol.3, Issue 1, 2013, pp. 35–54



Analysing the Heritage Value of Urban Transformations in the Metropolitan Areas of Barcelona and London

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Résumé

Dans cet article, rédigé dans le cadre du projet européen CURBATHERI-Deep Cities, les auteurs présentent leurs réflexions sur les nouvelles façons d'aborder la conservation du patrimoine urbain dans les villes de Barcelone (Sant Andreu) et de Londres (Woolwich). Bien qu'un accent particulier ait été mis sur les méthodes historiques pour décrire, interpréter et évaluer le patrimoine urbain défini par les transformations historiques, une attention moindre a été accordée à la manière d'intégrer les connaissances et les usages apportés par la société. Dans ce sens, l'utilisation de différentes méthodologies ethnographiques comme instrument pour favoriser le dialogue entre les parties prenantes est nécessaire.

Mots-clés: villes, conservation, patrimoine urbain, durabilité

Keywords: cities, conservation, urban heritage, sustainability



Cities are complex systems in constant change. The project described in this paper stimulates a reflection on how to accommodate different ways of applying the concepts of time, temporality and survival, laying the foundations for multi-layered and sustainable conservation. The authors argue that it would be more sustainable to focus on the conservation of a site if there is deep knowledge of its historical uses and transformations. In modern western cities, the transformation of the built environment is conceived through urban planning and design, motivated by utopian visions for solving societal challenges. These transformations leave both a material and an immaterial impression. The objective of the research is to stimulate a reflection on the added value to gain from a dialogue with the social agents and, in parallel, to explore new methodologies for analysing the short- and long-term social impact of heritage enhancement projects. In the authors' view, the multitemporal and multivocal approach adopted in this study can allow for collecting very important data for measuring the true impact of the actions undertaken.

The questioning of prevailing development frameworks, supported by neoliberal policies, influences the way in which heritage values-based management has been framed in research. It could be argued that the revitalisation, renewal and recovery of historic urban areas have shown limited appreciation for the social differences and dynamics in cities. Whilst academic approaches are exploring new interdisciplinary and transdisciplinary approaches for valuing methods, the challenge of how this knowledge could be extracted and applied in real-time persist in practice. Can heritage management research on social values provide new analytical tools to the broader field of urban democracy and policy fields?

The Deep Cities project seeks to challenge a traditional aesthetic approach in the heritage discourse¹. For this, the authors are working on perspectives where



the long-term historical changes and the *longue durée* of changing memories of cities are emphasised for its current protection and use.

The three main objectives are:

- To bring to light diverse visions and perceptions of heritage in urban transformations.
- To improve the way citizens connect with heritage.
- To create new knowledge on the fast-changing production of urban heritage.

To work on these objectives, the authors have decided to analyse some urban spaces with distinctly post-industrial characters whose histories denoted a series of visible and invisible transformations. In Sant Andreu de Palomar, a district of Barcelona, the case study is centred on the Fabra i Coats, once a factory and today a cultural centre that has been one of the main motors behind the creation and development of the area. The factory underwent a process of decline from the 1970s to the 2000s², ending with its closure in 2005 (**Figure1**).



Figure 1. Entrance of the Fabra i Coats factory complex in Sant Andreu de Palomar (Barcelona).
November 2021. ©Ana Pastor



In London, the focal study is Woolwich Town Centre. It has recently been characterised as a conservation area with particular emphasis on the Beresford square and its gate, which used to form the entrance to the Royal Arsenal (a formerly industrial site accommodating factories for weaponry) (**Figure 2**).



Figure 2. Woolwich (London). Beresford Square. October 2021. ©Ana Pastor

Our research on the urban transformations, heritage and social use of post-industrial environments follows three main phases: conceptual framework design, documentary research and ethnographic and participatory research through digital innovation. It is expected that our research will have a practical impact through a series of open resources. This will be a management toolbox, as well as some practical recommendations.

Some of our early conclusions are:

- Learning about the narratives that are generated in these urban heritage landscapes contributes to shaping the traces of their transformation.



- Mapping and discovering the dynamics of transformation is allowing us to approach heritage in a multivocal way.
- Understanding the different lives and uses of places through participatory ethnographic research may lead to the generation of sustainable roots-based preservation strategies.

Acknowledgements

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¹ FOUSEKI, Kalliopi, GUTTORMSEN, Torgrim S., and SWENSEN, Grete (eds), *Heritage and Sustainable Urban Transformations: Deep Cities*, London; New York: Routledge, 2020

² PASTOR PÉREZ, Ana, and DÍAZ-ANDREU, Margarita, 'Analizando el valor patrimonial de las transformaciones urbanas en Barcelona', *Complutum*, Vol. 32(2), 2020, pp. 709–726. DOI: 10.5209/cmpl.78579.



European Citizenship: An Ancient Heritage to Fight For

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Résumé

En Grèce antique, des villes réunies en « sympolities » ont donné lieu à la mutualisation de la citoyenneté sur l'ensemble du territoire concerné. Comme la citoyenneté européenne, la sympolitie peut être vue comme une citoyenneté superposée ou, plus exactement, comme une citoyenneté élargie conduisant les citoyens à agir au niveau régional. En cela, la citoyenneté élargie est un patrimoine actif qui donne un sens précis au groupe concerné et peut contribuer à la diffusion de la démocratie.

Mots clés: citoyenneté européenne, sympolitie, Grèce antique, patrimoine, démocratie

Keywords: European citizenship, sympolity, Ancient Greece, heritage, democracy



Since 2016, Brexit has challenged the relationship between citizenship and European identity. European citizenship acts as a marker of belonging to a cultural group, in the same way citizenship marked membership of a national supra-civic group in ancient Greece. The symposium for which this paper was written questions the meaning of cultural heritage. Here I defend the idea that citizenship, particularly supra-civic citizenship, is one of the facets of heritage.

Citizenship as Active Heritage

The new institutionalism has called for rethinking institutions in a broader way by including the cultural aspect¹. Citizenship is now considered a set of social and cultural practices, not simply a political one. European citizenship is innovative as it operates beyond the States from which it belongs without being attached to a larger State, that is, a Federal State. Therefore, it constitutes an original and specific heritage that cannot be found anywhere else.

Historically, citizenship has already been considered with the same logic: we can, for example, mention the sympolitical citizenship in ancient Greece. Sympolity, literally 'citizenship with', consists of gathering together cities into a larger political and territorial whole through bilateral treaties. These 'federations of cities' could be composed of only two cities or a group of cities that would have eventually formed a region (a *koinon*). It is the case of the so-called Achaean confederation rebuilt in 280 B.C., and that succeeded in unifying all the Peloponnese.

In these federations of city-States, citizenship exceeded the *polis* borders, extending the rights of the citizens regionally. Individuals could join a larger territory thanks to an agency ability granted at the local level. They built a new whole - not only political but also cultural - and with a new identity through citizenship. Indeed, collective practices, such as participation in collective worship around a regional sanctuary and



the performance of rituals, led to the cohesion of the sympolities. The Achaeans brought together not only cities but also several sub-regions and multiple identities of the Peloponnese. They held their religious meetings in a single sanctuary, the temple of Zeus Homarios in Aigion, which eventually became the venue for their political meetings². Each member of the city retained its local – urban- cults and rituals, but all members of the *koinon*, since their induction, found themselves under the patronage of a common god and expressed this supra-civic identity. This concept is illustrated in the expression of their names, in winner lists, among other sources, where citizens were called by their regional name followed by their city name, for example, 'Achaean of Aigion' or 'Achaean of Sicyon'. This extended citizenship is thus itself heritage insofar as it allows a cultural and political community to recognise itself as a group.

Similarly, European citizenship represents a common civic and cultural heritage. It is also involved at different scales and constitutes a value shared by all Europeans at the same time, beyond the nation-state.

Extended Citizenship as a Conveyor for Democratic Inclusion

The research shows that the extension of citizenship through sympolity was used by the Greeks to extend democracy. In the same way, European citizenship can constitute a means of democratic inclusion in a community that constantly re-examines its identity. Treaties of sympolity frequently reported the integration of a city with the establishment or maintenance of democracy in the new entity. This clarification often appears in the agreements that concluded these texts, as the citizens had to swear to remain faithful to democracy. The association also appears in literary sources. For instance, Strabo, who tells the story of Skepsis in the Troad, lists the successive regimes of the small city. It was first ruled by kings descended from Hector and Aeneas, then by an oligarchy, and finally benefited from democracy



when it entered a sympolity with its neighbour, Miletus. Therefore, the people of Skepsis tasted the sharing of political life when, eventually, Milesians were associated with them as citizens, and they lived in a democracy³. Polybius even marks it as a component of the Achaean sympoliteia. When he tells how the Achaean *koinon* was created at the beginning of the 3rd century B.C., he indicates that 'the Achaeans adopted a democratic constitution' and that they endeavoured 'to ensure that the federal government remained democratic'⁴

It's a limited comparison, city-states in ancient Greece differ from the European states in many ways, but the power of sympolitical citizenship in ancient Greece seems a promising analytical framework. In this sense, European citizenship appears to be an invisible heritage of agency ability. It represents a powerful lever for young people who invest in urban identity by building a European network going beyond the national scale.

¹ HALL, Peter et TAYLOR, Rosemary, "La science politique et les trois néo-institutionnalismes », *Revue française de science politique*, vol. 47, n°3, 1997, pp. 469-496. Voir p. 482 : les institutions sont les « règles, procédures ou normes formelles, mais (aussi) les systèmes de symboles, les schémas cognitifs et les modèles moraux qui fournissent les « cadres de signification » guidant l'action humaine ».

² RIZAKIS, Athanasios, « États fédéraux et sanctuaires : Zeus Homarios et la construction de l'identité achéenne », in FUNKE, Peter, et HAAKE, Matthias (dir.), *Greek Federal States and Their Sanctuaries*, 2013, pp. 13-47.

³ SAVALLI, Ivana, « Remarques sur les 'grandes' et les 'petites' cités aux époques classique et hellénistique d'après les sources littéraires et épigraphiques », *Topoi*, Vol.18, 2013, p. 117-129, p. 13 et n. 23. Strabon, *Géographie* : XIII, 1, 52.

⁴ Polybe, *Histoires*, II, 41, 5; II, 41, 6



Heritage-Led Innovation, Social and Cultural Innovation, and the New Renaissance

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Résumé

La culture favorise l'innovation technologique. Alors que l'innovation fondée sur le patrimoine dépend de la technologie dans le sens où, sans technologie, il n'y aurait pas d'innovation, l'innovation culturelle se situe au sommet de la chaîne de la connaissance. Elle peut être comprise, en tant qu'hypothèse de travail, comme le résultat de processus complexes de co-création qui impliquent la réflexion des flux de connaissances dans l'environnement social tout en promouvant la diversité. Ce court article soutient la nécessité d'un changement de paradigme, que nous appelons « Nouvelle Renaissance ».

Mots-clés: innovation culturelle, innovation axée sur le patrimoine, Nouvelle Renaissance, infrastructures de recherche, innovation sociale

Keywords: cultural innovation, heritage-led innovation, New Renaissance, research infrastructures, social innovation



Substantial work is currently pursued in heritage-led innovation, which means that culture can foster technological innovation too. We can think of enabling technologies such as new materials and smart sensors, content rights management, content-aware networks, low-latency networks and huge-bandwidth networks for augmented reality.

Cultural innovation feeds open innovation like shared culture in society improves welfare, helps preserve and transmit heritage, fosters creativity, and gives a new sense to the experience of beauty¹. In this context, research infrastructures are pivotal for cultural innovation in society (e.g., E-RIHS and DARIAH ERIC)².

Environmental sustainability and social inclusion have a strong intertwining with aesthetics. A truly reflective cultural heritage plays a significant role in how our societies come together and flourish. It is also inherent to how individuals find their place and forge themselves within a community³. How to identify and select what is or will be cultural heritage? How to include citizens and local or national communities in that process? These issues might explain the attention of the European Commission towards the idea of a New European Bauhaus, whose goals are threefold: (1) reconnecting with nature; (2) reconstructing a sense of community and renewed belonging, and (3) equitable re-equilibrium and redistribution of resources⁴.

The centrality of the person (human-centric innovation) is what characterises the development of the transformative potential of innovation. In this context, the introduction of Societal Readiness Levels (SRL) helps verify the integration into society of new technologies (TRLs), products, and services. Hence, considering science and public policy agenda-setting, we hypothesise there is a need for a paradigm shift, which we call the 'New Renaissance'. As Bernd Fesl has suggested, the invention of



new raw materials meets new ways of production in architecture, fashion and industrial production, leading to new sustainable ways of building our homes, dressing, shopping, working and going on vacation. It is a driver of sustainability even in tourism culture⁵.

The climatic and economic-social crisis caused by the pandemic requires a collective effort in which the combination of art, science and technologies plays a key role. Together, they enable a creative rethinking of public spaces, the transformation of society, the sustainable growth of territories, and the improvement of the quality of life and well-being of citizens. The availability of cultural content contributes to the acceptance of each other, dialogue, sharing, health, and mental well-being.

¹ POZZO, Riccardo, FILIPPETTI, Andrea, PAOLUCCI, Mario, VIRGILI, Vania, 'What Does Cultural Innovation Stand for? Dimensions, Processes, Outcomes of a New Innovation Category.' *Science and Public Policy*, Vol. 47(3), 2020, pp. 425–433. [DOI 10.1093/scipol/scaa023](https://doi.org/10.1093/scipol/scaa023).

² ESFRI (2021): Strategy Report Research Infrastructures: Roadmap 2021. Brussels: Science and Technology Facilities Council.

³ Joint Programming Initiative on Cultural Heritage and Global Change Strategic Research and Innovation Agenda, 2020, Online.

⁴ EC-RTD (2021): Shaping more beautiful, sustainable and inclusive forms of living together: New European Bauhaus Beautiful Sustainable Together. Online.

⁵ FESEL, Bernd, 'Re-Built Better? Europe's #Recovery from #Covid-19 is a Renaissance 4.0!', 2021, Online.



Une gestion pérenne du patrimoine culturel



Building a Network of Partners to Develop the Use of Web Archives: the ResPaDon Project

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Résumé

Le projet ResPaDon réunit des bibliothèques et des équipes de recherche dans le but de réfléchir, expérimenter et partager des pratiques liées aux archives web. L'objectif principal de ce projet est de rapprocher les producteurs et les utilisateurs des collections d'archives web avec l'aide et la médiation des bibliothèques universitaires. A l'issue du projet, les chercheurs pourront utiliser plus facilement les archives web comme source pour leurs travaux de recherche.

Mots-clés: dépôt légal, réseau, archives web

Keywords: legal deposit, network, web archives



Web archives represent a huge research opportunity, offering possibilities for mining and analysis in many scientific disciplines. In France, the archiving of the web is mainly operated by the National Library of France, which is responsible for collecting, preserving and providing access to this special collection which represents nearly a petabyte of data for billions of URLs^{1 2}. French law allows access to web archives in the National Library of France and multiple public libraries around the country³. However, technical, legal, and methodological barriers prevent researchers from using web archives in their research work. Among these barriers, we especially note what we call the methodological cost of entry, namely the initial effort required from the researcher to access the collection and understand the data available in the web archives⁴.

The ResPaDon project mainly aims to reduce this methodological cost of entry by associating academic and national libraries, researchers and librarians within a network of partners. The project is undertaken by the University of Lille and the National Library of France in partnership with Sciences Po and the Campus Condorcet. It has been funded for two years by the GIS CollEx-Persée (a French research infrastructure dedicated to building links between researchers, collections and librarians). It brings libraries and research teams together to think, experiment and share practices related to web archives. The main goal is to bring the producers and the users of the web archive collection closer together with the help and the mediation of academic libraries. At the end of the project, it must become easier for researchers who are not specialised in web history to use web archives as one source among others in their research work.

The intellectual basis for the project is provided by a usage analysis led by a research team in information science and by several workshops which aim to produce recommendations for developing the use of web archives by researchers. Researchers present use cases and explain the obstacles they encountered during



their research work. Librarians build on these use cases to develop ideas for services and training courses. Some experts, such as lawyers or trainers, are also invited to contribute to the recommendations.

Two experiments are also being carried out. The first one involves the implementation of an access point to the web archives in Lille academic libraries. The plan is to conduct tests of the access point with researchers to identify the services and the skills required to support researchers in using web archives. A research team from Sciences Po is conducting the second experiment.

The goal is to develop a methodology to compare the living web and web archives. A data sprint will bring together researchers and librarians to test the application to web archives of software used to analyse the live web and define some best practices in this field.

Because it links together professional practices and research uses, the ResPaDon project represents a new kind of partnership and network around a heritage collection.

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⁴: GÉROUDET, Marie-Madeleine, (2021) « Faire réseau autour des archives du web, usages et opportunités ». Journée d'étude, ResPaDon, URL: <https://respadon.hypotheses.org/1>



Wet Collections: Preserving Their Values for the Future!

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Résumé

Les collections liquides sont une mine d'informations pour étudier l'évolution des espèces ou d'anciennes pathologies. Ces collections sont cependant parfois négligées, mal documentées et difficiles à conserver. Afin de préserver ces archives, nous avons minutieusement fait l'inventaire des dégradations observées parmi les collections et entrepris une recherche sur l'herméticité des bocaux. Pour remplir adéquatement les bocaux, le liquide est, dans un premier temps, identifié sans que le bocal ne soit ouvert. L'impact du changement du liquide est ensuite étudié en passant d'une échelle macroscopique à une échelle microscopique. Les résultats de cette recherche sont partagés par le biais de publications et d'échanges avec les gestionnaires de collections.

