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Contents of the public report

Preface

This public report provides an overview of the problems raised by the management of heritage buildings and sites (HBs/sites) in their surroundings. A multidisciplinary team comprising conservation professionals, art historians, archaeologists, architects, biologists, civil engineers and information technology experts have joined forces within the framework of the European Cooperation in Science and Technology[1] Action TD1406 - i2MHB (Innovation in Intelligent Management of Heritage Buildings) to provide their expertise and experience on the risks to which HBs/ sites are exposed (urban development, infrastructure works, demographical changes, natural and technological hazards, bio-deterioration, lack of cultural heritage education and technical knowledge and skills, etc.). Traditional and new approaches to manage the principal risks are then developed. Nine representative European HBs/sites are used to illustrate the different problems raised and to offer possible solutions. The report ends with a number of recommendations to better integrate HBs/sites in their surroundings.

This report is addressed to policy makers at the local, regional and national governments; economical and industrial players; research and education stakeholders; and, the public to the preservation and valorisation of HBs/sites in their surroundings. We hope that readers will find tentative answers to their question(s) on the difficulties encountered by the management of HBs/sites in their surroundings. Further reading is available through the references and the online literature provided.

João Martins, Chair of COST Action TD1406 - i2MHB
Christian Degrigny, Leader of WG3
Anna Lobovikov-Katz, Co-leader of WG3

[1] www.cost.eu [Accessed 07.08.2018].

1

Introduction

i2MHB (Innovation in Intelligent Management of Heritage Buildings), launched in 2015, is a four year European Cooperation in Science and Technology (EU COST) Action project. The objective of this Action is to create a Pan-European open network to promote synergies between heritage science specialists, industrial stakeholders, research/ education contributors and the public, to achieve a collective understanding and procedure towards interventions on heritage buildings and sites (HBs/sites). Its aim is to integrate multidisciplinary expertise, technology and know-how through a novel and independent global framework. i2MHB is organised into five working groups (WGs): WG1 Common framework; WG2 Interoperability roadmap for heritage buildings' (HBs) sustainability; WG3 Integration of HBs into their surroundings; WG4 Social dimension of HBs; and, WG5 Policy coordination and deployment. The Action involves 26 countries and more than 250 participants. Throughout its four years project duration, the Action has organised 16 Core Group/WG meetings, 5 Training Schools (involving more than 90 trainees with an average of 18 trainees per a training school), and more than 45 Short-term Scientific Missions across all of Europe.

Working Group 3 (WG3) focused on the study of optimisation of HBs/sites' integration into their urban or rural landscape. All the diverse aspects of HBs/sites are considered. They can be either historical or archaeological, belong to different periods, may be public or private, listed or not. They are not necessarily fully authentic; they may be partly or entirely restored, well maintained, physically protected, located in an outstanding position, accessible, illuminated and exposed to natural aggressive environments (seaside, windy area, etc.) or human pollution (industries).

WG3 activities are strongly interlinked with other i2MHB WGs activities. Based on current practices of preservation[2] and valorisation of HBs/sites in their surroundings at the EU level (WG1), this public report proposes innovative strategies to optimise their management (WG4).

[2] Action taken to prevent further changes and deterioration. It differs from conservation which involves treatment and preventive care (Getty Research - Art & Architecture Thesaurus Online, http://www.getty.edu/research/tools/vocabularies/aat/ [Accessed 17.07.2018].

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Objectives and approach

Objectives of the public report

This report has three main objectives: (a) to discuss the key challenges of preserving and valorising HBs/sites; (b) to define appropriate strategies to optimise their management; and, (c) to make recommendations that would promote a more efficient integration of HBs/sites in their surroundings.

Given the multidisciplinary nature of the HBs/sites, which necessarily encompasses technical, socio-economic, cultural and historical backgrounds, this report aims to provide an overview of all the core aspects and different perspectives involved. In order to ensure this, the report introduces and discusses the different topics, along with (where relevant) references to past and current related national, EU and international projects.

Target audiences

The public report is directed towards:
1. Policy makers at local, regional, national and European levels
2. Economical and industrial players
3. Research and education stakeholders
4. The general public

Approach

A core group of WG3 active members with complementary expertise has been constituted in order to provide an EU vision (in this case, countries which signed i2MHB Memorandum of Understanding[3]) which captures the key issues/problems raised by HBs/sites in their surroundings. Through interviews, questionnaires surveys and focus group meetings, these problems are tackled in the following and illustrated through nine representative EU case studies which have been described and examined from different angles to investigate the difficulties of their management, the solutions found, and the possible recommendations which can be used to optimise their preservation and valorisation. Two sites are rural (Case 1 Châ-

[3] http://www.cost.eu/COST_Actions/tdp/TD1406 [Accessed 19.08.2018].

teau de Germolles, Mellecey (FR), Case 5 Monastery of Santa Maria la Real, Palencia (SP)), four are urban (Case 2 Temple-cathedral, Pozzuoli (IT), Case 4 Baroness' House, Maribor (SI), Case 6 Lamot brewery, Malines (BE) and Case 9 Valletta Waterfront, Floriana (MT)), two are at the periphery of an urban environment (Case 3 Tvrđa – Osijek old city nucleous and baroque fortress (HR) and Case 7 Belgrade fortress – Kalemegdan (RS)), and one is mixed (Case 8 the Romanesque route (PT)) (see Figure 2.1 and Table 2.1). Detailed information on these case studies are available on i2MHB e-book and website (http://td1406. csites. fct.unl.pt/wordpress/).

Figure 2.2 indicates the location of these sites in their respective countries.

Table 2.1 gives some preliminary information on these nine case studies. In the following each HB/site will be denoted as a case number and its designation. For example, Case 1 Château de Germolles, Mellecey (FR) will be referred as Case 1 Germolles (FR).

Due to the fact that the selected nine EU case studies do not cover all of aspects addressed in this public report, references to other EU HBs/sites are given when needed.

Case 1 Château de Germolles, Mellecey (FR), © Rodrigue

Case 2 Temple-cathedral, Pozzuoli (IT)[4]

Case 3 Tvrđa – Osijek old city nucleous and baroque fortress (HR)[5]

Case 4 Baroness' House, Maribor (SI), © Bogdan Dugonik

Case 5 Monastery of Santa Maria la Real Palencia (SP), © Fundación Santa Maria la Real

Case 6 Lamot brewery, Malines (BE), © 51N4E

Case 7 Belgrade fortress – Kalemegdan (RS), © Public Enterprise "Belgrade Fortress"

Case 8 The Romanesque Route (PT)[6], © Rota do Românico

Case 9 Valletta Waterfront, Floriana (MT), © S. Cefai

Figure 2.1. Pictures of the nine case studies selected.

Figure 2.2. Location of the nine case studies.

[4] www.marcodezzibardeschi.com/index.html/portfolio/opere/Pozzuoli [Accessed 19.06.2018].
[5] http://www.aoot.hr/galerija [Accessed 19.06.2018].
[6] http://www.rotadoromanico.com/vEN/Paginas/Homepage.aspx [Accessed 19.06.2018].

Case no.	Designation	Name of the site	Description	Ownership	Architectural features	Integration in the surroundings
1	Germolles (FR)	Château de Germolles, Mellecey, FR	Medieval palace of the Dukes of Burgundy (14th c.)	Private	Pre-renaissance château	Very good (rural)
2	Temple-cathedral (IT)	Temple cathedral, Pozzuoli (Naples), IT	11th c. cathedral built upon an Augustan temple	Public - Roman Curia and the municipality of Pozzuoli	Church elements integrated in a Roman temple structure	Very good (urban)
3	Tvrđa (HR)	Osijek old city nucleous and baroque fortress, HR	18-19th c. fortified city	1/3 private and 2/3 public	Baroque urban form	Medium (peripheral to urban)
4	Baroness house (SI)	Baroničina hiša, Maribor, SI	Aristocratic house (1903)	Public - University of Maribor	Secession building	Good (next to a modern complex) (urban)
5	Santa Maria la Real (SP)	Monastery of Santa Maria la Real, Palencia, SP	Funded in the 9th c. but mainly built in the 11-13th c.	Public - Regional Government, and Fundación Santa María la Real	Transition from Romanesque to Gothic	Medium (rural)
6	Lamot (BE)	Lamot brewery, Malines, BE	One of the largest industrial areas when built (20th c.)	Public - City of Malines	Contemporary architecture	Very good (urban)
7	Kalemegdan (RS)	Fortress of Belgrade, Belgrade, RS	Old citadel and Kalemegdan park (12-18th c.)	Public entity - 'Belgrade Fortress'	Medieval architecture intertwined with dominant Baroque elements	Very good (peripheral to urban)
8	Romanesque route (PT)	Rota do Românico, PT	58 Cultural Heritage (CH) monuments in the Tâmega and Sousa region, mainly built in the 12-14th c.	Mainly public (state) -Managed by 12 municipalities through the association of Valsousa[7]	Romanesque	Good (rural/ urban)
9	Valletta Waterfront (MT)	Pinto Stores, Floriana, MT	19 Stores built in 1752 under the Portuguese Grand Master Emanuel Pinto de Fonseca	Private - Under the management of the Valletta Cruise Port, a limited liability company	Baroque	Poor (urban)

Table 2.1. General description of the nine case studies selected to illustrate the integration of HBs/ sites in their surroundings.

[7] Associação de Municípios do Vale do Sousa e do Tâmega.

Add notes:

3

HBs/sites in their surroundings: overview

This chapter focuses on an overview of HBs/sites in their surroundings. It starts with a brief introduction to the problematics of HB/Sites illustrated through nine case studies, followed by the identification of key challenges for their preservation and valorisation in their surroundings.

3.1. Descriptions and interventions

3.1.1 Legislation

The levels of protection of HBs/sites present different stages and frameworks of decision in EU countries although there are several similarities and differences (see Table 3.1). The protection of HBs/ sites in each country can be broadly divided into three areas: (1) national legislation reporting to internationally recognised HBs/sites in the country or national protection of HBs/sites, (2) regional regulations combined sometimes with urban planning defined by Town Councils or other regional bodies; and, (3) the local level of protection which is under municipality decision. However, the administrative structure of a country, namely when regional bodies have independency on the decisions and the management of the protected areas, imposes, in consequence, specific differences regarding the hierarchy of responsibilities and decisions. As a result appropriate skills and preparedness of the staff of these administrative structures and the guarantee of multidisciplinary approaches supporting the decisions become essential. It shows the relevance of the independent consulting bodies to complete and to achieve accurate decisions, to implement and to monitor the application of the legislation, regulations or planning strategies. In brief, the sustainability of the protection of HBs/sites is determined by the power of such administrative structures and in their long term visions. Drawn from the International Council on Monuments and Sites (ICOMOS) and

the United Nations Educational, Scientific and Cultural Organization (UNESCO) reports[8] on heritage at risk required at the European level, the following improvement needs are exposed: the need to solve problems at the administrative level, and problems at the design stage and the shared responsibilities; and the need to understand how legislation is compiled to and is enforced: namely how is the protection of HBs/sites influenced by the philosophical decision as to how to intervene on a site and vice versa.

Reports from the ICOMOS and UNESCO[9] about the situation of listed Heritage or the reasons why some HBs/sites are nominated to the List of World Heritage in Danger can be good resources to identify and understand the gaps in national legislation or in its implementation. UNESCO presently defines fourteen types of threats: buildings and development; transportation infrastructure; utilities or service infrastructure; pollution; biological resource use/modification; physical resource extraction; local conditions affecting physical fabric; social/cultural uses of heritage; other human activities; climate change and severe weather events; sudden ecological or geological events; invasive/alien species or hyper-abundant species; management and institutional factors; and, other factor(s).

The adoption of the guidelines identified in the Charters within the national legislation of EU countries is still not uniform. It is the case of terminologies such as authenticity and integrity (see section 3.1.2) which are not clearly applied in their heritage protection legislation. Another instance is the way in which HBs/sites are recognised and protected (including proactive measures) against urban development, provision of urban infrastructure or mass tourism which is not controlled. One must also consider the lack of control on good practice in the interventions required for the reuse of HBs/sites. An important manifestation of this diversity is how buffer zones around HBs/sites are defined and managed despite the fact that they have the same objective, that is to protect the integrity of the HBs/sites and surroundings (see section 4.1).

Table 3.1 opposite summaries the potential advantages and disadvantages of listing of HBs/sites in selected EU countries. It is interesting to note that they vary from one country to another.

[8] https://whc.unesco.org/en/158/ [Accessed 17.07.2018].
[9] https://whc.unesco.org/en/list/ [Accessed 17.07.2018].

Country	Advantages	Disadvantages
Belgium	Pursues a solid management and policy for HBs/sites and prevents destruction with the support of the Flanders Heritage Agency.	HBs/sites face problems that directly or indirectly derive from the situation of their buffer zone' due to the lack of funding for other buildings in these zones. Most of them are 'recognised HBs/sites' although they do not benefit from governmental funding.
Croatia	Conservation work can be financed by governmental funding through application.	Repressive law without benefit for investors. No investment refund for private investors.
France	Prevents destruction, unethical intervention within the buffered zone; control by authorities of any conservation work; shared funding for conservation (40% maximum for private HBs/sites).	Lack of flexibility for small interventions; governmental funding is not always available; management of private HBs/sites when open to the public (the opening is requested as a compensation to governmental funding).
fYR Macedonia	Provides proper approach and treatment in planning, designing and realizing the interventions, thus protecting from damaging due to unethical interventions.	Time consuming administrative procedures even in the case of 'heritage in danger'; very strict procedures versus non-sufficient governmental funding often lead to late interventions and possible damages, especially in the case of private owners.
Greece	Prevents destruction, unethical intervention within the buffered zone; control by authorities of any conservation work.	Lack of adequate monitoring; lack of governmental funding.
Italy	Prevents undertaking unauthorised work; prevents the loss of buildings of a certain historical value; helps sensitize and appreciate the value of the heritage of these sites; allows better control by the authorities, in case of change of HBs/sites and transformation of the surroundings.	The Superintendence of CH is under-staffed; the difficulty to preserve buildings of historical importance; bureaucratic procedures that require time even in the case of buildings that are in danger of collapse; lack of flexibility for small interventions.
Malta	HBs/sites are listed and graded as Grade I (having the highest CH importance), Grade II and Grade III. Development in Urban Conservation Areas is not encouraged and is controlled.	All permits for works in HBs/sites are handed in to Planning Authority and is then sent to the Superintendence of CH for their consultation. By law the Superintendence of CH is responsible for all interventions on historic structures.
Portugal	Prevents or diminishes destruction, unethical intervention within the buffered zone; offers more control by authorities and involvement of experts within a multidisciplinary team; increases the recognition of the HBs/sites values which in consequence gives more opportunities to funding for conservation work.	Lack of mandatory maintenance plans and sufficient funding to support them for all HBs/sites; lack of a national conservation philosophy that could have a wider application with accurate guidelines for all technicians, namely in terms of reuse interventions.
Serbia	The State gives funding and provides protection against unethical intervention or any misuse.	Sometimes control of interventions to allow repairs (even of minor damages) is too strong and the process is slowed down.
UK	Prevents listed HBs or buildings in conservation area to undertake unauthorised works; provides a clear way of documenting structures of architectural and historical interests/values; helps in raising awareness and appreciate the heritage value of such places; and, enables local authorities and other funding bodies to prioritise their budgets.	Slower decision-making process - securing listed building consents for listed HBs and planning permission for new building developments adjacent to listed HBs or conservation areas can be lengthy and costly.

