Conservation / Sustainable Design

Heritage Challenges in Historic Urban Landscapes

VIII EAAE CONSERVATION NETWORK WORKSHOP

European Association for Architectural Education
Association Européenne pour l'Enseignement de l'Architecture

EDITORS
Donatella Fiorani
Giovanna Franco
Loughlin Kealy
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EAAE TRANSACTIONS ON
ARCHITECTURAL EDUCATION N. 68

PUBLISHED BY
EAAE, Hasselt, Belgium, 2024.

PRINTED IN
Portugal, Maiadouro

ISBN
978-90-831271-4-9

This book presents the papers written by 43 participants following the 8th Workshop CONSERVATION/ SUSTAINABLE DESIGN organized by the Conservation Network of the European Association for Architectural Education and the UNESCO Chair "Heritage, Cities and Landscapes. Sustainable Management, Conservation, Planning and Design".

The workshop was hosted in the Faculty of Architecture of the University of Porto between 21st and 24th of September 2022 and was attended by 49 participants from 23 Universities, representing 9 countries: Portugal, Italy, Romania, Spain, Ireland, United Kingdom, Brazil, Belgium and Montenegro.

The views and opinions expressed herein are those of the authors and do not necessarily reflect the opinions and beliefs of the editors. Illustrations to the text were provided by the authors. All papers were peer-reviewed.

European Association for Architectural Education
Association Européenne pour l'Enseignement de l'Architecture

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UNESCO CHAIR "HERITAGE, CITIES AND LANDSCAPES. SUSTAINABLE MANAGEMENT, CONSERVATION, PLANNING AND DESIGN"

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ACKNOWLEDGEMENTS

The editors would like to acknowledge the Board of the Faculty of Architecture of the University of Porto (João Pedro Xavier and Teresa Cálix) for hosting and supporting the Workshop "Conservation/Sustainable Design" held in Porto from 21 to 24 September 2022. Also, the Editors would like to thank the Center for Studies in Architecture and Urbanism for the assistance in the secretariat and workshop organization.

Acknowledgements are due to the Municipal Council of Porto (Rui Loza, Margarida Guimarães, Ana Leite Pereira) and to the Municipal Council of Guimarães (Ricardo Rodrigues and Miguel Frazão) for the contributions to the workshop visits and introductory essays in this book.

The Editors are grateful to the Organization Committee Teresa Cunha Ferreira, Rui Fernandes Póvoas, Clara Pimenta do Vale, Joaquim Lopes Teixeira, Nuno Valentim Lopes, Pedro Murilo de Freitas, Tiago Trindade Cruz, David Ordóñez-Castañón and Domingas Vasconcelos. Special aknowledgement is due to Pedro Murilo de Freitas and Tiago Trindade Cruz for their collaboration in the production of this book.

Finally, the Editors would like to express their gratitude to the European Association for Architectural Education for the institutional and financial support of the book "Conservation/Sustainable Design. Heritage Challenges in Historic Urban Landscapes".

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A Future for Historic Cities

From crisis situations towards new opportunities, today and tomorrow

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The science is clear.
Climate change is happening.
The impact is real.
The time to act is now.

Ban Ki-moon (2007)

INTRODUCTION

Cities represent a unique wealth of our countries and are evidence of the intellectual, relational ability of humanity as well as the manual ability that has elevated Western civilization. Cities have always been a place of innovation and evolution toward new, more innovative perspectives, a place to cultivate the shoots of social, material and especially cultural growth (Fioretti et al. 2020). The cultural value, of which they are an expression, is such that cities have become privileged places of interest since their foundation, where material and intellectual exchanges were encouraged and sought. This period also includes moments of unease which, in some historical periods, have introduced dangers to the heart of the city. These hazards were primarily related to social difficulties caused by economic, social, or distant events such as wars or natural events. In these situations, we have witnessed phenomena of involution mostly of the social and material type, which, despite the apparent lack of resources, demonstrated a high degree of resilience on the part of the population, i.e., an ability to cope positively with adversity by co-evolutive cultivating and implementing remaining assets (Rausell-Köster et al. 2022).

The desirable activation of this strategy, aimed at the survival of life in its various expressions, and the intellectual and physical regeneration of humanity, offers new ideas for reflection. These ideas direct the strategies to be implemented for contemporary life, and, above all, the strategies to be sought for future growth.

The new challenge, besides being directed towards improving living conditions, confronts humanity with the necessary and shared search for the strategy mentioned above.

This is a much more complex challenge, related to the level of development achieved by society, particularly Western society. Our society has directly contributed to creating and implementing the causes of the problems within cities, territories, the environment, and the wider space.

The increase in these problems is part of the wider risk that causes climate change which takes on an increasingly extreme, aggressive, and exponential trend in growth (Bonazza et al. 2018).

Within this broad context of thought, in which the awareness of the scale of the problem becomes a cause for upheaval and the abandonment of hopes for future progress, it is essential to seek new energy. These strengths are dictated by a capacity to bring resources back into play and to re-interrogate oneself to find a new direction to take for the future. The actions to be planned need to be globally shared and to be able to offer real protection to the heritage, not only in the immediate future but also for their preservation and future continuity. The people benefiting from our heritage are visitors and tourists (Calzolaio 2017), as well as citizens of the cities, and all of them deserve a guarantee from the institutions that they will be able to enjoy these assets safely and have access to them in any personal physical condition. The debates, which have arisen in the various institutions at the international level, share how there has been a progressive realisation of the risks that the absence, even unintentional, of governance of transformations, can lead in dangerous directions (Pedrini and Rossi 2022: 9), even tending to the loss of the identity of the place (Martelloni 2023). From this concept, moments of confrontation were triggered in which the shared interest of the various disciplines involved (conservation, economics, sociology, environment, management) were able to create innovative discussions, in the awareness that these opportunities for collaboration are the few possibilities available to halt an otherwise unstoppable course (Loulanski 2006: 66).