Mots-clés: analyse, chimique, biomoléculaire, échantillons, modèles, partage d'expérience

Keywords: analysis, chemical, biomolecular, model, samples, experience sharing



The fluid collections constitute a unique heritage because of their museological and scientific value. They are crucial for international biological research concerning the comparison of species, organs and tissues, but also for medical research, to study ancient pathologies and epidemics. Therefore, their preservation is one of the great challenges of this century.

The French Museum of Natural History (MNHN) holds about four million specimens in its wet collections. Although the oldest specimens date back to the 17th century, new pieces are added to the museum's reserves each year, thanks to scientific expeditions. Many universities, hospitals or veterinary schools and museums also have wet collections. In the current context of species extinction, it is important to perpetuate these archives of nature, reflecting past biodiversity. Unfortunately, these collections are sometimes poorly known, poorly documented, or even forgotten within some institutions.

Consequently, their management and preservation are complex, especially since these collections must be taken care of by diverse actors within institutions of different sizes and functioning. The proper preservation of these collections is therefore difficult. To anticipate the risks that threaten these collections, research is undertaken to better understand their materiality and propose diagnostic tools and solutions to improve their conservation¹.

First, a systematic and automated condition report method was developed to make an exhaustive inventory of the degradations observed in the collections. The process was tested on three different collections of the Sorbonne University Alliance.

One of the most critical conservation problems is the evaporation of fluids. To act preventively, we are conducting research on the performance and durability of jar sealing technologies. Historical sealants were characterised by chemical analysis to know the old formulations, which are not well documented². Then, we developed



several experiments to measure the efficiency of the sealants against ethanol and water evaporation by performing model jars and to test the resistance of these recipes against exposure to different fluids. The jar is often filled to preserve the specimen when the fluid has partially or totally evaporated. To act appropriately and limit the harmful impacts of management operation on the specimens and the staff (exposure to potentially hazardous chemical vapours), we implemented a non-invasive fluid identification technique that does not require opening the jar. This essential step uses Raman microspectroscopy through glass, as in the pharmaceutical, food industry or forensic, and allows for identifying the most classical fluids and more complex mixtures (**Figure 1**) such as Bouin's liquid or Kaiserling III solution³.



Figure 1. Identification of a fluid through the jar thanks to Raman microspectroscopy (piece of the MNHN comparative anatomy fluid collection: brain of *Sus scrofa domestica* in Bouin's solution – inventory number MNHN-ZM-AC-1929-211). © CRC-MNHN - S. Cersoy

In order to know the multi-scale impact of a change of conservation solutions on specimens over time, we analysed specimens that had been changed from one fluid to another (e.g., ethanol to formalin) or always kept in the same one. Macroscopic changes are minor, and the specimens can be displayed to the public. At the microscopic level, on the other hand, an efficient fixing solution, such as

formaldehyde, is necessary to preserve the fine cellular structures. Finally, at the molecular level, the change and substitution of the fluid is not the main disturbance, but the acidification of the solution, linked, for example, to the entry of oxygen through the sealant, prevents the extraction of the DNA (if the pH became lower than 5.4)⁴. In addition, replacing ethanol or formalin with the less toxic glycerol solution of Kaiserling III causes rapid and significant browning of the solution (**Figure 2**).



Figure 2. Colour change upon fluid change – *Mus musculus* specimens' reference collection with (a) formalin fixation and storage, (b) ethanol pseudofixation and storage, and (c) pseudofixation in ethanol and then storage in Kaiserling III solution. © MNHN - M. Herbin

Most of the results of this research have been published in the American professional journal *Collection Forum* and in analytical chemistry journals. Conferences are also regularly given to share our findings with collection managers and the public. An international conference dedicated solely to the preservation of wet collections was organised for the first time in 2018 in Paris and brought together one hundred and forty actors from seventeen different nationalities. This event allowed identifying the essential research fields to be explored to solve the problems encountered in wet collections and to constitute an international expert committee to look for solutions.

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Digital Molding Approach for Non-Standard Architectonic Restorations of the Early 20th Century Molded Cement Built Heritage

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Résumé

Le ciment moulé issu du patrimoine bâti français du début du XX^{ème} siècle est aujourd'hui confronté à de nouveaux enjeux pour l'élaboration et la mise en œuvre de solutions durables et adaptées à sa conservation et sa restauration. Pour gérer les interventions de grande amplitude qui dépendent principalement de l'accessibilité au bâtiment et de la complexité technique de certains éléments architecturaux, une majorité de méthodes s'intéresse au développement d'approches numérisées non invasives et complémentaires aux pratiques conventionnelles. Cet article vise à évaluer le potentiel de l'utilisation du moulage numérique pour le perfectionnement des techniques de restauration des ciments moulés du patrimoine architectural du XX^{ème} siècle.

Mots-clés: restauration, technique, moulage, ciment, patrimoine bâti, XX^{ème} siècle

Keywords: restoration, technique, moulding, cement, built heritage, 20th century



From the 1910s, moulded cement buildings gradually emancipated from the technical constraints encountered in the previous centuries when the use of decorated cut stones was still reserved for the construction of historical monuments. Therefore, buildings such as modern churches showed a significant amount of non-standard moulded cement arts and crafts until the mid-1940s. In this period, moulded cement techniques for sculptural details and monumental reliefs were widespread and represented a major technological breakthrough in the field of construction science¹.

However, due to the appearance of new risks (climate change, pollution) and the strong recurrence of degradation causes (poor cement quality, materials losses, formation of crack), the growing concern about their preservation has recently become more critical. It includes the need to develop new sustainable approaches and the emergency to carry out efficient and rapid intervention with low impact².

In response to operational constraints surrounding today's building restoration practices and methods, using digital manufacturing technologies appears to be a reliable approach to determining sustainable and non-invasive solutions for repairs or maintenance cases. This short article presents the first results of an experimental methodology that proposes to repair moulded cement ornaments with a non-standard and reusable digital moulding approach.

According to the architectural research field, recent studies have already demonstrated the existing links between preventive maintenance issues in built heritage and adaptive use of digital technologies in building restoration practices. Also, several experimental approaches have shown the interventional capacities of robotic manufacturing at large-scale building restorations, thanks to decision support tools for detection, automation and task control for maintenance and repairs³. Among



the most common and affordable processes used, 3D scanning combined with additive manufacturing technologies appears to be the most advanced digital technique for reproducing existing building parts⁴.

Most often used to optimise time savings in production thanks to rapid prototyping, additive manufacturing technologies also allow the implementation of complex moulding systems through geometric contour crafting approaches. Indeed, some applications made on case studies have shown how digital moulding techniques could be developed by 3D printing to restore damaged building parts or material losses⁵.

To go further and bring innovative solutions in the architectural field, it has been hypothesised that additive manufacturing and AI technologies could efficiently restore moulded cement ornaments, particularly those that stemmed from damaged or missing building parts. To demonstrate how digitalisation of craftsman moulding techniques could contribute to developing new robotic manufacturing continuums for built heritage sciences, preliminary results focus on a generative approach for digital moulding systems designed to ease non-standard architectonic restorations (Figure 1).

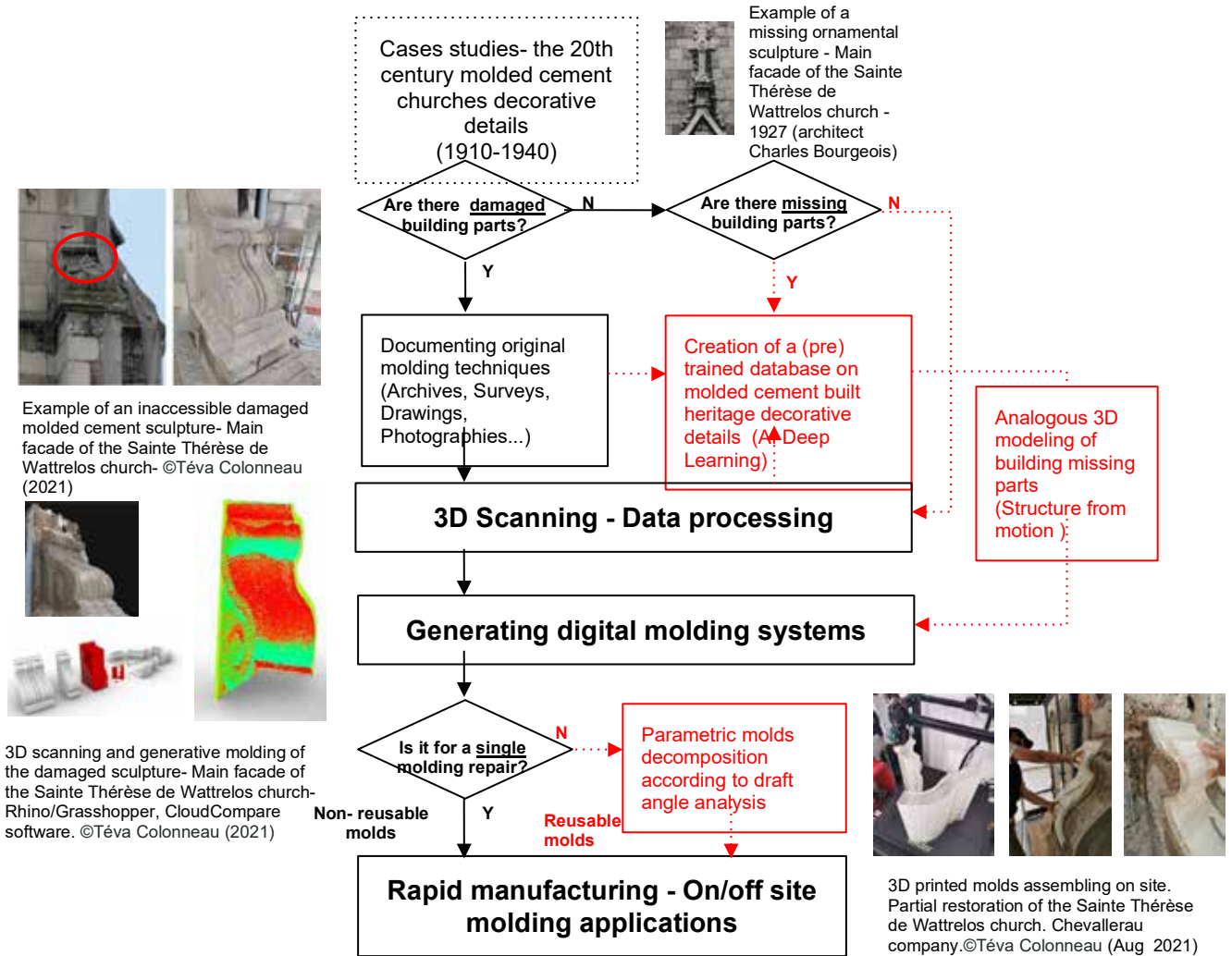


Figure 1. Flowchart presenting the transposition of a digital moulding methodology used in the architectural restoration field (in black) and the proposed scientific innovation (in red). © Téva Colonneau (February 2022)

The experiment below presents results based on the application of the proposed methodology. It illustrates the different stages of a digital moulding system generation through modelling and reproducing an existing moulded cement ornament (Figure 2).

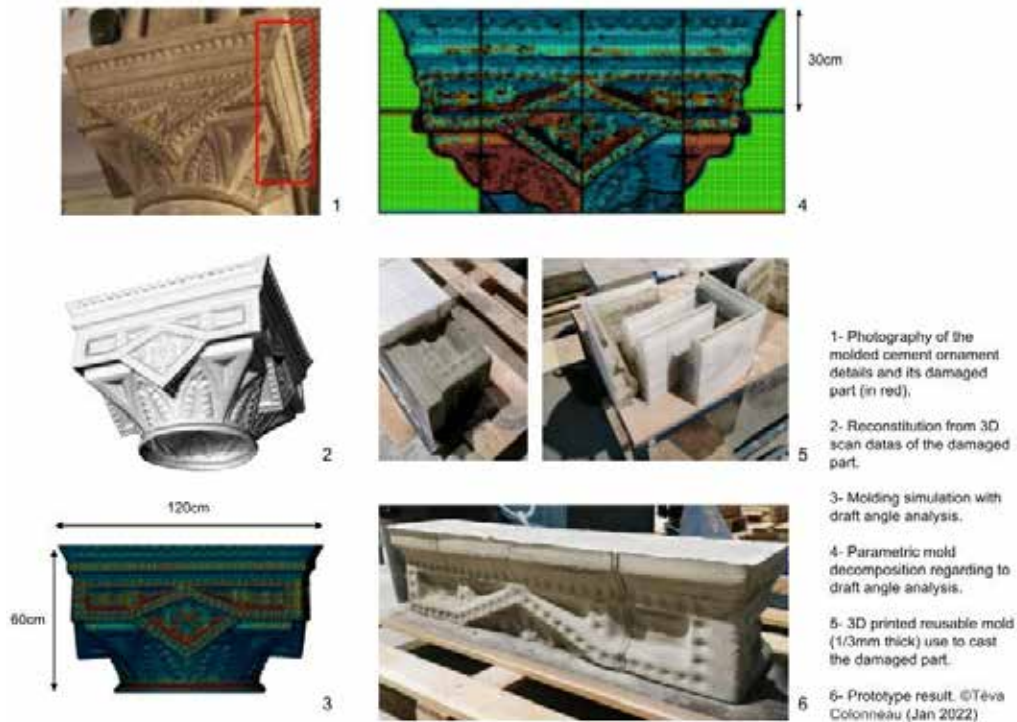


Figure 2. Generative design and prototyping results of digital moulding systems for a non-standard moulded cement ornament repair. St Michel de Roubaix church, 1927 (Architect A.J Nasousky). © Téva Colonneau (February 2022)

Considering this case study, it has been observed that several angle variations and undercut geometries could cause significant deformations or breaks during mould use (3). To overcome these limits, a parametric script able to split and convert the complex moulding shapes into 'n' modules has been developed according to the configuration of draft angles to reduce the number of undercuts constraints and keep volume and detail proportions (4). At the end of the generative design stage, rigid mould modules composed of bioplastic materials have been printed and assembled using methods inspired by the technical history of the building⁵.

Thanks to the mould splitting script, robotic manufacturing has been calibrated according to the level of details and the mechanical resistance degrees expected. It has then reduced the time needed to produce large-scale moulds.



Therefore, the results of this approach demonstrate that digital-generated moulding modules could provide sustainable and non-invasive solutions for non-standard architectonic repairs of the 20th-century moulded cement-built heritage.

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La Fabrique Numérique du Passé : une plateforme de données ouverte pour les approches géohistoriques

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Abstract

The open data platform 'Fabrique Numérique du Passé' (FNP) addresses geohistory research stakeholders. FNP is a data repository interface which allows its community to simply engage in an open data approach that takes root in a more global movement of open science. Practically, it is a question of gathering the existing information and to make available to all and in free downloading data produced as part of research projects and programs in their rawest format in order to be easily reusable.

Mots-clés: géohistoire, données ouvertes, bases de données

Keywords: geohistory, open data, data base



Il est aujourd'hui complexe pour les chercheurs qui travaillent sur des projets géohistoriques (à l'interface entre la géographie et les sciences historiques) de savoir où et comment déposer leurs données en respectant les principes *Findable, Accessible, Interoperable, Reusable* (FAIR) ou encore de connaître ce qui existe sur des thématiques similaires et pourrait être disponible pour leurs projets de recherche.

Ce constat est pour le moins contradictoire avec le développement des entrepôts de données à l'échelle internationale (<https://data.europa.eu/fr>) ou à l'échelle nationale avec par exemple le développement de l'entrepôt Nakala en France par la Très Grande Infrastructure de Recherche (TGIR) Huma-num (<https://www.nakala.fr/>). Même si ces derniers développements constituent une réelle avancée pour faciliter l'accès et rendre pérennes les jeux de données de la recherche. Il n'en reste pas moins que ces outils sont encore très largement sous-exploités et méconnus dans la communauté des géohistoriens.

La Fabrique Numérique du Passé (FNP) a été développée pour poursuivre cette dynamique d'ouverture et pour réduire la distance qui existe aujourd'hui entre la communauté des géohistoriens et des dispositifs technologiques. Ces dispositifs permettent de répondre aux besoins d'une science plus ouverte articulée autour du déploiement de hubs de données considérés comme déterminants pour le paysage de la recherche de demain.

La Fabrique Numérique du Passé (FNP), un aperçu global

D'un point de vue fonctionnel, la FNP permet de déposer des jeux de données ou *datasets* géohistoriques produits à l'occasion de projets de recherche et de les mettre à disposition de tous, en libre téléchargement dans leur format le plus « brut » afin que ces données soient facilement réutilisables. La FNP permet aussi de mettre



à disposition des chercheurs et de tout public les principes de l'open science et du FAIR Data, un écosystème de données et de fonctions permettant le développement d'approches nouvelles basées sur la réutilisation des données accessibles selon les standards actuels de diffusion (connexion par interface de programmation (API), flux de données, etc.).

Nous pouvons compter à ce jour (15-02-2022) trois-cent-neuf *datasets* déposés sur la plateforme. Cet ensemble de données est issu de onze projets de recherche menés par vingt-neuf laboratoires partenaires. Plus de cent soixante-huit *datasets* sont totalement publiés et disponibles sous la licence libre *Open Database License* (ODbl).



Figure 1. La plateforme Open data Fabrique numérique du passé (<https://www.fabriquenumeriquedupasse.fr/>)

Cette offre de service permet ainsi de faire la jonction entre des lieux de dépôts pérennes (entrepôts de données comme Nakala pour les sciences humaines et sociales sur lequel l'application s'appuie), des acteurs qui produisent des *datasets* dans le cadre de projets de recherche (projet collectif de recherche, agence



nationale de la recherche, Conseil Européen de la Recherche, fonds européen de développement régional etc.) et un capital de données géohistoriques existant qui doit être à la fois valorisé, pérennisé et surtout rendu accessible selon les standards actuels (Open Geospatial Consortium (OGC), Web de données). Financé par le Ministère de la Recherche et de l'Innovation (MESRI) en 2020, le projet FNP est aujourd'hui scientifiquement adossé au consortium Huma-num Paris Time Machine (PTM) dont il complète l'action sur les questions d'ouverture des données et d'*open data*.