Table 3.1. Potential advantages and disadvantages of listing HBs/sites in selected EU countries.

3.1.2 Main threats to authenticity and integrity of HBs/sites

The importance given to both authenticity and integrity criteria is expressed in several international documents of UNESCO, ICOMOS as well as the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) and guidelines were setup in relation to HBs/sites. As regards the surroundings of HBs/sites as historical gardens only in 1982 the Florence Charter took them into consideration[10]. The well-known Nara Charter presents for the first time an emphasis on authenticity in the "Authenticity of Cultural Heritage" and it is still a key document to establish guidelines[11]. Integrity is not so often expressed directly[12], despite its importance in any evaluation of classified HBs/sites.

Definition of authenticity and integrity

Authenticity and integrity should be emphasised since both of them are two key issues present in the evaluation pursued by UNESCO[13] to recognise the Outstanding Universal Value (OUV) of World Heritage proposals and criteria for selection[14].

• Authenticity: ability of a property to convey its OUV through the way its attributes (form and design, materials and substance, use and function, traditions, techniques and management systems, location and setting, language and other forms of intangible heritage, spirit and feeling) convey truthfully (credibly, genuinely) that OUV.
• Integrity: completeness/intactness of the attributes that carry OUV.

Country	Application of authenticity and integrity to legislation
Belgium	Fully integrated. The Heritage Agency strives for 'conservation through development'. Heritage values are the result of evolution and dynamic use. Instead of preservation of physical aspects that represent certain intrinsic value, the option is to choose passive for a dynamic and contemporary use that still respects the authenticity of HBs/sites.
Cyprus	Integrated in addition to architectural, historical, social or other values.
France	Fully integrated as well as in any conservation project.
fYR Macedonia	Fully integrated and usually followed during conservation and restoration.
Greece & Italy	Fully integrated.
Portugal	Used to list HBs. However, there is a predominance of administrative acts to the detriment of a wider investment in scientific knowledge to evaluate authenticity in order to support the necessary preservation guidelines.
Romania	Integrated in addition to age, rarity, rarity in a town, area or region, representativeness for an architectural style, an artistic movement, a historical period and its memorial value.
Serbia	Fully integrated.
UK	Fully integrated in addition for buildings to be in a conservation area, of special architectural interest or special historic interest.

Table 3.2. Consideration of authenticity and integrity criteria of HBs/sites for their listing in selected EU countries.

[10] https://www.icomos.org/charters/gardens_e.pdf [Accessed 17.07.2018].
[11] Nara charter, 1994, https://www.icomos.org/charters/nara-e.pdf [Accessed 17.07.2018].
[12] Madrid document, 2012, http://www.aeppas20.org/wp-content/uploads/2015/10/03-DM-ingles.pdf [Accessed 17.07.2018].
[13] S. Denyer, Retrospective statements of OUV for world heritage properties: authenticity and integrity, Workshop of the 2nd cycle of World Heritage Periodic Reporting for Western Europe, Prague 27th May 2011.
[14] https://whc.unesco.org/en/criteria/ [Accessed 17.07.2018].

Consideration of authenticity and integrity criteria of HBs/sites for their listing in EU countries

Table 3.2 identifies the countries that have actually applied both authenticity and integrity criteria in their legislation. It was found that the level of application of these two criteria to their legislation is different from one country to another.

Level of compliance of national legislation regarding authenticity and integrity values of HBs/ sites with EU and international standards in EU countries

Table 3.3 below illustrates the debate and balance between arguments of each country and identifies the way each country or region assumes these two criteria crossing the international guidelines put forward by: UNESCO, ICOMOS and EU with national or regional legislation.

Country	Advantages	Disadvantages
Belgium	The Flanders Heritage Agency keeps track of international developments and shares knowledge, expertise and ideas on policy through several European institutions such as the EU and the Council of Europe.	N/A.
Croatia	Heritage under UNESCO protection is cared according to UNESCO standards.	National legislation is still adjusting to other international guidelines.
France	National legislation is in line with international and EU standards for HBs/sites.	The problem of respect of intervention in buffered zones; financial issues (too costly interventions).
fYR Macedonia	National legislation is in line with international and EU standards for HBs/ sites.	Interventions are not always respectful of the HBs and its surroundings; lack of sufficient funding for overall timely interventions.
Greece	National legislation is according to international and EU standards with special mention to HB.	Interventions are not always respectful of the HBs and their context; lack of funding.
Italy	National legislation is in line with international and EU standards for HBs/sites.	Interventions do not always respect the value of HBs/sites and their context; lack of sufficient funding for timely interventions the whole; and lack of control of workers on site.
Portugal	National legislation presents some gaps on the objective to be in line with international and EU standards for HBs/sites, namely in terms of prevention of natural risks and mass tourism that can be harmful to integrity values.	Lack of investment in the control and qualification of the surroundings; lack of proper protection of HBs/sites at the regional level in several cases; lack of prevention of the excess use of demolitions in cases of reuse of HBs; lack of shared responsibilities recognised by national and regional bodies to control urban pressure and real state speculation; and lack of funding for timely interventions.
Serbia	National legislation is in line with the international and EU standards for HBs/ sites.	Except a few cases due to the lack of funding.
UK	National legislation is in line with international and EU standards for HBs/ sites. Indeed, “Listed buildings” or “buildings in conservation areas” are subject to UK statutory protection and control. It is a criminal offence to carry out work which needs listed building consent without obtaining it beforehand.	The scale and scope of conservation interventions of a HB/site in some cases are constrained by the budget limitation.

Table 3.3. Respect of authenticity and integrity values versus HBs/sites in selected EU countries.

3.1.3 Conservation issues

The definition of CH has changed drastically over the last century and hence its protection is now more than ever multidisciplinary. Caring about conservation and restoration of HBs/ sites that are considered particularly important from a public or artistic point of view started in ancient age, but the consideration of preserving even the simplest structures as a testimony to a specific activity of mankind became part of our history much more recently. For example, the reconstruction of L'Aquila after the earthquake of 1703 did not create any polemics for the local government. But the 2009 earthquake of the same city raised the question of whether HBs that had collapsed should be reconstructed as replicas or replaced by new designs. The culture of protection is now firmly established, because we have acquired the awareness of the historical perspective. At the same time, however, the availability of new materials and technologies have revolutionised conservation and restoration approaches, breaking the continuity of tradition and introducing materials (such as concrete) whose behaviours are completely different from those offered until then by stone, brick and binder (mortar). To these effects the pollution that causes an acceleration of degradation needs to be considered. Moreover, the positive aspect of extending cultural use is to be confronted with the wear of ancient structures when subjected to 'mass tourism'. It is clear that this complexity of problems requires multidisciplinary competencies in operations and guidelines that should represent a methodological orientation, rather than provide stiff schematic solutions that cannot be adapted to the individuality of the structure and to its context, given that both have their historical stratification and reciprocal adaptation.

Criteria to respect are[15]:

• Ensuring the best possible transmission, to the future, of a historical-artistic heritage that is by definition unique and unrepeatable; so that the functional issues and other practical problems, although important, are the 'means', rather than the 'aim' of the intervention;

• 'Minimum intervention'; everything done or proposed should be based first of all on justifications of a cultural and conservation character, with all other considerations remaining secondary. That is to 'maximise' the efficacy and 'minimise' the weight of each intervention, aiming at quality and appropriateness;

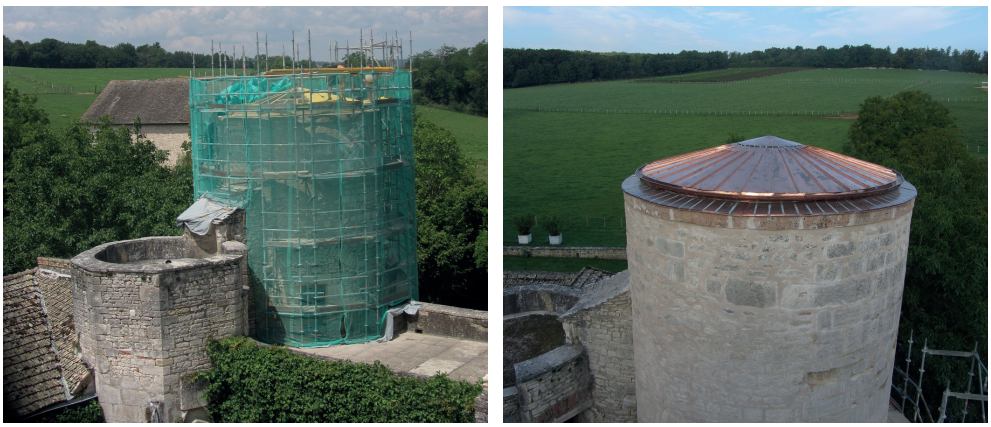
• Same care should be devoted to the most grand, noble historical parts as well as the humblest, least impressive ones. All of which fully deserve the title of 'monuments' and 'cultural assets', because they bear 'material witness, containing values of civilization'. Following the philological study and critical analysis of the structure to achieve the best quality restoration, protecting authenticity and avoiding any temptation of reconstruction or falsification involving imitation of style, in the awareness that we are not operating with historical certainties, but at best on the basis of valid 'critical hypotheses';

• Indispensable addition(s) should clearly demonstrate their modern character (at least to the specialists), with their own contemporary expressive efficacy, so that the new and the old will remain such distinguishable but integrated without any risk of introduction of counterfeit parts, nevertheless avoiding visual impact;

[15] Listed on the call for the Temple-Cathedral restoring-reuse and based on 1972 Restoration Charter, Law 6 luglio 2002 n. 137, art. 10 and D. Lgs. 22 gennaio 2004, n. 42 about the Cultural and Landscape Heritage code plus additional recommendations, http://www.unesco.org/culture/natlaws/media/ pdf/italy/it_heritlandscode_2004_itorof [Accessed 31.08.2018].

• Necessary work of reconstruction of original parts or reinsertion of architectural and decorative elements should be visibly distinguished (through certain well-defined, discreet techniques, again borrowed conceptually from philology) from the undisturbed, intact original parts; and,
• Intervention should consider the connection of the structure with its surroundings, aiming at restoring the monument to its history and to its context (urban/rural environment).

Interventions on HBs/sites include first their maintenance which is a daily task of the managers. Since maintenance of HBs/sites is not a legal obligation, the situation might be different from one country to another as indicated in Table 3.4 and even at regional/local levels in the same country.



(a) During conservation (b) After conservation

Figure 3.1. An example of a discrete conservation approach used on one of the towers of the entrance gate of Case 1 Germolles, FR, © Germolles.

(a) Before conservation[16] (b) After conservation[17]

Figure 3.2. An example of a more drastic conservation approach used – Case 6 Lamot, BE.

[16] www.rim.be [Accessed 13.06.2018].
[17] https://inventaris.onroerenderfgoed.be/erfgoedobjecten/113770 [Accessed 13.06.2018].

Country	Application of authenticity and integrity to legislation
Belgium	The Flanders Heritage Agency emphasises preventive care of HBs/sites. Every restoration, however minimal and respectful, impinges on the authenticity of a monument. Restoration recommended only as normal maintenance is no longer enough. In Flanders protected HBs and recognised HBs are clearly treated differently. In the case of protected HBs (monuments) the aim is to preserve the heritage and its heritage values. The national government subsidises the restoration and maintenance of these monuments. Recognised HBs are included in the heritage inventory and through a legal procedure 'are recognised' so the Government, owner or administrator have to consider certain legal effects but there is no funding available for these HBs.
Croatia	Maintenance is provided by the owner. Conservation work is carried out under the control of the Conservation Department.
France	Maintenance is provided by the owners and responsible stakeholders (municipalities, administrative institutions, volunteers, etc.). Conservation work of listed HBs/sites is carried out under the control of architects 'des monuments historiques' while architects 'des bâtiments de France' are in charge of not listed ones.
fYR Macedonia	HBs/sites usually benefit from protection by a policy provided by national and regional conservation centres. Basic principle of 'minimum intervention – maximum protection' is always followed during conservation and restoration of HBs/sites. Due to high seismicity of the country, the interventions often include retrofitting which is realized by compatible but not only original materials. However, reconstruction process often involves modern structural materials.
Italy	The superintendence of CH supervises the works on listed HBs/sites and in some cases covers part (a small part!) of the cost. The costs of maintenance or restoration works often are the responsibility of the private owners and the responsible authorities involved (municipalities, other institutions, etc.). The conservation interventions on HBs/sites have to be carried out under the supervision of an architect and/or a restorer. The work has to be entrusted to a specialised contractor.
Portugal	HBs/sites often benefit from a conservation policy provided by the responsible stakeholders (municipalities, administrative institutions, etc.), although major difficulties in the assumption of the importance of implementation of maintenance plans are also observed. Conservation work of listed HBs/sites is carried out under the control of multidisciplinary expertise teams, from Direcção Geral do Património Cultural or by the several Direcção Regional de Cultural of each region, as well as municipalities, depending on the type of classification.
Serbia	Maintenance is provided by the owners and responsible stakeholders (municipalities, administrative institutions, volunteers, etc.).
UK	The owner of a listed HB is responsible for its care and upkeep. There is no direct legal obligation on the owner of a HB to carry out repairs. However, local and central government may force repairs to be carried out by using an urgent works notice on a listed building not in use, or to a part not in use, where the works are urgently necessary for its preservation. If the works are not carried out by the owner, the authority has the power to enter the property, carry out the works and seek to recover the costs from the owner.
UK	Fully integrated in addition for buildings to be in a conservation area, of special architectural interest or special historic interest.

Table 3.4. Maintenance and conservation/restoration policies in selected EU countries.

Minimal conservation includes the protection of uncovered spaces to limit further damage. For example, at Château de Germolles (Case 1), the towers of the entrance gate are covered with a discrete wooden structure isolated from the environment by a copper roof (Figure 3.1). In contrast, a more drastic conservation approach is used for one of the façades of Case 6 Lamot, BE (Figure 3.2).

3.1.4 Use or reuse - strategies adopted

Definition of use and reuse strategies

As society develops, the use of historic structures and the structures themselves can become obsolete. This implies that the structures would need to undergo refurbishment such as the installation of services to update them to current use. It has to be understood that reusing historic structure is encouraged but has to be carried out correctly. It could also mean that the layout of the HB makes it difficult to reuse and meet the requirements of society's demands today and many resort to radical interventions such as façadism as a solution. Façadism is not to be considered as an ethically correct intervention on HBs.