Therefore, the preservation of heritage, more than at any other time, today passes through the governance of urban development, which encounters numerous challenges (Fanzini, Tartaglia and Riva 2019: 9). The increase in population, the contamination of cultures and the role of the individual, and new demands for use, are aspects that have already been under discussion for some time. Therefore, guidelines have been envisaged, even if not yet consolidated, that favour the conservation of the built environment, the challenge appears to be more complex about the increasingly necessary transformations resulting from the effects of climate change and natural events that override the aforementioned requirements.

The European Parliament's (2023)[1] recent proposal for a law on the reduction of energy consumption in the building sector (if it becomes enforceable) has important consequences for historic centres as they are characterised by well-established construction choices, which have marked the ways of building for centuries and which are now energy inefficient according to the new standards proposed. On the other hand, devastating building interventions in recent decades have placed no limits on energy consumption but have placed high energy consumer

1 Articles 51.a and 51.b.

living volumes on the building market. As things stand at present, we are at a crossroads, the two directions of which will, either way, entail significant economic costs. On the one hand, opportunities can be created for a redesign of fragmented and degraded urban fabrics if the adaptation concerns an urbanisation where building solutions are part of a predominantly speculative process.

In the case of historic centres, on the other hand, which are nerve centres of the social histories of European civilisations, of the succession of styles, building types, construction techniques and ways of life, the issue appears more complex and at the same time worrying, and must necessarily start not only from an understanding of the problems.

In this context, in which the awareness of the scale of the problem becomes a cause for upheaval and the abandonment of hopes for future progress, it is essential to seek new energy. These strengths are dictated by a capacity to bring resources back into play and to re-interrogate oneself to find a new direction to take for the future.

CASE STUDIES: THE CITIES OF PORTO AND GUIMARÃES

Looking at the issues of the cities of Porto and Guimarães, as in many European historic centres, it is evident that the management and conservation of the historic city is the central theme of many questions that need to be answered, even with some speed.

Both cities represent two examples that, with different facets, stimulate parallels and comparisons also with numerous Italian realities (Montanari 2022). Particularly with sites where tourist pressure, construction inadequacy in the face of the violence of natural and unpredictable atmospheric events, the problem of energy saving, but also the desire for real, inclusive, and holistic design for people, represent opportunities for knowledge of the historic built environment. But this can be done with a conscious approach and innovative theoretical and operational foundations.

The two Portuguese cities of Guimarães and Porto constitute two different but very useful cases for proposing a reflection on the relationship between the conservation of the historic centre and the development of the city due to the new environmental problems described above.

— THE CITY OF PORTO

The city of Porto is the capital of the second largest Portuguese metropolitan area. The municipality is distinguished by the many activities related to tourism, facilitated by cheap travel, which is pushing the renovation of the old town. The services are functional for visitors rather than citizens, similar to what happens in Italian tourist areas (Loza 2010: 8-10). This changes both the direction mapped out by the architect Távora[2] and his commitment to support the contribution of the social element, granting it the same role as other stakeholders. The preservation of heritage has been proposed with the cautious physical recovery of buildings to respond to and satisfy the needs of comfort, hygiene, and quality of life of the human community living there. "[Porto has] become an example of a precursor study of the methodologies foreseen in the concept, still contemporary, of an 'Integrated Urban Rehabilitation'" (Aguiar 2010).

The urban redevelopment study of Barredo (Loza 2010: 16; Canto Moniz, Correia and Gonçalves 2014: 6) marked a turning point in the design philosophy of the historic centre of Porto. Previous urban plans promoted extensive demolition of the urban fabric, mixed with a strategy of recovering historic buildings for tourism activities. Távora aimed to preserve not only the buildings but also those who lived in them[3] (Távora 1978: 95-99; Moniz 2017).[4] In other words, the attention paid to the diffuse built environment was similar to that of monumental architecture (FIGG. 1-3).

2 In fact, the Barredo Urban Renewal Study (ERUB) elaborated by a group of officials of the Housing Services Department — Building of Housing Services — represents an important turning point in theories on the fate of cities in the Portuguese context.

3 The work was developed based on previous surveys on the social, economic, and physical dimensions). Globally, the study addressed this sector as a living part of the city and promoted the improvement of its links with surrounding areas, aiming to recover it from the identified ghetto situation. The proposals revealed a strategy based on reducing the density of employment and redeveloping buildings, improving their living conditions through the introduction of toilets and the reorganisation of the interior spaces of dwellings.

4 The principles underpinned in Barredo's Urban Renewal Study consisted of an integrated conservation policy based on the improvement of the social and economic conditions of the populations affected by the business operations; participation in the municipal's urban and housing policies; the evaluation of all buildings or groups of buildings of historical, artistic and archaeological interest, agreeing, in principle, to their preservation and the necessary upgrading of existing conditions; the determination of the housing capacity of buildings, thereby ensuring the housing capacity of buildings, and the only temporary relocation of residents; the definition of the criteria for determining the terms of any transfer deemed necessary when the number of residents exceeds the housing capacity established for the buildings affected; the definition of the factors to be taken into account for the revision of the rental policy; the definition of guidelines for the actions to be taken in cases where the owners do not carry out the planned building work; the definition of non-repayable financing for private interventions; and the determination of expropriation criteria. These nine aspects also underline the need to collaborate, not only with people but also with people when technicians (architects, engineers, geographers, sociologists, etc.) develop urban regeneration plans.