Figure 2. Le site web du Consortium Huma-num Paris Time Machine (<https://paris-timemachine.huma-num.fr/>)

Chaque jeu de données publié est associé avec une fiche de métadonnées descriptive dont le noyau est au format *dublin core* et l'ensemble des jeux de données est placé sous licence libre. La licence ODbI est par exemple privilégiée pour les données géohistoriques. Un accent a été particulièrement mis sur la rédaction des métadonnées et sur leur traduction en anglais pour rendre accessible à une plus vaste communauté ces productions expertes et francophones.

Nous avons tenté avec le projet FNP de mettre en œuvre les cinq principes du FAIR. Le premier point que nous avons privilégié est « l'accessibilité » (A) et la « trouvabilité » (F) qui ont été travaillées en privilégiant la simplicité des interfaces et la forme de la fiche de métadonnées qui tout en reposant sur des standards (*Dublin core*) possède une structure que nous avons voulue à la fois simple, faisant sens pour la communauté des géohistoriens. Dans le domaine des sciences humaines et sociales (SHS), cet aspect métadonnées est fondamental car toutes les données -même les plus simples- reposent sur des processus de sélection et de modélisation parfois complexes et dont rien ne transparaît dans la donnée elle-même.



Le second point que nous avons voulu mettre en avant est « l'interopérabilité » (I). Nous avons fait le choix de privilégier une interopérabilité de forme et de format de données et pas de structure de données, chaque projet ayant besoin de développer son propre modèle de données. Nous avons donc travaillé sur des outils qui fonctionnent en routine et qui permettent de normaliser les données géohistoriques pour les rendre conformes aux standards de la donnée géographique (normes OGC).

En termes de perspectives, nous avons mis en place une interface de programmation d'application de transfert d'état représentatif (API REST) ouverte permettant, en plus du téléchargement direct, d'intégrer les jeux de données ou les métadonnées dans des applications tierces. Il est prévu, pour 2022, de développer une série de flux normalisés (*Warehouse Management System*, *Web Map Tile Service*, *XYZ*) permettant à tout usager d'accéder aux *datasets* déposés dans FNP. Nous avons enfin entrepris une démarche de formation des chercheurs autour de la question de la « réutilisation » (R) en tenant de privilégier autant que possible les licences les plus ouvertes possible, la licence ODbI ayant été privilégiée pour toutes les données déposées.

Remerciements

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Bio-Cleaning of Historical Iron Artworks: Innovative Green Gels Amended with Microbial Derivatives

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Résumé

Le projet HELIX vise à développer des gels écologiques, biosourcés et faciles à utiliser pour le nettoyage d'œuvres d'art historiques composées de métaux altérés. Afin de sensibiliser la communauté de la conservation à la fiabilité et à l'efficacité des gels de nettoyage verts HELIX, quelques essais réalisés sur des objets en fer sont présentés dans cet article.

Mots-clés: écologique, nettoyage, gels, solvants, métaux

Keywords: ecological, cleaning, gels, solvents, metals



In response to the potential hazards of traditional cleaning methods employed in art conservation and affecting human health, environment or artworks themselves, research towards safer and more sustainable practices is of high interest¹. For this purpose, previous studies demonstrated the efficacy and reliability of microorganisms exploited in conservation treatments². In addition, the combination with gel delivery systems provides controlled cleaning action and significantly reduces the number of active agents appearing as an attractive alternative approach.²

The HELIX project seeks to develop environmentally friendly, bio-based and easy-to-use gels for cleaning altered historical metal artworks. Commercial hydrogels from renewable sources are amended with selected microbial metabolites capable of complex metal ions, thus tackling detrimental corrosion. In parallel, bio-derived organogel formulations are designed to remove undesired or altered organic coatings on metallic artefacts.

To make the conservation community aware of the reliability and efficiency of HELIX green cleaning gels, some assays carried out on model iron objects are here presented.

In iron-deficient environments, some microorganisms produce siderophores which are natural iron chelators³. As opposed to traditional chelating agents exploited in metal care (i.e., sodium salt of ethylenediaminetetraacetic acid - Na₂EDTA), siderophores are biodegradable and have a pH close to neutral, thus being less harmful to both the environment and targeted artwork⁴. To illustrate the cleaning action of siderophores, a naturally corroded iron-based mezzaluna knife was treated with an agar hydrogel amended with the studied green chelating agents (**Figure 1A**). The success of the complexing reaction is ascertained by the colour of the formulation turning to vivid red during application (**Figure 1A**).

In metal care, protective organic coatings are often applied to prevent corrosion. However, they are sensitive to detrimental factors through time, prefiguring a possible negative impact on their protective property and the underlying metallic substrate.⁵ HELIX cleaning organogels are designed to remove undesired or altered organic coatings, employing bio-polymers and bio-solvents in their formulation exclusively. The cleaning systems are devised to tackle nitrocellulose or acrylic-based lacquers and show compelling results, as observed by UV light inspection (**Figure 1B**).

Following these remarkable outcomes, pioneering research is addressed to design green gels capable of bio-cleaning simultaneous undesired corrosion and organic coatings. Promising evidence is already obtained and reported in **Figure 1C**. HELIX formulations come as great green alternatives in metal care praxis. Various siderophores are currently under study to assess their potentiality to clean other metallic substrates. Close collaboration with conservators appears fundamental to verify the reliability on actual artworks and bring innovation out of the research laboratory.

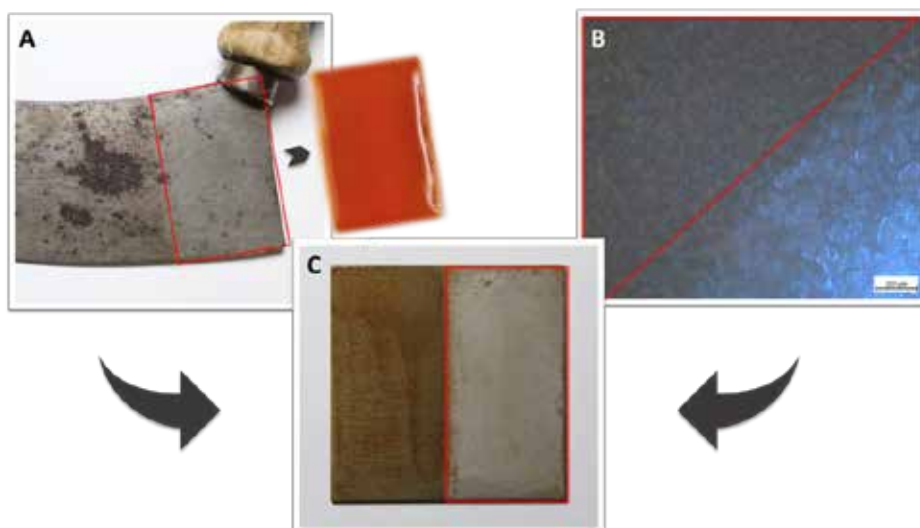


Figure 1. (A) Corroded iron-based mezzaluna knife partly cleaned with a siderophore-amended agar gel (red square) and embedded image of the gel after application. (B) Iron sample coated with Paraloid B72, removed thanks to HELIX organogel (upper red triangle) under ultraviolet illumination. (C) Iron coupon chemically corroded and coated with Paraloid B72, with a red square indicating the cleaned area after the application of a double-action gel.



Acknowledgements

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Representations, Experiences and Appropriations of Glocalized Heritage: Opportunities and Challenges of High-Profile Historical and Religious Sites (EXPER project)

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Résumé

Ce projet de recherche s'intéresse aux opportunités et aux défis que présentent le site Notre-Dame de Paris (France) le paysage naturel de Sintra (Portugal) et l'abbaye de Westminster (Royaume Uni). Ces sites patrimoniaux, autour desquels de puissants imaginaires se sont développés, forment des lieux dits «glocaux» pour des pratiques tant spirituelles, touristiques, qu'universitaires, ainsi que pour le développement d'identités multiples. En explorant le patrimoine comme un champ dynamique construit par la société au fil du temps, cette recherche vise à déployer les représentations, les expériences et les appropriations des sites patrimoniaux pertinents à la fois au niveau local, national et mondial (« glocal ») afin de comprendre ceux qui décident, ceux qui entretiennent et ceux qui utilisent ces sites.

Mots-clés: imaginaires patrimoniaux, usages religieux/ civiques/ touristiques, multi-échelle, protection du patrimoine, vulnérabilités

Keywords: heritage imaginaries, religious/ civic/ touristic uses, multiscalarity, heritage regimes, vulnerabilities



This interdisciplinary research project studies the glocalisation of Europe's high-profile historical and religious sites inscribed on the World Heritage List. With local experts, our researchers explore 'Paris, Banks of the Seine' (particularly Notre-Dame de Paris), the 'Cultural Landscape of Sintra', and the 'Palace of Westminster and Westminster Abbey including Saint Margaret's Church'. These spaces, where powerful imaginaries are at work, form 'glocal' places for mediating meanings and values for spiritual, touristic, scholarly and civic constituencies. Our analysis unveils the complex topography of human interactions in these heritage and tourism centres of international significance, discerning their profound role in forming multiscale identities. Our interdisciplinary exploration draws on various disciplines (anthropology, communication, cultural policy studies, history and art history) and complementary methods (text, media, visual analysis, ethnography, interviews, and surveys).

The sites selected include religious buildings (for Paris and Westminster, cathedrals, and, for Sintra, monasteries and palace chapels), but their contrasted religiosities go far beyond. Notre Dame, a beacon for Catholics, is also one of the world's most iconic monuments, whose fire spectacle moved many globally. The 'Cultural Landscape of Sintra', a renowned vacation destination, is inscribed as 'a model of romantic monumental and natural heritage', whose religiosity is imbued with the mystical aura of its mountains. Westminster is the political and religious centre of Great Britain, where the monarchs are crowned, married and buried according to the Anglican religion. These diverse religious local and national heritage practices coexist with visitors from various cultures, religions and cults.



With the help of our key local and international partners (the sites themselves, local heritage associations, the International Council on Monuments and Sites, the National Centres of Research, ministries, etc.), we will:

- analyse diverse existing sources reflecting how the sites' patrimonial destiny extends across and beyond Europe: public discourses, individual testimonies, collective expressions, cultural and artistic creations;
- produce new data through surveys and questionnaires and untapped sources on the cultural imaginaries (private photographs);
- reflect on the use of participatory archiving and digital tools in these heritage sites' museography.



Figure 1. Notre-Dame de Paris, 2021 © C. Doustaly

By exploring heritage as a dynamic field constructed by society over time, we aim to unfold the representations, experiences and appropriations of heritage sites that are both relevant locally, nationally and globally ('glocal'), and the importance of

innovative scientific research to understand those who decide, those who maintain and those who use them. We pursue a crucial line of inquiry for future policy-making and for heritage professionals and public authorities dealing with major management, conservation and economic issues while facing both aspirations for global communion and cohesion and conflicting regimes of values and appropriation.

Our research questions the role of traditional and social media in circulating images, ideas and emotions. How do heritage mobilisations or controversies travel through media? What are the different appropriations and constructions of local value and international reputation depending on site, country of origin, religion, media, and cultural policy? How secular are these religious sites? Does their lay dimension help them become universal?



Figure 2. National Palace of Sintra. 2018 (Fascínio. Left Hand Rotation)

The project aims to gather and analyse detailed documentation and ethnographic data about heritage sites with diverse users (religious, historical, touristic and civic) to understand their representations and expectations. We aim to transform scientific knowledge and academic discourse into new methods, policy insights and



recommendations. We plan to produce a reasoned framework for comparing such sites, analyse the underlying tensions, help devise refined visitor surveys, face use issues, enhance communication between stakeholders, and support heritage management and conservation. This will allow capacity-building for the future of a common heritage. Our results will be shared with research and training institutions, heritage professionals and civil society through workshops, exhibitions and public events.

Acknowledgements

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War Ruins in Hauts-de-France Area: from Being Resilient to New Uses of War Ruins from 1921 to the Present Day

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Résumé

Les ruines liées à la guerre peuvent-elles être un moyen de célébrer la résilience d'une société ? Comment, dans certains cas, sont-elles entretenues et utilisées comme un nouveau type de patrimoine culturel et de lieu de mémoire ? Dans cet article deux cas issus des deux Guerres mondiales et situés dans la région des Hauts-de-France sont étudiés. Le premier exemple est celui de la ville de Noyon, qui illustre la façon dont les autorités peuvent maintenir vivante la mémoire de la guerre. Le second est le blockhaus d'Eperlecques qui montre comment une marque honteuse de la défaite peut devenir un lieu de mémoire.

Mots-clés: guerres, ruines, patrimoine, tourisme

Keywords: wars, ruins, heritage, tourism



For a long time, French society did not attach heritage value to war-related ruins. Despite the enthusiasm for 'romantic ruins' that appeared during the 19th century in Europe, those created by wars, seen as 'violent', were considered something to destroy afterwards or merely as a source of building materials. During the 20th century, total war and heavy artillery caused greater destruction on battlefields than ever. It also affected more towns. Therefore, the Hauts-de-France area suffered a lot of destruction after both World Wars. During World War I, authorities considered the possibility of maintaining some remarkable ruins to help people remember the Great War and its aftermath. After World War II, it was decided to rebuild and modernise the whole country to erase evidence of the defeat. For about forty-five years, ruins were not seen as a remembrance mark and were slowly forgotten. Between 1986 and 1992, Pierre Nora published his book *Les Lieux de Mémoire*, which gave a fresh impetus to studies about remembrance places and the form they could take.

Could war-related ruins be a way to celebrate a society's resilience? How, in some cases, are they maintained and used as a new kind of cultural heritage and remembrance place? We will study two cases from each World War in the Hauts-de-France area. The first example will focus on the town of Noyon, which shows how authorities can keep the memory of war alive. The second one will focus on the Eperlecques' blockhaus, which shows how a shameful mark of defeat can become a remembrance place.

Noyon, in Northern France, was occupied from 1914 to 1917. Amongst the towns occupied during the war, it was the closest to the capital. Known as the birthplace of John Calvin and the city of Merovingian kings, it became a symbol of occupation thanks to an article written on 28 August 1915 by Clémenceau in his newspaper *L'homme enchaîné*. Noyon was destroyed during the German Army's withdrawal in 1917 and again in 1918 by the French artillery who bombarded German forces entrenched in the town. By the war's end, every building in Noyon had suffered



damage. It was decided to rebuild everything. However, local authorities also wanted to keep a memory of the war and its aftermath in Noyon. Therefore, in 1923, the War Veteran Association made a submission to erect a war memorial that would visually depict four different phases of the war in the city. Everything about the memorial represents the city's history from 1914 to 1920: the hostage-taking on 29 September 1914; the first French liberation of the city on 18 March 1917; the ruined city on 25 August 1918; the 10 July 1920 when the city received the Legion of Honour from Marshall Joffre. These scenes were sculpted by Emile Pinchon, a local artist. The memorial was inaugurated in 1925. The scene from 1920 is also commemorated in the city hall with a painting by Porphyre Pinchon, showing the city council and war authorities in front of the ruined town hall.

Thanks to these works of art, Noyon was able to rebuild the city and keep a symbol of its ruined streets after the war. This shows that it is possible to both commemorate a disaster and pay respect to the resilience of survivors. It also shows the importance of war ruins in the early 1920s society, when residents had to live amidst the war's evidence.

After World War II, ruins were spread across the whole country. The tendency was to erase each ruin for rebuilding and modernising the urban landscape. Still, some 'shameful' ruins have remained because they were difficult to destroy, such as German bunkers, which reminded them of the defeat. This was the case with the Eperlecques' blockhaus.

This strongpoint was built in a forest in 1943 to launch V1 missiles towards London. The allies bombed it only a few months after the beginning of the construction and many times subsequently. In 1945, the French state became the building owner, but it was left unused by both public and military authorities. In 1973, the forest's owner decided to buy the blockhaus to create a museum.



Today, the site is a promenade in thirty hectares of forest, marked by explanatory signposts along the way that lead into the blockhaus. Those signposts explain the building of the fort and the V1 and V2 missiles but also tell the story of the prisoners of war who were forced to take part in the building. Inside the blockhaus can be found more explanations about weapons, and a theatrette where a film can be viewed. The information is provided in French, English, German and Dutch, and there are facilities and guides for people with a disability.

The actual owner intends the site to be a vivid source of engagement for a broad audience, as well as a place where people experience strong emotions such as astonishment at the effort of constructing the building and V-weapons, as well as pity for prisoners of war.

This short study shows that war ruins are not only vestiges in our landscape. They hold much potential, as they can become proof of society's resilience after a disaster. But they can also help build a stronger tourism experience around war remembrance in Northern France, which can be improved and renewed. Including ruins would offer more opportunities, which would also provide a source of income to fund the maintenance of the sites themselves.



The 'Sourced and Informed' 3D Digital Model, an Innovative Methodology for Knowledge and Management of Built Heritage

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Résumé

L'une des caractéristiques de la conservation du patrimoine est son inscription dans le temps qui dépasse la dimension humaine. Afin de maintenir vivantes ces réflexions et ces œuvres, de faire face à la perte de compétences intellectuelles, de techniques et à la dispersion des archives, ce projet propose de concaténer ces données et de les introduire dans un modèle numérique 3D paramétré. Cela permet d'obtenir un état des lieux des bâtiments patrimoniaux sous plusieurs angles, données précieuses pour chaque opération de conservation et de restauration.