It is also imperative that issues of accessibility for all, fire safety, provision of infrastructures, safety on site for visitors are carried out in such a way that the value of the HBs/sites is respected and proper monitoring of the works to be carried out is done by the pertinent authorities to avoid permanent damage to the heritage structures due to the decisions taken. The reuse of HBs/sites will also be influenced by the context in which they exist and their reality in that new context. One must also identify the difference between the value and hence the use to be given to a HB (which can also be referred to as modern archaeology) and that to be given to an archaeological site. Another issue is the difference between the 'archaeology' that has never been buried or concealed inside subsequent buildings (e.g. the Colosseum in Italy which has always been part of the urban fabric) and buried concealed archaeology that has been brought to light in the last century: HBs/ sites can react in many different ways to new conditions, as much for the structure as for the resistance of materials (e.g. Hagar Qim temples in Malta, Roman theatre in Teramo, Italy – see Figure 3.3). It becomes a problem in the case of the Colosseum on what reuse it should be given – should it only be allowed to be visited by tourists and researchers or should it be given a use for events as is currently being proposed. This is particularly important as decibel excess effects/vibrations on HBs stability during music performances.

(a) A photograph taken in 1975 (b) A photograph taken in 2010

Figure 3.3. Evolution with time of two radial walls in gypsum-sandstone where the difference of conservation of original materials exposed to pollution has to be noted – Roman Theatre, Teramo, Italy, © L. Migliorati.

Strategies adopted (including levels of compatibility with the pre-existent parts)
The new use must be compatible with the historic structure, but must not cause unethical changes to the structure that may cause the loss of part of the history of the structure. Compatibility implies that the intervention should not impinge on the value of the HBs/ sites and allow the different layers of history to be preserved and understood. Interventions carried out on HBs/sites should abide by Heritage Laws and follow the guidelines set out by the relevant Charters for conservation/restoration. Modern interventions should be designed in a way which does not detract from the value of the HB/site such as in Case 2 Temple-cathedral, IT (see Figure 3.4).

(a) General view

(b) The original cathedral façade, now separated from the entire building, © L. Migliorati

(c) The space between the original façade and the current one corresponding to the Temple access side[18]

Figure 3.4. An example of reuse similar to the ancient use - Case 2 Temple-cathedral, IT.

3.1.5 Rehabilitation and reconstruction

Rehabilitation may be requested if a building is in use and rundown such as in Case 6 Lamot, BE (see Figure 3.5) and Case 4 Baroness house, SI (see Figure 3.6), or could be the case of a building which has not been used for a few years but is not derelict. This concerns the change of finishes (floors, ceilings, apertures) and/or installation of services (water, electricity, air-conditioning). Whether the reuse of HBs/sites is with a use not different from the ancient one (e.g. Case 2 Temple-cathedral, IT) or with different use (e.g. Case 6 Lamot, BE and Case 4 Baroness' house, SI), interventions must be carried out with the restoration criteria, using service providers and human resources specialised in restoration, with different skills from those useful for interventions on buildings not considered historical. The choice of materials should obey the same rules**.**

[18] www.marcodezzibardeschi.com/index.html/portfolio/opere/Pozzuoli [Accessed 13.06.2018].

(a) Before rehabilitation/reconstruction

(b) After rehabilitation/reconstruction

Figure 3.5. An example of rehabilitation/reconstruction (with a use different from the ancient one) – Case 6 Lamot, BE, © Reuse concept.

(a) Removal of a supporting wall to open the basement spaces to the interior of the existing atrium

(b) Construction of a steel roof

Figure 3.6. Another example of rehabilitation/reconstruction (with a use different from the ancient one) – Case 4 Baroness' house, SI, © Dr. Bogdan Dugonik.

Reconstruction is needed when the original structure has lost some of its fabric but still has potential unity as a whole – that is it has not been reduced to ruins such as in Case 3 Tvrđa, HR (see Figure 3.7), Case 7 Kalemegdan, RS (see Figure 3.8), Case 5 Santa Maria la Real, SP (see Figure 3.9), Case 8 Romanesque route, PT (see Figure 3.10) and Case 9 Valletta Waterfront, MT. In contrast, if a HB/site has suffered extensive damage due to natural disasters (e.g. earthquakes), manmade disasters (e.g. wars), reconstruction is a more delicate and ethical issue.

(a) Bird eye's view of the north side fortified old city nucleous before intervention[20]

(b) View after intervention (b)[19]

Figure 3.7. An example of reconstruction – Case 3 Tvrđa, HR.

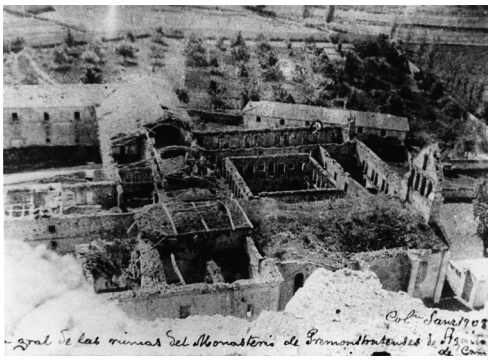
(a) Sava gate during reconstruction

(b) Sava gate after reconstruction

Figure 3.8. Another example of reconstruction - Case 7 Kalemegdan, RU, © Public Enterprise 'Belgrade Fortress'.

The reconstruction strategy should be such that the new structure will be evident from the existing fabric either by the use of a different material or the way it is designed. Reconstruction must be ethically correct towards the original structure and the legibility of the structure's new reality. That is the history of the 'loss' must be evident and the reconstruction must show this evidence. Such reconstruction works must be supervised by architects who have to be endowed with historic sensitivity and renounce to personal visibility.

[19] http://www.mgipu.hr/doc/Slike/Graditeljstvo/Image-Osjecka-Tvrda-sl5.jpg [Accessed 30.06.2018].
[20] http://aoot.hr/galerija [Accessed 30.06.2018].



(a) Conservation state in early 20th century

(b) Current conservation state

Figure 3.9. Another example of reconstruction – Case 5 Santa Maria la Real, SP, © Fundación Santa Maria la Real.

(a) Church of São Mamede of Vila Verde before reconstruction

(b) After reconstruction

Figure 3.10. Another example of reconstruction - Case 8 Romanesque route, PT, © Rota do Românico.

3.1.6 Interactions between HBs/sites and their surroundings

Easy access to HBs/sites combined to an efficient informative signage make them more legible to visitors. It requires a good integration of signage in their surroundings and their appropriate maintenance such as in Case 1 Germolles, FR (see Figure 3.11a). If not respected, there is a risk of neglect. Furthermore, illumination and colour rendering contribute greatly to the integration of HBs/sites in their surroundings, such as in Case 4 Baroness' house, SI (see Figure 3.11b) and Case 6 Lamot, BE (see Figure 3.11c).

(a) Access to the site with signage (Case 1),© Germolles

(b) Illumination of Baroness house (Case 4)[21]

(c) Illumination of Lamot brewery (Case 6), © 51N4E

Figure 3.11. Examples of good practices of interactions between HBs/sites and their surroundings.

3.1.7 Sustainability and management of HBs/sites

Sustainability and built CH seem to be two conflicting terms, since environmental factors were not considered when HBs were designed and built, in particular those buildings built earlier than the late 20th century. In the case of the conservation of CH a more holistic understanding of the word 'sustainability' needs to be considered. In CH, the classical three pillar structure of sustainable development needs to be extended to five pillars: people, planet, profit, heritage and policy. Some indicators[22] are given for each of these pillars below:

- People: safety, community building and sense of place;
- Planet: use of materials and traditional techniques, energy, mobility, ecosystem quality and pollution;
- Profit: return on investment, local employment, economic embeddedness and future value;
- Heritage: integration of modern techniques, spatial aesthetics, immaterial CH, knowledge building, opening-up and accessibility; and,
- Policy: planning and process quality, legal security and support, integrity and voluntarism.

The Building Research Establishment Assessment Method (BREEAM) is one of the most commonly used methods for the assessment of sustainable developments in all types of construction projects. It explicitly regards 'sensitivity' or 'empathy' for buildings on the basis of specific criteria (management, energy, transport, water, materials, waste, land use and ecology, pollution, and health and well-being). The application of BREEAM International Refurbishment and Fit-Out 2015 (BREEAM IR & FO 2015)[23] is intended for reuse, restoration and renovation projects.

Management policies are different if the HBs/sites are considered as purely tourist attractions, or as being integral to the development of cultural tourism. Abusive interventions tend to occur in the former case than the later one. A balance of two approaches is required. The same principle also applies for communication, i.e. communication should be at the service of quality, not quantity.

[21] https://feri.um.si/o-nas/baronicina-hisa/ [Accessed 13.06.2018].
[22] M. Leus and W. Verhelst. Sustainability Assessment of Urban Heritage Sites, Buildings, 8(8), 2018, 107-121, http://www.mdpi.com/2075-5309/8/8/107 [Accessed 24.08.2018].
[23] http://www.breeam.com/discover/technical-standards/refurbishment-and-fit-out/ [Accessed 13.06.2018].

3.2. Key challenges of their preservation and valorisation

The combination of legislation and planning which identify a clear structure of responsibilities is a key point to achieve good practices to maintain HBs/ sites. Similarly well thought interventions (maintenance, conservation, rehabilitation and partial reconstruction) are essential for their better preservation while efficient signage and highlighting (see section 3.1.6) might contribute to their better valorisation.

3.2.1 Parameters of sustainability evaluation

Social, economic, environmental parameters

The Eurobarometer on Europeans and Cultural Heritage[24], published in December 2017, gives interesting insights related to social, economic, environmental parameters:

• The majority of Europeans are exposed to CH in their daily life and consider it as important (for them, their community, region, country). CH is seen as a positive force in Europe (sense of belonging to Europe, improving quality of life, creating jobs, etc.).

• Most countries agree that public authorities should allocate more resources to Europe's CH;

• The participation to CH activities are not the same for the different countries. This is often due to the lack of time and finance; and,

• The younger generation (aged 15-24) have opposing perceptions about the importance of CH. They seem to be less likely to accept that CH is important to them at a personal level (lack of interest) and less likely to get involved in CH activities, while their holiday destination often includes the proximity of HBs/sites to visit.

It is not only the HBs/sites that have a strong impact on the local population and visitors, but also their surroundings and the way they are maintained. It is expected that public authorities should look after heritage, whether the HB/site is private or public. Furthermore, it is considered that more importance should be given towards the education of the younger generation towards CH as it is becoming apparent that they are not giving it its due value.

Balancing valorisation versus preservation

The preservation of HBs/sites should start with the consideration of their diverse values (giving a context, respecting authenticity and integrity) which is an accepted practice in most EU countries. In the case of HBs/sites with regional/local significance for which funding might be more difficult to raise, the involvement of the local community to create the necessary awareness and pressure is paramount to maintain the HBs/sites and make them sustainable.

Attention should be given towards the fact that the valorisation of HBs/sites should be carried out for the service of the conservation, not at its expense. Current policies to reuse HBs/sites as entertainment sites where the visitors can have a historic experience without any preoccupation for the preservation of the existing structures should be condemned.

[24] http://europa.eu/cultural-heritage/toolkits/special-eurobarometer-europeans-and-cultural-heritage_en [Accessed 13.06.2018]. The report is published in most EU languages.

Balanced sustainability
National HBs/sites which are under the control of the states are usually sustainable.

Regional and local HBs/sites however are in a more challenging situation. A balance should be found between their preservation and valorisation. Their maintenance on a daily basis is a key issue. The engagement of the local community (through volunteers, associations, etc.) also plays a major role. When major interventions are required and funds need to be secured, thoughtful valorisation policies have to be developed. This means that the public authorities have to play a key role.

3.2.2 Examples of good practice

The management of a HB/site should be given paramount importance which goes beyond the local, regional, national or international importance of a public or private HB/site. Owners or managers of HBs/sites should not only have a vested interest in their HBs/sites, but also appreciate their authenticity, integrity and context before any intervention takes place. They should adopt a clear valorisation strategy. Examples of good practice can be found in our nine HBs/sites selected (http://td1406.csites.fct.unl.pt/wordpress/):
• Maintaining a HB/site in use, with its original context (surroundings and population): see examples of Case 1 Germolles, FR; Case 7 Kalemegdan, RU; and Case 8 Romanesque route, PT. Good practices depend on their long term sustainability (funding, problem of inheritance for private heritage, etc.) and the appropriate training of the staff (ensuring the maintenance, the quality of the information provided).
• Reuse of a HB/site while conserving most of its original features: see examples of Case 3 Tvrđa, HR; Case 4 Baroness' house, SI; Case 5 Santa Maria la Real, SP; and Case 6 Lamot, BE. Good practices depend on the awareness of the fragility of HBs/sites, the aspect of the original materials and structures, etc.

3.2.3 Examples of critical issues

• Maintaining a HB/site in use but with different users (tourists instead of local communities) such as in Case 2 Temple-cathedral, IT;
• Mass tourism: lack of control on the visitors; and,
• Business (making profit) at the expense of the preservation of CH – see an example with Case 9 Valletta Waterfront, MT, (see section 4.2.2).

Add notes:

4

HBs/sites in their surroundings: optimisation strategies

4.1. The need for multi-criteria optimisation procedures

In 2016 UNESCO emphasised that for Europe "the practice of urban conservation has unlocked new approaches and instruments to achieve urban and environmental sustainability, emphasising local knowledge, creativity and well-being"[25]. Furthermore, the global recommendations are:
• Regenerate cities and rural-urban linkages by integrating culture at the core of urban planning;
• Build on culture as a sustainable resource for inclusive economic and social development;
• Promote participatory processes through culture and enhance the role of communities in local governance; and,
• Develop innovative and sustainable financial models for culture.

In this sense, the proposal of the use of a multi-criteria optimisation tool to help the decision makers in the process of safeguarding, urban planning and decisions about the possible reuse of HBs/sites, the management of buffer zones or the decisions about financial supports to energy efficiency applied to HBs/sites combined with accurate planning of preservation, can be a good way of implementing a multidisciplinary engagement to ensure a more reliable inheritance for future generations.

Multi-Criteria Decision Analyses (MCDA) are instruments used in the management and economical fields.

The MCDA include several methods and the most used are:
• Multi Attribute Value Theory (MAVT)[26];

[25] Culture urban future, global report on culture for sustainable urban development, UNESCO, 2016, http://www.unesco.org/culture/culture-for-sustainable-urban-development/pdf-open/executive-summary_en.pdf [Accessed 17.07.2018].
[26] P. Goodwin and G. Wright. Decision Analysis for Management Judgment, John Wiley & Sons, 1991.

• Analytic Hierarchy Process (AHP)[27]; and,
• Multiple Criteria Decision Making (MCDM)[28].

These methods enable the possibility of combining several expertise and fields, pre-establishing a structure (tree of decision) where the criteria are defined and their balance are pre-evaluated and subsequently divided in more sub-criteria if necessary. These methods have a particular exigence on the pre-established structure of the decision tree to guarantee the best results.