FIG. 1 Barredo, Porto. (Canto Moniz, Correia and Gonçalves 2014).

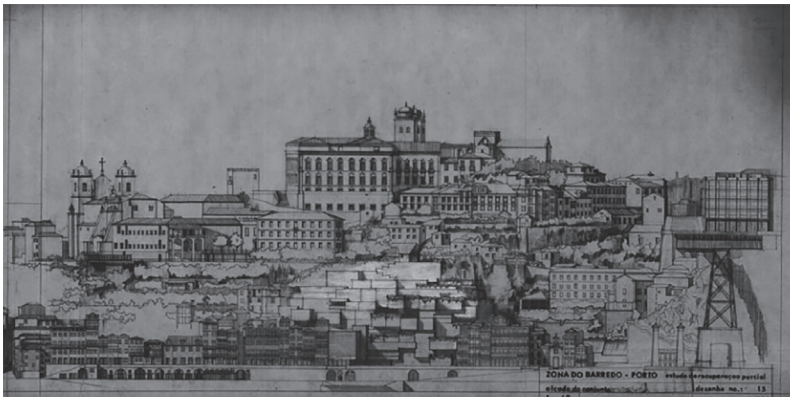

FIG. 2 Área Barredo, initial renovation study, Architectural Composition 3, ESBAP, 1967-1968 (Fernando Távora).

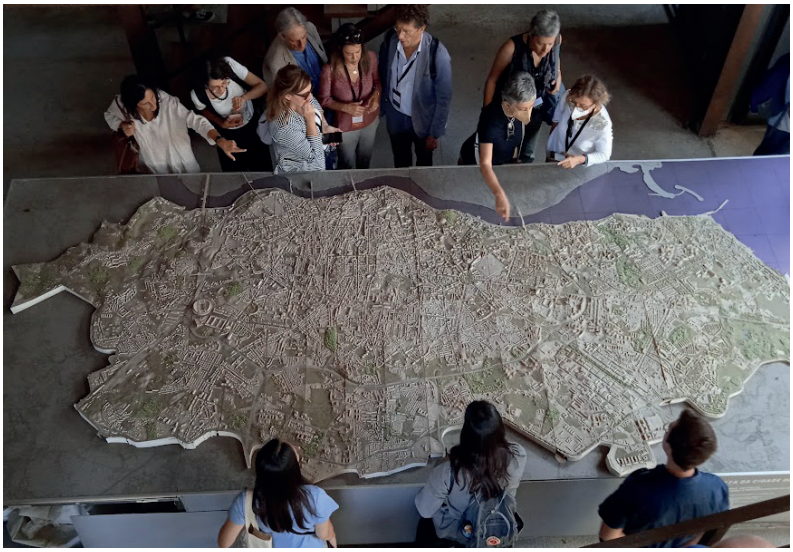

FIG. 3 Interior of the House of 24.

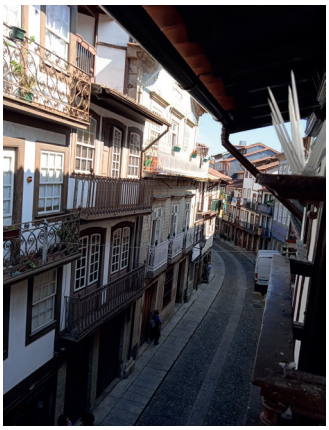

FIG. 4 Building along the internal streets of Guimarães.

FIG. 5 Building along the internal streets of Guimarães.

On the other hand, the city of Guimarães shows a historical centre centred on two key elements: the monastery and fortress distributed over two areas of the upstream and downstream territory (Távora 1982). Around them, there has been continuous development and progressive growth outwards of the circle of walls built in the thirteenth century (UNESCO 2007: 21). In addition to the residence, the functions that saw the most development were those of manufacturing. The latter directed urban and economic growth until they reached their peak in the twentieth century. The strong anthropic pressure, which has been widely debated not only in the local area, has led to the occupation of the historical building for residential use and also by the tanning factories.

The implications of these factors were twofold. On the one hand, there has been a progressive increase in pollution in the Couros stream. On the other hand, the transformation of the historic centre into areas of severe urban, architectural and, consequently, social decay has been observed. This situation was mirrored in many European cities after the Second World War when the search for new jobs led the population to move to urban centres and adapt to any living situation.

It was necessary to wait until the 1980s for the local municipality to show some attention to this part of the city. The projects, aimed at trying to improve the living conditions of the inhabitants and with the desire to safeguard the city centre, took place with the involvement of a particularly perceptive team of operators. The working group gave rise to an articulated planning process (public spaces, public and private buildings, urban management) with the direct involvement of the population as the preferred interlocutor. It is worth noting that in the local debate, the professional team needed to be well-versed in the management of the historical building (FIGG. 4-5).

Moreover, the protagonists of this land reclamation work had continuous contact with the local population so that their needs could be readily understood, and decisions could be shared at all levels.[5] Interventions on private properties were guided and directed with great care by the identified team, creating a kind of mutual "contagion" action among the inhabitants in the recovery of properties.