Mots-clés: modèle paramétrique 3D, H-BIM, connaissance, patrimoine, archives, source de données

Keywords: 3D parametric model, H-BIM, knowledge, heritage, archives, data source



One of the characteristics of heritage conservation is that it takes place over a long time, which goes beyond the human dimension but not beyond its writings or architectural and technical interventions. To keep these reflections and works alive and deal with the loss of intellectual and technical expertise and archives dispersal, we propose concatenating the data and introducing them into a parameterised 3D digital model. This makes it possible to obtain a state of the art of heritage buildings from several angles, which is useful and necessary before each conservation and restoration operation.

The digital models realised are databases associated with each element of the architectural works. The latter is characterised by multiple data, which are previously identified, assessed, confronted and validated. These data are referenced through a code linked, using the 'source' parameter, to the 3D graphic restitution. These sources can be graphical, such as plans, photographs, postcards, and surveys, and textual, such as estimates, letters, site reports, study reports, etc. An expert reading of this information is compared with the geometric data referenced in a points cloud and the technical data collected by direct observations.

This virtual reconstruction is documented and reproduces the construction process step by step. All this is conducted in connection with theoretical issues, treatises on architecture, stereotomy, art history and expert observations *in situ*. At the end of this process, the digital model contains all the geometric data (2D and 3D) and non-geometric data (material and immaterial).

These 'sourced and informed' parameterised 3D digital models are digital tools that enable the collection, storage, visualisation and incrementing of architectural data. Furthermore, their interoperability allows the use of data in many other independent systems already existing or yet to be created, such as the Management Operation Maintenance (GEM), Diagnostic of Energy Performance (DPE), and structural study.

This modelling method applies to diverse types of buildings and heritage and can be calibrated according to the objectives but is always based on solid documentary analysis.

For instance, the Nanterre prefecture headquarters by A. Wogensky model aiming to define management strategy has been carried out from the structure archives. This makes it possible to know materials, quantities, installation passages, surfaces, and affectation.

The case study of a Neolithic Cairn in the Gulf of Morbihan was a further opportunity to reflect on the method, especially for entering the collected degradation data.

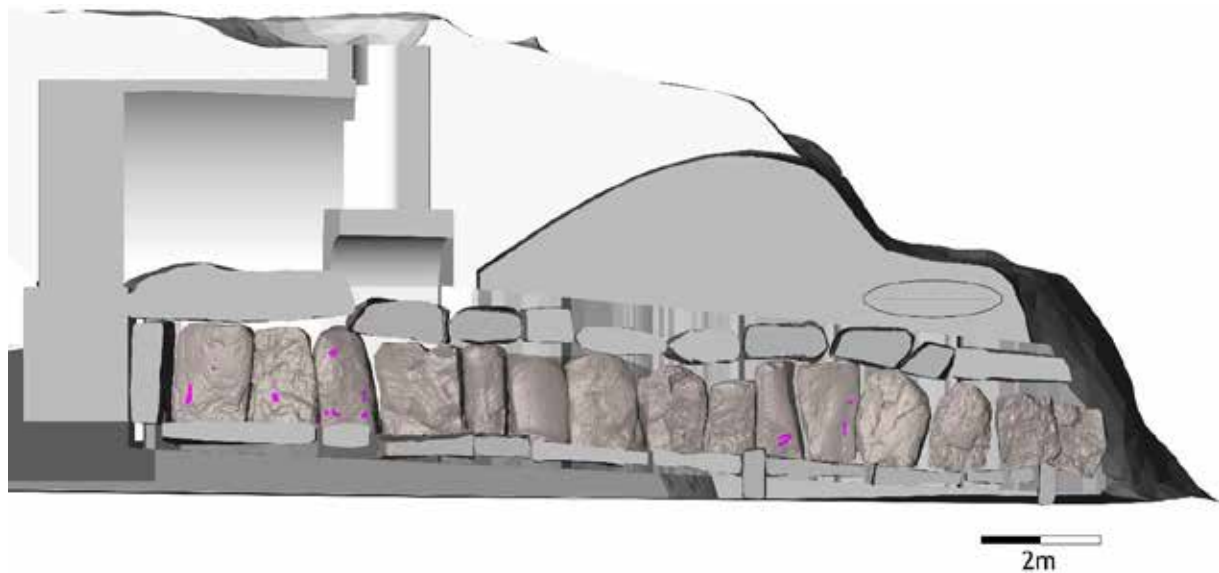


Figure 1. Gavrinis Cairn – 3D model longitudinal section view of the passage tomb: cairn stratigraphy and location of the scaling zones (purple)

On the urban scale, the Cité Frugès' (Pessac, France) architecture and landscape model is based on archive data and data collected in recent years. The model includes buildings and open spaces. It aims to support appropriate development solutions to improve the conservation of the neighbourhood.

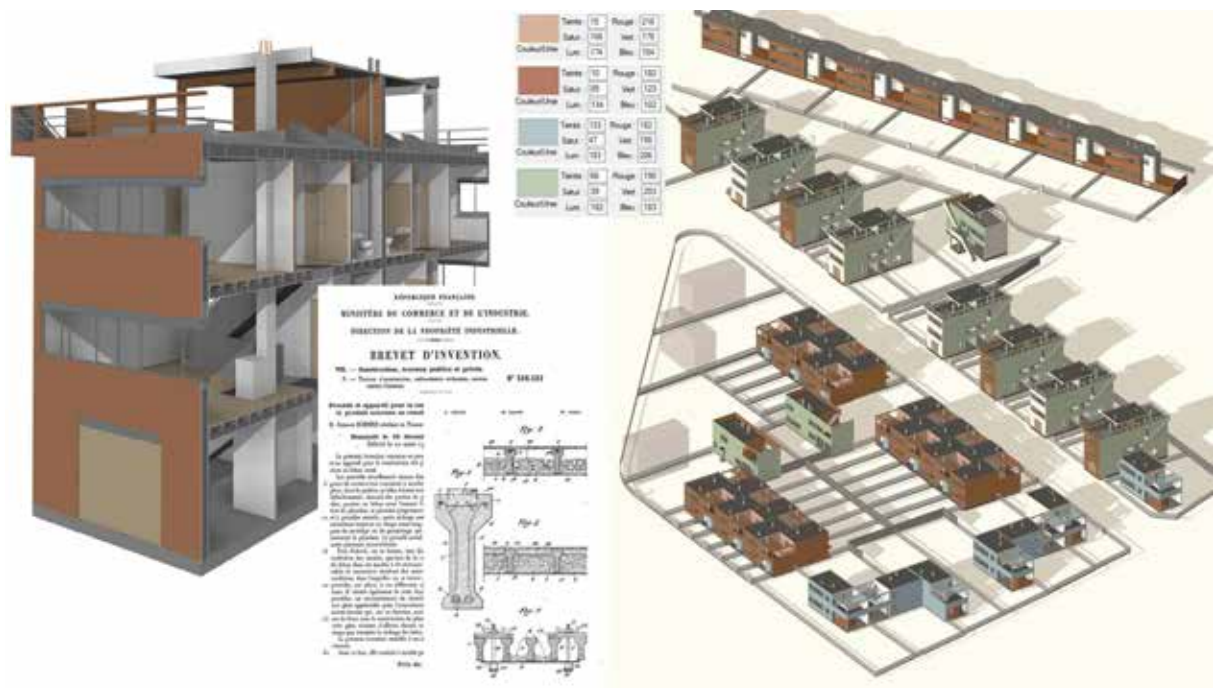


Figure 2. The Cité Frugès by Le Corbusier et Pierre Jeanneret detail of a single house and analysis on neighbourhood polychromies

The modelling of these digital parametric BIM objects according to standardised principles allows us to constitute real libraries of objects, an architect's characteristics, or even an era. This reflection will continue to be enriched according to new projects, extended around the raising of new dictionaries and new common vocabularies.

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Conservation Management Plan: A Tool for Sustainable Management of Cultural Heritage. A Case Study of the Kaunas Military Research Laboratory in Lithuania

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Résumé

En 2019, la Fondation Getty accorde une subvention pour le plan de gestion de la conservation (*Conservation Management Plan*) du Laboratoire de recherche militaire de Kaunas. Conçu dans les années 1930, ce bâtiment est légalement protégé depuis 1972. Son haut niveau d'authenticité détermine la grande responsabilité dont il fait l'objet en termes de conservation mais aussi les difficultés à l'adapter aux besoins contemporains. Les questions abordées par l'équipe interdisciplinaire d'experts mobilisés dans le cadre du plan de gestion du Laboratoire servent d'étude de cas pour répondre aux défis contemporains de gestion et de conservation durable du patrimoine. Ces questions servent aussi de base pour une plus large discussion sur la façon de préserver le patrimoine pour l'avenir.

Mots-clés: plan de gestion de la conservation, gestion durable, patrimoine culturel, subvention

Keywords: conservation management plan, sustainable management, cultural heritage, grant



In 2019, the Getty Foundation programme 'Keeping It Modern' awarded a grant for the preparation of the Conservation Management Plan (CMP) of the Kaunas Military Research Laboratory¹, which currently belongs to the Kaunas University of Technology. The modernist building was designed by the famous Lithuanian architect Vytautas Landsbergis-Žemkalnis in the 1930s (**Figure 1**) and has been declared a cultural monument as early as 1972. It is situated in the area of the Modernist Kaunas that has been submitted to a tentative World Heritage List. The laboratory bears unique heritage significance because of its architecture, innovative constructions, furniture and top-grade imported engineering equipment of the period, most of which have been preserved until today (**Figure 2**). Its high level of authenticity determines the high responsibility regarding its preservation and the difficulties in adapting it to contemporary needs. An interdisciplinary team of experts took part in the CMP, which was completed in 2021². The thorough analysis conducted in preparation for the CMP revealed several aspects relevant in the broader context of sustainable heritage preservation for the future.



Figure 1. General view of the Laboratory building. © Martynas Plepys, 2020



Conservation and Adaptation Issues in the Laboratory Building

The team of specialists who contributed to the CMP carried out a comprehensive analysis of archival documents, detailed condition assessment and investigation *in situ*, as well as interviews with various stakeholders who manage, take care of or work in the building. Therefore, a full picture of the advantages and issues was captured.

First of all, it was understood that even though the building has been legally protected for nearly fifty years, being rather new and built in the 20th century, it is not always perceived as 'real' heritage. This ambiguous attitude and lack of knowledge to conserve modern materials result in loss or damage of original fabric and elements. Many constraints and tensions emerge in the current management process due to limited budget, public procurements, and lack of skills and knowledge. Legal requirements often allow lower standards than good conservation practices would determine.

Sustainability is usually understood as energy efficiency for contemporary buildings and is regarded as the opposite of historical ones. Thus, following a goal to save limited budgets, the introduction of standard energy efficiency measures is often prioritised over appropriate conservation, causing the loss of authenticity of attributes. As in most prominent institutions, such issues could be prevented by involving competent staff and external conservation experts, with better internal communication and clear responsibilities in the management process. Relevant proposals were included in the CMP based on this approach, setting certain policies to assist the property owner.

Because of the laboratory's protected authentic scientific function, it is essential to ensure the continuity of the activities inside the building. However, the needs of contemporary scientists might contradict conservation goals and while they are



proud to work in such an exceptional environment, some adjustments are inevitable to avoid turning it into a museum. The CMP provided gradation of the elements regarding their heritage significance (cultural value) followed by related conservation actions and possible alterations, as well as guidelines for necessary interventions.

As the site is becoming a popular local tourist destination as part of the Kaunas modernist architecture route, it is understood that uncontrollable visits could disturb primary scientific and educational activities. Therefore, the CMP also suggested interpretation and public access to balance various needs.



Figure 2. Interior of the laboratory: authentic fixtures and equipment preserved to this day.

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The Laboratory building is a genuine example of contemporary challenges for sustainable heritage management and conservation. It embodies a constant balance between authentic and contemporary, building and people, good conservation



practices and lack of skills, wishes and budget constraints, and finally, constantly changing needs of the various stakeholders involved.

The CMP addressed these issues, and if it is at least partially implemented, the next time it is revised, the achievements and failures will again be used as a basis for broader discussions on how to preserve heritage for the future.

Acknowledgements

The authors would like to express their gratitude to the Getty Foundation for its programme's 'Keeping It Modern' grant that made the Conservation Management Plan of the Kaunas Military Research Laboratory possible and acknowledge the valuable contributions of all the colleagues who took part in the CMP.

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² Full text of the CMP will be available online at The Getty Foundation website Keeping It Modern Report Library: https://www.getty.edu/foundation/initiatives/current/keeping_it_modern/report_library/index.html



From Semantic Reverse-Engineering to Virtual Reality Toolbox for Digital Heritage Objects

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Résumé

Le projet national ReSeed vise à offrir une alternative permettant aussi bien une modélisation sémantique (sources 2D) qu'une modélisation physique (3D) pour notre patrimoine scientifique, technique et industriel, tout en garantissant l'authenticité et l'intégrité de la connaissance. L'intégration numérique d'un savoir hétérogène est ambitieuse. L'équipe du projet a par la suite démontré que concevoir un seul outil était impossible. La proposition du projet ReSeed est un « conteneur numérique » au savoir auto-structuré créé simultanément avec le double numérique de l'objet patrimonial étudié. Considéré comme une « réalité historique augmentée » définie par un outil virtuel (au lieu des habituelles procédures papier), ReSeed reste néanmoins un outil d'aide à la décision.

Mots-clés: patrimoine numérique, ingénierie inverse, passé

Keywords: digital heritage, reverse-engineering, history



The recent democratisation of the digital world has allowed new possibilities for capitalising, analysing and enhancing our heritage, tangible or intangible, in order to face the lack of 'humanity knowledge'. Today, digital techniques are invading the field of cultural heritage for studies, conservation and valorisation, and they are constantly developing. Within a few years, the fields of use of digital techniques have become numerous and diversified: volume scanning (artefacts, monuments, landscapes), virtual restitution, databases, multiple requests and artificial intelligence aiming to coordinate representation such as 2D (map), 3D (volume), 3D + t (dynamic) with information (archive, printed text, sound, image, movies, etc.). The main rules applied today are practical rules of feasibility. They are essentially evaluated from the point of view of their technical efficiency, and their specifications are mostly functional.

However, if data acquired are intelligible and interoperable, they are rarely presented to the public or experts. This low use can be explained because of the large amount of data to be handled, which greatly exceeds the capacities of current computers and the skills of those carrying this knowledge. Indeed, the use of digital tools for different types of cultural heritage projects and programs involves multiple professional and scientific communities: architects, heritage curators, historians, archaeologists, geographers, computer scientists, engineers, etc. Communities with diverse interests appear to be involved in the projects: owners of the heritage in question and its projects, consultants and implementing companies, academics and research projects, institutions and conservation rules, etc.

Beyond simply using 3D tools for graphical visualisations, new approaches and tools allowing the semantic linking of objects through databases must fit as new standards. The ReSeed project aims to offer an alternative allowing both semantic (2D sources) and physical (3D) modelling without going through a filtering process, which is



synonymous with loss of information and knowledge.

Nowadays, reverse engineering is widely used in manufacturing industries in order to record geometrical data from products. However, digitising physical data does not provide any knowledge about the products. Capitalising on this know-how and knowledge is critical to advancing tomorrow's products.

The aim of these research projects is to develop methods and technologies for the heritage and museological field in the new field of the so-called 'digital humanities'. These innovative research works are interdisciplinary: both human sciences and engineering sciences. Two approaches have been identified:

- Classical knowledge management based on semantic sources;
- Computer-assisted design and scanning tools.

The ReSeed project aims for the development of a new technology: a tool and an interoperable format in order to digitise both semantic and physical data about objects. Before applying the process to industrial production cases, it has been decided that, firstly, our approach would experiment on existing assets related to identified knowledge and whose intrinsic value is firmly established: ReSeed will be tested on industrial cultural heritage.

In the end, in case of the success of the National Research Agency (ANR) ReSeed program, a cycle between the past and the present knowledge will be established. Protecting, analysing and understanding these objects from 'past heritage' may turn them into 'present capital'. The transposition of past knowledge into a contemporary form, readable and intelligible in our present socio-technical system, may become a source of inspiration to anticipate our future. However, new technical and epistemological issues arise: which new methodologies? Which scope for digital tools? Which interoperable data formats? Which new professions? How to validate

the results?