The use of MCDA to HBs/sites and surroundings however is still scarce. The existing limited studies are being made namely to choose which unoccupied HBs/sites have the best location to establish particular new facilities or to choose the best function in the case of a proposed reuse. Improvements to implement specifically MCDA methods for HBs/sites should be pursued.

Indeed, when adopting MCDA methods, the following points need to be taken into consideration:
• Use of specific software: most MCDA methods need them, although others such as AHP can be accessed through methods of analyses;
• Factors of evaluation and types of agreements of scores attribution;
• Type of actors involved and their interrelation with the owners of the heritage places (public, private or non-profit organisations);
• Multi-criteria models that fit to the decision support of the management of HBs/sites: characterisation and evaluation; and,
• Problems in the adoption of multi-criteria models: compromising of the cultural preservation of the HBs / sites.

4.2. Identification of measures for protection and prevention of damage

Urban development and demographical changes together with the major infrastructural works contribute to HBs/sites' losses significantly. Additionally wars and ethnic confrontations are still the cause of colossal damages. Anthropological disasters also include dramatic climate change and the consequences of the world-wide pollution of air, water and land; including the destruction caused by pollution of monuments made of metal and stone which in some cases have deteriorated at a faster rate in the last decades than in the previous centuries (see Figure 3.3). The current threats to our CH are in many ways incomparable to those of earlier times now that we live in a world that has been undergoing faster changes since the last decades of the 20th century. This

[27] T.L. Saaty, Decision Making with Dependence and Feedback: the Analytic Network Process, 2nd edition, RWS, Pittsburgh (USA), 2001.
[28] V. Belton and T.J. Stewart, Multiple Criteria Decision Analysis: an integrated approach. 2ed. Boston: Kluwer Academic Publishers, 2002.

rapid development taking place under the pressures of world population growth and progressive industrialisation leads to an ever-greater consumption of land which risks the destruction not only of buried archaeology but also of entire historic cultural landscapes as well as faster cycles of demolition and new construction with their concomitant burden on the environment. Faced with social and economic changes, HBs/sites that are no longer in use become endangered not only due to their fast rate of deterioration but their possible damage due to neglect. In many countries, not only are the financial resources unavailable to manage such developments so as to respect the cultural continuity of HBs/sites, but sometimes the political scenario does not back the protection of CH. This is clearly seen for instance, when there is no state conservation organisation engaging appropriate experts, no CH protection laws, or legal regulations are not enforced. The continuous loss of CH may be assumed if the public sector is not involved in the protection of CH. Also, without sufficient protection, many archaeological sites are plundered as a result of illegal excavations, and the illicit traffic of archaeological objects and works of art represents a continuous loss of cultural goods that, from the conservation perspective, should be preserved in their original context[29].

4.2.1. Impact of legislation

Good practice is needed to retain the authenticity and integrity of HBs/sites. To achieve this, it is imperative to create a clear structure of responsibilities where legislation and planning are integrated – this is also referred to as integrated conservation. One typical tool in integrated conservation of HBs/sites is to define buffer zones (BZs). UNESCO defines a BZ in paragraph 17 of the Operational Guidelines[30] as "an area surrounding the property which has restrictions placed on its use to give an added layer of protection; the area constituting the buffer zone should be determined in each case through technical studies". Whenever necessary for the proper conservation of a cultural or natural property nominated, an adequate 'buffer zone' around a property should be provided and should be afforded the necessary protection. Details on the extension, characteristics and authorised uses inside a BZ, as well as a map indicating its precise boundaries, should be provided in the nomination file relating to the property in question[31].

The UNESCO, European Council and ICOMOS provide a number of guidelines for the protection of HBs/sites and the philosophy necessary behind the decision of how an intervention (conservation or reuse) should be carried out. Nevertheless, European countries are not obliged to make the transposition of these guidelines to their own legislation; they are free to decide. In this sense, a common legal framework in Europe is not presented. The multiplicity of approaches cannot be assumed as a main threat in itself, although problems arise from the lack of one legal system as it has direct impact on HBs/sites and surroundings. A typical example of this can be seen through the analysis of the definition of BZs in each country. A BZ in France can require an area of 500 meters around a listed HB/site in France, whilst in another country the BZ can be a mere 50 meters (e.g. a common extension of BZ applied in

[29] https://www.icomos.org/risk/world_report/2000/riskindex_eng.htm [Accessed 13.06.2018] and personal notes.
[30] Operational guidelines for the implementation of the World Heritage Convention, UNESCO, 2002: https://whc.unesco.org/archive/opguide02.pdf [Accessed 17.07.2018].
[31] UNESCO February 1996: Information Document Glossary of World Heritage Terms. Merida, Yucatan, Mexico: UNESCO - World Heritage Committee, http://whc.unesco.org/archive/gloss96.htm [Accessed 17.07.2018].

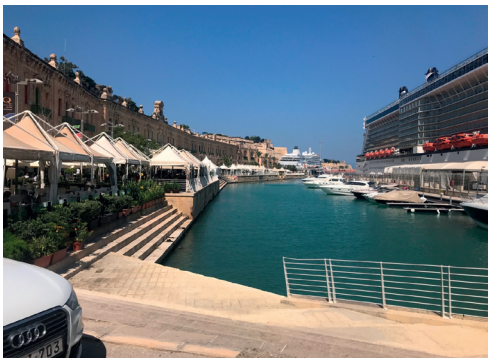
Portugal, nevertheless recent legislation tries to surpass this restriction) or other distances (e.g. in the case of Italy where this definition is established by the Superintendence of CH (Soprintendenza archeologia, belle arti e paesaggio)). Hence it is clear that one country may control a wider area around the HB/site and this helps the preservation of its visual integrity in the surroundings and controls the pressure from urban development in the surroundings. On the other hand, another European country may have to deal with a higher impact from urban development, deal with daily problematics with the management of urban space in order to achieve the same level of protection of the HB/site and integration with their surroundings, and in the way it is perceived by citizens.

Some other differences present in the legislation of European countries should have urgent assessment regarding the impact on the protection of HBs/sites, which are detailed below:
• Old but not listed residential buildings which have an important impact on the urban image where the site is classified. The evaluation is pursued case by case, nevertheless the decision makers do not always have the proper technical and scientific team to support the decision. Due to this, several buildings have been demolished or seriously changed with negative impacts to the historic urban image. An example of how this problem was controlled in Portugal in the past is that several town councils had adopted the idea of employing a multidisciplinary Commission (Cultural Heritage Commission), an independent body of the town councils, to evaluate the individual cases when an owner was requesting the demolition of his/her building in a sensitive area. However, the current situation proves that the increased influence of political decisions overruling the technical or scientific recommendations has led to the extinction of these Commissions. From the analysis of 283 town councils, to date only one has a Commission that still functions as stated above. In a sense this Commission can be assumed to be taking the role of a citizen participation on the decisions of the future interventions of the town they live in.
• Unbalanced dependence on governmental bodies in relation to protection against urban pressures or external economic pressures.
• Legislation about energy efficiency imposing drastic changes on HBs which have irreversible impact on their authenticity and integrity. An example is the application of thermal insulation and the substitution of the old timber windows or doors in the facades without being justified or supported by any evidence.
• European Codes that are not well adapted to the economic reality or social reality of every country or even the specific environmental conditions, imposing drastic changes to the building, in order to accomplish the targets imposed by those Codes.

4.2.2. Impact of urban development and major infrastructure works

Urban development is usually perceived as a risk to HBs/sites. Past and present experiences show negative consequences to HBs/sites due to the movement of population to large urban centres. In some European countries this shift of population occurs mainly in coastal cities while in others the impact is more of the abandonment of rural areas. These combined facts show the huge need of actions at decision levels that are well known but for which solutions are not sufficiently controlled. In some cases tourism is the mechanism that highlights these gaps. In this sense, the following areas to improve should be emphasised:

• European sense of culture that despite the different typologies, respects the culture of other country as its own;
• Territorial management of areas of development, even without borders between European countries, but with solidarity combined with exigence of responsibilities and actions to control the continuous emptiness of some regions and the loss of HBs; and,
• Shared and balanced power of decision between European countries and regions.



(a) Pinto Stores severed from their original context and direct link with Valletta Grand Harbour due to the marina which serves as a cruise liner terminal

(b) View of the road created behind Pinto Stores which caused the demolition of the backyards to Pinto Stores

Figure 4.1. Pinto stores (1752), now known as the Valletta Waterfront, Malta (Case 9), © S. Cefai.

The consequences of major infrastructure works in an urban context must be envisaged in both cases of above ground (roads) and underground (metro, sewage) constructions. In the first case (above ground) they can radically change the context of HBs (e.g. Case 9 Valletta Waterfront, MT – see Figure 4.1, Rome S. Paolo Gates, Bologna S. Donato Gate). In the second case (underground), it is obvious that the testimonies of the past still existing underground are definitively damaged. Severe damages could also be caused to the structural stability of HBs due to the vibrations created by drilling as works are carried out to install the infrastructure (e.g. Rome HBs/ sites along the new metro C line – see Figure 4.2). Such works require prior consolidation works and consequent need of more funding.

Figure 4.2. Reinforcement of Basilica of Emperor Massenzio along via dei Fori Imperiali during the construction of metro C in Rome, © L. Migliorati.

Other negative impacts are due to greater pollution caused by traffic.

In rural context major infrastructural interventions (e.g. building motorways or widening of regional roads) or any interventions towards industrialisation or land allotments, involving the areas close to, or around HBs/sites, may cause their structural damage. Such interventions are also frequently associated to negative impact to the landscape surrounding HBs/sites and their access (e.g. Medieval church on Via Salaria near Rieti, Villa dei Volusii near Rome, new allotments near the Imperial Villa of Hadrian Emperor (see Figure 4.3); even if the last two cases had a positive issue at the end of a long period of debates). As mentioned before, proper BZs would prevent these damages (see section 4.2.1). Another way to intervene would be to stop any property speculation within sensitive HBs/sites and their surroundings.

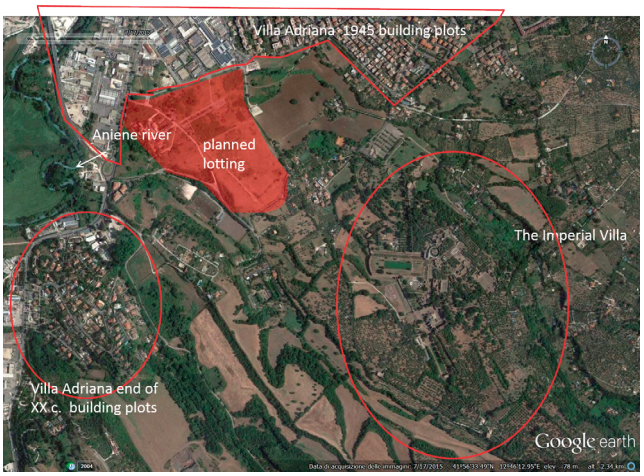


Figure 4.3. Existing building blocks and planned new ones (abandoned since) around the Imperial Villa of Hadrian Emperor, Villa Adriana, Tivoli, Rome, © Google earth, modified by L. Migliorati.

4.2.3. Impact of demographical changes

The decrease of the population and the lack of balanced integration of newcomers (migrants, tourists) completes the difficult scenario described above. The following areas to improve should be emphasised:

• Accurate strategy of integration of newcomers, which should involve the respect of European culture (local or global); and,

• Monitoring demographical changes in European regions is crucial to understand how HBs/sites will be perceived in the future or managed under changes in the urban culture.

4.2.4. Impact of natural hazards

Humankind's built heritage has always been threatened by the consequences of earthquakes, typhoons, hurricanes, floods and fires. One example of recent earthquakes which left drastic damage on EU HBs, happened on 6th April 2009 in L'Aquila (see Figure 4.4) and nearby villages and small towns in the Abruzzi region[32].

[32] M. Leus, Dimensions of performance as a revitalisation strategy for Castelvecchio Calvisio in: R. Crisan, D. Fiorani, L. Kealy, S.F. Musso (ed.), Restoration/Reconstruction. Small Historic Centres. Conservation in the Midst of Change, EAAE Transactions on Architectural Education no 64, EAAE, Hasselt, Belgium, 2015, 379-385.

Figure 4.4. The church of S. Maria Paganica in L'Aquila after 2009 earthquake, © Direzione Regionale Abruzzo.

Such events exposed the urgency to re-think the methodological and technical approaches to seismic vulnerability of HBs, on the grounds of the adverse impact induced by the inadequacy of preventive measures applied in the past often too intrusive, cost-inefficient and unreliable. A new integrated methodology was developed within the European project NIKER[33], which establishes a wider, multi-disciplinary framework of activities including essential steps complementary to the execution of interventions. Such a methodology formalises four different interrelated phases namely the investigation, intervention, evaluation, and management phases. The aim of the project was to develop and validate innovative materials and technologies for systemic improvement of behaviour of CH construction. NIKER outputs include the creation of a database relating damages, components/materials and techniques for intervention; experimental testing, numerical simulation, parametric modelling and derivation of design methods; the development of knowledge-based assessment procedures and final validation of the entire methodology with real case-studies; and, the exploitation of project results in formal guidelines intended for the end-users.

Flooding is one of the most significant risks to HBs which results from the negative impact of climate change, as well as man-made induced changes in the landscape (ex: extensive areas of waterproofed soil) without predicting impacts in unusual heavy rain episodes. Many HBs/sites are in areas where there is a chance of river or coastal flooding. They are even more at risk from flooding of surface-water, groundwater or sewers. Therefore, special care should be given to prevent flooding. This can be done through the application of flood-resistance and flood-proofing measures. It is suggested that a flood-protection survey should be carried out at least once per year. One example of protection against flooding is the rampart of the Belgrade Fortress (Case 7 Kalemegdan, RS) built on the river side as early as the beginning of the 16th century and rebuilt in the 17th century (Figure 4.5).

[33] www.niker.eu [Accessed 13.06.2018].

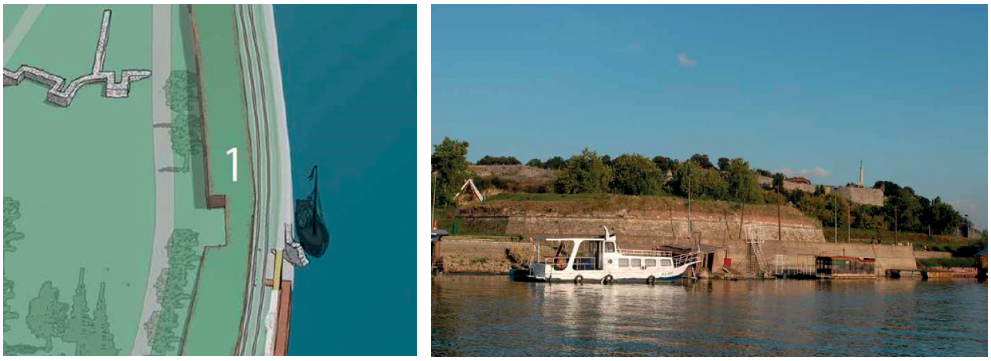


Figure 4.5. Riverside Rampart of Kalemegdan, © Institute for the Protection of Cultural Monuments of the City of Belgrade.