The declaration of the city as a World Heritage Site (UNESCO 2023) has defined several instances aimed at activating increased control to protect and enhance the historic centre.[6] A buffer area has been identified around the old centre. It was considered a filter between the expansion part and the heart of the city. However, this added value sometimes led to the underlining of the material symbols of architecture that the UNESCO declaration had identified as elements of recognition of the city's value. The consequence is the laying bare of part of the heritage in its deepest aspects to the point of stripping away the building element as a way of guaranteeing historical testimony.

5 Internationally known examples such as the conflicts over the renovation of Le Marais (Paris, France) or the architectural criteria for the transformation of Bologna (Italy).

6 Decree-Law n° 309/2009 of 23 October 2009, Art. 44.

It is widely agreed that the protection of cultural heritage and landscapes is an international priority with important economic, social and cultural impacts (Pajno and Smigel 2022: 11).

For many years, disaster scenarios have been planned for the effects of climate change. Unfortunately, the predictions are being borne out with violent events occurring without any careful preparation. These factors put the "historical city" system in crisis. Irregular precipitation, severe and sudden landslides, high temperatures and water emergencies are the main causes of the urban problem.

New specialized studies have been undertaken to understand the development of the climate system and, more importantly, the effects to find sustainable solutions.[7] At the same time, to prevent risk situations and related degradation processes, strategies have been activated for detailed knowledge of the characteristics of the historical materials and their interactions with the environmental action.[8]

— MOMENTS OF ANALYSIS TO ACQUIRE BETTER KNOWLEDGE ON THE ISSUE OF HERITAGE

The first level of attention strictly concerns problems generated by chemical-physical processes (Sabbioni et al. 2010).

The material cultural heritage consists of marble and limestone, sandstone, brick, metal, wood and glass. The climatic parameters, which most interact with the materials and structures of the built cultural heritage, are numerous.

Temperature-related parameters, for example, include seasonal and annual temperature variations, frost and thaw cycles, and thermal shocks. Other associated parameters are precipitation, seasonal and yearly mean values, consecutive rainy days, and extreme precipitation.[9]

7 See "Culture and Creativity" section, item "Cultural Heritage", subitem "Cultural heritage in EU policies" in the European Commission website. Availabe at: <https://culture.ec.europa.eu/it/cultural-heritage/cultural-heritage-in-eu-policies/sustainability-and-cultural-heritage>.

8 This research theme focuses on the study of the mechanisms of physical, chemical, and biological deterioration in the interaction between the environment and cultural heritage, both inside and outside.

9 Annual precipitation will not change. What will change will be the intensity of rains and drought periods. This will have an impact on heritage both in terms of the frequency of extreme events, such as floods and droughts, and for more subtle changes, such as the alteration of relative humidity values. Floods have a dramatic impact on materials. Beyond structural damage, the worst time is not when an active is submerged in water, but when the water withdraws and dries. There is a risk of too fast evaporation leading to irreversible degradation of wood and porous materials.

Other related parameters include precipitation, seasonal and annual mean values, consecutive rain days, and extreme precipitation. No less important are data related to air pollution such as gas concentration (SO_2, HNO_3 and O_3) and acidity of precipitation.[10]

Based on the available knowledge, the predominant role of water as a factor of direct and indirect degradation of the materials making up the cultural heritage appears. Increasingly frequent extreme events such as heavy rainfall, floods and storms are also responsible for structural damage in historic buildings (Bonazza et al. 2021). At the same time, the chemical dissolution of carbonate stones is primarily due to precipitation and increased atmospheric CO_2 concentration. Structures made of stone material will continue to experience a high level of risk from thermal stress.

Rising temperatures and temperature ranges can negatively affect the preservation of Mediterranean heritage stones. It is a phenomenon known in the jargon as "thermoclastism": marble, composed of calcite crystals, expands unequally as the temperature rises while it decreases as the temperature drops. The difference in volume between day and night produces thermal stresses that can lead to the disintegration of the material.

Decohesion of porous building materials is expected to increase as a result of increased cycles of crystallization/solution of salts. Instead, as temperatures rise, there will be a general reduction in the damage caused by frost and thaw cycles. Another danger to the artistic heritage may finally come from the crystallisation of sea salt, an effect that occurs when the relative humidity fluctuates around 75 per cent. A water cycle with humidity around these percentages causes crystallisation processes that can create efflorescence on surfaces and put the most porous materials under stress. Due to the temperature variations that will occur during the century, the number of water cycles with 75% humidity will increase throughout Central Europe.

In summary, the main critical issues related to chemical-physical factors with direct effects on cultural heritage can be summarised as follows (Sardella et al. 2020):

- increased extreme precipitation and temperature events that, by alternating wet and dry soils, increase the risk of ground subsidence and accelerate the degradation of masonry structures;
- intense and frequent rainfall causing increased erosion of archaeological sites and damaging flooding with direct effects on historical settlements;
- changes in the hydrological and hydrogeological regime endangering buried archaeological heritage and historical settlements;
- changes in vegetation patterns and related proliferation of invasive species that threaten the integrity of archaeological remains and historical landscapes;

10 There are maps of the 30-year averages for the reference period (1961-1990), the near future (2010-2039) and the distant future (2070-2099) and maps of the differences between the averages of the near future and the reference period and between the averages of the distant future and the reference period for assessing and quantifying the entity.