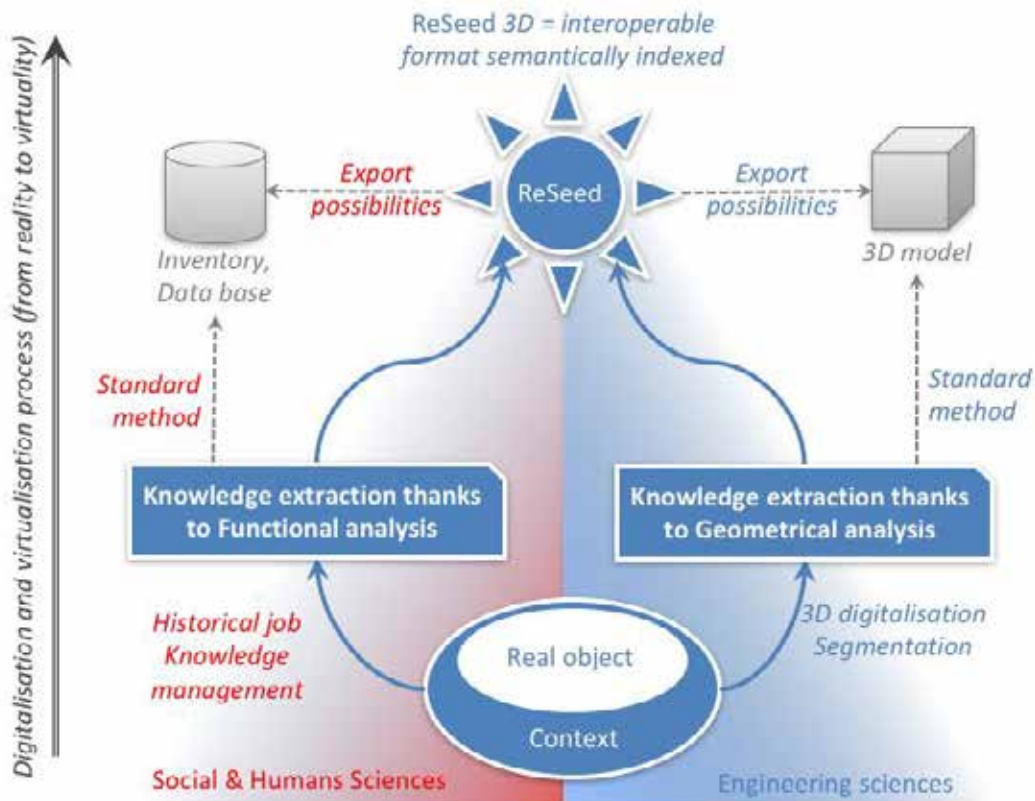


Figure 1. Digitisation and virtualisation process (from reality to virtuality)

Also, the ReSeed technology covers the entire heritage process:

1. From the capture of traces of the object: here, it is a question of capturing and storing 3D type elements, documentation, analyses, archives, etc. Two processes are put in parallel: the ability to digitise the object and the possibility of capitalising on the associated knowledge to allow its analysis and understanding (as shown by the previous figure)
2. By way of digital modelling of the physical object for processing and exploitation for purposes of expertise and chaining of knowledge. The point here is to link the elements together by setting up, for example, a 'knowledge container' associating documentation and archives with the geometry and the operating of the object.



3. Until it is valorised and stored for the next human generations by viewing and using the data for transmission and mediation purposes, it is about exploiting the container of knowledge at different levels: from mediation for the general public to the analysis tool for research in history, including the curious amateur, and in different situations: on a heritage site, in a museum, at a distance, etc.

The major scientific barrier lies in the interoperability of these three phases, which are often compartmentalised. Scientifically speaking, the ReSeed proposal is a digital container of knowledge which is self-structured all along the creation of the digital twin of the heritage object studied. The purpose of the ReSeed technological tool is to be an asset decision support thanks to the digital integration of heterogeneous knowledge. It is a virtual tool that replaces a 'paper' catalogue (with a research tool and not an inventory base): it can be defined as 'Historical Augmented Reality'.

Functionalities provided by the system are detailed in the figure below:

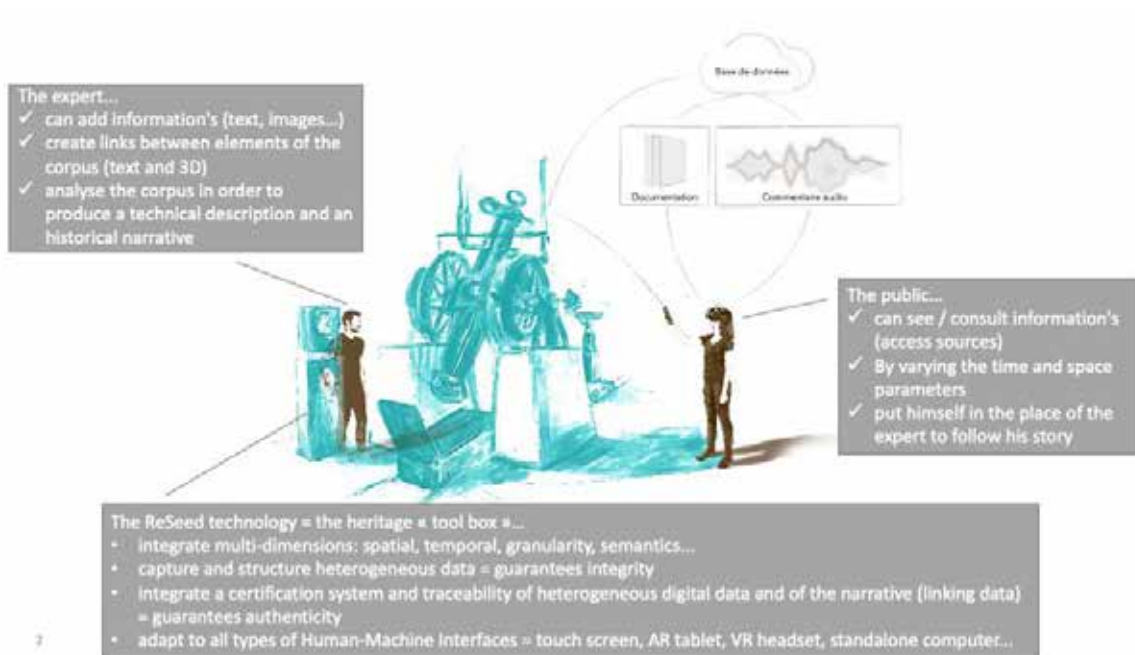


Figure 2. Functionalities of the ReSeed technology



From an operational point of view, the ReSeed tool is a virtual world where Lego bricks can be organised (manipulation of 3D clouds of points, the addition of semantics, etc.). It allows multiple business views. Several variations are considered: a 'ReSeed App' with public version, pro-version and a 'heritage tool box': 'ReSeed Eye', 'ReSeed Snap', etc. Moreover, to guarantee the authenticity of digital data, we are adapting the concept of blockchain to our project. It allows tracing the use of a source and its modifications. The digital tool itself becomes the certificate of authenticity: it is 'ReSeed Blockchain'.

Several scientific prototypes have been developed both for capturing 3D historical traces or historical archives and also the 'ReSeed App'. In addition, the first prototype software based on augmented reality for smartphones and also available through virtual reality for standalone computers has been developed for mediation purposes. The prototype is applied to a use case coming from a national scientific collection (French meridian observatories) managed by the Ministry of Culture. The ReSeed technology supports more than 20 GB of clouds of points and data archives which are streamed in real-time on the internet.

To try the prototype, you can go to the project website: <https://reseed.ls2n.fr/fr/the-project/prototype-reseed/>



Deep-Learning Technology for Book Conservation Assessment in Libraries and Archives

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Résumé

Un des principaux objectifs des bibliothèques et des archives est la conservation de leurs collections afin qu'elles soient transmises aux générations futures. Le grand nombre de livres gardés en réserve rend cette tâche particulièrement difficile. L'intelligence artificielle offre la possibilité de traiter de grands volumes de données en un court laps de temps, pourtant, elle n'a pas été encore utilisée dans le domaine de la conservation des livres. Une équipe de scientifiques étudiant l'intelligence artificielle et un conservateur développent ensemble un outil qui évalue automatiquement l'état de conservation d'une reliure à n'importe quel moment.

Mots-clés: intelligence artificielle, deep-learning, conservation du livre, archives, bibliothèques

Keywords: artificial intelligence, deep-learning, book conservation, archives, libraries



The research presented is part of a PhD thesis of ED 628 of CY Cergy Paris University, in collaboration with the laboratory ETIS UMR 8051 (CY Cergy Paris University, ENSEA, CNRS). The subject of this research is the use of deep-learning technology to assess the conservation state of bindings in libraries and archives. To date the bindings, conservation assessments for books are done by hand using statistical methods¹. These studies are time-consuming and costly for most libraries and archives. Therefore, they are only partially done despite the growing need for loans and digitisation.

The main goal of the research is to develop a tool that will warn curators and conservators in case evidence of deterioration that is cause for concern is found on a binding within a visible area of a book when placed on a storage shelf. This corresponds to the spine and the hinges that are structurally decisive for handling. The tool should be easy to use and able to give an overview of conservation states for a large number of books. Nowadays, artificial intelligence makes it possible to automatically and accurately detect damages such as cracks and losses on pictures of bridges and buildings². The system uses deep-learning techniques based on convolutional neural network algorithms. These neural networks must be trained with image databases which feature damages that can often occur to recognise images and classify them. A similar system was used for our research and applied to binding deteriorations.

First, an image data set was created from the eleven thousand five hundred sixty registers of the Parliament of Paris kept at the French National Archives. Most bindings selected were in leather and showed clear deteriorations: split hinges, missing areas in the leather, missing head cap and headband. Registers that were in poor condition were kept in individual conservation boxes. One hundred fifty-nine photographs were taken using a digital camera, featuring a total of 822 bindings on



storage shelves. The purpose of these photographs was for a conservator to create segmented images with the Photoshop® software to obtain seven classes of binary masks corresponding to the different types of deteriorations. A convolutional neural network was trained to first detect bindings on shelves (**Figure 1**). The confidence score was 97.77%. Call numbers were recognised by a different network and linked to the binding with a confidence score of 98,31%. A third network was able to separate bindings in boxes from the rest of the collection with a confidence score of 80,25%. Finally, each deterioration was detected. This task was more challenging when the deterioration was small. Confidence scores varied from 76,78% to 26,56 %. The tool analysed a hundred bindings in 10 seconds (**Figure 2**).

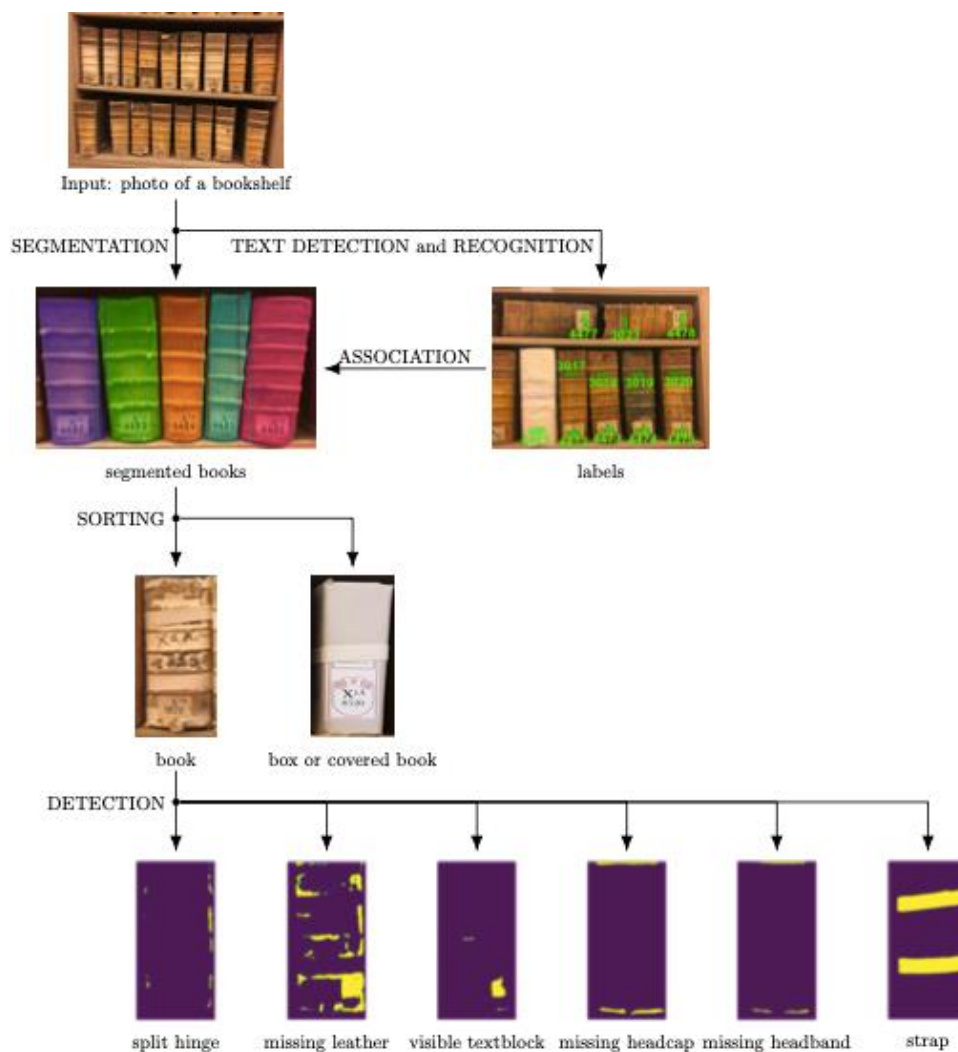


Figure 1. Detection of deteriorations on bindings. © Camille Simon Chane



Figure 2. Missing leather areas are automatically detected with a U-Net pre-trained model.

© David Picard

The research will continue for two more years with the Library of Quai Branly - Jacques Chirac Museum and the National Library and Archives of Quebec (BAnQ). The tool developed so far will be tested on new images of bindings dating from the end of the 19th century to the 21st century. The research will go beyond a simple implementation of existing algorithms. In the first instance, the images of the Quai Branly and BAnQ's collections are so different from those from the French National Archives that a finetuning of the network will surely be necessary. Indeed, the task becomes more complex as we move from leather bindings to more recent works of various heights, thicknesses, and materials whose spines are often smooth. BAnQ's conservation team is also interested in counting and recognising particularly difficult-to-digitalise bindings. Indeed, 15,000 books will be digitised each year, and BAnQ does not have enough staff members to count the number of books per shelf nor to know the number of damaged bindings that require restoration. If the confidence score is over 95% correct, the tool could be used yearly for the collection's digitisation plan.

We hope this research will improve the limitations of the existing conservation assessment methods and help libraries and archives make treatment decisions for



their book collections. After its development, the tool is programmed to be available online, so any library or archives can upload pictures of books on shelves and get a database pointing out which binding needs urgent care.

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SPHINX, Rebranding the World through an Innovative System for the Protection of Heritage

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Résumé

Dans le cadre de sa thèse de doctorat, l'auteure s'est intéressée à la création d'un système innovant appelé "SPHINX" pour la gestion du patrimoine culturel immatériel et naturel présent dans la région de Béotie, en Grèce. Ce système s'appuie sur la compilation et la superposition de cartes et les principes d'aménagement du territoire pour révéler le portrait dynamique d'un paysage.

Mots clés: SPHINX, Béotie, paysage, palimpseste, patrimoine

Keywords: SPHINX, Boeotia, landscape, palimpsest, heritage



Under the framework of the writer's doctoral thesis, an attempt was made to create an innovative system called 'SPHINX'ⁱ for the management of intangible and natural cultural heritage and implemented in the region of Boeotia in Greece. This system is a particularly valuable methodological project both for the field of research and for any other area where SPHINX will be applied. The research revealed a very important aspect of Boeotia, its global uniqueness, and in particular, its cultural virtues, that are clearly incomparable with any other global feature. One example is the prominent Lavdakid circle, one of the two pillars of Greek mythology and drama.

The process of mapping was used for the development of the innovative SPHINX system. It is mainly based on superimposing one –or more- maps on top of one another and constitutes a continuous search of landscapes – as dynamic and timeless fields of cultural inscription and manifestation - that seeks their enhancement and interpretation within the sphere of meanings and symbols. The process of compiling maps can bring up, through the projected concept of palimpsest, the continuously vibrating images of the landscape through the complexes of multilayered dynamic topological systems and networks inscribed on holographic surfaces.

The understanding of space as a generator structure raises important questions, which are answered in the dissertation. These questions are related to:

- a. The current situation
- b. What the inhabitants of the area perceive today
- c. What one expects from the implementation of the SPHINX system
- d. What the present research in the landscape offers
- e. The ways of approaching a landscape
- f. What a landscape has to do with the place and its deeper content - the myth and the discourse.



The proposed research is framed by the basic perspectives, perceptual concepts and conceptual approaches related to the possibilities and conditions offered by urban spatial planning. This aims to stabilise the development process and ensure 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 strategic development planning that aims to provide sustainability for each landscape.

The most important deliverable will be the creation of the innovative digital information system, or database, SPHINX, which will work on both computers (server, desktop) and mobile phones (application). It will be equipped with all the necessary information in order to enable the promotion of the tangible and intangible cultural elements of a place -in this case, Boeotia.

Moreover, applying the SPHINX system in any area and spatial scale achieves 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.

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Some Observations and Considerations about the Effects of Digital Technology on Field Practices in Archaeology over the Last Forty Years: First Results of an Ongoing Research

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Résumé

Cet article analyse les effets du numérique sur l'archéologie en tant que discipline et sur les compétences et savoir-faire des archéologues. À l'aide de diverses sources, nous démontrons l'évolution récente des pratiques d'enregistrement sur le terrain des archéologues, due à l'utilisation d'appareils d'enregistrement numérique. Depuis une vingtaine d'années, la grande majorité des archéologues ont choisi d'hybrider leurs pratiques, entre enregistrement traditionnel et numérique. Ce processus de « bricolage » permet aux acteurs de s'adapter à un contexte contraint par des moyens limités et des technologies qu'ils apprennent très souvent à utiliser par eux-mêmes.

Mots-clés: archéologie, enregistrement sur le terrain, équipement numérique, pratiques numériques, compétences numériques

Keywords: archaeology, field recording, digital equipment, digital practices, digital skills



Our research analyses the repercussions of digital means on archaeology as a discipline and on archaeology professionals in their practices. It contributes to the historiography and epistemology of this discipline. The various sources we used - eighty interviews and field observations in France and abroad, a study of a large number of papers and digital excavation archives, one-year online survey - reveal the evolution of practices used by archaeologists over the last four decades due to the evolution of techniques and methods.

Firstly, this change is due to the deployment of standard-level recording tools and methods - field recording forms, stratigraphic Harris method- and, secondly, to digital devices and programs dedicated to data recording during field excavations^{1,2,3,4}. This evolution initiated in the 1960s with computers used for documentation management⁵ took a new step in the mid-1980s with personal microcomputers⁶. For the past decade, this evolution has accelerated with the deployment of equipment facilitating the massive acquisition of born-digital data in the field, enabling archaeologists to acquire new digital skills and know-how⁷.