4.2.5. Impact of technological (man-made) hazards

Technological (man-made) hazards include vandalism, armed conflicts, gas explosion, bomb threats, etc.

After the destruction of World Heritage sites during the war in former Yugoslavia in the 1990s, the Iraqi invasion of Kuwait (1990) and the first Gulf War (1991), the 1999 Second Protocol to the Hague Convention of 1954 introduced the notion of enhanced protection for CH of the greatest importance for humanity. The Second Protocol entered into force in 2004[34] clarifies states' duties during peacetime concerning the safeguarding of collections and inventories to facilitate their recovery; planning of emergency measures; and legal instruments on removal for protection and responsible bodies.

A question is raised as to whether the consequences of the armed clashes are so specific that they should be separately treated. Are or are not the consequences from war devastations similar or the same as the consequences from earthquakes and catastrophic fires as far as the CH is concerned? We might certainly find some differences in the consequences because the causes are different, i.e. the forces destroying the CH are different. However, when damage or destruction of HBs is considered, the reason does not play a primary role anymore. The consequences are the same and so are the problems and the activities for repair and/or reuse, conservation and restoration of the HBs.

Measures to be taken for the reduction of the consequences should be divided into three main phases (Figure 4.6):
- Phase 1: Emergency measures and action during the disaster.
- Phase 2: Planning and measures after disaster (action plan).
- Phase 3: Long term protection of HBs.

[34] https://treaties.un.org/Pages/showDetails.aspx?objid=0800000280076dd2 [Accessed 17.07.2018].

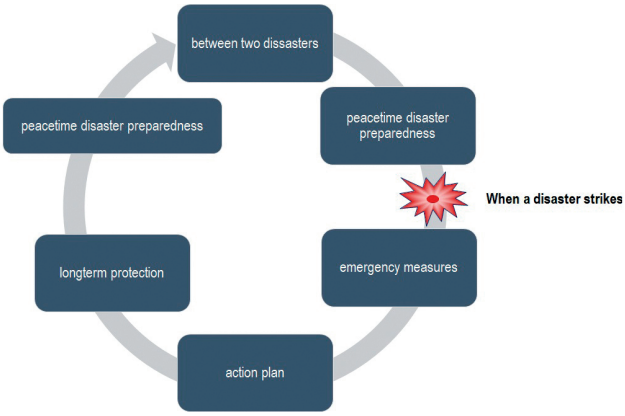


Figure 4.6. The three phases in the CH protection process after the disaster strikes[35].

4.2.6. Impact of bio-deterioration

Microorganisms (fungi and bacteria), in addition to lichens and insects, cause problems in the conservation of HBs because of their bio-deteriorative potential. The variety of bio-deterioration phenomena observed on heritage materials (stone and wood, mural paintings, objects exhibited in museums and libraries, as well as human remains and burial-related materials) is determined by several factors, such as the chemical composition and nature of the material itself, the climate and exposure of the object, and the manner and frequency of housekeeping. In the case of HBs/sites, the danger of fungal attack can be reduced by suitable design features to minimise prolonged dampness. The three design features to be considered usually are: (1) suitable drainage of rainwater, (2) avoidance of condensation from moist, warm internal air, and (3) avoidance of the slow diffusion of water rising from the soil. In general, no conservation project is possible if the appropriate attention to prevent bio-deterioration is not paid.

Several EU-funded projects which ve covered bio-deterioration issues include: EC-funded BACPOLES program (EVK4-CT-2001-00043)[36], aiming to prevent bacterial decay of wood in foundation piles and archaeological sites; COST Action E37 'Sustainability through new technologies for enhanced wood durability'[37], concentrating on the contribution of wood durability to sustainability through the development of systems for quality assurance and performance classification of modified wood as alternatives to wood treated with traditional wood preservatives; EC-funded NOAH'S ARK project (2004- 2007), establishing meteorological parameters and variations which affect in a critical way the material heritage environment[38], and proposing a new improved climate risk index for wood exposed to the outdoor weather to determine real moisture penetration depth resulting in real volumes of fungal

[35] B. Feilden, Between Two Earthquakes, joint publication of ICCROM and the Getty Conservation Institute, 1987, http://d2aohiyo3d3idm.cloudfront.net/publications/virtuallibrary/089236128X.pdf [Accessed 16.06.2018].
[36] https://www.researchgate.net/publication/236846227_Final_report_EU_project_BACPOLES [Accessed 18.07.2018].
[37] http://www.cost.eu/COST_Actions/fps/E37 [Accessed 18.07.2018].
[38] https://www.ucl.ac.uk/bartlett/heritage/research/projects/project-archive/noahs-ark-project [Accessed 18.07.2018].

infestation; and, COST Action IE0601 'Wood Science for Conservation of Cultural Heritage (WoodCultHer)'[39], aiming to improve the conservation of wooden CH by increasing the interaction and synergy between wood scientists and other professionals applying wood science and technology towards the study, conservation and restoration of wooden artefacts of artistic or historic interest.

4.2.7. Risk assessment (indicators) and emergency reaction plan

The European and United Nation strategy for Disaster Risk Reduction, based on the Sendai Framework principles[40], is strongly pushing the application of risk indicators for the protection of HBs/sites against natural hazards. A huge effort is now being made at the worldwide level to create rules to shape common risk indicators. On 6th December 2017 in Bonn, the United Nation Office for Disaster Risk Reduction (UNISDR) organised the launch event of the Sendai Monitoring Process. During the event the need to have proper risk indicators for CH, in particular related to potential economic losses, was greatly pronounced. The event also launched a document released in November 2017, an operational guidance to create risk indicators validated both at the European Commission and United Nations levels. The document is named 'Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction', and contains a number of practical risk indicators which are coherent with the global strategy[41].

The risk indicators are specifically structured to achieve the targets prioritised in the Sendai Framework, in particular:
• Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015 (Target 'A');
• Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015 (Target 'B'); and,
• Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030 (Target 'C').

4.3. Optimised management

4.3.1 Structure of responsibilities and inter-organisational coordination

Each European country has its own rules and it is important to define an appropriate legal structure to the HB/site. The legal structure chosen will result in specific funding possibilities. For instance, in France, when owners of a private HB have constituted a family real estate company, any association created to support the action of this HB such as the association

[39] http://www.cost.eu/COST_Actions/mpns/IE0601 [Accessed 18.07.2018].
[40] https://www.unisdr.org/we/coordinate/sendai-framework [Accessed 13.06.2018].
[41] https://www.unisdr.org/files/54970_techguidancefdigitalhr.pdf [Accessed 18.07.2018].

of the Friends of the HB cannot be recognised to be of public interest. Therefore, donations cannot benefit from tax deductions.

The management of a HB/site is a job. Indeed, a sustainable HB/site project is often the result of the proactive role of the owners/managers. Public national HBs/sites tend to be managed by CH professionals. However, this is not the case for private HBs/sites. Private HBs/ sites tend to try to achieve an economical balance whatever the quality of the information given to the public visiting HBs/sites is. In many cases, the number of visitors is considered as a mark of the success of a project instead of the quality of the activities provided. Statistics at local and regional levels reinforce this impression. Since these statistics are used by politicians to develop certain economic sectors, owners/managers of HBs/sites have a tendency to increase constantly the number of their visitors at the expense of the quality.

Today there is no official evaluation of the quality of activities a HB/site can propose. Professionals of the heritage sector have to rely on social media (such as Google, Trip Advisor) which provide some feedback from the visitors. However there is a demand from CH professionals for an institution to develop a classification that would highlight the pros and cons of HBs/sites' engagement activities. This classification would encourage the search for quality and the collaboration between partners who today compete for resources (e.g. funding) on different criteria.

4.3.2 Optimised documentation and monitoring

If basic documentation of a HB/site exists, further scientific information (reports, thesis, articles, archival documents, photographic surveys, movies, etc.) should be made available online. The visitors would then have a better awareness of the historical importance of the HBs/sites visited.

HBs/sites suffer from wars, natural disasters, passage of time and human negligence. The need for their systematic documentation is well recognised from international organisations, such as ICOMOS, CIPA (the International Committee for Heritage Documentation), the International Society of Photogrammetry and Remote Sensing, the World Heritage Center and UNESCO. The documentation of HBs/sites and monitoring of their condition are related to the systematic recording and visualisation of their elements that reliably define the geometric form and location of its indiviual parts at a given point in time. They are critical for their effective management and preservation through time[42] [43]. An important issue is that all the characteristics that make an object unique (not only architectural, but also historical, social and artistic) in a HB/site should be documented.

The importance to assess the condition of HBs/sites and pass them on to future generations

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[42] P. Patias, Cultural Heritage Documentation, The Aristotle University Faculty of Surveying Engineering, Commission VI Special Interest Group "Technology Transfer Caravan", International Summer School "Digital Recording and 3D Modelling", Aghios Nikolaos, Crete, Greece, 2006.
[43] P. Patias, Cultural Heritage documentation. In: Fryer J, Mitchell H, Chandler J (eds) Application of 3D measurement from images, vol 59(3). Whittles, Dunbeath, 2007, 225– 257.

"in the full richness of their authenticity" is stressed in the Venice Charter (1964)[44], including monitoring the threats and their impact on the HBs/ sites; and, the rate and the causes of their deterioration. This requires the support of the use of appropriate documentation methods[45] [46]. The most common ones include the capture of digital data and the use of 3D measurement technologies for mapping the HBs/sites. These include photogrammetry and terrestrial laser scanning. They capture three-dimensional shapes, points, and to some extend the colour of the textures. The data produced can be accurate and in high resolution, three-dimensional, georeferenced and in small and large scales. These technologies can also be used to train emergency operators in safe environment. They are penetrating the market more and more. The final product of such documentation should be organised in inventories and provide information for the understanding and interpretation of the HBs/sites by the wide public and promote the latter's active involvement to the CH experience.

4.3.3 Maintenance plan and monitoring: guidelines

Maintenance and periodic controls play a key role in conserving built CH since identifying damage in its early stage is crucial to avoid irreparable losses, to preserve the integrity of the building and to reduce the costs of intervention. A maintenance plan, which sets a long-term routine of management and care, is therefore essential. Because of the specific features that make historical heritage different from the recent constructions, it is necessary to develop a specific approach and tools to ensure a proper intervention.

The preventive conservation approach, widely established in the field of museums and movable works of art, is now being applied to architectural heritage, and the opportunities for research and discussion on prevention have also multiplied in that field.

On that topic a UNESCO chair on Preventive Conservation, Monitoring and Maintenance of Monuments and Sites, has been established at the Catholic University of Leuven[47], in March 2009 and confirmed until 2020.

In the last 20 years two main approaches to the maintenance of HBs have been developed and tested:

• Prevention through screening (based on inspections and controls - the 'Monumentenwacht' approach)[48]. In this approach an independent advisory body performs periodic inspection on the building, giving advice to the owners/managers that join the program on voluntary basis.

• Prevention through planning. In this approach a 'conservation/ maintenance plan' is pre-

[44] https://www.icomos.org/charters/venice_e.pdf [Accessed 18.07.2018].

[45] P. Patias, P. Grussenmeyer and K. Hanke, Applications in Cultural Heritage documentation. In: Advances in photogrammetry, remote sensing and spatial information sciences. 2008 ISPRS congress book, vol 7, 2008, 363–384.

[46] P. Patias, Overview of applications of close-range photogrammetry and vision techniques in architecture and archaeology. In: McGlone C (ed) Manual of photogrammetry, vol 59 (3). American Society of Photogrammetry, Maryland, 2004, 1044–1050.

[47] https://set.kuleuven.be/rlicc/research/precomos [Accessed 13.06.2018].

[48] http://www.monumentenwacht.be/en [Accessed 13.06.2018].

pared that entails an accurate description of the state of conservation of the building (that also includes monitoring) and a comprehensive evaluation of risks and intervention priorities.

Examples of some EU projects in relation to these topics are as follows:
• EPICO - Preventive Conservation in Historic Houses and Palace-museums – methodologies and applications[49]. The project EPICO (European Protocol In preventive Conservation) aims at defining a strategy of preventive conservation for the collections that are hosted in a HB or that are part of the HB itself, such as furniture, art objects, paintings, sculptures and textiles. The expected outcome of the project is to collect and compare best practices and experiences that can be transferred to other similar cases.
• HeritageCARE - Monitoring and preventive conservation of historical and Cultural Heritage[50]. The HeritageCARE project is part of the Interreg-SUDOE program. Its aim is to implement a system for the monitoring and preventive conservation, starting a non-profit entity in charge of periodic inspections, according to the Monumentenwacht model; involving the owners and the general public in heritage conservation is of outmost importance, due to the strong connection between the social, cultural, environmental and economic impacts of heritage conservation (see on that point also the report Cultural Heritage Counts for Europe, 2015[51]).

4.3.4. Engagement of locals and stakeholders

In general term, "stakeholders are individuals or groups with an interest in HBs/sites and their surroundings because they are involved in the work or affected by the outcome"[52]. There are eight common key stakeholders involved in the protection and conservation of HBs[53] [54]: (1) national/central government, (2) regional / local government (authority), (3) non-governmental organisations, (4) building owners (e.g. public, private), (5) contractors / subcontractors / specialists, (6) public / local community / citizen, (7) professional associations, and (8) research and teaching organisations (e.g.universities). "Engagement" signifies all of the things we might do with stakeholders such as consult, listen, understand, communicate, influence and negotiate with the broader objectives of satisfying their needs, gaining approval and support, or at least minimising their opposition or obstruction. Stakeholder management is defined as "the systematic identification, analysis, planning and implementation of actions designed to engage with stakeholders"[55]. Stakeholder engagement is complex, given the potential uncertainty and ambiguity of how each stakeholder views and reacts to a project.

[49] https://chateauversailles-recherche.fr/english/research/other-research-programmes/preventive-conservation [Accessed 13.06.2018].
[50] http://heritagecare.eu [Accessed 13.06.2018].
[51] http://blogs.encatc.org/culturalheritagecountsforeurope//wp-content/uploads/2015/06/CHCfE_FULL-REPORT_v2.pdf [Accessed 13.06.2018].
[52] APM (Association of Project Management). APM Body of Knowledge, Buckinghamshire, UK, APM, 2012.
[53] S. Lu and G.M. Merkurjeva (eds.), WG4 Social Dimension of Heritage Buildings: Year 1 Interim Report - Social Engagement in Heritage Buildings: Country Perspective, Brussel, Belgium: European Cooperation in Science and Technology (COST), 2016.
[54] Thanks particularly go to the individual country contributors: Dr Olga Kvasova (Cyprus), Giovanna Patti (Italy), Dr Marina Mihaila and Cristian Banica (Romania), and Dr Öget Cöcen (Turkey). Without their input, Year 1 Interim Report for Working Group 4 - Social Engagement in Heritage Buildings would have not be possible.
[55] RICS (Royal Institution of Chartered Surveyors). Stakeholder Engagement. RICS Professional Guidance, UK. 1st ed. London, 2014.