- rising temperatures that make some plantations of historically native tree species difficult to conserve;
- climate change with effects on the proliferation of pests that threaten the integrity of historical heritage and landscapes, particularly in agriculture;
- reduction of snow cover, a retreat of glaciers leading to disruption and degradation of the landscape;
- rising sea levels and increasing storms that pose serious threats to historical landscapes, structures, buildings and archaeological sites in coastal areas.

— STRATEGIES OF GOVERNAMENT TO IMPROVE THE HERITAGE CONSERVATION

A second level of focus is on how culture and material and immaterial heritage can reorient the values based on which we make our environmental, economic and social energy choices. Awareness of the importance of cultural heritage encourages more careful and conscious choices. So culture and the heritage that represents it *is* sustainability. Cultural policies are at the heart of the 2030 Agenda for Sustainable Development. Integral culture, linking social, economic and environmental dimensions, is the means for human capital to build pathways through different and courageous visions new to inventing solutions. This work starts from the Faro Convention, which first sanctioned and emphasised the value of cultural heritage, a resource for sustainable development used wisely for the quality of life in the evolution of society. The IFCD are no less important because it is an instrument in which culture is defined as a process of cultural production. This aspect shows that culture produces effects, goods, services, activities, and art. As a productive sector, it is essential to the quality of a territory's good governance. Similarly, the new European agenda for culture offers financial instruments and economic measures; it identifies culture as the main lever for the promotion of active citizenship and the common values of inclusion of intercultural dialogue — we are in the area of social sustainability. Finally, another decisive step in our achieving awareness of how much culture and sustainability are linked is the World Health Organization, which confirms the primary role of the arts and culture in the prevention and treatment of health.

11 See the "Recovery plan for Europe" section in the European Commission website available at: <https://commission.europa.eu/strategy-and-policy recovery-plan-europe_en>.

These are not the only documents that will direct the approach to the growth of society and consequently of cities in the coming years. The NextGenerationEU[11] is an opportunity to transform our economies and our society, where culture is still a determining factor in strengthening human capital, not with a temporary solution but with solutions and tools that are part of the daily strategy of people and companies. Sustainability has three social, economic and environmental dimensions. Not harming the environment is the primary criterion for ensuring the green transition. This can be done through the strengthening of the competencies of the public and private system concerning processes, services and cultural and creative products with low environmental impact, promoting networking opportunities to initiate interdisciplinary dialogues and collaborations to develop/adopt system solutions aimed at the reuse of resources and the pooling of skills.

The European Union has promoted three main policies in the environmental field. The first is the decarbonisation of the economy, which involves reducing impacts, mitigating greenhouse gas emissions through economic activity and taking into account adaptation or that the climate is changing and the need for business to adapt. The second policy concerns the circular economy, which means reviewing goods and services, taking into account that they can be or come from recycled products, perhaps reusable or recoverable and recyclable. The circular economy is a process of reviewing how we have conceived the economy, taking into account the principle of prevention, namely that goods are more durable, have a longer life cycle, can be maintained and are reusable. The third concerns the use of natural resources while respecting biodiversity, in other words, ensuring that ecosystem services that are the basis of human prosperity are protected. In compliance with these three policies, funding from the European Union considers as a criterion of assessment of the impact and environmental risk, evaluated using the DNSH technique.[12] This means, when submitting project implementation and reporting, demonstrating that your business does not cause significant damage to the environment.

12 Economic activity causes damage: 1. to climate change mitigation, if it leads to significant greenhouse gas (GHG) emissions; 2. to climate change adaptation, if it leads to a greater negative impact of the current and future climate, on the activity itself or on persons, nature, or property; 3. on sustainable use or protection of water and marine resources, if it is harmful to the good state of water bodies (surface, underground or marine) leading to deterioration in quality or reduction of ecological potential; 4. to the circular economy, including the prevention, reuse, and recycling of waste, if it leads to significant inefficiencies in the use of recovered or recycled materials, increases in the direct or indirect use of natural resources, the significant increase in waste, its incineration or disposal, causing significant long-term environmental damage; 5. pollution prevention and reduction; if it leads to increased emissions of pollutants into air, water, or soil; 6. to the protection and restoration of biodiversity and ecosystems, whether it is harmful to the good condition and resilience of ecosystems or to the conservation status of habitats and species, including those of interest to the European Union.

In addressing the assessment of the impact of climate change on monumental complexes and historic buildings, the identification of resolutions of global and regional model outputs remains an open question. Indeed, highly reliable forecasts require a standardised global/regional database and time series of at least 30 years. Recently, research has begun to focus on developing projections of extreme events related to climate change and the risk to cultural heritage (Sardella et al. 2020; Bonazza et al. 2021). The complexity of this research topic lies in the significantly increased uncertainties in modelling future scenarios of extreme events, such as heavy rain, storms, floods, prolonged droughts, and heat waves.

For a complete risk assessment, it is also necessary to assess the vulnerability of exposed assets. Vulnerability can be characterised by parameters covering different aspects (structural, management, socio-economic, environmental) and depends on the combination of three main factors: susceptibility, exposure and resilience, which must be characterised to provide an assessment.

From the state-of-the-art analysis and the remaining gaps in knowledge of the sector, It is urgent to invest resources and efforts in the production of tools and solutions to improve the preparation of cultural heritage in addressing extreme climate change events.