Our observations show that the vast majority of people we observed and interviewed have chosen to hybridise their practices and sometimes their conceptual framework, between traditional and digital recording, according to similar observations made by other researchers^{8,9}. This 'Do-it-yourself' process allows individuals to adapt to a context that rapidly changes, constrained by the pressure of rescue archaeology, the means available for fieldwork and digital technologies they learn to use on their own very often¹⁰.

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Paris University (International Mobility Assistance). We would like to thank them warmly.

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On the Opportunity of Coordinating World Heritage Sites' Management at Regional Level: Insights from Veneto

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Résumé

Si la gestion des sites classés au patrimoine mondial de l'Unesco est encadrée par la Convention de 1972, de nombreuses tentatives ont été développées pour permettre l'intégration des pratiques de gestion. Les réseaux de sites et les expériences de coordination territoriale jouent un rôle clé en ce sens, et fournissent des plateformes où les problèmes, les opportunités ainsi que les éventuels outils communs sont discutés. Le Conseil des sites du patrimoine mondial institué par la Vénétie est l'une de ces plateformes. Il rassemble les gestionnaires des neuf sites situés, au moins partiellement, sur son territoire. Depuis 2018, grâce à un accord entre l'administration régionale et l'Université Iuav de Venise, un groupe de recherche soutient les activités du Conseil. Cet article présente ses activités.

Mots-clés: sites du patrimoine mondial, région de Vénétie, gestion des sites, Unesco

Keywords: World Heritage sites, Veneto region, sites management, UNESCO



While World Heritage sites' management is framed at the global level by the 1972 Convention concerning the Protection of the World Cultural and Natural Heritage and the following Operational Guidelines¹, many attempts at mainstreaming management practices have been developed². Site networks and territorial coordination experiments play a key role in that sense, by providing platforms where shared issues and opportunities, as well as possible common tools, are discussed.³ The board of World Heritage sites instituted by the Veneto Region is one of those, gathering managers from all nine sites situated, at least partially, since they include three serial and/or transboundary sites in its territory⁴. Since 2018, through an agreement between the Regional administration and the Iuav University of Venice, a research group has been supporting the board's activities.

First, a survey of every single site's management, as well as current issues, has been completed through the analysis of management plans and relevant documents as well as a series of interviews with public officials, experts, and observers from the civil society.

In the second phase of this collaboration, currently underway, three key dimensions in which regional coordination of sites' management can play a key role are being explored, with a view to promoting shared practices between sites' management authorities and the Veneto Region. Those three dimensions, all related to competencies pertaining to the regional authority itself, among which heritage enhancement, tourism promotion as well as urban and strategic planning, are respectively sites' monitoring, the articulation between their management plans and management systems (or governance), and their territories' integrated development.

Although monitoring is a key part of the World Heritage Centre's tasks and is required from the sites' managing authorities, effective monitoring practices are often lacking.



In Veneto, where much autonomy has been entrusted to local authorities in terms of planning, two recent regional acts have introduced more control over land consumption, which provides a significant indicator of spatial change within the sites' environment. We are, therefore, inquiring into potential synergies between such requirements.

After two decades of focus on World Heritage management plans, literature and experts' attention is shifting somewhat towards management systems or governance⁵. The recent listing of the Prosecco Hills of Conegliano and Valdobbiadene, as well as Padua's fourteenth-century fresco cycles, offers the opportunity to examine World Heritage sites' governance arrangements in the making.

Finally, whilst tourism promotion represents a strong driver for new applications, in contrast, tourist flows exert significant pressure on sites themselves and local communities. Drawing upon experience from sites belonging to other regional and/or national contexts and other UNESCO programmes, such as Man and the Biosphere reserves, the third and last focus will deal with the relationship between tourism and local development within World Heritage sites.

A synthesis of all three focuses' outcomes will be provided through a short document shared both with the board of sites and the Veneto Region's officers, with the aim to further facilitate common understanding and collaboration between different professional practices and cultures.

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⁴ See its official web page: <https://www.culturaveneto.it/it/patrimonio-mondiale-in-veneto>

⁵ See LUSIANI, Maria, FERRI, Paolo, ZAN, Luca, Making Sense of Site Management, in Makuvaza (ed.), *Aspects of Management Planning for Cultural World Heritage Sites. Principles, Approaches and Practices*, Singapore: Springer, 2018, pp. 227-240, and RIPP, Matthias, RODWELL, Dennis, Governance in UNESCO World Heritage Sites: Reframing the Role of Management Plans as a Tool to Improve Community Engagement, in *ibid.*, pp. 241-253



Le patrimoine culturel dans un contexte changeant



Design, a Creator of Connections. Territory, Know-how and Heritage in the Champagne Region

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Résumé

Cet article présente un projet de design développé au sein de la chaire IDIS (ESAD de Reims) pour rendre compte de la capacité du design à être simultanément un outil de recherche, un moyen de collecte de données et un créateur de liens. L'article pose la question de la place et du rôle du designer non pas en tant que simple concepteur, mais en tant qu'acteur de la recherche sur le terrain et offrant, de fait, des éclairages sur les questions économiques, sociales, environnementales et patrimoniales avec tous les acteurs d'un même territoire.

Mots-clés: design, territoire, canal, vignes, bois

Keywords: design, territory, canal, vines, wood



Since 2019, the Industry, Design and Social Innovation (IDIS) Chair hosted by ESAD de Reims has been interested in the specific ecosystems of the Regional Natural Parks (PNR) of the Grand Est region, whose role is to protect and enhance the natural, cultural and human heritage of its territory.

It is in this context that the *filière bois* (wood sector) project was developed. This has made it possible, within the Parc de la Montagne de Reims, to understand the close link between the forest, the vineyards and the water of a river and the inclusion of cultural heritage in a landscape.

From the choice of a species, oak – both material and representative of local industry – research-creation projects have been developed with design students. One of these projects is specifically presented here to better understand the place and role of the designer amid transition.

Design, Revealing Porous Areas

The TON-NEAU project by Justine Duchêne is a floating structure made of oak from the Park's forest by a local artisanal cooperage. Located on the banks of the Marne river, it tells the forgotten story of the role played by the lateral canal of the river in the commerce and reputation of champagne. The field survey leads us little by little to visualise a past and still-present relationship between vine, forest and water, woven under the effect of both economic actors and flow. This relationship is expressed even in the landscape. The Marne lateral canal's proximity between these different landscapes is indeed observable. Thus, the idea of the possibility of reading a landscape appears crucial in the design project. History and geography are then visibly linked to and by the landscape. History is seen as if it is projected onto the geographical surface and informs us of its simultaneously past, present and, therefore, heritage content.



In the design process, this reading of the landscape guides the designer. It has, thus, made it possible in the current case to determine the place of the installation: TON-NEAU takes place along the promenade, which runs along the canal in the village of Mareuil-sur-Aÿ, as this location offers an exceptional view of the hillsides of vines classified by UNESCO since 2015.

The TON-NEAU project then becomes an object that tells a forgotten story through its form and informative content, its immersive position, and the specific view of the landscape it offers. We see here how the design allows, through its investigative approach, the reconstitution of a story from fragmented elements and its ability to create a device to share a reconstituted story with a dependence on locality and the very significant present context. Therefore, design reveals the porous areas that underlie past and present, history and geography, and formalises the existence of a vibrant heritage dynamic.



Figure 1. TON-NEAU. ©Justine Duchène - Chaire IDIS



TON-NEAU ultimately considers, in its design, both economic and technical, organisational and social, historical and geographical aspects for an understanding that we could qualify as multi-faceted and for a contribution of design well beyond the object or the material. The project becomes evocative of a way of doing things in the design that finds its substance more in the ability of the discipline to question and deconstruct a contextualised and localised property to better understand it than in a usual construction that could then be qualified as unrooted. By restoring a past story for its telling, using local resources and know-how for its production, being part of a landscape which offers itself for reading and by linking local economic actors and users of the structure, TON-NEAU reveals and enhances a cultural heritage in connecting the elements that were used in its design.

We see here how the design appears as a specific research discipline that practices research-creation. Nowadays, the designer participates very directly in designing a future, no longer as a simple executor but as a proper reflective eye, a conversing, mediating figure. Design participates in the transition in its ability to create connections, link and restore. The design then shows itself as a comprehensive and strong discipline in technical, plastic or even narrative proposals, weaving a common characteristic specific to what we call heritage.

¹. EUDES, Emeline, MAIRE, Véronique, 2018, La fabrique à écosystèmes, Paris, éditions LOCO.

². [Filière bois, carnet d'expérience, chaire IDIS, 2020.](#)



RESTORE (smaRt accESs TO digital heRitage and mEmory): CIDOC- CRM Data Mapping and Modeling for Data Integration in Social Sciences and Humanities

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Résumé

Cet article présente le projet RESTORE (smaRt accESs TO digital heRitage and mEmory) et donne un aperçu de son élaboration en tant qu'ensemble de méthodes de travail pour la gestion de données hétérogènes. Le principal objectif de ce projet est la récupération, l'intégration et l'accès aux données et aux objets numériques produits par les partenaires des institutions Galeries, Bibliothèques, Archives et Musées (GLAM) afin de développer une base de connaissances alimentée par des informations sur l'histoire des villes au XIV^{ème} siècle, et en se basant sur l'exemple de la ville de Prato (Italie).

Mots-clés: principes FAIR, sciences sociales et humaines, GLAM, représentation sémantique des données, CIDOC-CRM

Keywords: FAIR data, social sciences and humanities, GLAMs, semantic representation of data, CIDOC-CRM



The RESTORE (smaRt accESs TO digital heRitage and mEmory)¹ data pilot started in June 2020 with a duration of two years, and the project consortium, co-financed by the Regione Toscana, is coordinated by the Istituto Opera del Vocabolario Italiano - CNR (National Research Council of Italy) based in Florence. The Galleries, Libraries, Archives and Museums (GLAM) partners, which are the project's data providers, are: the State Archives and the Museum of Palazzo Pretorio in Prato, the Archival and Bibliographic Superintendency of Tuscany, and the software company SPACE SpA. With regards to the original data, the process involved two archival fonds `Datini'² and `Ospedale Misericordia e Dolce'³ (one hundred fifty thousand letters, almost six hundred registries, and seven thousand archival folds); a selection of works of art from the Museo di Palazzo Pretorio (forty-nine distinct artworks); texts and lemmatised elements from the textual corpus, including also letters of the `carteggio Datini' (three thousand twelve letters)⁴.

The RESTORE platform follows a Findability, Accessibility, Interoperability and Reuse (FAIR)⁵ approach and is based on a modular architecture: the research team developed custom components and tools of already existing integrated solutions to support each different domain's standards, such as Text Encoding Initiative (TEI)⁶ for texts; Europeana Data Model (EDM), Metadati Amministrativi e Gestionali - Management Metadata (MAG), Metadata Object Description Schema (MODS) and Metadata Encoding and Transmission Standard (METS) for librarian contents; Encoded Archival Description (EAD) and Encoded Archival Context - Corporate bodies, Persons and Families (EAC- CPF) for archives; Central Institute for Cataloguing and Documentation standard of the Italian Ministry for Cultural Heritage (ICCD) for museum collections; heritage science's analyses formats, the European Synchrotron Radiation Facility data format (EDF) and Hierarchical Data Format (HDF5)⁶.



The complete workflow goes from data ingestion and storage in the datastore Comprehensive Knowledge Archive Network (CKAN) to data mapping and uploading the chosen ontology in the triple store Virtuoso populated with the information coming from the Social Sciences and Humanities (SSH) and heritage science contexts. The digital resources provided by the archive and museum ingested, encoded with different standards such as the EAD, EAC-CPF, TEI, and ICCD, have been mapped and modelled on the International Council for Documentation - Conceptual Reference Model (CIDOC-CRM)⁷, the ontology chosen as the 'common language' for semantic data integration for the RESTORE project. Three main entities of common interest have been found and noted as points of contact between the information represented by the different original datasets:

- Person name → anthroponyms
- Place name → toponyms
- Time frame → dates or time periods

The workflow is based on the conversion of the originally provided data, in its own format, into semantic triples⁸ through the use of a custom parser made *ad hoc* in the Python language. The 'triple' is a transformation of the single phrase in a logical construct consisting of three properties (entities): a subject, an object, and a predicate; these three parts of the expression are associated with unique character sequences that identify the semantically modelled resources, named Universal Resource Identifier (URI). **Figure 1** gives a synthetic overview of the workflow (October 2021).



Activity	Tool
Data Ingestion from GLAMs partner	CKAN Comprehensive Knowledge Archive Network
Data conversion, XML a CSV	Python Algorithm (<i>custom</i>)
Data mapping and modeling through entities and properties	CIDOC-CRM
Data transformation, CSV a RDF	Python Algorithm (<i>custom</i>) + 3M (Mapping Memory Manager)
Import of RDF triples	VIRTUOSO Endpoint SPARQL (+ <i>custom script</i>)
Documenting of data conversion	Gogs + JupyterLab
Final visualization and data browsing	VIRTUOSO Facets + LodLive View + EVT

Figure 1. Workflow description: activities and related tools

A complete and detailed description of the RESTORE project is given in the document MS49 Heritage Science and Humanities Pilot alpha release.⁹ The RESTORE team developed custom solutions and a software platform that integrates digital humanities and heritage science datasets, from data ingestion to data publication and browsing. Taking as RESTORE's lead figure the merchant Francesco di Marco Datini (1335 – 1410), his family and his entourage, through data integration and a user-friendly visualisation strategy also based on the collection of data as 'Stories', it



was possible to build a knowledge base populated with information about the history of the city of Prato, of its institutions, its economic and entrepreneurial system. As for the sustainability of the project's results, the collaboration with key players in the European Union Research and Innovation field, such as DARIAH-ERIC (European Strategy Forum on Research Infrastructures (ESFRI) Landmark for the Humanities and Social Sciences) and the European Research Infrastructure for Heritage Science (E-RIHS - ESFRI project for the Heritage Science), as well as other actors within the European Open Science Cloud (EOSC) Framework, such as the Social Sciences and Humanities Open Cloud (SSHOC) Horizon 2020 project, represents the most relevant landscape for further extensions.

¹ Project website: <http://restore.ovi.cnr.it>

² Archive of administrative entries and letters of the merchant Francesco di Marco Datini (1335-1410): <http://archiviodistato.prato.it>, <http://da-tini.archiviodistato.prato.it/il-progetto/>

³ Digital resources related to the fond: <http://www.archiviodistato.prato.it/accedi-e-consulta/aspoSt005/tree>

⁴ Lemmatised corpus of the letters of Francesco Datini (1335-1410): [http://aspweb.ovi.cnr.it/\(S\(qmmiy5m0sybb4lao4qqmexyo\)\)/CatForm01.aspx](http://aspweb.ovi.cnr.it/(S(qmmiy5m0sybb4lao4qqmexyo))/CatForm01.aspx)

⁵ Findability, Accessibility, Interoperability e Reuse - FAIR: <https://www.go-fair.org/fair-principles/>

⁶ Text Encoding Initiative - TEI: <https://tei-c.org/>

⁷ CIDOC - Conceptual Reference Model: <http://www.cidoc-crm.org/>

⁸ <https://www.w3.org/TR/rdf11-primer/#section-triple>

⁹ DEGL'INNOCENTI, Emiliano, DI MEO, Carmen, CORADESCHI, Francesco, SANESI, Maurizio, BRUNONI, Elisa, KRITSOTAKI, Athina, TSOULOUHA, Eleni, (MS49 Heritage Science and Humanities Pilot alpha release, 2021. <https://doi.org/10.5281/zenodo.5217113>



Cultural Heritage Revitalization in European Urban Fringes. Stakes and Opportunities

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Résumé

Cet article présente les résultats d'une recherche menée dans le cadre de sept universités partenaires Una Europa et situées à Bologne, Édimbourg, Helsinki, Cracovie, Louvain, Madrid et Paris. Ce projet de recherche s'intéresse au rôle du patrimoine culturel dans le processus de métropolisation, notamment en périphéries des villes européennes.

Mots-clés: patrimoine culturel, périurbain, tourisme

Keywords: cultural heritage, urban peripheries, tourism



The paper presents the results of a research carried out in the framework of seven Una Europa Universities in seven European metropolitan areas (Bologna, Edinburgh, Helsinki, Krakow, Leuven, Madrid, and Paris). Therefore, the used methodology was broadly comparative.

The research asks to bring answers to the following questions:

- What are the trajectories of heritagisation for heritage located at the urban peripheries, both bottom-up (recognition by the local populations) and top-down (institutional recognition and labellisation) and to what extent are they successful?
- How do the heritagisation processes depend on the typology of heritage (former industrial sites; transport infrastructures; 'dark' memories sites), and are they embedded in structural projects for the protection/re-production of tangible heritage?
- Beyond these heritage typologies, is 'peripherality' a common characteristic impacting heritage trajectories?
- How does heritagisation interfere in terms of local attractiveness, in particular in the field of tourism?

The Meaning of Urban Fringes

Usually considered as the 'city's backyards', urban fringes are crucial for contemporary metropolisation. They attract new interests from national, regional and local governments, private investors and local communities. They are the theatre of diverse social processes and reconfigurations. These processes involve formal, functional and symbolic changes that include the formulation of new uses of public space and the creation of new landmarks, references or heritage symbols, and they offer the potential for renewed and more inclusive understanding of (often contested and dissonant) cultural heritage.



Undervalued in recent years, the heterogeneous vestiges and heritages of the urban fringes are beginning to be recognised by both institutional authorities and the people who occupy them as assets on which one can build a new and more inclusive scenario for local development. De- and post-industrialised areas are redeveloped, and former factory buildings are converted into cultural and leisure spaces, attracting new visitors to formerly stigmatised areas. An 'off the beaten tracks'¹ tourism is developed in these areas attracting visitors to 'adventurous' spaces, offering new experiences (i.e., URBEX)² under the guidance of local communities and using digital technologies for discovering, recording and sharing adventures. The 'backyards' may evolve into new places with their own centrality.



Figure 1. 'Urban Renovation yes! But no without the inhabitants!'. Residents' mobilisation in front of the Maladrerie Social Housing at Aubervilliers, Northern Suburbs of Paris. Though labelled 'remarkable heritage', the social housing estate, outstanding work of the architect Renée Gailhoustet, is threatened by a renovation project. © M. Gravari-Barbas, January 2022



Heritagisation and Metropolisation

Multiple reasons cause not capturing any economic or cultural benefit due to a 'negative spiral' from which these fringes and/or urban areas are historically suffering (de-industrialisation, desertification, marginalisation, etc.). This spatial imbalance fuels a territorial injustice. Targeted and specific tools and instruments are needed to use cultural heritage as a resource not just in the centres of cities, where we expect to find it, but in their peripheries, where its appearance is more unexpected.

The development of particularly strong metropolitan nodes at an international (Paris), national (Edinburgh, Bologna) or regional (Leuven) scale tends to modify urban networks inherited from the 20th century. Urban areas are globally rescaling³ as they try to reposition themselves in globally shifting urban and metropolitan hierarchies. The entanglement of heritage, development, tourism and local stakeholders is particularly important since, politically speaking, they have also become important in the current COVID context, in which local authorities aim at developing alternative cultural offers. The (re)discovery of fringe areas becomes crucial in that respect.



Figure 2. The changing face of the Vaartkom in Leuven © D. Vanneste, December 2021



The project is still ongoing, but from the intermediate results, we can confirm a double hypothesis. First, cultural heritage at the edge of European metropolises represents new oxygen for current metropolisation processes. It contributes to the metropolis narrative and offers local narratives, contributing to the building of local identities. Second, cultural heritage at the urban peripheries is currently particularly strong and important due to the transition of European urban space and as an attractive resource for external stakeholders such as tourists⁴ and local (re)development⁵. For the dissemination of results, we opted for the publication of a manifesto on cultural heritage of urban fringes aimed to be submitted to local stakeholders.

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3. BRENNER, Neil, 'The limits to scale? Methodological reflections on scalar structuration', Progress in Human Geography, vol.25, Issue 4, 2001, p591-614.

4. GRAVARI-BARBAS, Maria, JACQUOT, Sébastien, COMINELLI, Francesca, 'New cultures of urban tourism', editorial International Journal for Tourism Cities, vol.5, Issue 3, 2019, p301-306.

5. CHCFE Consortium, Cultural Heritage counts for Europe. Full Report. Krakow, International Cultural Center & supported by Bertelsmann, 2015.



Understanding UK Waterways Heritage in a Changing Context

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Résumé

Une large compréhension du contexte culturel apporte des nuances importantes à la connaissance du patrimoine des canaux et des voies navigables en Angleterre et au Pays de Galles, et fait partie de la communication de la valeur et de la finalité de ce patrimoine. La compréhension du patrimoine des voies navigables britanniques est un projet en constante évolution, l'histoire de la Grande-Bretagne étant plus largement réinterprétée et reconsidérée à la lumière des débats politiques et des contingences sociales contemporaines. Les questions "pour qui les canaux existent-ils aujourd'hui et que signifient-ils ?" reçoivent des réponses très différentes selon la personne qui y répond et le moment où elle le fait.

Mots-clés: canaux, cours d'eau, industriel, volontaires, diversité

Keywords: canals, waterways, industrial, volunteers, diversity



Following their industrial heyday in the late eighteenth and nineteenth centuries, Britain's industrial canals fell into decline. Proposals to regenerate the canals for leisure use emerged in the mid-twentieth century. Nowadays, regeneration prompts two questions: 'for whom do the canals exist, and what do they mean?'. Typically, these questions receive very different answers depending on which group answers (towpath users, museum visitors, live-aboard boaters, leisure cruisers, urban residents of canalside properties, businesses, heritage professionals, academics, young people, volunteers, etc. This matter interests several communities. The canals do not have a single and static meaning: like the water they contain, it flows and changes. 'Liquid History' is the canals collecting around themselves 'a multitude of buildings, objects, people, memories and ideas'¹.

One example of this flow of meaning relates to the experiences of those who lived and worked on the waterways. Their stories have been largely reported by Victorian philanthropists, the workers themselves or their descendants, historians, and museums. George Smith of Coalville's campaigns in the 1870s to regulate canal-boat life cast the 'floating population' as savage nomadic tribes². Today their lives and labour are celebrated in oral and family tales³. As work attitudes, religion and class are changing, so does the meaning of canal labour and the way we value it in extant industrial heritage sites.



Figure 1. Lapworth family, 1889. Image supplied by National Waterways Archive, Canal & River Trust

Despite the canals' industrial beginnings, in 1948, *The Times* newspaper noted that they 'speak at once of leisure and the past'⁴. Around this time, the Inland Waterways Association, a lobbying group, was asserting the idea of the canals as integral to the countryside. Ideas about both 'the countryside' and 'the past' continue to be at the centre of debates about access, ownership, community and identity in the United Kingdom today. British history is disputed on multiple aspects, and waterways heritage is one of these. This was starkly demonstrated in the wake of the Black Lives Matter protests in 2020. A number of prominent statues were defaced, toppled, or hurriedly removed, including a statue of Robert Milligan, a Scottish slave-factor in Jamaica whose wealth built the West India Docks in London from Canal & River Trust land. Canals transported goods produced by enslaved people, including indigo, tobacco, rice, cotton, and sugar. There are lots of individual examples of the profits of slavery being invested in canals⁵. Drawing attention to these aspects of the waterways is not always welcome as people love their canal spaces and resent a focus on uncomfortable histories since these narratives are seen by some as implicated in 'culture wars'. Nevertheless, the unexamined canal histories of commodities and investment gain new impetus as Britain revisits its role in Transatlantic slavery.



The value of waterways heritage is currently articulated by the Canal & River Trust in terms of wellbeing, a discourse that provides a new vocabulary for, and way of thinking about, the preservation of the industrial past for the benefit of the future. Life is 'better by water', says the Trust, and the canal space can be somewhere to 'get away from the noise, pressure and pollution of everyday life'⁶. The industrial canal was designed to connect inland Britain to the wider world and its market. The space was once full of the noise, work and pollution that we now use to escape. Today, the canal connects the past, present and future. We argue that openness to more cultural debates and discourses keeps the heritage of the waterways alive.

¹ BABBS, Helen, *Adrift*, London: Icon, 2016

² MATTHEWS, Jodie, 'Thousands of these Floating Hovels: Picturing Bargees in Image and Text', *Nineteenth-Century Contexts*, Vol. 35 (2), 2013

³ Canal & River Trust, 'Researching your Waterway Family History', <https://canalrivertrust.org.uk/news-and-views/features/research-your-waterways-family-history>; The Oxford Canal Heritage Project, 'Oral Histories', <http://www.oxfordcanalheritage.org/oral-histories?page=1>

⁴ 'Holidays Afloat', *The Times*, 4 March 1948, cited in GEHRKE, Jules, 'Countryside, Recreation, and the Transformation of Canals in Britain in the Mid-Twentieth Century', *Journal of Tourism History*, Vol. 11 (2), 2019

⁵ Canal & River Trust, 'Canals and Transatlantic Slavery', <https://canalrivertrust.org.uk/enjoy-the-waterways/canal-history/canals-and-transatlantic-slavery>.

⁶ Canal & River Trust, 'Wellbeing by Water', <https://canalrivertrust.org.uk/enjoy-the-waterways>



Le patrimoine face aux changements climatiques et environnementaux



Knowing and Understanding the Effects of Climate Change to Adapt Prevention and Protection Measures for Museums: an Absolute Emergency!

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Résumé

En matière de gestion des collections, les risques liés au changement climatique ne sont pas nouveaux pour les responsables des musées : la moisissure et les inondations sont, entre autres, des concepts qui leur sont familiers. Pourtant, il est difficile de dater, évaluer et mesurer leur impact, leur fréquence et d'identifier les moyens de protection existant pour faire face à ces événements extrêmes. Il est par conséquent important de poursuivre les efforts de sensibilisation. Il est également primordial de proposer des outils et de coordonner des actions au niveau territorial afin que la conservation préventive se réinvente et puisse répondre aux mieux à ces nouveaux enjeux.

Mots-clés: sensibilisation, adaptation, protection, changement climatique, outils

Keywords: awareness, adaptation, protection, climate change, tools



Adapting to climate change implies considering risks in the day-to-day management of collections and in the protection systems of cultural organisations. This is the only way to implement efficient and coherent actions. Public policies have been working for several years to raise awareness among professionals in order to build a solid 'risk culture'. The National Climate Change Adaptation Plan (PNACC) emanating from the 2017 Climate Plan, reinforces this commitment to action: 'The Ministry of Culture, museum curators and public establishments for cultural cooperation will endeavour to integrate the impacts of climate change into heritage and cultural management plans and cultural heritage preservation actions, and will ensure that the plans for safeguarding cultural assets are adapted to foreseeable medium and long-term climate hazards (Action P&R-7)'.¹ However, faced with these challenges, museums are struggling to measure the impact of these changes in order to adapt their management tools and protection systems. To help them in this evolution, it is essential to continue efforts to raise awareness, develop information and target the actions to be taken (for both minor and major risks).

The climatological map of the heritage established by the University of East Anglia in Norwich (United Kingdom) indicates that a large part of France will be subject to a 'hot, very humid climate' that can favour mold development.² The example of the summer of 2021, described by Météo France as 'one of the wettest summers in the period 1959-2021', confirms this trend.³ Many reports of fungal growth on collections have been recorded. For the first time, the Centre for Research and Restoration of Museums of France (C2RMF) has sent an alert note to museums to reinforce the monitoring of collections and environmental parameters. In this sense, the C2RMF's Preventive Conservation Department is working on distributing a special file on the management of mould that will soon be available for download on its website.



Moreover, among the major risks correlated with climate change, one risk stands out from the others, namely flooding (the leading risk in metropolitan France in terms of damage and the leading risk on a global scale).⁴ The obligation to draw up a flood risk protection plan through the Intergovernmental Panel on Climate Change (IPCC) for Parisian public establishments appears to be an effective response in terms of knowledge of the hazard and the implementation of structural or organisational protection measures. For the establishments that have drafted them, the results are highly positive in taking into account the risk and improving protection. Museums must continue to mobilise nationally on the need to address this risk in the most vulnerable areas and increase resilience levels.

Also, the latest IPCC report indicates that precipitation may be higher over a short period. Museums may be subject to significant water infiltration that could affect the collections and the indoor climate. Therefore, it is essential to think about the adaptation of the building to ensure the best possible protection. On 13 October 2002, the C2RMF is thus organising a conference dedicated to flood risk that aims to present tools to help diagnose vulnerability and examples of organisational and structural measures that can be implemented according to the specificities of the institutions. The question of the insurance system will also be addressed.



Figure 1. Flooding by storm at the Unterlinden Museum in Colmar, works evacuation © Thierry Gachon – 2011

The risks linked to climate change create new challenges for which it is important to set achievable and financially compatible objectives, provide concrete solutions and propose adapted tools while raising heritage experts' awareness within a relatively short timeframe. In addition to taking into account the specific risks of climate change, the approach to preventive conservation must also be reinvented in a territorial and more holistic approach.

¹ French Ministry of Ecology. National Climate Change Adaptation Plan (PNAAC 2) In French. Accessed January 31, 2022. p9.

https://www.ecologie.gouv.fr/sites/default/files/2018.12.20_PNACC2.pdf

² BRIMBLECOMBE, Peter, Heritage climatology, Edipuglia, Bari, 2006, p49-63

³ Météo France, Bilan climatique de l'année 2021 sur la France métropolitaine. In French. Accessed January 31, 2022. p2.

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⁴ Ministère de la transition écologique, "Prévention des inondations". In French. Accessed January 31, 2022. <https://www.ecologie.gouv.fr/prevention-des-inondations>



Climate Change and Cultural Heritage: Atlantic Challenges and Experiences

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Résumé

Issu du projet interdisciplinaire ALERT, qui pendant quatorze ans a étudié la vulnérabilité du patrimoine culturel côtier, le projet ALOA vise à anticiper les effets destructeurs des changements globaux et de la pression anthropique sur le patrimoine côtier et maritime des Antilles françaises, et ce à travers une action participative et publique. Son objectif principal est de surveiller ces phénomènes et de contribuer à l'élaboration de protocoles appropriés pour atténuer la perte irréversible de ce patrimoine.

Mots clés : changement climatique, patrimoine côtier, Antilles françaises, science publique

Keywords: climate change, coastal heritage, French West Indies, public science



In the Lesser Antilles, the coastline has always been occupied by human settlements. It is the place where prehistoric Amerindian societies exploited the 'nourishing sea' and where the Europeans developed military and port activities, urban housing and exchanges (including slavery).

However, coastal zones of the Caribbean islands are strongly exposed to the effects of marine erosion due to the rise of the sea level, major calamities, such as storms, hurricanes, earthquakes, and local anthropogenic development. Faced with these effects, archaeological sites are threatened with destruction or even disappearance. That is why it is urgent to implement solutions in order to ensure their safeguarding¹.

While the approach implemented by the ALERT project² in mainland France has enabled the development of effective tools designed for this issue³, the challenge is to adapt the existing mechanisms to the specific contexts of the Lesser Antilles, taking into consideration both environmental and cultural specificities. For this purpose, the ALOA project⁴, which follows the principles of the ALERT project, develops a participatory action research approach involving academic institutions and the community, following a circular process based on:

- 1) The participation of communities in the inventory of sites and the assessment of their vulnerability
- 2) The analysis and mapping of vulnerability, prioritizing actions to carry out, which may be either:
 - Monitoring (surveys, photogrammetry, etc.)
 - More in-depth investigations (soundings, excavations, analyses)
- 3) Finally, communication of the results to managers and the community in order to raise awareness and collect documentation. (**Figure1**)

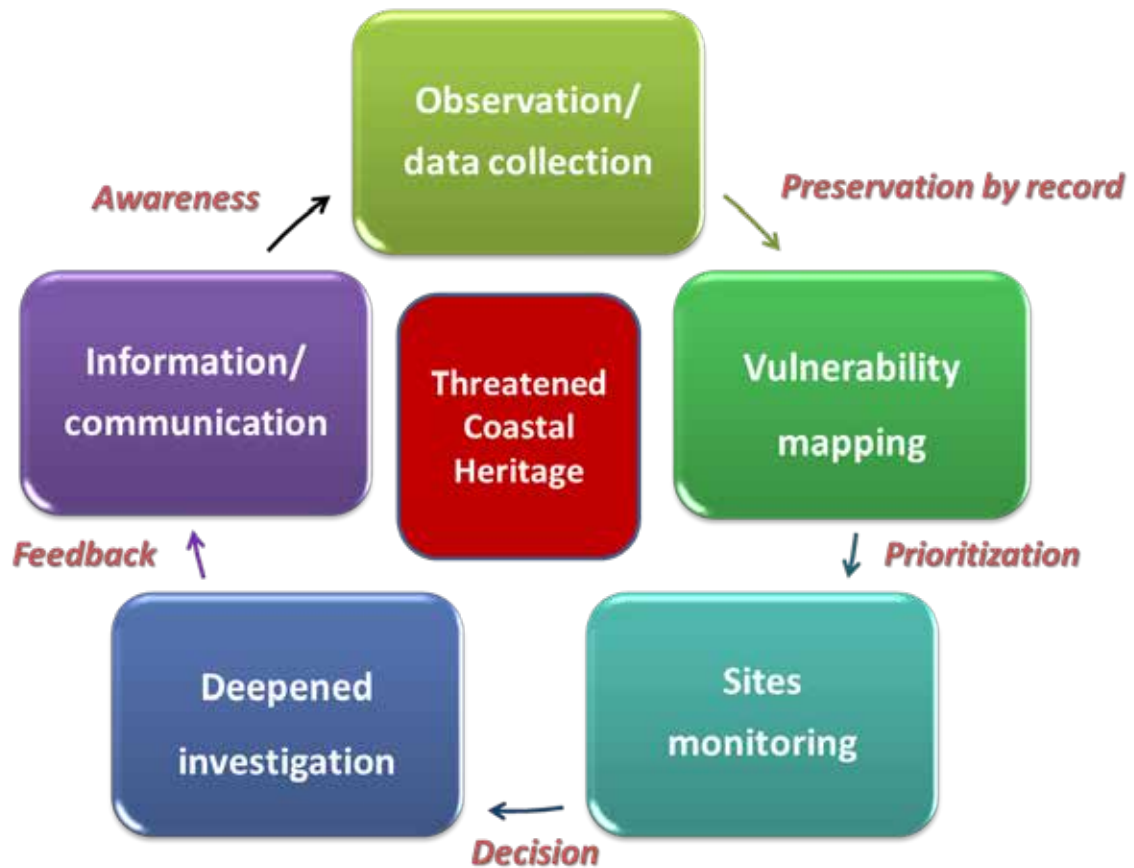


Figure 1. Conceptual and methodological scheme of the ALeRT and ALOA projects.

A public application reporting venerable remains has been developed in the form of an interactive database⁵ to support this approach. In the meantime, the project has also set up a digital photo library to display the history of the shoreline and its evolution over the past decades⁶. Finally, the ALOA project offers training to raise awareness about the issue and to involve citizens in the project. In order to carry out concrete actions, the municipality of Le Moule has been chosen as the main partner.

In addition to the enthusiasm shown by a municipal team strongly involved in the preservation of the local heritage, this town covers a very extensive coastline (21 km) representative of a great diversity of geomorphological contexts and has been the site of significant human occupation since the Mesoindian period. This cooperation, which eventually provided an official partnership, has already given rise to:



- Several communication actions (conferences, TV and radio broadcasts, relay via social networks) and training sessions for schoolchildren and students; **(Figure 2)**
- A systemic coastal survey campaign
- Photogrammetric recording on sites threatened with fast disappearance.



Figure 2. Schoolchildren field training in archaeological observation. Le Moule, 2022, © L. Quesnel

The actions that have already been carried out gave the chance to perform a complete survey of the commune's archaeological heritage and to start archiving the most threatened sites through photogrammetry. The investment in communication and training laid the foundations of a solid network of actors - including schoolchildren and local associations- involved in the long-term process of recording sites.

The project's blog⁷ regularly reports the activities carried out in the field. It relays the various communications and publications of the team and provides educational resources that can be freely downloaded by the partners (schools, associations).



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² Archéologie littorale et réchauffement terrestre : <https://alert-archeo.org/>

³ DAIRE, Marie-Yvane, LÓPEZ-ROMERO, Elías, PROUST, J.N., REGNAULT, Hervé, PIAN, Soizig, SHI, Benheng, "Coastal changes and cultural heritage: Assessment of the Vulnerability of the Coastal Heritage in Western France", *Journal of Island and Coastal archaeology*, Vol. 7, 2012, pp.168-182.

⁴ Archéologie Littorale Outre-Atlantique : <https://aloe.blog/>

⁵ Interactive database : <https://aloe-archeo.huma-num.fr/public/accueil>

⁶ Digital photo library: <https://aloe-archeo.huma-num.fr/public/participation/>

⁷ Project's blog: <https://aloe.blog/>



The Foraminifer and Ostracod Collections of the Muséum national d'Histoire naturelle, Paris: A Key but Fragile Scientific Heritage in a Context of Global Warming

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Résumé

Le Muséum national d'Histoire naturelle abrite des collections de foraminifères et d'ostracodes menacés par les polluants intérieurs. Les produits de l'altération sont des sels organiques de calcium, dont la plupart contiennent des acétates dans leur composition. De manière inattendue, les analyses d'échantillons endommagés ont révélé que les formiates de calcium étaient les principaux produits de la dégradation, malgré la présence d'acide acétique dans l'environnement. Ces observations mettent en évidence la nécessité d'une meilleure compréhension de la minéralogie et du comportement des sels organiques de calcium dans des conditions de température et d'humidité variables.

Mots-clés: Byne, fossiles, efflorescence, sels organiques

Keywords: Byne, fossils, efflorescence, organic salts



Particularly abundant in aquatic and mostly marine ecosystems, foraminifers and ostracods provide valuable information on the environmental parameters conducive to their growth, such as water temperature or salinity. These micro-organisms, whether fossil or current, are considered effective biomarkers. Fossil specimens are widely used for the reconstruction of paleoenvironments. Current specimens, collected several decades ago, can also be compared with newly collected material to measure the environmental impact of anthropogenic pressure and climate change (temperature rise, decrease in salinity due to ice melting, pollution, etc.).

Different Types of Collections

The Muséum national d'Histoire naturelle (MNHN), Paris, houses large collections of foraminifers and ostracods. The most prestigious of them are included in the d'Orbigny's collection acquired in 1858. Alcide Dessalines d'Orbigny was a pioneer in the field of palaeontology and biostratigraphy. Native of La Rochelle, he dedicated his life to the study of foraminifers, of which he published the first classification in 1826. A chair of Palaeontology was specifically created for him in 1853 at the MNHN but he died shortly after, in 1857. His succession at the MNHN was chaotic, and his foraminifer collection was somehow neglected. After the 1870s war, two enthusiast geologists, Olry Terquem (1797-1887) and Charles Schlumberger (1825-1905), led research in micropalaeontology at the MNHN. They sorted, filed and remounted the d'Orbigny collection. Some of their personal material also joined the MNHN collection. After World War II, the development of oceanography and stratigraphy led to new interests in foraminiferal studies, which also contributed to the increase of collections.

Different Types of Damage

Many of these collections suffer from Byne decay (**Figure 1**), a phenomenon that takes its name from Loftus St. George Byne, who first described this alteration observed on shell specimens stored in oak cabinets¹. This alteration is related to indoor pollutants. Indeed, the tests, made of calcareous materials, are sensitive to Volatile Organic Compounds (VOCs) emitted by storage materials² such as paper, wood, adhesives, paints, rubbers, etc. The interaction of acidic VOCs with the calcareous matrix leads to the formation of calcium salt efflorescence. As alteration products generally include some acetate in their formula, acetic acid is often pointed out as the main cause of degradation.

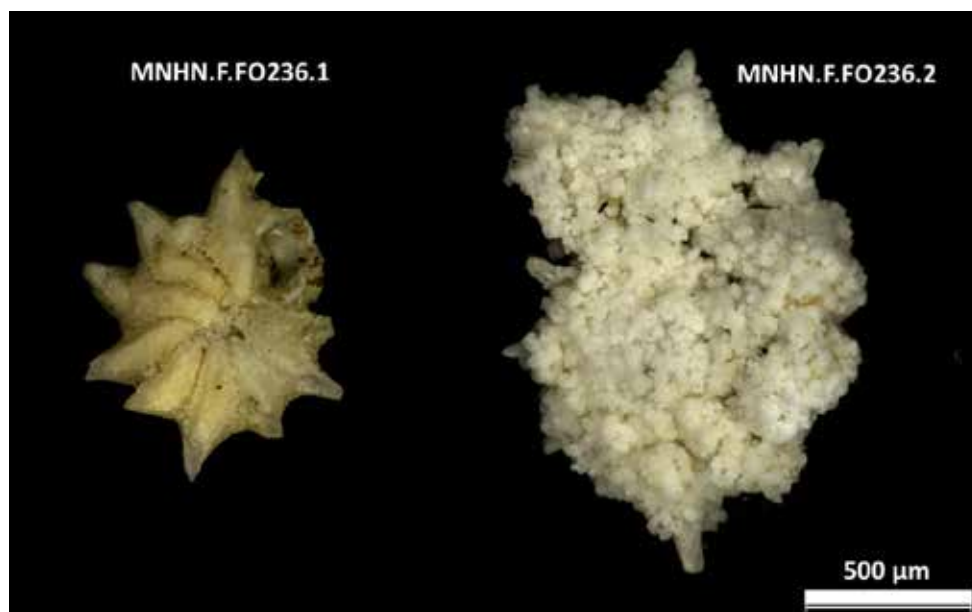


Figure 1. Two specimens of the foraminifer *Calcarina calcar* belonging to the d'Orbigny's collection. On the left, the specimen is in a fair condition. On the right, the specimen is severely damaged by calcium formate crystalline growth ©MNHN

Damaged specimens from different micropaleontological collections were selected for analyses by Raman microspectroscopy (InVia, Renishaw, 732 nm laser, x50 objective, ten acquisitions for one second). This technique was chosen because it can be performed in situ in a non-destructive way on small crystals of a few microns.



Surprisingly, calcium acetate hemihydrate $[\text{Ca}(\text{CH}_3\text{CO}_2)_2 \cdot 0.5\text{H}_2\text{O}]$ and monohydrate $[\text{Ca}(\text{CH}_3\text{CO}_2)_2 \cdot \text{H}_2\text{O}]$ were not detected. Calcium formate acetate monohydrate $[\text{Ca}(\text{CH}_3\text{CO}_2)(\text{HCO}_2) \cdot \text{H}_2\text{O}]$ was detected, but in minor amounts, the main degradation phase corresponding to the tetragonal form of calcium formate $[\beta\text{-Ca}(\text{HCO}_2)_2]$.

This point is the trickiest of all, as this phase is notoriously unstable in environmental conditions³. This polymorph of calcium formate was also exclusively found in a collection dating from the 1970s and stored in a laboratory where fossils were periodically extracted by the use of concentrated acetic acid. Despite the use of fume hoods, one could easily and periodically smell the odour of acetic acid in this environment. Yet the collections seem in fair condition. Only a few ostracods were altered, and the damage concerned the formation of calcium formate exclusively.

These observations illustrate the variety of degradation by-products occurring during Byne decay and question their formation mechanism. Moreover, many of these salts are scarce and do not exist in nature. Their occurrence is due to anthropogenic activity, and their physicochemical properties remain to be explored. Indeed, the behaviour of these salts in varying temperature and humidity conditions is a crucial parameter of degradation mechanisms. It is tempting to make storage room temperature and humidity conditions more flexible to save energy and money. Yet, variations of these parameters may have some consequences on degradation mechanisms involving salt formation. Anticipating this impact needs a better knowledge of the hygroscopic properties of these salts and a better understanding of alteration mechanisms underlying these crystal growths.



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¹ BYNE, Lotfus. St George., *Journal of Conchology*, 1899, pp. 253–54.

²GRZYWACZ, Cecily. M., *Monitoring for gaseous pollutants in museum environments*, Getty Conservation Institute, 2006, p.176

³ COMEL, Claude, MENTZEN, Bernard F, ‘Comparative study of the polymorphic species of strontium and calcium formates. I. Differential thermal analysis (DTA)’, *Journal of Solid State Chemistry*, Vol. 9 (3), 1974, pp. 210-213, [https://doi.org/10.1016/0022-4596\(74\)90076-0](https://doi.org/10.1016/0022-4596(74)90076-0)

POSITION PAPER



POSITION PAPER

The symposium highlighted, at the European level, the dynamism of heritage science in its interdisciplinary and intersectoral dimensions. Interdisciplinarity embraces humanities, social, experimental, and digital sciences. Intersectorality is a result of co-creation processes between academics, professionals, entrepreneurs, users and communities.

It demonstrated that Heritage Science strongly contributes to positioning cultural heritage at the core of major contemporary challenges, whether societal, environmental or economic, through a multi-perspective approach to cultural heritage, both at conceptual and operational levels. In a holistic approach to the field, smells, food, graffiti, and the memory of human work, together with monuments, sites, archaeological objects, artworks, can become heritage today, be it tangible, intangible, natural or digital, in order to preserve and study what may disappear over time.

Viewpoints on policies, the diversity of the EU context, and the global conditions of the twin green & digital transition were addressed in plenary sessions. At the same time, exciting case studies were further discussed in various roundtables.

Regarding the green transition, the combination of climate change and cultural heritage issues enables us to approach not only the essential aspects of conservation and restoration from other angles (green conservation), but also to think afresh about the challenges of a reasonable use of digital devices for both research and heritage management. Digital frugality in heritage science is still an area to be explored. Putting heritage at the heart of the green transition should be a priority for decision-makers. While its vulnerability to climate change makes it part of the problem, its long-term resistance to environmental stress and its conservation can be considered part of the solution.

Regarding the digital transition, it has been confirmed in the most striking way that research on digital tools strongly contributes to the conservation and restoration of cultural heritage by enabling the production, sharing and storage of various and heterogeneous data, to its accessibility through virtual visits or serious games, as well as to its democratisation by facilitating citizen participation at all stages of the heritage process.

By supporting heritage science, the European Union promotes a European grammar of cultural heritage, liberated from restrictive and exclusive identities. This approach unveils new opportunities while reinforcing the need for a common European approach to research perspectives on cultural and environmental heritage.

Based on the research projects and innovative actions presented during the two days of the symposium, **the principles of this European grammar of heritage** can be identified:

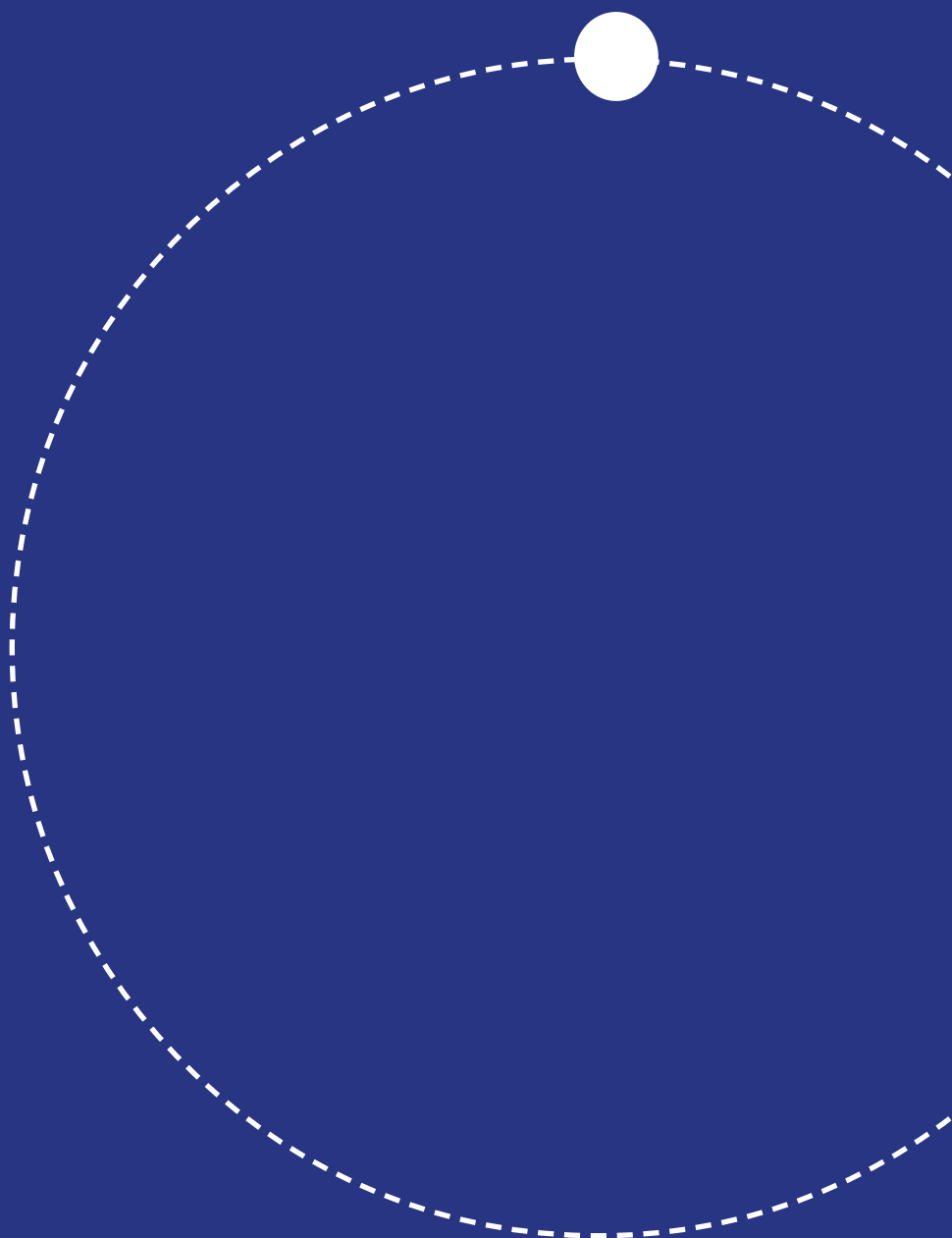
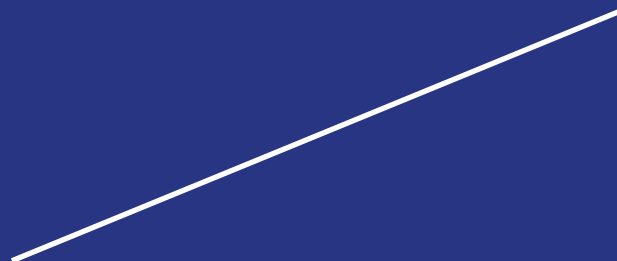
- **The principle of active plurality** is not the accumulation of juxtaposed diversities. A plurality of heritage and plurality of actors are democratic conditions for making heritage without making the economy of dissensus, and epistemological conditions for studying it.
- **The principle of collaboration**, transnational and trans-European, at different scales and across sectors, crossing academic, cultural, and artistic worlds. This collaboration includes the participation not only of European citizens but also of «non-EU residents».
- **The principle of ecology**, understood as an “ecosophy”, articulates the three ecological registers: that of the environment, social relations and human subjectivity. This European grammar of heritage would draw attention to the remains of the past - even the most invisible or less visible ones - and would be centred on the finality of work and human activities and the articulation of heritage with social and cultural memory. Finally, it would emphasise the social appropriations of heritage, its uses and re-uses.

This grammar must be operative. It allows us to combine temporalities (past, present, future) based on the idea that heritage is a constantly renewed and reflexive actualisation of the relationship to the past, a present-day reading of the past for the future. It thus leads to identifying the source of heritage, by making the archaeology of the processes of patrimonialisation (heritage-making) and by considering them from a critical point of view, but also to recall to what extent heritage and memory are exposed to disappearance or instrumentalisation. This grammar implies a variety of modes, underlines the potentialities of heritage, and promotes experiences rather than imperatives. It leads to linking and articulating rather than choosing or establishing a hierarchy. And last but not least, it is based on a principle of adaptability to various configurations and contexts, and a translation principle that goes beyond the creation of common vocabularies.

There is an **indispensable effort of training and education to be made by all actors of Heritage Science**, in an interdisciplinary, intersectoral perspective for the invention of new practices, and new professions adapted to global change. The process is well underway but must be consolidated, developed, and constantly adjusted to respond to contemporary challenges.

In times of war and extreme climatic events over Europe and the world, the participants of the “Heritage for the future, Science for heritage” symposium are convinced that keeping our cultural heritage must be the foundation for our future and that it requires dynamic interdisciplinary research and the participation of all the stakeholders in Europe and beyond.

**REMERCIEMENTS
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