Key challenges in engaging with key stakeholders in HBs/sites and their surroundings
The following lists the key challenges in engaging with key stakeholders in HBs/sites and their surroundings:
• Lack of communication strategies. Poor communications is cited as an issue most pertinent to individuals who feel excluded from the heritage, in particular at local areas[56];
• Lack of the younger sections of the population engaging with HBs/sites[57];
• Lack of financial capital to support stakeholder engagement activities, e.g. the cost of maintaining access to social media platforms; and,
• Lack of the necessary "heritage skills" to effectively investigate, manage and conserve the HBs/sites[58], especially those with an understanding of funding issues.

Methods used to engage with key stakeholders in HBs/sites and their surroundings
There are a number of methods by which an effective engagement with key stakeholders, particularly the public/ locals in HBs/sites and their surroundings can be achieved[25]. The adoption of these methods can however vary according to circumstances and site characteristics, e.g. site size, ownership, location. The following lists methods which are commonly used.
• Dedicated websites play a significant role in promoting the HBs/ sites and in communicating information to the key stakeholders, in particular the public about HBs, e.g. site history, past activities, virtual tours, forthcoming events, on-line resources. Among our nine case studies, five cases (i.e. Case 1 Germolles, FR; Case 5 Santa Maria la Real, SP; Case 6 Lamot, BE; Case 7 Kalemegdan, RS, and Case 8 Romanesque route, PT) have their dedicated websites with different purposes. For example, Case 1's website[59] appears to be built to simply provide site information to its visitors in comparison to Case 8 which further provide a thematic website[60] which provide further publications to be downloaded, e.g. independent of specific technical solutions. There are some cases where HBs/sites are promoted through a wider network partnership at the local, regional and/ or national levels. For example, in Italy, websites of the Regional CH Directions (Archaeology and Architecture) operate always within the frame of the Ministero per i Beni e le Attività Culturali (MIBAC). Furthermore, there are also town councils websites with pages dedicated to CH in the municipality. In the case of Case 2 Temple-Cathedral, IT in Pozzuoli, it is promoted by Campania Region website. In contrast, lack of dedicated websites appears to constrain HBs/ sites' visibility to the public (i.e. Case 4 Baroness' House, SI).
• Social media has been demonstrated to be a popular method in terms of communicating information to the public about HBs/sites[25]. Real-time interaction using social media applications such as Twitter, Facebook, blogging websites, WhatsApp, YouTube, has made communication and dissemination of information very effective and it is a two-way flow of information. For example, Case 8 Romanesque route, PT, simple supports as the passport (as small booklet) with a very brief information of each of the monuments to be revisited is one of the

[56] HLF: Heritage Lottery Fund. (2003). Making Heritage Count? Research study conducted for English Heritage, Department for Culture, Media and Sport and the Heritage Lottery Fund.
[57] D. Bradley, M. Coombes, J. Bradley and E. Tranos, Buildings, monuments and spaces that are important to young people and the contribution of the historic built environment to young people's sense of place, report, 2011.
[58] English Heritage, Heritage Counts 2013 - Skills in the Historic Environment Sector, Hybert Design, 2013,
[59] www.chateaudegermolles.fr/ [Accessed 13/05/2018].
[60] http://www.rotadoromanico.com/vEN/CentreforStudies/Editorialline/Paginas/EditorialLine.aspx [Accessed 13/05/2018].

strategies used to help visitors establishing their own route to visit inside the main Route. An example of the use of this information and also the map in the website are the several blogs of motorcycle groups that proposed their own routes inside the Route of Romanesque. Similarly, Case 7 Fortress of Belgrade, RS is well presented on the web page of the Public Enterprise 'Belgrade' Wikipedia and tourist internet sites (e.g. TripAdvisor, Lonely Planet) and social networks (e.g. Facebook, Instagram).

• Printed resources such as tourist brochures, newsletters, flyers and advertisements in local newspapers have formed a key part of communication strategies to encourage people to engage with HBs/sites and their surroundings. The importance of touristic brochures to be available particularly was highlighted (e.g. Case 7 Fortress of Belgrade, RS). It can be argued limited touristic brochures might constrain HBs' visibility to the public (e.g. Case 3 Tvrđa, HR). More specifically, Case 8 Romanesque route, PT, further developed several supporting materials to engage with younger sections of the populations such as 7 board games for children (some of them based on medieval games or with some emblematic image of the site), 3 activity books, 1 youth guide and 6 documentaries. The UK Heritage Lottery Fund (2003) further indicate that there is a need for communications to become more visible to the local communities, such as public notices and leaflets that could be distributed throughout the local community, in places of worship, education facilities, and community centres. It is argued that by access and engaging the local community, HBs/sites can be saved as they benefit the local community.

• Exhibitions/events, such as history event days, open days, cultural events, archaeology days/tours, European Heritage Days, have been recognised as a key method to engage local communities and individuals with HBs/sites. HBs/sites are good storytellers. People can have a brief idea of the function of the building by walking around the building and to discover the culture, hidden value, past human activities and history of a place by stepping through inside. Exhibitions/ events can be promoted at the national and individual HB/site levels. At the national level, in Italy, for example, both the Fondo Ambiente Italiano (FAI)[61] and Archeoclub d'Italia[62] manage cultural events and, in special occasions, open places of interest usually closed to public. At the individual HB/site level, for example, the museum of Case 5 Santa Maria la Real, SP is an exhibition centre of the Romanesque art, where more than ten types of visits are carried out. At the same time, the museum also works as a window to the territory that surrounds it, which is a really rich area in Romanesque art, organising routes and other types of activities. Similarly Case 1 Germolles, FR has setup an event named 'a Middle Age air' which shows the poetry of the end of the 14th century in France (middle of the 100 years war between France and England) through different artistic activities (such as theatre, tales, children workshops, food tasting). For instance, Case 7 Fortress of Belgrade, RS periodically organises free-of-charge archaeological tours for visitors with a special overview on interesting places on the Belgrade Fortress (e.g. the remains of Despot Stefan Lazarević Castle) and on the latest archaeological localities. Similarly, Case 8 Romanesque route, PT has organised

[61] FAI (Fondo Ambiente Italiano) (https://www.fondoambiente.it/) is a non-profit foundation founded in 1975, on the model of the UK National Trust, with the aim of protecting and enhancing the Italian historical, artistic and landscape heritage. The aims of FAI are taking care, for the generations of today and tomorrow, of special places of Italy; educate to the knowledge and love of historical and artistic heritage and landscapes of Italy; watching on the protection of the landscape and cultural heritage; and translating into reality the Article 9 of Italian Constitution [Accessed 09/09/2018].

[62] http://www.archeoclubitalia.org/ [Accessed 09/09/2018].

over 350 events between 2008 and 2015, involving several cultural fields (such as theatre, music, dance, workshops, exhibitions), artistic performances, the communities and the local intangible heritage to promote culture heritage. According to the UK Historical England (2015), participants from the open days felt that they had learnt something new about UK's culture, history or heritage, and it had made them feel more part of the local community.

• Volunteering to care for the HBs/sites has been identified as an important engagement mechanism. Volunteers provide an essential link to the local community and offer opportunities to develop skills and competences. For example, in Case 8 Romanesque route, PT where volunteer interpreters from the region are recruited to help in the accompaniment of visitors.

• Education (formal and informal) links to local schools are identified as a key mechanism to increase participation among children and young people. HBs/ sites are the living history which act as an educational resource for teaching the history and culture of a place. For example, Case 8 Romanesque route, PT's education services have promoted over 500 activities between 2010 and 2015, which involved over 800 teachers and 15,000 students of local schools. Figure 4.7a shows a site visit to the Reading Abbey Quarters[63], UK which was specifically targeted at local students, organised by the Chartered Institute of Building[64] and the CRL Restoration (the main contractor). The visit helped local students learn about the preservation and conservation of HB/sites, and increased their enjoyment and appreciation of the site.

• Large communal spaces offered by HBs/sites which public and community can use. Many listed churches in the UK now offer large communal spaces which the public and community can use which help to develop the necessary business case to preserve them[65].

• Being part of wider partnership network helps to support the cultural and touristic promotion of the site. For example, Case 1 Germolles, FR is a partner of the 'Châteaux de Bourgogne du Sud' and 'Route des Ducs de Bourgogne', two networks of châteaux open to visitors in South Burgundy. Therefore Case 1 appears on touristic brochures of these networks that are available on site and distributed to visitors. Another example is the management entity for Case 8 Romanesque route, PT is the association of Valsousa which is a joint management bodies by six municipalities.

(a) Site visit to Reading Abbey Quarters, UK, © S-L. Lu

(b) STSMs at Case 1, © E. Mère (JSL)

Figure 4.7. Examples of how HB/sites engage with locals and stakeholders.

[63] https://www.readingabbeyquarter.org.uk/ [Accessed 24/07/2018].
[64] The Chartered Institute of Building (CIOB) (http://www.ciob.org/) is the world's largest and most influential professional body for construction management and leadership [Accessed 13.06.2018].
[65] E. Waterton and S. Watson (eds.), Heritage and Community Engagement: Collaboration or Contestation? Oxon, UK: Routledge, 2011.

Each method identified above has an overlapping relationship with the others and this interplay reflects the nature of trying to engage with stakeholders in a holistic fashion, namely: there is no single answer or approach and the influence of one cannot be considered without impacting the other. Effective stakeholder engagement is about two-way communication and engagement methods are used to complement to each other. For example, the use of events (e.g. archaeology tours) complement the reading of HBs/sites in their surroundings in printed resources (e.g. touristic brochures).

Indeed, there are other innovative engagement mechanisms which have been demonstrated as successful. For example, during this Action project duration, a number of HBs (e.g. Case 1 Germolles, FR; Case 2 Temple-cathedral, IT; Waterfront, MT) had been specifically used as 'physical space' to host 'short-term scientific missions' (STSM) – a COST Action network tool; or used as a locus point to engage with the selected HBs'/ sites' key stakeholders. Taking Case 1 as an example, the key stakeholders within that particular region responsible for the protection, preservation, promotion, management, touristic strategies and funding were identified and interviewed. The use of STSMs in this case demonstrated as a valuable engagement mechanism for Case 1 to engage with their key stakeholders (Figure 4.7b). For instance, during the construction of the UK Crossrail project (a new 118 kilometres metro railway running across London), Crossrail undertook one of the most extensive archaeological programmes[66] in the UK, which has gone beyond conventional / traditional view of stakeholder engagement and created a new set of clients, users and beneficiaries (e.g. long-term legacy, soft benefits, knowledge creating and sharing).

HBs/sites have played an increasingly central role in the delivery of a wide range of public benefits, including education, economic development, sustainable growth, urban and rural regeneration, and repopulation of inner-city areas, improved competitiveness, and cultural development[67]. There is no doubt that numerous methods and tools used to engage the key stakeholders, in particular, the public with HBs/sites has led to growing evidence that people are participating in heritage more, by visiting sites, donating money or volunteering time to support heritage organisations[68]. These engagement activities have further enabled people to recognise the social benefits that HBs/ sites can provide, and has made them an important aspect of today's society through recognition of these benefits[69].

[66] http://www.crossrail.co.uk/sustainability/archaeology/ [Accessed 30/07/2018].
[67] IHBC (Institute of Historic Building Conservation). Valuing Historic Places, 2017, http://www.ihbc.org.uk/policy/docs/IHBCValuingHistoric.pdf [Accessed 13/05/2018].
[68] Historic England, Heritage Counts 2014: The Value and Impact of Heritage, 2014, https://content.historicengland.org.uk/content/heritage-counts/ pub/2190644/value-impact-chapter.pdf [Accessed 14/05/2018].
[69] Historic England, Heritage Counts 2017: Heritage and Society, 2017, https://content.historicengland.org.uk/content/heritage-counts/pub/2017/ heritage-and-society-2017.pdf [Accessed 13/05/2018].

4.3.5. Tourism as a tool and resource

The management of tourists on HBs/ sites, a city or a region is not only the responsibility of the owners/managers but also of tourist offices and agencies of tourism at local, regional and national levels. Tourism and CH objectives do not always exist in harmony. Therefore, it is important that owners/managers of HBs/ sites meet tourism professionals regularly to develop common strategies. Today in the absence of any classification of HBs/ sites as regards the quality of activities proposed, it is difficult for the tourism professionals to recommend certain sites or others depending on what a tourist really wants to discover.

HBs/sites and cities are sometimes exposed to mass tourism. Applications have been developed to visit certain cities (Barcelona[70] and Malta[71]) and avoid, when possible, crowds of tourists.

4.3.6. Funding and share resources network

Good practices in the use of public funding

Only public HBs/sites are concerned today since public funding cannot be used for the management of private properties. Some initiatives have been developed recently to support private HBs/sites such as *Donation factory*[72]. Donations can be done on site, just after a visit and benefit from tax deductions.

Compilation of good practices of sharing resources network

HBs/sites are keen to setup collaborative tools (e.g. touristic routes, packages) to offer the visitors reduced entrance fees. Tourist routes are particularly interesting for visitors who do not know well the close surroundings of HBs/sites which might offer enlarged possibilities of visits.

4.4. Classification of interventions

Technology is linked to material employed in interventions on HBs/sites. In the past years innovative materials have been invented such as artificial stone, composite which can be used in different types of action on HBs/sites; but caution in using them is needed since consistency with traditional materials and building techniques, reversibility or durability has not yet been assessed. The implication is that it is needed to entrust work to specialised companies.

Technology applied in conservation/ rehabilitation/reconstruction should be the nearest to the original one even with differences in materials. Technology should take the following into account: (1) materials behaviour and their interaction (e.g. chemical and physical stability under temperature stress and prevailing wind); (2) the interaction with the original structure

[70] http://www.barcelonaturisme.com/wv3/en/page/1464/mobile-apps.html [Accessed 13.06.2018].
[71] http://www.visitmalta.com/en/mobile-apps [Accessed 13.06.2018].
[72] https://donation-factory.com/en [Accessed 17.07.2018].

(e.g. load balanced to the HB/site - see Figure 4.8); and (3) the relation of HB/ site and its surroundings (e.g. colour, design in case of reconstruction).

A precautionary action should be the water disposal system. A topic related to conservation is the covering of ruins to avoid continuous deterioration from wind, rain or temperature range. Coverings of archaeological areas always have a visual impact in the urban or rural context (see Figure 4.9); it should be identified the most adequate insertion into the surroundings, ensuring protection (atmospheric agents and sun) and maintenance. Any action is connected to the economic impact.

Figure 4.8. The restoration of the 1970s in Roman Theatre, Teramo, Italy did not consider that modern bricks integrating gypsum-sandstone blocks were too heavy and would detach, © L. Migliorati.

(a) The covering in Trajan Imperial Villa, Arcinazzo, Rome gives an idea of the volume of the halls, © C. F. Giulian

(b) The covering of the ancient temple in Castel di Ieri, L'Aquila, Abruzzo, Italy, originally located in a rural environment, re-proposes the monumental nature of the original structure, © L. Migliorati

Figure 4.9. Examples of covering of archaeological areas.