This is also in support of the Action Plan (2015-2030)[13] for the implementation of Priority 4 of the Sendai Framework for Disaster Risk Reduction where among the measures is the development of good practices for the integration of cultural heritage into national disaster risk reduction strategies to be developed by EU Member States. To this end, platforms have been developed for the mapping of both the risk of Interreg Central Europe ProteCHt2save and STRENCH[14] Projects and of protection and emergency preparedness strategies such as emergency evacuation, specifications for the protection of property in the event of flooding and fires due to prolonged dry periods.

13 See the "European Civil Protection and Humanitarian Aid Operations" section in the European Commission website. Available at: <https://civil-protection-humanitarian-aid.ec.europa.eu>.

14 The webGIS platform created as part of the Interreg Central Europe ProteCHt2save and STRENCH projects aims to provide a support tool to public and private authorities and bodies in the safeguarding and management of cultural heritage at risk in Europe from extreme events and climatic conditions, such as heavy rains, floods, and prolonged dry periods. It is based on the concept of risk, which implies the existence of a source of danger and the possibility of harm resulting therefrom. Analysis of the exposure and vulnerability of the sector affected by the danger is therefore necessary. This tool allows one to view and download in an interactive way dangerous maps with a spatial resolution of 12 km, based on data provided by regional climate models and satellite services of the Copernicus program (Climate Change Service, C3S). Involves the use of indices to assess the danger from extreme events related to temperature and precipitation changes, such as R20 mm (number of days in the year with precipitation greater or equal 20 mm) and R5xday (maximum monthly precipitation value in 5 consecutive days). The platform also provides a methodology for vulnerability assessment on a local scale, calculated based on the accurate identification of critical physical and managerial elements of the asset in question. Short-term (2021-2050) and long-term (2071-2100) risk assessments in Europe and the Mediterranean Basin are possible.

For public and private institutions in charge of cultural heritage management, the most effective way to respond to the impact of climate change is to integrate the necessary measures into existing or ongoing management plans. In this sense, a success case is represented by the National Strategy of Adaptation to Climate Change (Pasella and Pierantonelli 2014) produced in Italy by the Ministry of Environment and Land Protection (MATT), which dedicates an entire section to Cultural Heritage. This document outlines the general measures necessary to produce appropriate action plans for the conservation of cultural heritage in response to climate change, including:

- disseminating existing knowledge;
- continuous monitoring;
- routine maintenance;
- the evaluation of priorities about the conservation status of manufactured goods;
- the assessment of the conservation status of the artefacts about the observed environmental conservation conditions;
- assessing priorities in response to climate change;
- data collection to support decision-making at both national and regional levels;
- understanding the environmental, economic and social context of cultural heritage.

From this emerges the historical importance given to the ordinary maintenance of the cultural heritage compared to sporadic restoration work, which will be particularly necessary for anticipation of the impact of climate change as an additional factor of damage to the heritage.

But even for everyday activities, there are daily decisions to be made. For example, investing money to switch from traditional heating to new sources of renewable energy, and such decisions can also occur on a very individual scale. However, these individual choices are the result of both individual awareness and collective action, so bottom-up and top-down approaches must find common ground and a way to cooperate. The issue of the energy efficiency of historic buildings is very important both to contribute to the reduction of the carbon footprint and to increase awareness of the role that cultural heritage can play in guiding public opinion towards wiser decisions. For this reason, it is very important to support research and encourage the exchange of knowledge between traditional systems and new scientific trends.

It is difficult to accept a loss of an asset and to accept its replacement because it is damaged or destroyed. The lesson learned from the natural disasters of the past is that even when all is lost, something survives that is still able to give direction to reconstruction, preserve memory, provide a basis for reconstruction and fuel a resilient policy. The memory of abandoned sites could also be substantial, allowing us to preserve the heritage of images for the future. Traditional practices should change, taking into account this type of transformation, but change is a condition of our existence. We need to think in terms of dynamic identity with a coevolutive perspective: we should not only consider adapting to what is happening, but also the potential of new technologies, and new techniques, designed by learning from the past

for the future without losing the link with traditional knowledge systems. In this way, it becomes possible to build something new that is closely related to our heritage and what we can learn from it. In other words, it is necessary to change our minds if we want to influence processes that contribute negatively to climate change.

It is essential to focus on the real problem, which is that it is impossible to exclude heritage from life and development. We must continue to use heritage, consider it part of our lives and we cannot separate the real world from museums; and then, within museums, we could develop a discourse about the future. We need to develop a real change of attitudes and opinions, because climate change is a matter of awareness, and awareness implies practical actions that are linked to engagement.

Conserving it involves changing the management paradigm. Data is needed to stir consciences and change behaviour, but it is also a matter of empathy, of imagination. At the same time, to change things, it is necessary to involve people in real processes, but I am not sure how much ordinary people have a real knowledge of heritage: sometimes it is just storytelling that passes through the official media, television, etc.[15] People should be involved, even through social media, in real practice, because this is the way to change.

It is also necessary to develop long-term funding strategies to make the protection of cultural heritage sustainable, such as promoting relations with the insurance sector or introducing tax breaks. Cultural heritage is an extremely complex area of research that can only be tackled by joining forces and maximising synergies.

Cultural heritage is a non-renewable resource: access to citizens and visitors must therefore be encouraged, but at the same time it is our responsibility to pass on this heritage, which we have received from the past and which we are creating, to future generations.

ACTIVITIES IN DAILY PRACTICE

As can be observed in the bibliography, a strong and recent problematic situation has emerged in the Guimarães area regarding exposure, sensitivity and vulnerability to flooding. In particular, the historic buildings show a sensitivity to the actions of floods, with impacts differentiated about the construction characteristics, and with a strong risk, especially for masonry and/or wood. To respond to these risks, the Guimarães plan contains guidelines for action to implement the will to recover the collective cultural memory and recognition as the core identity. This happens through the redevelopment of public, private

15 For more information, see this article available in the Hoop Project website: <http://hoopproject.eu/portuguese-city-of-guimaraes-fosters-participatory--strategies-for-environmental-protection/>.

and symbolic spaces, the training of technicians and assistants for the intervention in the cultural heritage and the start of the recovery of the material and intangible heritage throughout the Municipality (Covenant of Mayors for Climate and Energy et. al. 2016)

At the same time, many studies assess changes in the impacts of climate change based on historical documents that help to better understand local identity.

An interesting contribution, mainly related to the effects of heavy or absent rainfall on agriculture, reconstructs the periods of higher or lower rainfall about the processions, prayers and masses held to ask for divine intercession to improve weather conditions from the sixteenth to the twentieth century. The research done by Alberto Vieira Braga in 1943, is reported in the work "Cercos e Clamores" (Cardoso 1965), and includes the prayers, the words about the harvest, etc.

The data shows that the hardest periods dominated much of the time during which the recordings were made. The changes that have occurred in recent years seem to follow a trend towards a certain climatic instability, similar to what occurred in previous historical periods. However, unlike in the past, where alternating cycles had natural causes, the processes currently taking place are linked to the effects of human activity on the climate.

At this point, a question arises: how can you operate in daily practice to prevent climate change and be simultaneously sustainable in the management of historic buildings?

The concept of sustainability[16] (Patters et al. 2017), that is to ensure the needs of current generations without compromising the possibility that future generations can meet their own, has gone from the consumption control applied in the 1970s to the efficiency of the technological elements notoriously difficult to apply if not at the expense of conservation. In other words, if the ancient builders have always addressed the aspects of living comfort with a series of technical measures to compensate for seasonal or daily temperature changes, the modern attitude has neglected the study of the passive behaviour of real estate, focusing almost exclusively on building systems engineering.

We are left with the following dichotomy: conservation experts are concerned that implementing energy efficiency measures could endanger the heritage value of historic buildings; while energy consultants complain that the authorities responsible for the conservation of buildings are too restrictive, hindering energy efficiency improvements. The main challenge in implementing a concept of renovation of historic buildings is that all stakeholders communicate without prejudice.

The most appropriate solutions for a given building will likely be found if the manager succeeds in sensitizing the public to the historical value of the building, whether the technical experts consult the person responsible for the storage at an early stage and whether all parties communicate continuously. Approaches that limit the perspective of

16 The concept of sustainability was first proposed in the Our Common Future report presented in 1987 by the World Commission on Environment and Development (WCED), known as the Brundtland Report, and was sanctioned by the World Conference on Environment and Development in Rio de Janeiro in 1992.

the individual building do not recognize that the supply of renewable energy sources is limited and that, for example, biomass used for heating a house will no longer be available for other purposes, such as transport. Therefore, if you consider historic buildings as interconnected with a complex energy system at regional, national and international levels, it becomes clear that both energy efficiency and energy production should be optimized independently.

There are no standard solutions to retrofit a historic building, but with the right approach, you can find the right solution for a specific building. There are many technologies available; it is up to the design team to select the right ones and adapt them to the needs of each building.

A helpful attitude to adopt in daily planning begins with an articulated and thorough reading of built heritage. In the Mediterranean area, you can recognize traditional solutions of limiting energy from the city to the detail of the furniture inside the building. For example, the construction of narrow streets to shelter from the heat or protect from the winds, the presence of arcades in the wider streets to shelter from the sun, the traditional laying of sheets between adjacent buildings to create shade along the road, the construction of underground areas to cool down with solar fireplaces, the laying of wall tapestries and carpets on the floors, the execution of canopied ceilings or slats, the laying of double windows, up to the creation of specific furniture systems such as beds with canopy to contain more heat. It should be added that the completion of the life cycle of the resources was guaranteed by the migration of built parts no longer functional to the original use in another sphere of profit.

Modern technological capabilities in the above-mentioned direction can improve the tricks already in place and on the other hand ensure the reuse of resources continuously. Consequently, it is useful not only to emphasize the historic solutions adopted as it happens in the new building site of Guimarães but rather to consider them as creative resources.

REFERENCES

Aguiar, J., 2010. "Após Veneza: do restauro estilístico para o restauro crítico", in Custódio, J. *100 Anos de Património: Memória e Identidade. Portugal 1910-2010*, Lisboa, IGESPAR.

Allan W., 1980. "Conservation Planning in Oporto: An Integrated Approach" in *Town Planning Review*, Vol 51, n. 2. 177.

Bonazza A., Maxwell I., Drdácký M., Vintzileou E., Hanus C., Ciantelli C., De Nuntiis P., Oikonomopoulou E., Nikolopoulou V., Pospíšil S., Sabbioni C. and Strasser, P., 2018. *Safeguarding cultural heritage from natural and man-made disasters: A comparative analysis of risk management in the EU.* [online] Available at: <https://data.europa.eu/doi/10.2766/224310> [Accessed 20 April 2023].

Bonazza A., Sardella A., Kaiser A., Cacciotti R., De Nuntiis P., Hanus C., Maxwell I., Drdácký T. and Drdácký M., 2021. "Safeguarding cultural heritage from climate change related hydrometeorological hazards in Central Europe", in *International Journal of Disaster Risk Reduction*, v. 63, 102455. Available at: <https://doi.org/10.1016/j.ijdrr.2021.102455> [Accessed 20 April 2023].

Calzolaio, F., 2017. "Cultural and Touristic Strategies for Preservation and Enhancement of Venice and its Lagoon", in Pinton S. and Zagato L. eds. *Cultural Heritage*. 81-90. [online] Available at: <www.edizionicafoscari.unve.it/it/edizioni/libri/978-88.6969-179-9/> [Accessed 20 April 2023].

Canto Moniz, G., Correia, L. M., and Gonçalves, A., 2014. "O Estudo da Renovação Urbana do Barredo. A formação social do arquitecto para um território mais democrático", in *Revista de Estudos dos Século XX*, 14. Coimbra, Universidade de Coimbra.

Cardoso, M., 1965. "Alberto Braga (1892-1965)", in *Revista de Guimarães*. [online] Available at:<https://www.csarmento.uminho.pt/site/files/original/0dbfcffcd98e57cab95a83d68ba4df6976278522.pdf> [Accessed 20 April 2023].

Convenant of Mayors for Climate and Energy, Municipality of Guimarães and Irradiare Science for Evolution, 2016. *Guimarães Sustainable Energy and Climate Action Plan*. Guimarães. Available at: <https://mycovenant.eumayors.eu/document/document-download?id=787601&filename=f3gYnqdAEnBhiZSEkSHgT8wLXfbs0m7a.pdf>.

Fanzini, D., Tartaglia A. and Riva, R., 2019. *Project challenges: sustainable development and urban resilience*. Milano, Maggioli. Available at: <https://re.public.polimi.it/bitstream/11311/1124833/5/916.32487_AAVV_e-book_Project-challenges.pdf >[Accessed 20 April 2023].

Fioretti, C., Pertoldi, M., Busti, M. and Van Heerden, S., 2020. *Manuale delle strategie di sviluppo urbano sostenibile*. Luxembourg, European Commission. [online] Available at: <https://data.europa.eu/doi/10.2760/885369>[Accessed 20 April 2023].

Gonçalves, A., 2007. "Which urban plan for an urban heritage? An overview of recent portuguese practice on integrated conservation." *City & Time*, 3 (2): 6. [online] Available at: <https://estudogeral.uc.pt/bitstream/10316/19976/1/Which%20urban%20plan%20for%20an%20urban%20heritage.pdf> [Accessed 20 April 2023].

Ki-moon, B., 2007. Speech at the COP13 conference, Bali in Aldred, J. "UN Chief: World 'must act now' on climate change". *The Guardian*, 12 Dec. 2007. Available at: <https://www.theguardian.com/environment/2007/dec/12/bali.climatechange2>.

Loza, R. *Centro Histórico do Porto Património Mundial. Plano de Gestão.* Porto. Available at: <http://www.portovivosru.pt/files/uploads/cms/sru/5/files/16/2021_Plano_de_Gest%C3%A3o_do_CHP_Patrim%C3%B3nio_Mundial.pdf> [Accessed 20 April 2023].

Montanari, T., 2022. *Le pietre e il popolo. Restituire ai cittadini l'arte e la storia delle città italiane.* Firenze.

Moniz, G. C., Correia, L. M., and Gonçalves, A., 2019. "Fernando Távora Oporto's Urban Renewal: A Changing Moment in Urban Rehabilitation Policy Debate". *Journal of Urban History,* 45 (4) Available at: <https://doi.org/10.1177/0096144216688453>. [Accessed 20 April 2023].

Nunes, L. J. R., 2022. "Reconstitution of the Climate in the Municipality of Guimarães (Northern Portugal): A Regional Approach Based on Historical Information and the Record of Measured Data". *Climate*, 10 (5). Available at: <https://doi.org/10.3390/cli10050068> [Accessed 20 April 2023].

Rausell-Köster, P., Ghirardi, S., Sanjuán, J., Molinari, F. and Borja, A., 2022. "Cultural experiences in the framework of 'cultural cities': measuring the socioeconomic impact of culture in urban performance", in *City Territ Archit*. Available at: <https://cityterritoryarchitecture.springeropen.com/articles/10.1186/s40410-022-00189-8> [Accessed 20 April 2023].

Sabbioni, C., Brimblecombe, P. and Cassar, M., 2010. *The Atlas of Climate Change Impact on European Cultural Heritage — Scientific analysis and management strategies*. [online] London/New York. Available at: <http://op.europa.eu/en/publication-detail/-/publication/3de7d536-d2bd-463d-b40d-684b067ae7ee/language-en> [Accessed 20 April 2023].

Sardella, A., Palazzi, E., Von Hardenberg, J., Del Grande, C., De Nuntiis, P., Sabbioni,C. and Bonazza, A., 2020. "Risk mapping for the sustainable protection of cultural heritage in extreme changing environments". [online] *Atmosphere*, 11 (7). Available at: <https://doi.org/10.3390/atmos11070700>[Accessed 20 April 2023].

Távora, F., 1978. "Barredo: Operazione di rinnovo urbano", in *Lotus International*, n. 18, 95-99. Milano, Electa.

Távora F., 1982. "Experiências de Planeamento Municipal 5 — Guimarães Plano Geral de Urbanização". *Cadernos Municipais*, 16-17.

UNESCO, 2023. *Historic Centre of Guimarães and Couros Zone.* Available at: <https://whc.unesco.org/en/list/1031> [Accessed 20 April 2023].