4.5. Visualisation, preservation and dissemination

Among best practices, we already mentioned a good signage of HBs/sites and their respectful illumination (see section 3.1.6), but other innovative tools can be used as discussed below.

4.5.1. Digital technologies to support cultural and touristic dissemination and highlight the heritage value

Digital technologies such as 3D reconstructions, augmented reality (AR) or virtual reality (VR) are making it possible to travel though time, to experience famous or less known historic sites, especially those which do not exist anymore, or are seriously endangered or not accessible. At the same time, digital technologies allow us to be intellectually and emotionally stunned by this cognition. Indeed, digital technologies are powerful tool for transferring historical, cultural and other CH values to the public. Based on examples of well-known heritage sites such as Domus Aurea (mid-first century A.D.) in Rome, Italy; Cluny abbey (11th century and later) in France; Spanish Royal Palace El Pardo (15th century and later) near Madrid; or Case 1 Germolles, FR in addition to results of a questionnaire reporting the use of digital technologies on twenty two HBs/sites from eleven European countries and Israel[73], the following present the advantages and challenges of using such tools as well as recommendations for their optimised usage.

Advantages

Digital technologies help in the valorisation, preservation and experiencing of HBs/ sites. The better understanding of heritage and simultaneously to its appropriate valorisation and preservation is traditionally performed through historical documentation and education. As confirmed by the results of the questionnaire, the same can be achieved in a modern way using AR and especially 3D reconstructions[74] (73% of the examples of the questionnaire). Precise digital documentation is valuable for reconstruction purposes and for keeping information on historical sites, particularly when they are in danger of decay or disappearing. In addition, education about heritage is important in order to build a sense of identity, ownership and responsibility[8] and is seen as a key factor for the preservation of heritage. 32% of HBs/sites analysed within the questionnaire use digital technologies as interpretative media for education and entertainment. These emerging educational tools have a lot of potential that should be better exploited. Only continuous rethinking of CH and innovative approach to cultural identity, especially for cultural and touristic purposes helps in keeping an interest for National/European/World heritage and supports its preservation. Furthermore, modern technologies represent added value in understanding HBs/sites. Indeed they facilitate that

[73] Authors of this paper would like to express very great appreciation to all contributors for feedback given in questionnaire initiated within Topic 3. B.3: "Virtual HBs / sites – augmented reality and 3D reconstruction" of COST Action TD1406 "Innovation in Intelligent Management of Heritage Buildings (i2MHB)".

[74] M. Turkalj Podmanicki, T. Podmanicki, Digital Tvrđa. New ways of representing historical buildings/Digital Heritage Sites – Representing Historical Buildings Via Mobile Application on Example of Osijek's Fortress Tvrđa (Croatia) // Abstracts of IV. Encuentro Internacional de Investigadores en Historia del Arte Digital, Malaga, Spain, 2016, 61-64.

the numerous and versatile results of scientific research on HBs/sites become accessible to a large number of people[75]. All respondents to the questionnaire think that these tools are added value to HBs/sites and their surroundings and 82% respondents agree these tools enhance the cultural identity of the local community. AR or VR, often combined with 3D reconstructions, provide an entirely new experience of CH (63%). Sites such as Domus Aurea and Cluny are examples of best practices. In Domus Aurea an implementation of VR and video narration brings the visitors 2000 years back in time and authentically shows the vast luxuriant palace built by Roman emperor Nero as it might have been. VR glasses are a good solution since they provide a feeling of real involvement of the visitor in an experience of time travel. In Cluny tablets allow the visitors to discover the medieval town through its extensive interactive content, including augmented reality views with 3D visualisations of the lost abbey church from which today only 8% remains (Figure 4.10a).

(a) Use of a tablet in Cluny to visualise lost sections of Cluny abbey, © C. Degrigny

(b) Indoor use of a tablet at Germolles to further understand the meaning of wall paintings (reproduction of green fields) versus the location of the château in its rural environment, © C. Degrigny

Figure 4.10. Examples of the use of digital technologies to support cultural and touristic dissemination.

Challenges

Because CH is a significant part of history and identity of every nation or state its value should not be degraded in any way. It is necessary that heritage is presented in a suitable way, especially in a sense of authenticity (date, historical stories, cultural, historic and art value). In other words, presentation should be focused on highlighting the heritage value. Additionally, the age, level of specialisation or interest of visitors, should also be taken in account. For example, for the visitors of Royal Palace in El Pardo different working methodologies and activities with digital tools are developed (AR, VR, Minecraft, etc.). Furthermore, the form of graphic expression is very important for dissemination in touristic purposes. It is desirable that graphic is clear and readable, especially in AR and VR where quality of graphic is essential for best experience, as shown at Domus Aurea and Cluny. If it is not possible to make a good quality 3D reconstruction (i.e. in case of poorly documented sites or too costly to produce one), it is possible to integrate archival photographs or video documentation that

[75] Ibid.

will provide authentic impression. Furthermore, HBs/sites should not be overpowered by technology. In that context the choice of type of digital technology and platform to perform visualisation can also be challenging. The implementation of VR with specific glasses in a dedicated room inside the archaeological site of Domus Aurea is a good approach, while the use of tablets like in Cluny or Case 1 Germolles, FR (Figure 4.10b) appears to be more suitable due to their non-invasive, discrete and minimalistic character.

Recommendations

Digital visualisations and interactivities should be primarily used as tools to make HBs/sites more accessible, usable and sustainable in order to highlight their heritage value and to preserve authenticity in the sense of dating, historicity and architectonic relevance[76]. Such tools can offer more direct introduction to history and cultural values in order to keep visitors interest. Furthermore, they might also reduce tourist impact on endangered sites. The examples of Domus Aurea, Cluny, El Pardo and Case 1 Germolles, FR show that the digital presentation of heritage should be authentic and based on expert's knowledge. Still, despite its attractiveness it should be used wisely and moderately, especially when it helps to present heritage that otherwise would be difficult to understand – such as archaeological remains, sites that do not exist anymore or heritage sites that through their history had many interventions and phases. In this respect, it is recommended to complement digital tools with other traditional interpretation methods where it offers added value to them (as practice shows in 82% of the sites analysed).

A number of international research projects and initiatives have been activated under European Commission funding programs, with the aim to create new tools to support CH protection, including both platforms (e.g. E-RIHS[77], JPI-CH[78], EUROPEANA[79]) and projects (e.g. RESCULT[80], HERACLES[81], INCEPTION[82], RoyalSitesHeritage[83]). These initiatives are more and more highlighting that the CH digitalisation is a key factor to create a common ground across Europe and increase stakeholder's interoperability. Technologies for image acquiring and 3D model creation (e.g. laser scanners, photogrammetry, radar) and for enhancing e-CH perception (VR, AR) are going to penetrate the market more and more. This, in turn, create new opportunities to be explored and exploited.

4.5.2 Technical and scientific network – interoperability

The preservation and valorisation of HBs/ sites involve large and diverse actors who need to share the same language and knowledge so as to be in a position to communicate.

[76] Ibid.
[77] The European Research Infrastructure for Heritage Science, http://www.e-rihs.eu/ [Accessed 20.5.2018].
[78] Joint Programming Initiative on Cultural Heritage, http://www.jpi-culturalheritage.eu/ [Accessed 20.5.2018].
[79] www.europeana.eu/ [Accessed 30.06.2018].
[80] Increasing Resilience of Cultural Heritage, https://rescult-project.eu/ [Accessed 20.5.2018].
[81] Heritages resilience against climate events on site, http://www.heracles-project.eu/ [Accessed 20.5.2018].
[82] Inclusive Cultural Heritage in Europe through 3D semantic modelling, https://www.inception-project.eu/en [Accessed 20.5.2018].
[83] http://royalsitesheritage.eu/ [Accessed 20.5.2018].

Interoperability

Interoperability can be approached from different angles. The following concerns the protection of CH against natural hazards.

Protecting CH against natural hazards is challenging and involves a multitude of actors, including Civil Protection operators, firefighters, local political authorities, technical experts, etc. The aspect of interoperability between these actors is fundamental to ensure an adequate and effective intervention strategy, and this is even more relevant when considering cross-border/international scenarios.

If we consider all of Europe, the scenario is very heterogeneous. Even though international standards have been created, such as those issued by the UNESCO/ICOMOS[84], the classification of CH varies from country to country. In fact the large number of existing databases have problems to communicate between themselves at both national and regional levels. For example, emergency operators often are not adequately prepared to deal with CH, and a huge number of different barriers affect their interoperability: languages, the nomenclature to classify major disasters, alert systems code, regulations for intervention priorities, protocols/measures to preserve and intervene, means and resources management/deployment, methods to qualify and quantify major disasters consequences, local/regional/national authorities with different domain/roles, separated communication strategies for people warning and radio frequencies.

In recent years the European Commission has put a great effort in creating standardised approaches to document/ diffuse geo-referenced data on territorial strategic assets, including CH, with the aim to increase interoperability among Member States. Typical examples are the European Directive INSPIRE[85], which aims to create a European Union (EU) spatial data infrastructure, and the Danube Reference Data Service Infrastructure (DRDSI)[86], a platform created under the EU Strategy for the Danube Region (EUSDR) to facilitate access to comparable and harmonised data sets on various issues related to the Danube Region, including CH and natural hazards.

Other efforts to create cross-border database infrastructures can be found within the ARE-3NA Platform[87], which is another EU initiative with the aim to share reusable components for INSPIRE Directive implementation and interoperability enhancement in cross-border/ cross-sector contexts.

Another example specifically tailored on CH is EUROPEANA, a European digital multi-language platform launched in 2008 and promoted by the European Commission in the Strategic Plan for 2011–2015[88], which nowadays hosts more than 10 million digital objects.

[84] Heritage at risk, special Edition 2007. Cultural Heritage and Natural Disasters, https://www.icomos.org/images/Cultural_Heritage_and_Natural_Disasters.pdf [Accessed 30.06.2018].
[85] https://inspire.ec.europa.eu/ [Accessed 13.06.2018].
[86] http://drdsi.jrc.ec.europa.eu/ [Accessed 13.06.2018].
[87] https://joinup.ec.europa.eu/collection/are3na [Accessed 17.07.2018].
[88] "Strategic Plan 2011–2015". Europeana.eu. Archived from the original on 21 January 2011. Retrieved 10 March 2011.

Multidisciplinary language of conservation

Since the end of the 20th century, scientists[89] and engineers who are not specialised in conservation, are now applying their skills in the multidisciplinary field of conservation of Cultural Heritage (CCH) and provide their specific expertise to conservation research and practice. However, objectives, principles and methodology in their profession may vary significantly from those applied in CCH. It is common that non-conservation experts overlook some major targets, values, approaches and restrictions specific of CCH, because they are non-existent in their main research domain. Such incompatibility of basic assumptions and values may go undetected for some time (particularly in the early stages of research projects), and hence not only affect the overall projects' time schedule and productivity, but also affect the efficiency in the management and use of these high-impact human resources[90].

Every project's consortium tackles this problem in its own way; yet an integrated approach towards a project can be very beneficial. One of the main difficulties of collaboration between conservation specialists and those who are not specialised in conservation is due to the vast scope of the conservation field which combines science and technology, society and architecture as well as arts and crafts; the innovative and the traditional; the virtual and the real; etc. The highly humanistic goals of this field are often accomplished with the use of innovative technologies and traditional techniques, as well as the support of sophisticated scientific analysis. In order to assist in determining the objectives, the evaluation and the development steps of projects and make them clear to non-conservation experts, the following measures might be considered:

• Outlining major characteristics specific of CCH;
• Organising available online data[91] [92] and,
• Providing the crucial definitions used with respect to CCH (general terminology, goals, values[93] and specific terminology).[94]

Figure 4.11 presents the two main areas of input by experts with no background in CCH:

• General understanding of CCH' major goals; structural and non-structural elements; problems and causes; values; principles; methods and processes; objectives and expected results, etc.; and,
• Understanding of specific targets within a research project, specific principles, methodology, etc.

[89] STEM (Science, Technology, Engineering and Mathematics) and SSH (Social Sciences, Humanities) experts alike
[90] A. Lobovikov-Katz, J. Martins, M. Ioannides, D. Sojref, C. Degrigny, Interdisciplinarity of Cultural Heritage Conservation Making and Makers: Through Diversity Towards Compatibility of Approaches. In: Ioannides M. et al. (eds) Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection. EuroMed 2018. Lecture Notes in Computer Science, 2018, vol 11196. Springer, Cham, First Online: 16 October 2018, DOI https://doi.org/10.1007/978-3-030-01762-0_55.
[91] E.g. Understanding Conservation - an educational resource for all involved in, or interested in, conservation of the historic environment, http://www. understandingconservation.org/ [Accessed 13.06.2018].
[92] ELAICH (Educational Linkage Approach In Cultural Heritage) (2009-2012), Educational Toolkit, for educators and heritage authorities to introduce the values of cultural built) heritage and principles and challenges of its preservation to youth, http://www.digitalmeetsculture.net/wp-content/ uploads/2016/11/ELAICH_BRIEF_ENG2016_FIN_FULL_open.pdf [Accessed 13.06.2018].
[93] E.g. International Council on Monuments and Sites' (ICOMOS) https://www.icomos.org/en/resources/charters-and-texts [Accessed 13.06.2018].
[94] E.g. ICOMOS-ISCS: Illustrated glossary on stone deterioration patterns, https://www.icomos.org/publications/monuments_and_sites/15/pdf/ Monuments_and_Sites_15_ISCS_Glossary_Stone.pdf [Accessed 13.06.2018].

This contribution can be enabled through the EU web Platform (see section 5.2).

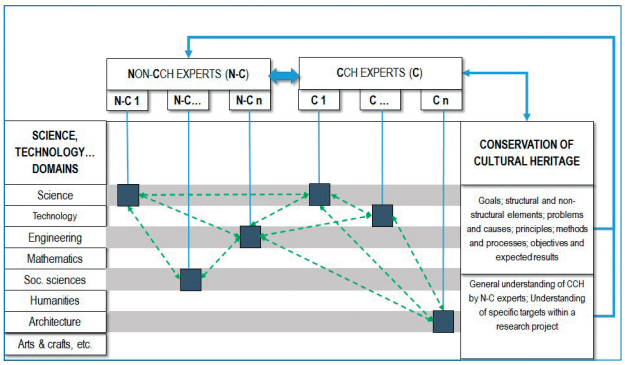

Figure 4.11. Exemplary scheme of facilitating contribution of experts with no background in conservation (n-c) and the interdisciplinary exchange between them and their conservation colleagues – conservation experts (c), © A. Lobovikov-Katz.

4.5.3 Novelty tools of marketing

New labels are regularly created by different governmental institutions in order to promote more specifically HBs/ sites. French labels 'Maison des illustres'[95] and more particularly 'Plus beaux jardins de France'[96] are emphasising the interest of HBs/sites versus their surroundings.

[95] http://www.culture.gouv.fr/Aides-demarches/Protections-labels-et-appellations/Label-Maisons-des-illustres [Accessed 13.06.2018].
[96] http://www.lesplusbeauxjardinsdefrance.com/ [Accessed 13.06.2018].

Add notes:

5

Recommendations for an optimised integration of HBs/sites in their surroundings

5.1. Identification of key issues and their associated recommendations

Drawn from chapters 3 and 4, Table 5.1 below summarises the key issues and their associated recommendations for an optimised integration of HBs/sites in their surroundings.

5.2. Proposal of structure of a European web platform

The main contribution of the proposed EU web platform is linked to the objective of this Action - Innovation in Intelligent Management of Heritage Buildings (i2MHB) which is to "create a pan-European open network, to promote synergies between Heritage Science's specialists, industrial stakeholders and research/education players, to achieve a unified common understanding and operation in the Heritage Buildings domain, integrating multidisciplinary expertise, technology and know-how through a novel and independent global framework."

The EU web platform should be clearly structured and easily navigated and thus allow non-conservation experts of CCH domain with options of guided and non-guided learning of major and/or specific areas/subjects within the conservation domain.

Key issues for an optimised integration of HBs/sites into their surroundings		Recommendations
Legislation	• Lack of an integrated legislation and planning to clearly identify the structure of responsibilities • Lack of monitoring and assessing the impact of legislation on the protection of HBs/sites and their surroundings • Lack of a common legal framework in Europe	• To develop an integrated conservation · To setup a clear structure of responsibilities where legislation and planning are integrated · To revise and extend definitions and measures with regard to buffer zones in existing urban environments • To monitor the impact of legislation on the protection of HBs/sites and their surroundings • To homogenise legislation on HBs/sites at an EU level
Management	• Lack of strategies or procedures for a better application of multi-criteria models to HBs/sites • Lack of citizen participation/local communities in the decision-making process (interventions)	• To promote and resource multi-criteria optimisation tools and procedures for implementing a multidisciplinary engagement • To implement maintenance plans • To develop and provide tools for the citizen' participation in management and maintenance of HBs/sites
Preservation	• Lack of understanding of the aims and principles of CH preservation among the general public • Lack of consideration of the impact of urban development and major infrastructure works, demographical changes, natural and technological hazards, and bio-degradation • Lack of proper risk indicators for the protection of HB/sites against natural hazards • Lack of balanced preservation and valorisation of HBs/sites policies • Lack of balanced sustainability policies	• To implement existing and efficient measures for protection and prevention of HBs/sites damage within their surroundings • To promote an integrated approach to predicting and tackling the problems originating from the urban development • To include demographic changes impact in territory and funding policies to achieve balanced CH preservation • To develop balanced and sustainable preservation and valorisation of HBs/sites policies • To homogenise preservation practices (including reuse) of HBs/sites at an EU level through a multidisciplinary approach
Documentation and valorisation	• Lack of documentation of all characteristics (general or unique) of HB/sites • Lack of use of digital technologies to support cultural and touristic dissemination	• To implement existing and efficient measures for documentation of HBs/sites within their surroundings • To promote the use of digital technologies in conjunction with traditional interpretation methods
Conservation	• Lack of appropriate maintenance and conservation/restoration policies • Lack of clear guidance on how an intervention (conservation or reuse) should be carried out	• To implement existing and efficient measures for maintenance of HBs/sites within their surroundings • To homogenise conservation practices (including rehabilitation/reconstruction) of HBs/sites at an EU level • To develop new integrated methodology to evaluate an intervention
Stakeholder engagement	• Lack of stakeholders' interoperability • Lack of engagement of the younger generation (aged 15-24) • Lack of focus of engagement activities on 'quality' versus 'quantity'	• To develop and resource appropriate training for staff who are involved in the preservation and valorisation of HBs/sites • To continue to promote the concept of a European web platform where good practice can be shared and lessons can be learnt
Cultural heritage (CH) education	• Lack of balanced integration of newcomers (migrants, tourists) which results in lack of respect of European culture (local or global)	• To include integration of newcomers (migrants, tourists) in CH education • To develop a unified educational strategy for a wider education of non-conservation officials[97] and experts for preservation of CH • To promote CH education among local population, and bring in line with the advanced methodologies and technologies in the modern heritage education
Funding and partnership network	• Lack of financial capital to support engagement activities • Lack of partnership network to support cultural and touristic promotion • Lack of novelty tools of marketing applied to HB/sites within their surroundings	• To raise awareness of the need for more funding into the heritage sector • To promote and share resources network · To develop network activities between similar HBs/sites and HBs/sites located in the same geographic area · To setup cultural events integrating the surroundings

Table 5.1. A summary of key issues and their associated recommendations.

[97] Politicians, local and national administrations, municipalities, etc.

It will be linked to the IT and interoperability outcomes of this COST Action, and to other relevant EU web platforms. Figure 5.1 presents an approach to draft the structure.

The EU web platform will promote the communication between European citizens and European institutions, regarding the debate around good practices and bad practices involving HBs/sites and the monitoring of both type of situations. The topic of the debate should include public responsibilities, the effectiveness of the application of strategies and future planning of integrated strategies involving good practices with sustainable results. In this way, a more unified common understanding and operation in the Heritage Buildings domain can be achieved within EU member states, and in turn leads to a more coherent and balanced European culture.

There are some already running work, such as European Commission Initiatives (EUROPEANA, JPI-Cultural Heritage, E-RIHS, etc.) and funded projects (RESCULT, HERACLES, PRODIGO, etc.).

5.3. European funding opportunities and criteria

The criteria used for European funding should show a balanced strategy with direct impact on the preservation of HBs/ sites. It should not be directed mainly to virtual concepts of HBs/ sites or supposed 'innovative materials' (as nowadays the nanomaterials which still present gaps of compatibility, production and use), which sometimes show problems of durability and compatibility with the existing materials. It is recommended that a more balanced distribution of resources addressed to all stages of work and use of HBs/sites, and the monitoring of the results of projects should be followed.

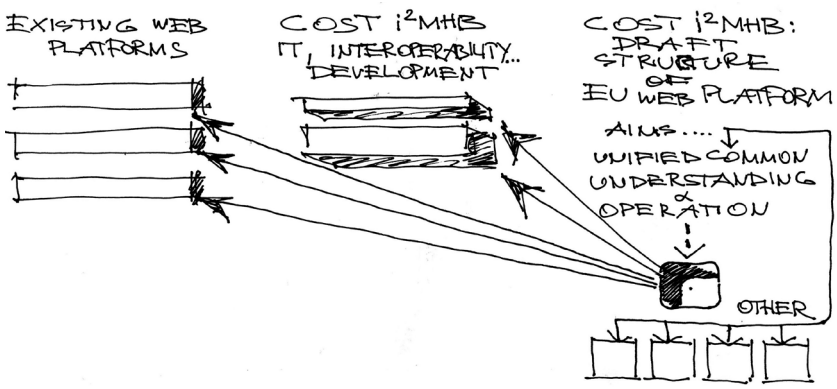

Figure 5.1. COST Action i2MHB sketch approach to the EU web platform structure, © A. Lobovikov-Katz.

5.4. Application in the smart heritage sector

The 'smart city concept' is based on the use of technology to make the city more efficient: functional, economically and energetically sustainable. The city is monitored by sensors to record and collect big data. This concept has also reached the heritage field. Smart Heritage City (SHCITY)[98] [99] [100] is a European project which aims to create an open-source tool to manage and monitor historical centres through the installation of sensors all over the city and HBs/sites. The data collected are humidity, temperature, light, traffic vibrations, and affluence of people, etc. They are transferred to a database where they can be processed, allowing then to take a rigorous control of the use and risk of damage of HBs/sites and to effectively manage their maintenance and conservation. The Spanish cities of Avila[101] and Santiago de Compostela[102] are good examples of smart heritage cities. Both concepts of, smart cities and smart heritage city are focused on the institutions or companies which use the data to make the cities more efficient, but none of them have in consideration the role of the citizen as an active player.

To address this gap, the 'sentient city' (or 'conscious city') concept has been developed. It is a smart city which has "the ability to sense and the intelligence to react appropriately based on the results of the sensing"[103]. 'Sentient City' explores the experience of living in a city that can remember, correlate, and anticipate[104].

The difference between a smart city and a sentient city is that, in the latter technology is used to serve people. This difference helps to configure a city which is user-centred. In the Sentient City, the value is not in the amount of technology being used, but in how the technology is used. Technology is used to encourage citizens and promote social cohesion, create an identity generating a sense of belonging and stimulate civic and social values. All these actions make the cities more sustainable.

The user-centred focus is especially important for buildings and heritage environments because it makes the inhabitants become an active part of the solution, not the problem, helping to make the heritage more sustainable. In this context, technology should help citizens and visitors to empathise with the HBs and their surroundings and thus create a personal connection and promote the feeling that heritage belongs to them.

[98] http://shcity.eu/finalidadobjetivos.asp [Accessed 13.06.2018].
[99] http://shcity.eu/socios.asp [Accessed 13.06.2018].
[100] https://santamarialareal.org/files/smart-heritage-buildings [Accessed 13.06.2018].
[101] http://www.avila.es/ciudad/patrimonio/item/2788-smart-heritage-city-en-avila [Accessed 13.06.2018].
[102] https://www.esmartcity.es/biblioteca/presentacion-smart-heritage-city-proyecto-ciudad-patrimonial-inteligente [Accessed 13.06.2018].
[103] B. McQueen, Big Data Analytics for Connected Vehicles and Smart Cities. Ed. Artech House, 2017.
[104] M. Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space. Ed. MIT Pree, 2011.

Fernando Benet in his article "Smart Cities and Cultural Heritage. A necessary Integration for Development"[105], also claims the importance of culture, as a means for comprehensive development, an enhancement of CH beyond the concept of smart city as a collector of big data.

5.5. Future work

5.5.1. Correlation between visual and technological characteristics

The perception of material and technological conservation intervention on HBs/sites plays an important role in the different stages of the conservation (restoration/reconstruction) process, from decision making, through the evaluation of conservation results and maintenance. The theme of correlation between visual and technological characteristics of CH is of importance to both the professional conservation experts and the general public (the 'consumer' of the conservation product). This is due to a constantly extending scope of the diversity of the forces involved in conservation. Along with conservation experts, many non-conservation experts (through collaborative research and conservation projects) and the general public (through heritage preservation educational and real projects) contribute to conservation of CH on a regular basis. In this reality, it is essential to make this theme understandable to the diverse non-conservation communities. In order to bridge between the functional, technological and material problems and solutions; the aesthetical, architectural and historical values; and human perception of HBs and their built /natural surroundings, we can approach the Correlation between visual and technological characteristics, incl. compatibility of: [Materials (building materials); Technology; Architectural value; Aesthetics; Authenticity…], as expressed through: ["Macro"Geometry: HB-surroundings; HB; HB parts…] and ["Micro"Geometry: [HB (facades and interior) surfaces; HB architectural/ structural elements; Materials surface texture…].[106] [107]

The further development of the "Correlation…" theme can be assisted by a methodology which is developed and applied in other relevant research (see section 5.3). In order to maximize the result, to make its development and the subsequent use less time-consuming, and facilitate the multidisciplinary understanding in the conservation domain, this development should be coordinated together with that of the "multidisciplinary" language for non-conservation contributors to CCH, and included in the EU web platform (see section 5.2). The results will be useful for both the contributors to CCH, and to the stakeholders, in CCH research, decision making, actual conservation intervention, interpretation, use, maintenance and preventive conservation.

[105] F. Benet, Smart Cities and Cultural Heritage. A necessary Integration for Development, Telos (102), (2015-2016), 59-66.
[106] A. Lobovikov-Katz, Technological and conservation aspects versus urban appearance in a stone-built environment: an evaluation approach, Chapter 4.2 in Kourkoulis S., (ed.) "Fracture and Failure of Natural Building Stones – Applications in the Restoration of the Ancient Monuments", Springer, 2006, 201-215.
[107] A. Lobovikov-Katz, G. Bueno, V. Marcos, J. Martins and D. Sojref, Training schools for conservation of cultural heritage: between expertise, management and education, , Chapter in Ioannides, M., Fink, E., Moropoulou, A.,Hagedorn-Saupe, M., Fresa, A.,Rajcic, V., Grussenmeyer, P. (Eds.), Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection Volume 10058 of the series Lecture Notes in Computer Science, Springer, 880-890.

5.5.2. Correlation between visual and technological characteristics

For a more effective achievement of one of the important aims of the EU web platform - facilitating the multidisciplinary understanding of the experts from diverse fields of knowledge, we recommend to enrich the EU web platform through inclusion of the results of innovative development in the field of education, which goes beyond the specific area of heritage education, including innovations and good practices in educational theory and the advanced technological development in education (e.g. e-learning, blended learning, application of MR, augmented reality, virtual reality) through the entire equilibrium of electronic to social factors.

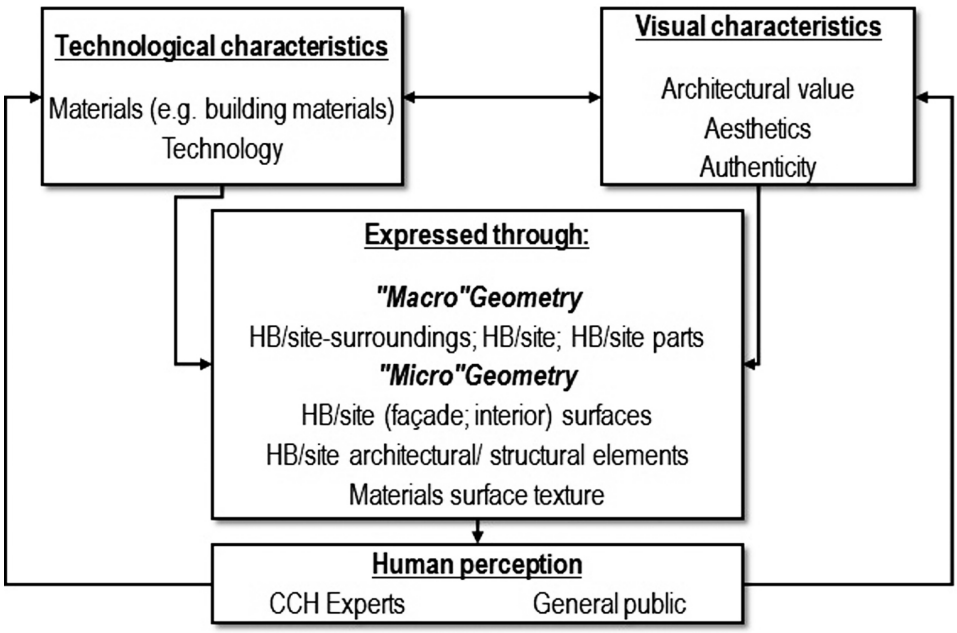

Figure 5.2. Correlation between visual and technological characteristics of HBs/sites and their surroundings in the conservation of CH, © A. Lobovikov-Katz.

Add notes: