ICOMOS

international council on monuments and sites

6 ISCs

JOINT MEETING 2020

Advancing Risk Management For the Shared Future

2020 ICOMOS 6 ISCs Joint Meeting Proceedings

Presented by the 6 ICOMOS-ISCs :
ICORP, ISCARSAH, ISCEAH,
ICTC, ISCES+CC and CIPA

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2020 ICOMOS 6 ISCs Joint Meeting Proceedings

Advancing Risk Management for the Shared Future

17 October 2020

Presented by 6 ICOMOS-ISCs
ICORP, ISCARSAH, ISCEAH, ICTC, ISCES+CC and CIPA

Foreword

This proceeding is generated by the papers presented in the 6 ISCs Joint Meeting: Advancing Risk Management for the Shared Future Joint Meeting. Consistent with the objective of ICOMOS, cross-disciplinary collaborations between International Scientific Committees have long been encouraged. For promoting the exchange of information and knowledge on cultural heritage conservation. The 6 ICOMOS-ISCs, including ICORP, ISCARSAH, ISCEAH, ICTC, ISCES+CC and CIPA, work cooperatively in organizing this joint meeting. The Webinar and Online Presentation is held on 17 October 2020. It aims to develop clear trans-disciplinary recommendations by addressing risk management in cultural heritage via this collaborative engagement.

The outcome of this joint meeting is based on developing potential tools (a selection of papers or guideline drafts) to risk management in cultural heritage for further implementation by the practitioners. The 6-ISCs Joint Meeting aims to provide a forum for considering the various threats (whether natural cause or human error) in cultural heritage regarding how to address and where to start by shared responsibility. By creating new tools and guidance among interdisciplinary fields, it shall lead us to achieve a shared future - with the theme- "Advancing Risk Management for the Shared Future". This joint meeting offers the opportunity to bring wider participants across the heritage sector in global together to share, exchange and collaborate regarding the relevant issues.

Theme - Advancing Risk Management for the Shared Future. The Risk management of Cultural Heritage is the theme of this joint meeting, including the following topics:

(1) Climate Change and Cultural Heritage,
(2) Disaster Risk Management and Resilience,
(3) Post-disaster reconstruction and authenticity,
(4) Post-disaster management,
(5) Relevant subjects, particularly the issues/case studies regarding Wildfires and Heritage — Community Engagement, Preparedness, Resilience and Recovery.

The Committee Board of the 6 ISCs Joint Meeting
October 2020

ICOMOS General Assembly 2020

ICOMOS (the International Council on Monuments and Sites) is a global organisation of cultural heritage professionals with its headquarters in Paris, which serves as the principal advisory body on cultural heritage to the UNESCO World Heritage Committee. ICOMOS has over 9,500 members and more than 110 National Committees throughout the world. ICOMOS works for the conservation and protection of cultural heritage places. It is the only global non-government organisation of this kind, which is dedicated to promoting the application of theory, methodology, and scientific techniques to the conservation of the architectural and archaeological heritage.

The theme of the ICOMOS General Assembly 2020's Scientific Symposium: 'Shared Cultures – Shared Heritage – Shared Responsibility', reflects the global context of heritage as part of cultural identity at a time of rapid population shift, conflict and environmental uncertainty. The important notion of shared stewardship, for which the 'culture-nature journey' is of particular relevance, requires agreed approaches to the sustainable protection, conservation and safeguarding of heritage. On 7 October 2020, Australia ICOMOS organised 'GA2020 MARKER EVENT' to acknowledge the work undertaken to organise the 20th Triennial General Assembly and Scientific Symposium of ICOMOS that could not be hosted in Sydney in 2020.

The GA2020 Scientific Committee developed a jam-packed program covering six themes in individual presentation and panel discussion formats.

1. Shared Cultures: Communities – collaborative, consultative, contested
2. Shared Heritage: Multiple attributes, multiple values, multiple actors
3. Shared Responsibility: Safeguarding and managing places, collections, and practices
4. Indigenous Heritage: Sharing, exchange, and control
5. Culture-Nature Journey: Reaching agreement on what's next?
6. Marginalised Heritages: Shared or shunned?

More information, please access: https://icomosga2020.org/markerevent/

Advancing Risk Management for the Shared Future
17 October 2020

http://www.6isc2020ga.org/index.html

11:00am - 01:00pm **Central European Time (Paris)**
05:00pm - 07:00pm **Taipei TIME ZONE**

TIME (CET)	6 ISCs JOINT MEETING PROGRAM (Webinar)
11:00 - 11:15	**Opening Remarks** Speaking order by, 1. Prof. Alex Yen/ Moderator's opening 2. Prof. Toshiyuki Kono/ President of ICOMOS 3. Dr. Gwo-Long Shy/ ICOMOS Institutional Member
11:15 - 11:35	**Keynote Speech** ***"Introduction of the 6-ISCs toolkit for Risk Management"*** Speaker: Prof. Mario Santana, V.P. of ICOMOS
11:35 - 12:10	**6 ISCs Panel – ISC Report** Panellists speaking order by, 1. Prof. Efstratios Stylianidis/ President of CIPA 2. Mr. Fergus Maclaren/ President of ICTC 3. Mr. Peter Cox/ President of ISCES+CC 4. Mr. Chris Marrion/ President of ICORP 5. Mr. Stephen J. Kelley/ Secretary-General of ISCARSAH 6. Ms. Claudia Cancino/ Chair of the Seismic theme of ISCEAH
12:10 - 12:30	**6 ISCs Panel - Comment** Invited Commenters speaking order by, 1. Prof. Rohit Jigyasu/ V.P. of ICOMOS 2. Prof. Peter Shih/ National Chiao Tung University 3. Prof. Takeyuki Okubo/ Ritsumeikan University 4. Ms. Catherine Forbes/ Principal of GML Heritage
12:30 - 12:55	**Discussion Forum and Q&A** ● Cultural Heritage Disaster Risk Management and Resilience for Climate Change ● Post-disaster management, re-construction, and authenticity ● Heritage Risk Management in the Post-COVID-19 World
12:55-13:00	**Conclusion and Closing Remarks**

Mario Santana Quintero

Vice President
ICOMOS
Professor
Architectural Conservation and Sustainability Engineering, Carleton University

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Mario Santana-Quintero is a professor at Department of Civil and Environmental Engineering, Carleton University teaching courses on Architectural Conservation and Sustainability, as well as, he is currently an associate faculty at the Carleton immersive Media Studio Lab (CIMS) and the director of the NSERC Create program on Heritage Engineering. He has an architectural degree, holding a master in the conservation of historic buildings and towns from the R. Lemaire International Centre for Conservation (University of Leuven). He is also a guest professor at the Raymond Lemaire International Centre for Conservation (University of Leuven). These past years he has been teaching also at the Universidad Central de Venezuela, Universidad de Guadalajara (Mexico) and Universidad de Cuenca (Ecuador). In the past, he was a Professor at the University College St Lieven and lecturer at the University of Aachen RWTH and the Historic Preservation Programme at the University of Pennsylvania between 2006 and 2011. Along with his academic activities, he serves as Vice President of the International Council of Monuments and Sites (ICOMOS) and he is the past president of the ICOMOS Scientific Committee on Heritage Documentation (CIPA). Furthermore, he has collaborated in several international projects in the field of heritage documentation for UNESCO, The Getty Conservation Institute, ICCROM, World Monuments Fund, UNDP, Welfare Association, and the Abu Dhabi Authority for Culture and Heritage.

Dr. Santana's research interest involves the digital advancement workflows for recording buildings in 3D with a high resolution of detail; this is essential for better characterizing existing buildings and implementing tailored rehabilitation, adaptive use, maintenance and sustainability approaches. Besides, the development of guidelines, specifications and protocols for the improvement of heritage information in the conservation process. As well as to design approaches for handling, storing and presenting large volumes of data generated from the heritage information-gathering activities.

Keynote Speaker / **Panelist** / Commenter / Moderator

Chris Marrion

President

International Committee on Risk Preparedness, ICORP

Chris is Founder/CEO of Marrion Fire & Risk Consulting, special expert for National Fire Protection Association, National Fire Heritage Center's Board of Directors, SFPE Fellow and on the ICORP Bureau. He focuses on protecting our cultural heritage from fire/disasters. Chris is a Fellow of the Society of Fire Protection Engineers (SFPE), a Director of the NY Metro Chapter of SFPE, Chairperson of the SFPE Design Basis Fires Committee, and Member of the New York Landmarks Preservation Conservancy. He holds a Master's Degree in Fire Engineering and is a Registered Professional Engineer.

He is intimately involved with fire/disaster management, capacity building and education efforts internationally, developing codes and standards, contributing to numerous books including 'Extreme Event Mitigation in Buildings', and the Federal Emergency Management Agency (FEMA) Report on the World Trade Center. Chris' work focuses on creating awareness, building capacity, and providing risk-informed, sustainable, cost-effective strategies and integrating local, indigenous traditions, methods and people into developing solutions to effectively protect cultural heritage. For 30+ years, Chris has worked globally with NGOs, Governments, private and public clients including UNESCO, UNISDR, ICCROM, SFPE, NFPA, et al, in this regard, including within the Sendai Framework.

Keynote Speaker / **Panelist** / Commenter / Moderator

Efstratios Stylianidis

President

International Committee on Heritage Documentation, CIPA

I am an Associate Professor at the School of Spatial Planning and Development, Faculty of Engineering, Aristotle University of Thessaloniki, Greece. For the period 2019-2023 I have been elected, from a voting process among all Professors, administrative and technical staff, as Vice Rector for Research and Lifelong Learning of the largest university in Greece.

I obtained my MSc and PhD in Surveying Engineering and Photogrammetry, respectively. My main teaching and research interests are in Photogrammetry and Geospatial Engineering and their close linkage with ICT for cultural heritage recording, documentation, and preservation. Since 1996, I participated in many recording and documentation campaigns (ancient theatres, archaeological excavations and sites, churches, castles, towers, frescos, historical buildings, museums, and artefacts, etc.) in Cyprus, Georgia, Greece and Italy. I served as ICOMOS Cyprus Secretary-General for the period 2003-2009. For the period 2015-2020, I served the ICOMOS International Scientific Committee (ISC), CIPA – Heritage Documentation, as Secretary General, while the running period 2020-2023 I am honored to run as the elected CIPA President.

I am the author of 2 theses, 2 books, more than 70 scientific publications in peer reviewed journals and conferences proceedings, 8 invited chapters in books as well as the editor of 2 books. I have participated in more than 50 national and mainly international research projects, 8 of which as the scientific and project coordinator. I received scholarships from the State Scholarship Foundation (Greece), the Greek Technical Chamber and the A. G. Leventis Foundation. In 2017, I received the European Satellite Navigation Competition 2017 award (Madrid Challenge), as EU-H2020 LARA project coordinator. The period January - June 2018, I was a visiting Professor at the Columbia University, Graduate School of Architecture, Planning and Conservation (GSAPP). As an invited speaker, I gave lectures at Columbia University, Princeton University, University of California Los Angeles (UCLA) / Cotsen Institute of Archeology, the Getty Conservation Institute, and Tsinghua University.

Keynote Speaker / **Panelist** / Commenter / Moderator

Fergus T. Maclaren

President

International Cultural Tourism Committee, ICTC

Fergus Maclaren is a sustainable tourism and cultural heritage management professional with 25 years experience in Canada and internationally, now focused on tourism at World Heritage sites and the 2030 Sustainable Development Goals. His background includes a broad range of tourism planning, destination management and community development expertise. He has taught and lectured on sustainable tourism in North America, Asia and Africa. Elected President of the ICOMOS International Cultural Tourism Committee in December 2017, he has also been its Canadian National Expert Representative since 2012.

He currently acts as the Director of International Relations and Knowledge Management for the Economic Innovation Institute for Africa, responsible for the development and implementation of their sustainable tourism program. Additionally, he acts in an expert capacity for the Organization of World Heritage Cities and UNWTO, and sits on UNESCO's World Heritage-focused Task Force on Culture, Tourism and COVID-19.

Peter Cox

President

International Scientific Committee on Energy and Sustainability and Climate Change, ISCES+CC

Peter has a background in chemical engineering and materials science he has worked in the analysis of decay of historic masonry, the treatment of stone and mortar in Heritage Buildings for over 35 years. He established Carrig Conservation International in 1993 – Carrig incorporates, Carrig Conservation – Carrig Research and Carrig Energy Conservation. Carrig has offices in Dublin, London and Naples, Italy with partnerships in Melbourne and Montreal.

Peter has been an active member of ICOMOS Ireland for many years and has held both vice-president and was President of ICOMOS Ireland from 2004 - 2008. Peter is also very active on the international ICOMOS scene and recently represented ICOMOS International on the CEN/TC346/WG8 on “Energy Efficiency in Heritage Buildings”. Peter is President of the International Scientific Committee on Energy & Sustainability and Climate Change” (ISCES+CC), which is a leading research group in this sector. Peter is chair of the ICOMOS Ireland National Scientific Committee on Energy, Sustainability and Climate Change.

Peter is instrumental in advising and implementing national conservation & heritage policies on behalf of government bodies and local authorities. As President of ISCES+CC Peter is also a member of the CCHWG and SDGWG.

Peter was recently elected a Fellow of the RSA, London.

Stephen J. Kelley

Secretary-General
International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage, ISCARSAH

Stephen J. Kelley, FAIA, SE, FAPT, FUSICOMOS is a registered architect and structural engineer who has devoted these two skills to the preservation of our built cultural heritage. His projects are located throughout the United States, but he has also worked on significant projects in Asia, Europe, Africa, South America and the Caribbean basin. He has performed significant evaluation work in response to natural and manmade disasters.

Mr. Kelley is a Fellow of the American Institute of Architects. He has served on the Board of Directors of both US/ICOMOS and the Association for Preservation Technology (APT) and was elevated to Fellowship in both organizations. Mr. He is a UNESCO Tangible Heritage Expert and is currently Secretary-General of ISCARSAH.

Keynote Speaker / **Panelist** / Commenter / Moderator

Claudia Cancino

Chair of the Seismic theme of International Scientific Committee on Earthen Architectural Heritage, ISCEAH

Claudia Cancino is a licensed architect from Peru and manages the Getty Conservation Institute Earthen Architecture Initiative which has three components: The Seismic Retrofitting Project in Peru, the Earthen Architecture Course in Al-Ain, Abu Dhabi and the Terra 2021 Congress in Santa Fe, New Mexico. She also manages the Retrofitting and Repair Component of the GCI Bagan Conservation Project. She earned a certificate in conservation at ICCROM in Rome, followed by graduate training in business administration at ESAN in Lima. She practiced preservation architecture and has taught Earthen Conservation at several universities in Peru, Morocco, Portugal, Canada, UAE and USA. She earned a Master of Science in Historic Preservation and an advanced certificate in conservation from the University of Pennsylvania. She is the chair of the Seismic theme of ISCEAH.

Rohit Jigyasu

Vice President
ICOMOS

Rohit Jigyasu is a conservation architect and risk management professional from India, who is currently Vice President of ICOMOS International Scientific Committee on Risk Preparedness (ICORP). Rohit served as UNESCO Chair holder professor at the Institute for Disaster Mitigation of Urban Cultural Heritage at Ritsumeikan University, Kyoto, Japan, where he was instrumental in developing and teaching International Training Course on Disaster Risk Management of Cultural Heritage. He was the elected President of ICOMOS-India from 2014-2018 and president of ICOMOS International Scientific Committee on Risk Preparedness (ICORP) from 2010-2019. Rohit has been the Elected Member of the Executive Committee of ICOMOS since 2011 and is currently serving as its Vice President for the period 2017-2020. He is currently working at ICCROM as Project Manager on Urban Heritage, Climate Change and Disaster Risk Management. Before joining ICCROM, Rohit has been working with several national and international organizations such as UNESCO, UNISDR, Getty Conservation Institute and World Bank for consultancy, research and training on Disaster Risk Management of Cultural Heritage.

Catherine Forbes

Principal
GML Heritage

Catherine Forbes is an architect specialising in heritage conservation and management, a member of Australia ICOMOS and an expert member of ICORP (International Scientific Committee on Risk Preparedness). She is also the convenor of the Joint Australia ICOMOS and ICOMOS New Zealand Cultural Heritage Risk Preparedness Working Group and a member of Australia ICOMOS National Scientific Committee on Energy and Sustainability. Catherine has specialist training in disaster risk management for cultural heritage (UNESCO ITC, Kyoto) and Humanitarian Action (International Red Cross and Red Crescent Society). In addition to undertaking hazard scoping studies and preparing risk management strategies for heritage sites, Catherine has been involved in emergency response, undertaking post-disaster damage assessments and reviewing post-disaster recovery of cultural heritage in Christchurch, Kathmandu, Tonga and Australia. She has presented her experiences globally and contributed case studies to the ICOMOS and ICCROM Global Recovery and Reconstruction Case Study Project. Most recently, Catherine has been developing emergency response and risk management guidance for heritage places in bushfire prone areas of Australia.

Keynote Speaker / Panelist / **Commenter** / Moderator

Takeyuki Okubo

Professor/ Director
Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University

Takeyuki OKUBO is a professor at the Graduate School and College of Science and Engineering, Ritsumeikan University and the director at the Institute of Disaster Mitigation for Urban Cultural Heritage (http://www.r-dmuch.jp/en/index.html). He is also a member of ICORP and JP-ICOMOS. His background in civil engineering, architecture and global environmental engineering informs his current research interests in urban design for disaster mitigation and architectural designs which promote the utilization of traditional knowledge and wooden materials. His recent work in partnership with colleagues Professor Rohit Jigyasu and Professor Kenzo Toki is UNESCO Chair International Training Course on disaster risk management for cultural heritage and historic city, which is holding every year since 2006. His recent article is “Traditional Knowledge for Disaster Mitigation in History of Japanese Architectures and Cities”, total 199 pages, Gakugei Publishing (Kyoto, Japan), June 2012. (in Japanese), “Introductory Volume” to Cultural Heritage Disaster Mitigation Studies，Part2 III.”Fire Disaster Mitigation Project in Historic Area around Sannei-zaka”，pp.49-59，Asia Insatu (Japan)，March 2010 (in English) and “Protecting Area of Traditional Wooden Construction from Fires Due to Earthquakes Using Local Water - Plan and Implementation of the Project on Environmental Water Supply System for Disaster Prevention - “, Journal of Disaster Research Vol.2 No.4，pp. 284-291，2007 (in English).

Peter Tian-Yuan Shih

Professor

Department of Civil Engineering, National Chiao-Tung University

Peter is the Professor at Department of Civil Engineering, National Chiao-Tung University, Hsin-Chu, Taiwan, Since 1995. He holds the Ph.D. at Department of Surveying Engineering, University of New Brunswick, Canada. He was the President of Chinese Taipei Society of Photogrammetry and Remote Sensing between 2015 and 2018. He is also the Executive Board Member of Taiwan Geographic Information Society, Board Member of both Chinese Society of Cadastral Surveying and Chinese Society of Surveying Engineering. His research interests include Terrain Mapping with Laser and Imaging Systems, Remote Sensing, Image Processing, Geographical Information Systems, Surveying Datum and Systems, and Global Change studies. He was awarded in 2010 for the Twenty-Ninth Surveying Engineering Medal, Chinese Society of Surveying Engineering; in 2010 for the 2012 Photogrammetry and Remote Sensing Medal, Chinese Taipei Society of Photogrammetry and Remote Sensing; in 2015 for the Sixteenth Cadastral Surveying Medal, Chinese Society of Cadastral Surveying.

Alex Ya-Ning Yen

Associate Professor
Department of Architecture
Director
Center for Cultural Sites Rehabilitation and Development, China University of Technology

Alex is the associate professor of the Department of Architecture, and the director of the Cultural Properties Research Centre, China University of Technology, Taipei. He is currently the vice president of the International Committee for Documentation of Cultural Heritage (CIPA), ICOMOS; the Member of ICORP and the Advisory Committee of the Asian Network of Industrial Heritage (ANIH). He holds the PhD in Architectural History and Theory with the specific interest in the conservation of heritage for more than 35 years. His research field includes History of Architecture, History of Urban, Cultural Heritage Conservation, Architectural Design. He was the Chair of the 25th International CIPA Symposium (CIPA 2015).

Contents

I.

Selected Papers

A. Cultural Heritage Disaster Risk Management and Resilience for Climate Change

1.

IMPROVING THE ADAPTIVE CAPACITY OF HISTORIC URBAN NEIGHBORHOODS WITH, DESPITE OF OR AT THE EXPENSE OF TOURISTS

Aylin Orbaşlı
Associate Professor, Oxford Brookes University, UK

Abstract

Cultural heritage, not only makes places attractive to tourism, but is a significant contributor to urban identity and place attachment for residents. Older neighbourhoods, through their walkable scale, diversity of uses and tenures support better community relationships and contribute to urban resilience. Tourism, while an important economic contributor, places pressure not only on cultural heritage but also on urban and community infrastructure. Moreover, conditions of overtourism, threaten to disrupt established networks and engender conditions of temporality and fragmentation for the local population, thus reducing the capacity for resilience. Often emerging as small scale stressors, disruptions triggered by tourism can slowly shift conditions over thresholds that adversely impact local wellbeing and equitable access to resources. This paper argues that the tourism industry and its multiple players, cultural heritage management and urban resilience planning need to become better integrated, so as to safeguard heritage, support local communities and to improve the capacity of historic neighbourhoods to adapt to ongoing changes caused by or linked to climate change.

Keywords: Overtourism, Urban Resilience, Historic Neighbourhoods, Tipping Points

1. Introduction

In the context of an unfolding climate emergency, cities are emerging as key centres for action, and city-scale policies and initiatives are increasingly becoming the focus of UN Habitat and other agencies (Zeiderman et al. 2017). At the same time, the impacts cultural tourism is being felt in much larger cities, compared to the small historic towns that were previously seen to take the brunt of overtourism, and present different and often more complex management challenges in these contexts.

Beyond making places attractive to tourism, cultural heritage makes a significant contribution to urban identity and place attachment for residents. Older neighbourhoods through their walkable scale, diversity of uses and tenures support better community relationships and contribute to urban resilience. The contribution strong urban networks make to community wellbeing and in responding to adverse situations, including disasters and major climate events, is now recognised (Zhang and Li 2018). Tourism, while an important economic generator, places pressure not only on cultural heritage but also on urban and community infrastructure. Furthermore, conditions of overtourism, threaten to disrupt established networks and contribute to situations of temporality and fragmentation for the local population, thus reducing the capacity for resilience.

Tourism can be both an opportunity and a threat to improving the resilience of historic urban areas. But, long accepted methods of tourism management are no longer sufficient to address the issues emerging from a rapidly evolving and increasingly volatile tourism industry and concurrent patterns of rapid urban growth. In many cities, action is only being taken once tipping points have been reached and a public outcry is significantly loud. This is all too often too late to safeguard community wellbeing or to reverse the changes in the urban environment that have been brought about by tourism. The purpose of this paper is to position the role of cultural tourism management in the context of resilience planning and disaster preparedness for historic urban neighbourhoods.

2. Conditions of urban resilience

Resilience, in the urban context means ‘the ability of a city or urban system to withstand a wide array of shocks and stresses’ (Leichenko 2011, 164), whilst resilience planning seeks stability and diversification, particularly of urban economic functions, in order to cope with unexpected change (Zhang and Li 2018). Resilience studies identify both shocks (e.g. extreme climate events) and stressors, which are more gradual but persistent changes as considerations for resilience planning (Leichenko 2011).

Urban resilience is multi-scalar (regional, city and neighbourhood level) and depends on interconnectedness across scales and sectors (Ernstson et al. 2010). The urban

neighbourhood, although the smallest unit on the scale, is also where the most human interaction is observed. The importance of the capacity of a community to come back after a shock and the role social factors play in urban resilience planning are increasingly recognised (Leichenko 2011; Zhang and Li 2018).

The strength of a community is often considered in terms of wellbeing and measured through indicators such as the quality of housing, the affordability of housing, liveability of neighbourhoods (Zhang 2013). Some of the common characteristics of historic neighbourhoods, such as walkability and mixed use, are also characteristics associated with liveable places (Evans 2014). Liveability is also a condition of urban districts' ability to succeed economically (O'Brien 2012). It is also these characteristics that make historic urban districts attractive to tourism.

While participation and inclusion emerge as wellbeing and resilience indicators, the overriding political desire for economic betterment is often at the cost of social betterment (Zhang 2013). Furthermore, it should be noted that fluid urban populations and their fragmented interests mean that places often have less of a singular social identity making social cohesion and inclusion complex issues to tackle (Khosla 2015; Blake et al. 2007).

3. Tourism impacts on resilience factors

Tourism is rarely classed as one of the risks or disasters that necessitate resilience planning, yet the gentle erosion of social wellbeing and reduction of economic diversity can adversely impact urban resilience in the face of catastrophic events. Tourism may not be a direct threat, but can be identified as a 'stressor' that weakens some of the systems that support resilience.

Cultural tourism in the urban context has significantly expanded over the past few decades from small city centre historic cores to encompass older neighbourhoods in general, former industrial districts and others that attract interest for their ethnic or creative communities, sometimes gaining 'hip neighbourhood' status. From an economics point of view, tourism supports economic diversification at city level and a larger footprint of visitor activity supports the spread the benefits. It also means that the impacts of tourism are more widely experienced across a city and its population.

Tourism has not been immune to the rapid speed of change that characterizes phenomena from urbanisation to climate change in the present day. Enabled by new technologies and social media, an (invariably unplanned) popularity of a destination can be achieved in a short period of time. Meanwhile, market disruptors such as cheap airlines or Big Tech supported interventions such as Uber or Airbnb have made a significant impact on urban tourism (Sherwood 2019). The combination of these factors has seen larger cities becoming adversely impacted by tourism and oversaturation, in

ways previously associated with small to medium sized historic towns (Orbaşlı 2000). A growing number of larger European cities including Berlin, Amsterdam and Barcelona are regularly cited as becoming overwhelmed or impacted by the pressures of tourism (Milano et al. 2018).

Impacts such as rises in property prices, and a general lack of affordable housing as the rental markets shift towards more lucrative short term lets are felt across a city. As attractive, and often historic, neighbourhoods are taken over by tourism uses, local residents and the businesses that support them are pushed out to the periphery, disrupting established social networks. Living further out, increases commuting times to jobs and central amenities, eroding quality of life for many local residents, as well as increasing the demand for infrastructure.

Figure 1: As city centre uses turn exclusively to tourism, local communities become marginalized and pushed to the urban periphery, ultimately causing the urban resilience infrastructure to become fragmented. Image of Warsaw in Poland, taken by the author, 2017.

In terms of urban governance, rapid cycles of change and potentially precipitous escalation of impacts, and the entry of bigger global players such as Airbnb, require new perspectives on governance, planning and management structures as well as on political alliances. At the neighbourhood level, the local life that is often the very attraction of historic districts is hollowed out as prices increase and amenities are lost. The recent unprecedented downturn in tourism in wake of the Covid-19 virus has exposed those still living in central districts to the realisation that they have no neighbours and no community, at the very time when community mutual support networks have been most needed.

4. Thresholds and edge conditions

Where private sector investors have gained ground as tourism is prioritised as an economic sector, this has often been at the cost of investment in communal life (Garcia and Claver 2003). As with other environmental stressors, these slow variables eventually push systems over a threshold and generate tipping points, where either irreversible change is being recorded or the strength of the public outcry threatens the political status quo (Ernstson et al. 2010). Venice is an example of where multiple tipping points (ecological, social) have been reached and the lagoon city has been so hollowed out that a point of no return has been reached with regard to the resumption of an urban life centred on residents' priorities. Barcelona, one of Europe's most popular urban tourism destinations attractive to visitors for its 'accessible public space and sociability', has experienced a shift in investments and urban improvements increasingly being focused on tourists' rather than residents needs (Garcia and Claver 2003, 113). The qualities that made Barcelona a liveable city have come to service a transient tourist population, while adversely impacting on residents' wellbeing.

The triggers, or stressors, are increasingly evident, but tipping points harder to determine as each place and community's realities will be different. Furthermore, the processes of urban heritage conservation are highly complex, and often an interplay between spatial scales and decision-making hierarchies that are not necessarily linked (Zhang 2013). The global nature of 'disruptors' and the multi-scalar and at times informal nature of many tourism businesses adds further to the complexity and the interplay between those who benefit from and those who are adversely impacted by tourism growth.

5. Managing tourism to support resilience

The climate emergency is beginning to teach us that short term economic growth may need to be overlooked in favour of longer term climate resilience action. Most recently, the loss of mass tourism in the wake of the Covid-19 pandemic has made many urban tourism destinations reconsider the impacts of tourism (Smith and Ripp 2020). Although the urban policy and management process is fragmented and complex, it is essential that its various and diverse players come together to improve urban resilience in the context of tourism management (Zhang 2013).

The biggest challenge is to be able to pre-empt tipping points, and be better informed of the nature of stressors and variables that have the potential to push systems over a threshold. This will require disciplinary experience beyond the bounds of urban conservation and tourism management. Scenario planning techniques used for climate change analysis, levels of acceptable change methodologies from nature conservation, and more effective use and interrogation of big data for real-time and dynamic analysis are just some approaches that could be adapted. All will require collaboration amongst

diverse players, and must ensure that local voices are heard (Zhang 2013).

A shift in urban investment and development that places social and environmental benefits as primary goals, will also support tourism management practices. Sustainable tourism practices that prioritise locals and take a wellbeing-centred approach to policy and planning and encourage local participation are best placed to identify and deliver on shared objectives. Ultimately, a place that works for and is good for locals, will also be attractive to tourists. Tourism and tourists often have a higher adaptive capacity than urban places, and they will undoubtedly adapt to changes brought about in the urban context that better serve sustainability and resilience goals.

Acknowledgements

This paper partly draws on a keynote presentation made to the Organisation of World Heritage Cities (OWHC) Asia-Pacific Region general assembly held in Suzhou, China in October 2018, and research carried out as part of a UK Arts and Humanities Research Council (AHRC) grant in 2016 for the project ‘Community-led Heritage Regeneration in India’ undertaken in collaboration with the School of Planning and Architecture in Delhi.

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2.

A GIS-BASED RISK MAPPING FOR THE GÖREME NATIONAL PARK AND THE ROCK SITES OF CAPPADOCIA

Özge Ceylin YILDIRIM[1], Figen KIVILCIM ÇORAKBAŞ[2]
[1] Research Assistant and PhD student, Yıldız Technical University, Istanbul, Turkey
[2] Associate Professor, Bursa Uludag University, Bursa, Turkey

Abstract

All heritage sites have natural and cultural values, which are frequently threatened by disasters like earthquakes, floods or human-induced disasters like wars. The dangers like the negative effects of urbanization, mass tourism and extensive infrastructure development create risks and negatively affect the authenticity and integrity of heritage sites. Risk maps of heritage sites are useful tools that can help reduce potential risks and to plan effective disaster management. The aim of this study is to identify, analyse and evaluate the factors that affect the formation of risks that threaten a specific World Heritage Site, that is the Goreme National Park and the Rock Sites of Cappadocia, and to develop recommendations for reducing and preventing risks. Geographical Information Systems (GIS) are utilized to prepare and evaluate risk maps. Within the scope of the study, a GIS database is established to identify, map and monitor risks in order to prepare a risk management model. Nature and human-induced hazards were identified and mapped for the case study; and the risk levels were determined by evaluating the risks with an holistic approach. Finally, the integration of risk maps to the site management plans; which are created to produce interdisciplinary information and to ensure public participation by sharing this information and to manage developments in a systematic and planned manner, were discussed. As a result, it is proposed that a GIS based model for the analysis and management of the risks can contribute to the solution of the administrative complexity.

Keywords: Heritage at Risk, Risk Management, Goreme National Park and the Rock Sites of Cappadocia, GIS, Risk Mapping

1. Introduction

The risk occurs depending on the vulnerability of heritage values exposed to certain hazards in the future (UNISDR, 2009). Natural or human-induced risks negatively affect the integrity and authenticity of heritage sites (UNISDR, 2009). Today, although the concept of risk is generally considered as emerging from natural or human causes, it is also argued that the human factor is the basis of all risks. Risk is calculated by multiplying two basic components of risk: hazard and vulnerability. The proposed expression defines risk as:

"RISK = HAZARD X VULNERABILITY" (Alexander ,2000).

In this study, by using the studies carried out by UNESCO as the primary source, the risks to heritage values and the factors affecting cultural heritage conservation are categorized as nature and human-originated risks. Each risk factor was reclassified within itself, as developing rapidly and slowly according to the realization speed of the risks (Table 1). All risks were classified as human or nature-induced, coded accordingly like NR-2 (natural), NR-3, HR-1 (human-induced), HR-7, HR-8; and were analyzed and evaluated.

Table 1. *Classification of risks according to their sources and speed of development (after Veillon, 2014 and UNESCO, 2012; prepared by the author.)*

NATURE-INDUCED RISKS		
NR -1: LOCAL CONDITIONS AFFECTING PHYSICAL FABRIC		
Fast Growing		**Slow Growing**
Wind		
Temperature	Water	
NR-2: SUDDEN ECOLOGICAL AND GEOLOGICAL EVENTS		
Fast Growing		**Slow Growing**
Earthquake	Rock Fall	Erosion and siltation/deposition
Volcanic Eruption	Tsunami	
NR-3: CLIMATIC DISASTERS		
Fast Growing		**Slow Growing**
Flooding		Drought
Storms		Desertification
Avalanche		Climate Change Impacts

HUMAN-INDUCED RISKS			
HR-1: RISKS EMERGED BY URBAN INFRASTRUCTURE AND DEVELOPMENT ACTIVITIES			
Fast Growing		**Slow Growing**	
		Risks emerged by Commercial Development	Risks emerged by Housing
		Risks emerged by Industrial Sites	Risks emerged by Transportation Infrastructure
HR-2: RISKS EMERGED BY UTILITIES OR SERVICE INFRASTRUCTURE			
Fast Growing		**Slow Growing**	
		Risks emerged by Water Infrastructure	Risks emerged by Renewable Energy Fac.
		Risks emerged by Non-Renewable Energy Facilities	
HR-3: RISKS EMERGED BY BIOLOGICAL RESOURCE USE/MODIFICATION			
Fast Growing		**Slow Growing**	
		Risks emerged by Hunting	Risks emerged by Land Conversion
HR-4: RISKS EMERGED BY PHYSICAL RESOURCE EXTRACTION			
Fast Growing		**Slow Growing**	
		Mining	Oil and gas
HR-5: RISKS EMERGED BY SOCIAL/CULTURAL USES OF HERITAGE			
HR-6: SECURITY BASED			
Fast Growing		**Slow Growing**	
Civil Unrest	Terrorism	Deliberate Destruction	Risks emerged by Military training
War		Illegal Activities	
HR-7: RISKS EMERGED BY MANAGEMENT AND INSTITUTIONAL FACTORS			
Fast Growing		**Slow Growing**	
		Risks emerged by Legal Framework	Risks emerged by Management Activities
		Risks emerged by Improper Management Systems	Risks emerged by Financial Resources
HR-8: RISKS EMERGED BY MASS TOURISM			
Fast Growing		**Slow Growing**	
		Risks emerged by Visitor Accommodation and Associated Infrastructure	Risks emerged by Interpretative And Visitation Facilities
HR-9 : POLLUTION			

Göreme National Park and The Rock Sites of Cappadocia which were declared as a WHC in 1985, were choosen as case studies. Cappadocia is a unique region with a multicultural past. It is a huge region containing Turkey's mixed (natural and cultural) UNESCO World Heritage Site and it hosts numerous urban, archaeological and natural conservation sites. This diversity in the socio-cultural, historical and physical contexts has made Cappadocia a meeting zone of cultures from all over the world throughout history. The people living and working in Cappadocia and visiting this region have various motivations to engage in the place. On the other hand, the authorities that are expected to conserve the rich natural and cultural values of Cappadocia have various limitations leading to the loss of values in the region. In this complex system of values,

stakeholders and their –sometimes conflicting- interests, this study argues if a GIS-based model for risk analysis and management can contribute to a more systematic, inclusive, and democratic decision-making process for risk management integrated into site management.

2. The Risks Threathening Heritage Values of Göreme National Park and the Rock Sites of Cappadocia

2.1 Description of the Study Area

Cappadocia was shaped dating back to the Neolithic period with the lava and ashes of the Erciyes, Hasandağı and Güllüdağ volcanic mountains and the erosion of these soft layers over the years. It reflects the harmony and balance between human and nature, in other words, it is the product of nature and human interventions. Throughout history, many civilizations have settled in these lands including Assyrian trade colonies, Hittites, Persians, Romans, Anatolian Seljuks, Karamanids and Ottomans. Cappadocia was formed by the direct or indirect experience of humans. Natural conditions transformed the easily shaped tuff into fairy chimneys that were used for shelter, defense and resistance in different historical periods. As a result, the region of Cappadocia is loaded with multi-layered historical, cultural and natural values. It is an exceptional geography with unique settlement typologies, spectacular topography, unprecedented cultural landscape, and numerous rock-carved settlements and architecture.

Cappadocia, which is a place that is formed by continuous human and nature interaction, continues to change. This situation makes it difficult to preserve historical identity, natural and cultural heritage values. The increasing pace and dynamics of change in the 21st century threaten the integrity and sustainability of both natural and cultural assets of Cappadocia. Conservation studies which started in 1976 by making a distinction between historical and natural sites throughout Cappadocia, were developed by grading them as natural, archaeological, and urban sites in 2014. However, the required protection plans for residential sites at a scale of 1 / 5000-1 / 1000 have not been realized. It is brought to light by the researchers that, for the most of the Cappadocia's settlements, the conservation and development plans have not been completed or have been approved so recently that they were not applied yet. This situation may be a result of the fact that the Heritage Management Plan that was proposed by UNESCO in 1994 has not been realized yet. On the other hand, in Cappadocia, a site management office more potent then the other examples in Turkey was founded in 2019. This office unified the responsibilities of managing the heritage sites and approving the projects related to the registered buildings or sites. Until today,

we have little clues if such a heritage management office will be adequate to solve all the conservation problems of such a huge and complex heritage site. It is also important to point out that, although it is one of the first sites to be registered as a World Heritage Site in Turkey; the Cappadocia World Heritage Site still does not have a n approved site management plan.

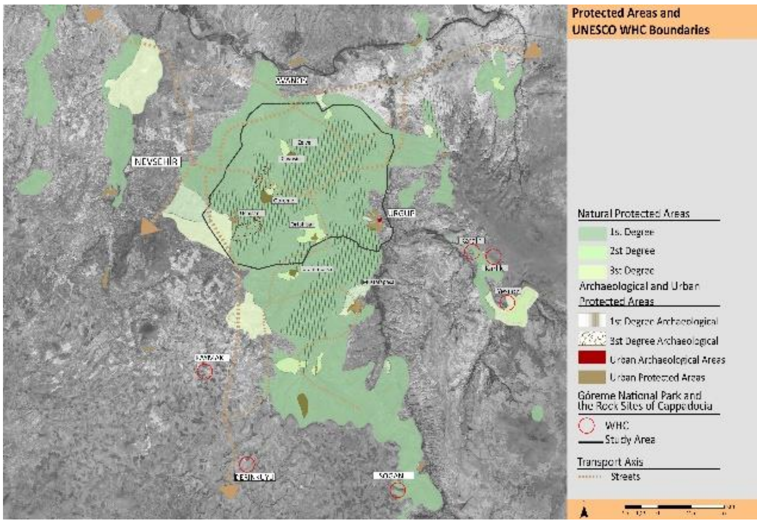

Figure 1. Geographic location of the study area

Site management plans are strategic management documents that contain decisions regarding the protection, survival, use, and evaluation of cultural heritage sites and ensure their implementation. The planning process should be realized in an open and comprehensive manner with an integrated conservation perspective. A systematic approach should be developed by focusing on the problems and solutions of the site. The site management plan should also incooperate a risk management plan that defines the risks to which the site is exposed and resolves the risks. Within the scope of the study, maps produced by GIS, will provide important contributions in identifying and handling risks in an integrated conservation outlook.

2.2 Identification of Risks

The first step of the risk assessment and management process is the identification of constantly changing risk dynamics and determining their locations. In this step, the risks that threaten the heritage values in the study area are defined by considering the past situations and those are likely to occur in the future.

First of all, it is seen that the geomorphological structure and its unique natural or artificial formations, which are among the distinctive features of the site, are open to being affected and deteriorated by natural processes. The risks originating from nature that threaten heritage values are determined as earthquakes, erosion, cave collapse, and

rockfall, which are caused by sudden ecological and geological events (Topal & Doyuran, 1998; Perret, et al., 2004; Gökçe, et al., 2008; Zorlu, et al., 2011; Özşahin, 2012). In addition to these, climatic disasters like flood, avalanche negatively affect heritage sites (Demirkesen, 2008; Arabacı, et al., 2017) (Figure 2).

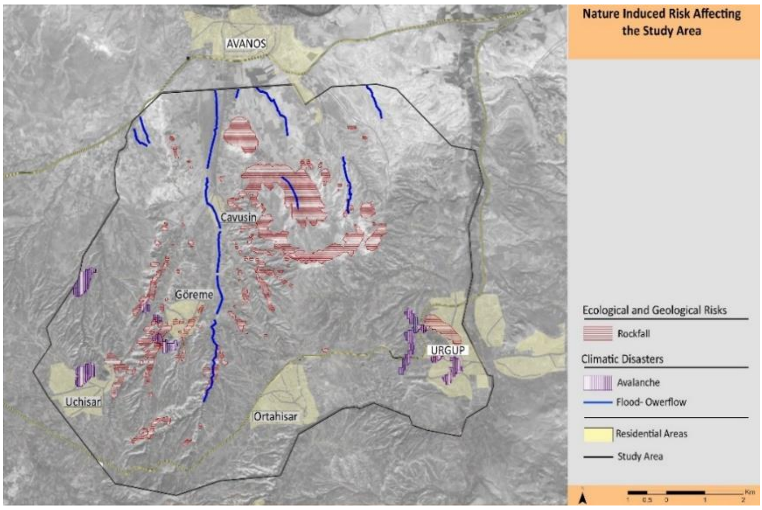

Figure 2. Map of Risk to the Nature- induced

The case study is exposed to many human-induced risks at the same time (Figure 3). However, these risks are developing slowly. For this reason, their developments in the historical process were examined in order to be able to define them clearly. It is found that the risks emerging from urban development and infrastructure activities were caused by zoning arrangements, restoration works or road construction activities, which weren't well-integrated into the conservation plans (Eravşar, 1996; Görmez, et al., 2002; Yıldırım, 2005; Kabaoğlu Yıldırım, 2006; UNESCO, 2009). These are one of the main hazards to natural and cultural heritage values.

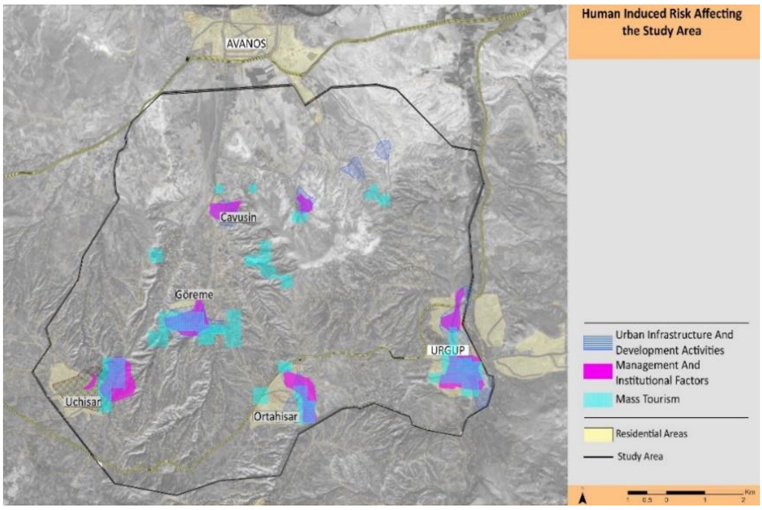

Figure 3. Map of Risk to the Human- induced

Moreover, the infrastructure systems such as sewerage, water network, treatment facilities, which are defined as" Utilities -Service Infrastructure" and the investments that were made in these had a negative impact on both urban sites and natural and archaeological sites (Eravşar, 1996; NÇŞB, 2017). Due to the increasing population ratio in the heritage site, the increase in tourism potential, vandalism, and illegal activities of the visitors and local people, security gaps were formed and this situation resulted in negative effects. The conservation sites, which include natural, archaeological and urban sites, were planned by different management units according to relevant national legislation. This legal and administrative situation brings along problems such as confusion of authority and lack of coordination in the decision-making processes between institutions (Eravşar, 1996; Protection Board Archive, 2018). (Kuşluvan, 1999). Additionally, mass tourism had been rapidly increasing since the 1980s until the pandemic, and this created a physical pressure on Cappadocia, which was very rich in heritage values but also highly vulnerable to risks due to the fragility of some of its delicate natural formations (Eravşar, 1996; Tosun, 1998; Orbaşlı, 2000; Simon et al., 2004; UNESCO, 2009; Somuncu & Yiğit, 2009; Tucker & Emge, 2010; Buyruk, 2011).

2.3 Risk Analysis and Risk Mapping

After the risks are identified in line with the hazards and vulnerability of the site, the level of the identified risk is evaluated and analyzed depending on the probability and severity of its impact (Waller, 2003). The higher the frequency, strength and scope of the threat, the higher the risk impact. Within the scope of the study, the priorities for analyzing the data collected on risk factors were graded from 1 to 3 with the ABC risk analysis model (Paolini, et al., 2012). In the ABC risk model; the initials stand for following characteristics of the risk factor:

A: How often and in which time the risk factor occurs,

B: The estimated value of the damage to the site,

C: The estimated domain value of the risk factor.

In addition to ABC Risk model, the analytical hierarchy process (AHP), one of the Multi-Criteria Decision Making Methods (Saaty,1980), was used as a statistical model to analyze the risks in the site. AHP method is widely used in decision theory to compare different factors and their relative importance. (Oikonomidis et al., 2015, Pourghasemi et al., 2012). Considering the existence and vulnerability of the hazards examined in the historical process, the risk levels were first determined with the ABC risk model. Afterwards, the AHP method was used for the statistical data and the relative situations of the risks, and the weight degree from 1 to 9 was determined (Table 2).

Table 2. The risk factors in the study area: the evaluation of the risk factors according to the ABC risk model and AHP methodology.

TYPES OF RİSK	RISK FACTORS	A	B	C	THE RATE OF RISK WEIGHT
Nature-induced	NR- 2: Sudden Ecological And Geological Events	3	2	2	7
	NR- 3: Climatic Disasters	1	2	1	4
Human-induced	HR- 1: Risks Emerged By Urban Infrastructure And Development Activities	2	3	2	7
	HR- 2: Risks Emerged By Utilities Or Service Infrastructure	1	1	1	3
	HR- 6: Security Based	3	2	1	5
	HR- 7: Risks Emerged By Management And Institutional Factors	2	3	3	8
	HR- 8: Risks Emerged By Mass Tourism	2	3	3	8

Nature- induced risks have been analyzed in a holistic manner by considering rock fall, flood and overflow, and avalanche risks (Figure 4). Zelve and Uçhisar settlements have very high-risk levels sites, as more than one risk overlaps and high-risk levels. Göreme settlement and the northeast of Göreme have high-level risk levels that contain more than one risk. The west of Uçhisar, northwest and southeast of Ürgüp are sites subject to low-risk levels.

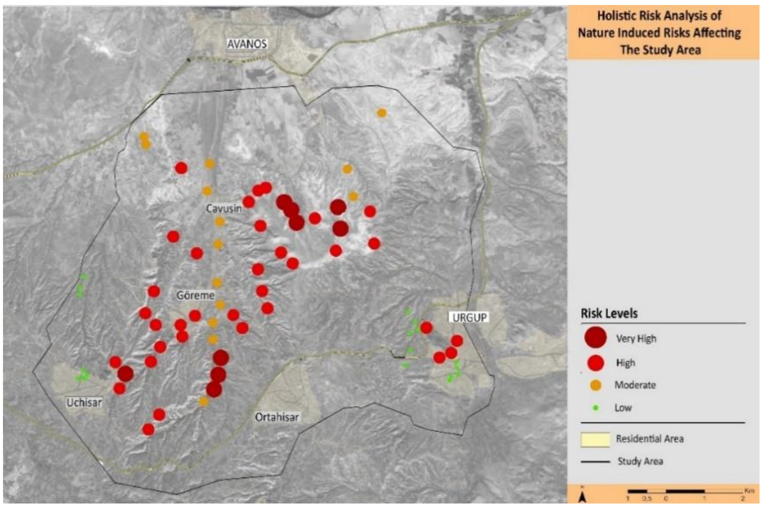

Figure 4. Map of the Holistic Risk Analysis of The Nature- induced

Human-induced risks are analyzed holistically (Figure 5).Urban conservation areas and surroundings of Ürgüp, Ortahisar, Uçhisar and Göreme settlements emerged as sites with very high-risk levels. The Göreme settlement is smaller than the other sites, but because of the tourism and administrative activities, it is exposed to very high and moderate risk levels. The Çavuşin settlement faces medium and low-risk levels. Zelve settlement is a heritage site where legal, administrative and tourism activities are intense and it carries a very high risk level in terms of conservation and use balance.

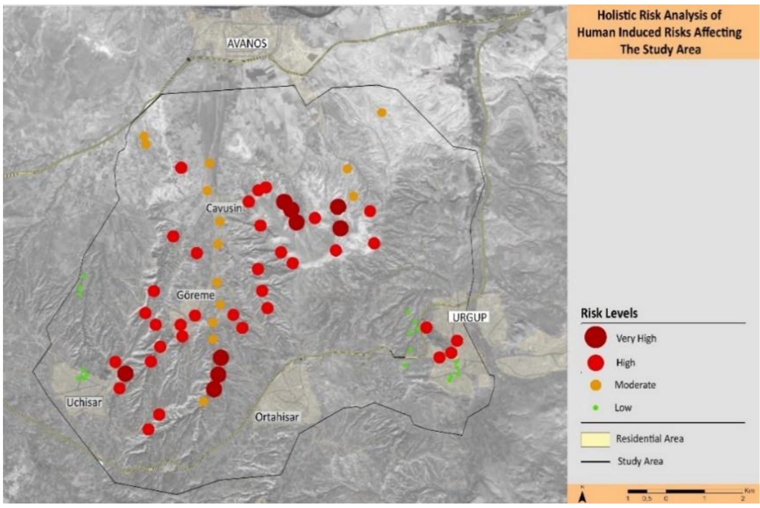

Figure 5. Map of the Holistic Risk Analysis of The Human- induced

2.4 Risk Assessments

Risk assessment was realized as the general evaluation of the analysis maps created in GIS. The existence of risks was used to reveal different risk types and risk exposure levels for the natural and cultural heritage values in the study area (low, moderate, high, and very high).

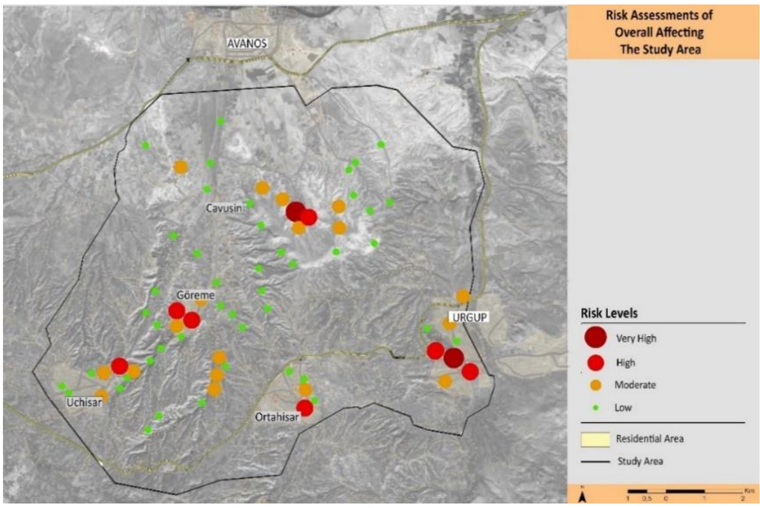

Figure 6. Map of overall risks

Table 3. Comparative assessment of risks threatening the study area with the AHP

method

TYPES OF RISK	RISK FACTORS	NR- 2	NR- 3	HR- 1	HR- 2	HR- 6	HR- 7	HR- 8	THE RATE OF RISK WEIGHT
Nature-induced	**NR- 2:** Sudden Ecological And Geological Events	1,00	1,75	1,00	2,33	1,40	0,88	0,88	0,17
	NR- 3: Climatic Disasters	0,57	1,00	0,57	1,33	0,80	0,50	0,50	0,10
Human-induced	**HR- 1:** Risks Emerged By Urban Infrastructure And Development Activities	1,00	1,75	1,00	2,33	1,40	0,88	0,88	0,17
	HR- 2: Risks Emerged By Utilities Or Service Infrastructure	0,43	0,75	0,43	1,00	0,60	0,38	0,38	0,07
	HR- 6: Security Based	0,71	1,25	0,71	1,67	1,00	0,63	0,63	0,12
	HR- 7: Risks Emerged By Management And Institutional Factors	1,14	2,00	1,14	2,67	1,60	1,00	1,00	0,19
	HR- 8: Risks Emerged By Mass Tourism	1,14	2,00	1,14	2,67	1,60	1,00	1,00	0,19

The risks were compared with each other with AHP method (Table 3). All risk analysis data was superimposed and evaluated (Figure 6). A total of 27% of the heritage sites in Cappadocia are subject to risk due to nature- induced risks. 17% of the sites are subject to sudden ecological and geological risks (NR-2). 10% of the sites subject to climatic disasters (NR-3). According to the results of the evaluation, a total of 73% of the sites are subject to risk due to human-induced risks. 19% of the heritage sites are subject to risks emerged from management and institutional factors (HR-7) and mass tourism (HR-8), which are the most widespread risk categories. 17% of the sites subject to risks that were emerged from urban infrastructure and development activities (HR-1). The risks emerged from lack of security (HR-6) are affecting 12% of the sites. Finally 7% of the sites are subject to risks that were emerged from utilities - service infrastructure (HR-2).

3. Conclusion and Discusssion

In Cappadocia, conservation studies started in the 1970s and have undergone numerous changes with different applications until today. However, the conservation approaches and plans that only regulate the physical space and that only contain high-scale decisions, did not include socio-economic and socio-cultural management models and did not provide holistic and sustainable conservation. This situation complicates the management of the risks faced by the study area. For this reason, risk assessment was made on a spatial scale for all the heritage sites in Cappadocia, and examine multiple risk factors were examined on a large scale rather than a single area. Due to the risks that the area is exposed to, it is necessary to analyze and evaluate with an integrated conservation approach.

With the risk maps created, the zones under risk are determined by considering the vulnerability and the threat level of the area. In this way, the interventions that should

be taken to protect the integrity of the area can be determined in order of importance. At the same time, this approach helps the conservation experts and managers identify the risks to which the area is exposed. Moreover, risk assessment is important for the implementation of the management plan and monitoring.

It is very important for multilayered cultural and natural landscapes such as the study area to have a site management plan. Model proposals can be developed in parallel with the development of databases in the GIS environment based on the collection and use of quantitative, qualitative and spatial data. However, interdisciplinary research is needed for more detailed analysis with statistical information about the existence, level and effects of risks.

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3.
THE PROTECTION OF BIOCULTURAL WORLD HERITAGE. BRINGING TOGETHER SCIENCE AND INDIGENOUS TRADITIONAL KNOWLEDGE

Grissel Meneses Camacho[1], Mindahi Bastida Munoz[2]
[1,2] Director of Original Nations Program, The Fountain. Member of the Executive Committee of Alliance Guardians of Mother Nature.

Abstract

State Parties to the World Heritage Convention are committed to protect the world's cultural and natural heritage for future generations. Despite these efforts, the world's tangible and intangible heritage is increasingly threatened by multiple factors (ICOMOS 2016, 9). As extreme weather events are more frequent and unpredictable, ecosystems and biodiversity are declining faster than ever in human history (IPBES 2019,10). Climate change is increasingly recognized as a threat multiplier with concrete impacts on cultural diversity, security and peace (UN, 2019) (Bern, Suisse, n.d.). Even more, the recent COVID-19 pandemic has caused more than 1,000,000 deaths (WHO, October 2020), disrupting health systems and plunging the global economy, particularly affecting Tourism and Culture sectors and compromising thousands of jobs around the world.

Overcoming these global challenges demands urgent and ambitious action, systemic change requires a shift in mindsets and strengthened synergies and collaboration across sectors and institutions. This paper underlines the positive role that Cultural Heritage protection, responsible tourism practices and forest conservation initiatives can have in mitigating social, cultural and economic impacts of the pandemic while contributing to the United Nations 2030 Agenda for Sustainable Development by "ensuring that no one is left behind" (UN 2015).We argue that the current crisis is not only material: destructive human behavior and broken societies reflect a deep disconnection of the human species with its true nature and spirituality and a profound misalignment with the principles of life. Indigenous traditional knowledge and modern science for conservation and risk management are critical to stop and revert the underlying causes of nature and cultural -*biocultural*- destruction and human conflict.

Keywords: Natural Heritage, Cultural Heritage, Risk Management, Indigenous Traditional Knowledge, Biocultural Sacred Sites

1. Covid-19 impacts on Tourism and World Heritage

Considered as a major economic driver and one of the most labor-intensive sectors, Travel and Tourism was responsible for 330 million jobs — 1 in 10 jobs around the globe— making an 8.9 trillion contribution to the world's GDP in 2019 (WTTC, Oxford Economics 2019). That was before the COVID-19 pandemic put an end to ten years of sustained growth and nine consecutive years outpacing global GDP (Ibidem). Accounting for approximately 8% of global greenhouse gas emissions (Lenzen *et al.* 2018*),* the sector that is also highly exposed to direct and indirect impacts from climate change (CISL *et al*. 2014) faces raising pressure from international agreements to drastically reduce and offset carbon emissions from flight transportation and accommodation.

In efforts to contain the virus spread, country lockdowns, closed borders, travel restrictions and cancellations of events resulted in air travel plummeting and international arrivals declining from 58% to 78% in 2020, putting over 120 million direct tourism jobs at risk (UNWTO 2020).

The unprecedented health crisis has also affected the cultural sector. Ninety-five percent of World Heritage sites were totally or partially closed (UNESCO 2020) and 95% of world's Museums were forced to close (ICOM 2020), losing millions in revenues, as museums professionals and policy services reinforced security measures to protect collections from emergencies and illicit trafficking of cultural property (ICOM-INTERPOL 2020). Artists of Original Nations,[1] especially native women, which largely operate in the informal sector, were particularly impacted by the closure of traditional products and handcraft markets and traditional festivals that were postponed (UN 2020).

In response to the crisis, the United Nations World Tourism Organization, launched the landmark report « Covid-19 and transforming Tourism » (August 2020) calling for coordinated policies across borders, to restart the sector and mitigate the pandemics' social, cultural and economic impacts, providing a roadmap to align the sector with the Paris Agreement targets and the 2030 Agenda, where a strengthened collaboration and partnerships at all levels are key to achieve the Sustainable Development Goals (hereafter SDG's). McKinsey & Company (2020) forecasts four to seven years for tourism demand to return to 2019 levels; the recovery will require *"*coordination at a level not seen before*"*.

As the sector struggles to adopt security measures and restore travelers' confidence, domestic tourism[2] appears as a main driver for the sector recovery, contributing to

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[1] Original Nations refers to the so-called Indigenous Peoples.

[2] Representing 71.2% of all tourism spending in 2018 (WTTC, 2019) and around 75% of the tourism

regional economic benefits and the building of national pride, particularly in developing countries (WTTC 2019). In this regard, the tourism crisis has also resulted in a return to valuing local knowledge and traditions as a means to provide solutions to enhance and sustain livelihoods in times of crisis. For example, to cope with the economic impact on local communities, governments around the world have promoted traditional gardening techniques in Dominica and Lebanon and the use of local ingredients in Colombia, Costa Rica and Jamaica. Other governments have found digital solutions to share intangible cultural heritage in accordance with social distancing measures. These comprise Czechia, UK, France, China and British Virgin Islands (UNESCO 2020).

1.1 - Managing Tourism Flows to Prevent Negative Cultural, Social and Environmental Impacts

As nature and culture are two major drivers of tourism, the protection of touristic sites is fundamental for the sector growth and competitiveness (OECD 2013). Paradoxically, the increasing growth of tourist flows over the past six decades was carrying major negative social and environmental impacts, affecting capital cities and popular destinations around the world (Peeters *et al*. 2018). The « *overtourism* phenomena » is a relatively new source of concern among policy makers given the important social and cultural implications for local residents such as: gentrification, musefication, tourism phobia, commoditizing of cultural practices (documented by Carlos Monterrubio and Melvin Bermúdez 2014), overuse of natural resources, degradation of natural and cultural landscapes and increased noise, air and water pollution. Venice, declared World Cultural Heritage in 1987, is a notable case of « gentrification » and « touristification », receiving on average 30 million tourists per year, before the Covid-19 pandemic, the city of 156,9 Km^2 has seen its local population decline by two-thirds since the last century (Trancoso Gonzales A., 2018, 48). According to the study of the European Parliament *Overtourism: impacts and possible policy responses (2018, 22)* the environmental, economic and social impacts of Overtourism, depend on the type of destination, where the most vulnerable destinations are not necessarily cities, but rather coastal, islands and rural heritage sites. From over 290 regions assessed in the study,[3] 53 presented at least one destination confronted overtourism and a preliminary number of 15 regions were identified « at high risk of overtourism ».

In the European region for instance « 52 out 60 overcrowded destinations contain or are close to one or more UNESCO World Heritage Sites » (Peeters *et al*. 2018, 70)

economy in OECD economies, (OECD, 2020)

[3] From 41 case studies 29 were from the EU, five from other European countries, and seven from the rest of the world.

while only one-third of all World Natural Heritage Sites have extensive tourism planning in place (McKinsey & Company 2017, 32).

A study by McKinsey & Company and the World Travel and Tourism Council (2017, 40-49) have identified five tactics to address overcrowded destinations: (1) Smooth visitors over time (2) Spread visitors across sites (3) Adjust pricing to balance supply and demand (4) Regulate accommodation supply (5) Limit access and activities.
The *UNESCO World Heritage Sustainable Tourism Toolkit*, provides with invaluable guidance on Sustainable Tourism management where the Guide 8, *Managing Visitors Behavior* appears particularly relevant to preserve World Heritage Sites while avoiding the negative effects that tourism may have over culture, nature and society.

2. Advancing Risk Management Understanding Multidimensional Risks

Cultural Heritage itself appears as an enabler for social cohesion and equity, with the power to strengthen communities' traditions, identity and well-being by providing common spaces for diverse groups to interact. (ICOMOS 2016, 11) It also plays an important role in supporting intercultural understanding, disaster risk and community resilience (Longworth, 118-119) Moreover, the role of cultural policies as reconciliatory among nations and peace-building is increasingly acknowledged (UNESCO 2013; Rouhani 2018).

Despite conservation efforts, the world's natural and cultural heritage face multiple dangers such as, natural disasters, physical decay, unsustainable tourism, increasing development pressures and progressive industrialization (ICOMOS 2016, 9; Longworth 2015, 119,120). More concerning, terrorism, armed and inter-ethnic conflicts and illicit traffic of cultural property, in all parts of the world, are increasingly threatening World's Heritage (ICCROM 2013, 11), (ICOMOS 2016). These destructive human patterns represent a direct existential threat to tangible and intangible heritage, implying collective trauma, loss of traditions and cultural identity.

Concerning the impacts of Climate Change on the World Cultural Heritage, UNESCO has identifies the following challenges to implement the Policy Document : (1) a passive role of states, (2) lack of awareness about the alarming rate at which impacts of climate change are affecting the World Heritage properties, (3) lack of financial resources and (4) lack of human resources, (5) absence of knowledge resources and (6) lack of political support and coordination between local and national levels. (UNESCO Online consultation, 2020)

Unfortunately, economic forces appear as a major cause of biocultural destruction. In the forest sector, for instance, where oil, mining and agricultural concessions are a

growing source of conflict of interest in the public and private sectors, worsened by lack of transparency and illegal activities, often result in indigenous land rights violations and the destruction of critical ecosystem services, undermining international efforts on climate change adaptation.

Local and indigenous land tenure directly contribute to many of the 17 Sustainable Development Goals, including SDG1 No poverty, SDG2 No hunger, SDG8 Decent Jobs, SDG 10 Reduced Inequalities, SDG12 Responsible Production and Consumption, SDG13 Climate Action, SDG14 Life on land, SDG16 Peace, Justice and Strong Institutions and SDG17 Partnerships for the SDGs. While these lands are increasingly coveted by governments and international investors, evidence shows that Indigenous Peoples and local communities owned and managed forests have historically delivered superior community benefits and greater carbon storage (WRI and RRI 2O14:2).

Moreover, ensuring local land rights is increasingly recognized as a low cost strategy to reduce forest carbon emissions, reduce financial risk to investments and secure a sustainable supply of commodities while supporting the most vulnerable populations (WRI and RRI 2O14:1). Risk management planning that involves local communities is key to avoid the erosion of natural heritage, to ensure traditional knowledge transmission while effectively addressing Climate Change related risks.

Although they have an enormous potential for job creation, food security, climate change mitigation and economic benefits estimated at nine dollars generated for every dollar spent, forest land restoration efforts have been underestimated by as many as 117 of the 166 countries that have submitted their Nationally Determined Contributions (NDC) under the Paris Agreement (Holder M. 09/2020).

Launched in 2011 by the International Union for Conservation of Nature - IUCN and the German Government, The Bonn Challenge, that has reached land restoration pledges for more than 2,010 million hectares of degraded land worldwide, appears as a major global initiative with potential to harness Nature-Based Solutions (NBS) benefits in the fight against climate change and the current economic downturn. In massive efforts to scale up the restoration of degraded ecosystems, the United Nations General Assembly has declared 2021-2030 the UN decade of ecosystem restoration. The restoration of 350 million hectares of degraded land between now and 2030, could generate USD 9 trillion in ecosystem services, while withdrawing 13-26 gigatons of greenhouse gases out of the atmosphere (UNEP, 2019).

The problem with these initiatives is that most of the indigenous territories involved become dependent on carbon offset dynamics and rules which rely on carbon emissions. This jeopardizes processes of empowerment of Indigenous Peoples relying on their ecosystems to enrich their biocultures. The consultation and Involvement of indigenous communities is crucial to achieve the global target to protect at least 30% of the world's

biodiversity by 2030 (CBD, 2020) and is a major opportunity to exchange knowledge and learn from Indigenous teachings, including moral and spiritual principles towards the achievement of the wider collective goal to live in harmony with nature.

2.1 - Taking into Consideration Modern Science and Indigenous Traditional Knowledge to Conservation and Risk Management Approaches

In a lapse of 50 years, human actions have accelerated nature's processes and landscapes (Steffen et Al, 2015). Reliance on fossil fuels and industrialized forms of agriculture have largely induced damage on Earth systems, driving us into a new geological era, *the Anthropocene*, where 3 of 9 interlinked “planetary boundaries” have already been overstepped (climate change, biodiversity loss, Nitrogen cycle), with disastrous consequences for humanity. (Rockström et al 2009)

While limiting global temperature to 1.5 °C before pre industrial levels would avoid long lasting or irreversible change in ecosystems and human development (IPPC 2018, B), under current climate policies, we are heading to a 3 °C to 4 °C trajectory by 2100 (Carbon Action Tracker, 2019), in which most forms of life seem unlikely. Direct and indirect drivers of change in nature are underpinned by *societal values and behaviors* (IPBES 2019,12), which are critical to address to reverse the current destruction trends and reduce impacts of climate change.

Despite overwhelming scientific evidence of the global emergency and the urgency of immediate coordinated efforts to avoid the extinction of life on Earth, many governments have used the COVID-19 pandemic to roll back environmental regulations, increasing the pressures on the environment and already vulnerable communities around the world (UN News 2020). In this context the OECD approach of Policy Coherence for Sustainable Development is of fundamental importance for the effective implementation of the 2030 Sustainability Agenda and the Paris Agreement.
Whereas there is a growing recognition across governments of the need to *break out of institutional and policy silos to fully realize the benefits of synergistic actions across the SDGs*, an « *effective leadership and strong commitment at the highest political level* », appear as a critical condition to respond to the multiple dimensions of the current crises (OECD, 2019).

It is therefore urgent to provide leaders with the right mindsets and skills to cope with today's complexity and enable the conditions where a global civilization and the entire Earth community can thrive. In the book *Manual for a Perfect Government,* Dr. John Hagelin (2002) explains that the complex challenges faced by governments fundamentally arise from a non-fully comprehensive scientific understanding on how nature functions and the violation of natural laws. The renowned quantum physicist

proposes that these challenges can be prevented and solved by applying modern and ancient Vedic science through educational programs that develop the expansion of consciousness.

3. Indigenous cosmology, an earth-centered holistic approach

Embodying traditional lifestyles, Indigenous Peoples have a clear understanding of the natural laws. Their cosmovisions (worldviews) comprise a holistic view of the world, where Mother Earth or « Gaia » is a sacred living being with spirit, and different ecosystems and unseen elements coexist and are interconnected. Each community constitutes a complex system of cumulative knowledge, strong value systems, based on reciprocity, a vibrant society where people talk to each other, where every being has its place and deserves respect and reciprocity.

Activities such as agriculture and spiritual ceremonies are organized around the solar and lunar calendars, the wisdom elder transfer knowledge, traditions, cosmology and spiritual practices to younger generations and men and women coexist as complementary dualities. Indigenous women have intrinsic and important knowledge of nature, supporting the unity and cultural strength of communities in the respect of natural life cycles and with love for all the beings of Mother Earth. Carriers of ancient knowledge, Indigenous communities are probably the most vulnerable populations to the effects of climate change, especially in Arctic regions, small islands and high altitudes (CBD Newsletter, 2007).

Being approximately 476 million people around the world and only 6% of the global population, they manage approximately 28% of the world's land surface, including some of the most ecological intact forest and biodiversity hotspots (FAO, UNEP, 2020). At least 5000 distinct Indigenous Peoples around the world support about 80% of the world's biodiversity. The Convention of Biological Diversity (CBD) recognizes the Indigenous Peoples' unique role in conserving life on Earth, especially that of women. Besides geographical specificites, Indigenous peoples face similar existential challenges and as noted by Siegfried Weissner they share a common quest: *the preservation and flourishing of a culture inextricably, and often spiritually, tied to their ancestral land (*Wiessner S. 2011,1).

Over millennia Indigenous Peoples have lived in harmony with nature, maintaining and developing their ways of life, traditions, cosmology and spiritual practices. In the Americas, Africa and other continents, for over five centuries of Colonial and Neo-Colonial history, they have defended their sacred sites from destruction, occupation, profanation and commercialization.

3.1 The Critical Role of Biocultural Sacred Sites in Sustaining Traditional Ways of Life and Elevating the Capacity of Mother Earth to Restore Systemic Balance

Sacred Natural Sites have an intrinsic capacity to sustain biodiversity and the quality to support indigenous and traditional peoples' ways of life, spirituality and policy contexts, that enable the conservation of the sites Otegui-Acha (2007). In a broader concept, Biocultural Sacred Sites can be added to the following concepts: 1) Bio-culture, (2) time–space, and (3) energetic-activation (Bastida Muñoz, Patrick Encina 2017).

The notion of Bioculture implies that any natural element on earth or in the sky that is apprehended by the human heart and mind becomes cultural. "Bioculture is ubiquitous, it is linked to a time–space coordinate". If the chronotope is activated with natural energy, mainly in the form of heat or electromagnetic discharge, and/or human energy, mainly as thoughts, words, songs, and music, then biocultural sites acquire a sacred quality and become highly spiritual (Ibidem).

In efforts to develop a mechanism that protects and nominate sites of sacred value, Indigenous Leaders gathered at the territory of Tezhúmake of the Wiwa community (Sierra Nevada de Santa Marta, Colombia, may 2013), with representatives of institutions like UNESCO, local governments and the civil society, proposing to create a Global Network of Spiritual Reserves (Red Mundial de Reservas Espirituales de la Humanidad), (Oficina de la UNESCO en Quito 2015).

However, the concept of « Spiritual Reserves » does not reflect the Biocultural diversity of these locations, neither alludes to the complex relation with the communities and these sites, moreover the word « reserve » holds negative historical connotations in some regions. In further meetings Indigenous leaders have brought together different perspectives and symbolic representations of harmony, spirituality and biodiversity. (Sitios Sagrados: Biodiversidad y Espiritualidad Andina, Conference 2009).

Traditional ways of life and activities around the Sacred Biocultural sites, including biodiversity protection and reforestation and sustainable tourism, are particularly relevant in the face of the current crises. The benefits of Sustainable Tourism practices, community-based approaches and local involvement of traditional peoples in the sustainable management and reconstruction of the world Heritage Sites (Sullivan, UNESCO 2003:49-55) are well documented in the outcome paper of the international conference: Linking Universal and Local Values: Managing a Sustainable Future for World Heritage, (UNESCO Series n°13 2004.)

While the local and Indigenous Knowledge has been recognized as a prime resource for empowering communities to combat marginalization and poverty (UNESCO, 2003:11), the Convention on Biological Diversity provides for restrictions of use and

access to sacred sites, in consultation with full involvement of Indigenous communities. (CBD 2004, D 20, F Akwé: Kon)

The *IUCN Guidelines for Sacred Natural Sites* and the work of Sacred Natural Sites dot Org underline the spiritual qualities of natural heritage, providing protected area managers, elements for a better recognition and engagement with cultural and spiritual and religious aspects of Sacred Natural Sites. Moreover, the *Benefits of religious tourism for socio-economic Development of host communities* was highlighted during the International Conference on Religious Tourism in Bethlehem, Palestine (UNWTO 2015).

Early this year, a group of interdisciplinary experts, activists, indigenous leaders and spiritual guardians proclaimed the *ASSEGAIA declaration* at the *2020 World Economic Forum* in Davos calling for a systemic shift in consciousness placing the regeneration of living Earth at the center of all decisions.

> *"We call for the 'ecocentric' protection of all Sacred Natural Sites based on an Earth-centred approach that places the sacredness, integrity, and regeneration of these sites at the heart of all decisions affecting them, regardless of their perceived usefulness, material value, or importance to humans. Sacred Natural Sites hold intrinsic value for the continuity of all life on Earth and cannot be monetized. They must therefore remain outside of the commercial value chain and receive protection."*
>
> Alliance for the Sacred Sites of Earth Gaia, August 2019

4. Conclusion

Intrinsically linked, nature and culture -biocultural heritage- are major drivers of tourism growth, the strategic sector has been particularly affected by the COVID-19 pandemic with disastrous economic impacts on developing and developed countries. The travel and Tourism industry has brought together public and private stakeholders and is currently transforming to respond to new safety traveling conditions; The unprecedented health crisis is a crucial moment to align the sector with the carbon neutrality target by 2050 under the Paris Agreement on Climate Change and towards the achievement of the 2030 Sustainability Agenda.

Local tourism appears as a meaningful way for driving local and regional economic recovery, where World Heritage Sites play a major role in building community resilience, reinforcing people's cultural identity and sense of belonging. Responsible Tourism practices and a coordinated management of visitor capacity are key to preserving the World's Heritage integrity while improving visitors experience. Nature Based Solutions (NBS) approaches to forest and land conservation involving local communities not only are key to avoid the erosion of biocultural heritage, to ensure

traditional knowledge transmission and to reduce Climate Change related risks, they also have an enormous potential for job creation, food security and economic benefits for local populations.

Harnessing Cultural Heritage contribution to inclusive sustainable development, requires to develop new integrated and holistic approaches, where indigenous teachings based in ancestral wisdom appear as a major source of guidance and inspiration. Having a critical role in sustaining life Ancestral Sacred Sites are an essential part of indigenous cultural identity by keeping alive heritage, traditions, ethnolinguistic diversity, livelihoods, indigenous ecological knowledge, cosmology and spiritual practices. While modern science provides us with a better understanding of the natural laws and the principles that govern the universe, Indigenous Peoples have safeguarded these principles through millenia and are leading efforts to restore them.

Nature, Culture and spiritual practices are the foundations of human societies. Testifying of major biocultural interactions having shaped human evolution, the World Heritage Sites are the paramount legacy for the future generations. Given the current multidimensional crises, it is urgent to stop the biocultural erosion and destruction and to cope with the impacts of climate change. Advancing risk management for the shared future, requires global strategies, and enhanced collaboration across sectors, disciplines, institutions, organizations, civil society and indigenous peoples toward shared objectives.

5. Recommendations

- Given the mounting social, political and ethnic tensions, exacerbated by climate change, (Schleussner et al, 2016) enhancing knowledge and understanding of cultural diversity, spiritual and moral values should be a priority and fully integrated as preventive actions.
- Develop and exchange statistical data and indicators concerning: (1) the carrying capacity of the Monuments and Sites, (2) local meteorological conditions, (3) Nature Conservation and Cultural Tourism, (4) contributing to tourism strategies at national, subnational and regional levels.
- Articulate Indigenous Forest and Land management and Cultural Heritage Conservation Approaches, while encouraging Sustainable Tourism initiatives.
- Explore the adoption of education and training programs integrating modern science and traditional techniques aiming to restore harmony with nature, cultivate curiosity, growth mindsets and ultimately expand consciousness.
- We suggest to fully integrate indigenous leaders in the ICOMOS International Scientific Committee on Places of Religion and Ritual PERICO working group and promote gender equality on the overall working groups.

- Given the strong links between natural and cultural heritage we encourage the adoption of the concept of Bioculture and address both types of properties jointly; integrate indigenous representatives for the conception of holistic concepts and a new conservation narrative.
- « Leaving no one behind » requires a reinforced international mobilization to ensure the protection of Indigenous Peoples and the transmission of traditional knowledge. We suggest to explore enforceable mechanisms to protect their sacred / spiritual sites and lands, essential part of their cultural identity.

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4.
IMPROVING NATIONAL HERITAGE MANAGEMENT BUREAUCRATIC FRAMEWORKS AND STRATEGIES TO ASSIST IN THE EFFECTIVE COORDINATION OF RISK MANAGEMENT AND RESILIENCE

Hilary du Cros
Honorary Research Fellow,University of New Brunswick, St John, Canada

Abstract

Climate change is a big picture issue for sovereign states and their public policy makers concerned with economic, as well as environmental development initiatives and their impact on heritage places. Drawing on a study of 45 years of national heritage policy generation in Australia, this paper aims to discuss what types of bureaucratic frameworks and strategies are needed to aid effective evidence-based policymaking on climate change and heritage to address the big picture without losing local relatability. As tourism is a pillar industry for many countries which also relies heavily their cultural heritage, a new approach is needed to enhance connection with heritage stakeholders (including those in tourism), gather information and minimize adverse social, economic and environmental impacts. Reflection on internal bureaucratic practices and policymaking is considered a timely exercise in this context. The recent study on this topic is an example of the kind of reflection that may be useful and could raise some insights on advancing risk management across multiple jurisdictions.

Interviewees contacted for the study noted that national data-gathering and grounding is needed for better more integrated policy making on the nature of climate change impacts. There is a concern that information is not being systematically collected at a higher level to understand broad-brush processes such as, land use changes/tourism development planning and climate change. For instance, one interviewee stated that it is possible that up to 80% of coastal shell middens around Australia could be destroyed by rising sea levels and storm surges in the next 20 years. It appears that there is a need for a nationally coordinated research strategy is more easily stated than achieved in practice. However, recent research into the history and development of bureaucratic administration of heritage policy in Australia has provided some insights into the best conditions to facilitate such coordination.

Keywords: Policy, Research, Climate Action, Tourism

1. Introduction

This paper acknowledges that sharing culture and heritage for tourism or other uses at its basis requires a systematic recognition of that shared responsibility. It aims to promote discussion of how government agencies at all levels can share that responsibility, source expertise and possibly provide some leadership on these important issues. National agency structures, policy and strategies could do with more scrutiny in terms of their capacity to take on such responsibilities. The study mentioned in the paper is an example of a type of research into cultural heritage management governance that should be undertaken more often and more widely in order to make this issue clearer.

Research that provides a greater awareness of what conditions are needed to enable climate action for heritage. It could also assist heritage professionals in the best way to direct their own efforts. A national approach to research towards designing measures for disaster risk management and resilience building for climate change is critical for large classes of heritage places effected by climate change, such as the coastal shell middens. Also, consideration is needed about where best to engage with issues like sharing responsibilities across cross-jurisdictional and territorial boundaries. Accordingly, I would like to address two key aspects of this research here, which are:

1. How coordination between agencies vertically and horizontally can be enhanced for effective coordination of risk management and resilience building
2. How research and expert opinion can be more strategically employed in national risk management and resilience building policymaking.

To discuss these aspects, material will be drawn from the recent study of national heritage policy which I undertook in 2018-2019 (du Cros 2019) and some recent observations of the operation of Australian federalism in relation to recent threats namely, extreme bushfires and COVID 19 Pandemic, as far as information on the two are available.

2. Bureaucratic coordination and effective policymaking

The practice of cultural heritage management is still a relatively new phenomenon – its rules, guidelines and protocols are still evolving and have been largely influenced by Western ideals (Byrne 1991; du Cros and Lee 2007). It includes a process where public sector agencies gradually implement more principles and practices to enhance cultural heritage management in any particular jurisdiction. Most countries develop CHM in a process highly influenced by local socio-cultural conditions. As an example, some brief points will be made about Australia's CHM national policy development

and bureaucratic coordination in regard to care of its heritage.

Australia became a federation of states (and later territories) on January 1, 1901. Federalism then was a dual house national parliament representing the British governed Australian colonies (later states). The national cabinet and supporting civil service developed from there and eventually moved from Melbourne and Sydney to the new national capital of Canberra in 1927 to break down the rivalry between the most powerful states (Lee 2020, NCA 2020).

The establishment of the Council of Australian Governments (COAG) in 1992 was the first major realignment of these powers since Federation. In relation to heritage, it set out a new heritage regime. Prior to 1992, a national approach to cultural heritage protection first emerged after election of Whitlam Labor government in 1972. It set in motion the establishment of the Australian Heritage Commission (AHC) (established 1975), which recognized places (Aboriginal/Indigenous, historic and natural heritage) being locally and well as national significant as "things we want to keep" as part of Australia's National Estate (AHC 1991a; Yencken 2019).

The *Environmental Protection and Biodiversity Conservation Act 1999* (and particularly the 2003 amendments) and various policy decisions changed this focus as a function of what was called 'cooperative or new federalism'. For instance, the 1992 agreement, inter alia, reduced the independence (or made it explicit) of the Australian Heritage Commission by requiring consultation with the States/Territories in certain matters. The Commission already advised and consulted before or at the time of some action with other levels of government, but this agreement established it as a more formal arrangement.

The intentions of the Federal Government to establish clear roles and responsibilities for all levels of Government using the principle of 'subsidiarity', was greatly detailed and extended in the 1997 agreement, and ultimately in the new legislation and its amendments. The principle of subsidiarity holds that powers and responsibilities should be held at the lowest level of government practicable (COAG 1997a and 1997b).

At the time of writing, it appears possible the nature of this relationship is in flux as two major emergencies – the extreme summer bushfires (2019-2020) and the COVID 19 epidemic – have required a quicker and more coordinated policy response with greater leadership at the federal level. This is being managed through the more frequent meeting of the relevant federal and state ministers in a "national cabinet". During such crises, it replaces COAG as the main governing tool for state-federal Commonwealth policy coordination. This kind of approach requires leaders of all Australian jurisdictions to negotiate on behalf of their people and to implement the decisions reached in what can be termed as "executive federalism".

In a crisis, response time is critical. The national cabinet can meet several times a

week, unlike COAG which met several times a year or less. Basically, the national cabinet is a way to bring together information and intelligence sharing with the capacity to pool and test ideas before setting coordination and jurisdictional capacity. There is talk that this type of relationship might continue to deal with serious issues, such as climate change (Grattan 2020). As such, it will inevitably have an impact on the generation of cultural heritage policy in that context.

Menzies (2020) observes that the national cabinet deals with negotiation and compromise between states and recognizes differences and diversity. Connection is not lost with parliament, which is suspended not prorogued, and is brought back to pass legislation from decisions made by the national cabinet. Once the crisis has passed, the full democratic processes and accountability measures can scrutinize the decisions taken. For Australia, this includes parliamentary committee investigations and royal commissions.

Some interviewees from the 2018-19 study observed that burying the conservation machinery' in any department of environment at any level meant it lost visibility and influence in the government machine. Also, losing the Australian Heritage Commission at the national level with its role to oversee background studies, research and investigation, meant that the importance of a comprehensive national approach was forfeited in return for a more ad hoc approach to policy generation by lower levels of government. The challenge now for public heritage agencies is to grab attention in times of crisis, so that its needs are included in the national cabinet decision-making process.

3. Employment of Research and Technical Advice

From the late 1970s to the early 2000s, the Commission provided leadership, independent technical advice and resources to improve heritage practice, and facilitating better land use planning that has preserved many heritage places. Much of this information came from Regional Forest Agreement (RFA) and National Estate Grant Program (NEGP) funded studies all of which also provided data for State Registers. The Commission did set funding priorities for the NEGP, so that it had some direction. According to one interviewee, it would set priorities for general policy research (e.g. expanding the vision for the Register, resolving conflicting heritage values and fiscal incentives for protection of National Estate). Then, it would set priorities for each class of heritage in regard to thematic studies/surveys (e.g. on historic cinemas, rock art or cultural tourism), regional studies/surveys, methodologies for identification and assessment and site-specific studies. Priorities would also be set for forest regional assessment, before this became managed internally by State agencies as part of the RFA process.

The Commission and its staff had an important role that was appreciated by

communities in setting up the 20-year Regional Forest Agreements (RFAs) system in State Forests that had existing and potential National Estate places in South-eastern Australia. Many of these forests are also important tourist attractions and the agreements sought to balance the needs of loggers, tourist operators and others. The Commission also tried to partner with other land management organisations. However, the RFAs were the most successful and long-lasting example of that. It was the first comprehensive national attempt to settle conflict. The Commission hosted workshops and issued consultation papers, which were foundation of the 1992 National Forest Policy Statement. Commonwealth and State Governments then further defined how RFAs would operate. Finally, the Commonwealth and four State Governments progressively signed the 10 RFAs between 1997 and 2001 (AHC 1994a and 1994b; DAWS 2017). That the Commission could work effectively horizontally, as well as vertically, across the government organisational structure allowed for more integrated heritage planning and practice.

4. Working with special interest groups

Aboriginal and Torres Strait Islander Communities (including both practitioners and Indigenous communities) viewed positively the Aboriginal/Indigenous Heritage Division of the Commission and its initiatives. While Forestry bodies eventually were brought onside and some tourism ones (AHC and CRC for Sustainable Tourism 2001), many other powerful stakeholder groups remained critical of the Commission and its statutory powers. Interviewees mentioned developers, mining and farming lobby groups being particularly critical. Also, lower levels of government often saw its attempts to intervene with Interim Orders to protect National Estate places and advice heritage practice as unnecessary interference. This resentment was more evident after they enacted their own heritage and planning legislation for state and local government actions. Failure to adequately deal with the states and these interest groups and their needs effectively doomed the Commission in the eyes of the more conservative Coalition government and led to its eventual dismantling.

Any new independent national body would have to develop a way to work with such interest groups outside of crises as well as during them. For instance, sustainable cultural tourism should involve a partnership that satisfies both tourism and cultural heritage management stakeholders. Six possible relationships that exist along the conflict / partnership continuum are possible. Full partnership represents one end while open conflict represents the other end (du Cros and McKercher 2020). Working on better information sharing and ways for establishing joint research initiatives are two strategies to build such relationships in good times in order for the relationship to

survive the bad times.

5. Discussion and conclusion

Local and global factors were evident in the earliest phases of the establishment of Australian national heritage policy. As with many other places, local factors associated with being a postcolonial society play a role, such as the way national/state relationships have developed that impinge on CHM and sustainable tourism development. Being also a New World settler society means that Australia has seen similar societies such as, USA, Canada and even New Zealand, as sharing similar experiences and needs. This awareness has been most evident in the creation and revision of initial legislation at both the national and state levels. Australia's special kind of federalism currently differs from all of the above and along with the nature of acknowledgement of Aboriginal and Torres Strait Islander's relationship to heritage informs the directions taken on CHM policy.

Although, Australia might be seen by other countries as having many of the right measures in place to protect heritage, its long-term ongoing management is not a given. It could also be argued that the underlying philosophy for national cultural heritage management policy has moved away from the broader more inclusive National Estate approach of the 1970s towards a more proscribed and narrower conservative one, which will not assist in generating heritage policy to face the challenges ahead presented by climate change and associated disruptions.

What helpful insights can be found from this study for disaster management and resilience building initiatives? One finding is that attention to heritage policy must be ongoing at all levels of government and inclusive of human rights, particularly those concerning heritage. The needs of special interest groups also have to be addressed in some way and not totally ignored in a difficult balancing act that often requires some political distance (lower levels of government are often too invested to see clearly). Alternatively, more effort could be put into creating more effective long-term relationships between land use agencies and other stakeholders. In regard to Australia, most Aboriginal and Torres Strait Islander respondents in this study would like to see targeted funding return for more than just iconic Indigenous places and for the creation of a more independent heritage body that allows them more self-determination in the care of their heritage. Cultural heritage managers would like to see a return of central funding for CHM research that could aid in proactive management for heritage under their care in the face of climate change.

Finally, better national data gathering, and grounding is needed for better more integrated policymaking in Australia. For instance, how should a 21st century national database function for Indigenous places that could identify those at risk for sea level

rises and other impacts? Would it follow ‘a dots on the map’ approach or some kind of cultural landscape one to represent the Aboriginal concept of ‘Country’? How would it protect secret or private cultural information? These are all important questions on which a national conversation is needed. Depending on the local conditions, many other ICOMOS member countries will be facing broader issues and similar challenges that are greater than they have in the past and governance that encourages research, information sharing and facilitation will be essential.

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5.

TOWARDS A METHODOLOGICAL FRAMEWORK FOR PRE-DISASTER RECOVERY PLANNING IN HISTORIC DISTRICTS

Kevin Florentin[1], Motoharu Onuki[1], Miguel Esteban[2]

[1] The University of Tokyo, Graduate School of Frontier Science, Graduate Program in Sustainability Science

[2] Waseda University, Global Center for Science and Engineering

Abstract

Target 11.4 of Sustainable Development Goal 11 (Sustainable Cities and Communities) outlines the relevance of historic preservation to the sustainability agenda. Disasters pose a serious threat to the protection of cultural heritage, especially historic districts that both receive tourists and have thriving communities within them. One potential approach to help tackle such issues is pre-disaster recovery planning, as proposed by FEMA and UNISDR. However, this approach is yet to see widespread use in historic districts. This paper aims to propose a methodological framework for the application of pre-disaster recovery planning in historic districts. The framework incorporates a transdisciplinary approach that draws upon the expertise in the fields of civil engineering and historic preservation, among others, to carry out pre-disaster recovery in the context of cultural heritage. Further empirical investigation and applications of the proposed framework to create a network of data, collaboration avenues, and knowledge exchange among comparable sites should be the target of future research. (157 words)

Keywords: Pre-Disaster Recovery Planning, Transdisciplinarity, Cultural Heritage, Disasters

1. Introduction

Cultural heritage has been gaining increasing attention from the development agenda of the United Nations (UN). Culture, both tangible and intangible, is considered to be an important element in the attainment of sustainable development (Gaetan and Allam 2017). In the UN's Sustainable Development Goal 11 -Sustainable Cities and Communities, Target 11.4 -member states are called to "strengthen efforts to protect and safeguard the world's cultural and natural heritage (UN 2020, 11)." However, natural hazards pose a threat to the preservation of heritage sites around the world (Stanton-Geddes and Soz 2017). Earthquakes, tsunamis, fire, and flooding are some examples of natural hazards that have destroyed important cultural assets (such as monuments, traditional buildings, archaeological artifacts, etc.) in historic districts in the recent past (UNESCO 2010). What is more, the urgency and panic that follows a disaster harms response and recovery efforts and may trigger further damages from secondary risk hazards; thus, presenting the need to explore an alternative method for disaster preparation.

Pre-disaster recovery planning (PDRP) is a promising development in this direction (UNISDR 2012; FEMA 2017), though literature is scarce on its potential for historic preservation. Although the frameworks available are comprehensive, heritage often requires stricter regulations to preserve their integrity. Therefore, there is a need to develop appropriate PDRP for historic districts in order to reap its benefits for heritage threatened by natural hazards.

Therefore, in light of the significance of cultural heritage to the sustainable development agenda and its exposure to natural hazards, there is an urgent need for exploring a methodological framework for carrying out PDRP in historic districts. This paper aims to propose an actionable framework for implementing PDRP in historic districts by conducting an analysis and synthesis of relevant literature. The remainder of the paper explores the concept of PDRP, argues for the relevance of a transdisciplinary attitude in the application of PDRP in cultural heritage contexts, draws relevant methodologies from related academic fields, and finally, proposes a framework for implementing PDRP in historic districts.

2. Pre-Disaster Recovery Planning for Heritage

According to the proponents of this approach, PDRP is "any planned attempt to strengthen disaster recovery plans, initiatives, and outcomes – before a disaster occurs (UNISDR 2012)." Chaos resulting from the impact of disasters may occur, and this can lead to poor response and recovery like misallocation of aid and relief, among others. The objective of PDRP, therefore, is to guide the recovery process by attempting to

resolve issues beforehand, with the hope of reducing complications that may occur post-disaster.

In 2017, the Federal Emergency Management Agency of the United States released a guidance note for local governments on implementing PDRP (FEMA 2017). FEMA situates PDRP within the context of disaster preparedness, with a particular focus on recovery efforts. In their interpretation, pre-disaster response and recovery planning is closely linked to post-disaster recovery planning. Under their framework, PDRP encompasses the activities of stakeholder consultation, goals and objective formulation, implementation, and monitoring.

Cultural assets (ex. Archaeological artifacts, declared national treasures, historic buildings, etc.) often require technical skill and care before any intervention can be done. As a result, there is an implied role and responsibility that cultural agencies have in PDRP. If PDRP is to be successful for historic districts, participation and collaboration between cultural agencies and other stakeholders is indispensable. The transdisciplinary approach, which is widely recognized in the field of sustainability science, proves useful here.

2.1 Utilizing a Transdisciplinary Approach

Transdisciplinarity is a trending concept that has garnered support from scholars (Tress, Tress, and Fry 2005; Scholz 2020; Lang et al. 2012; Jantsch 1970; Arnold 2013). Transdisciplinarity can be understood as the combination of efforts of academics and practitioners in solving complex issues for sustainable development, which includes disasters and cultural heritage preservation. Essentially, problems such as these should be dealt with as complex adaptive systems; that is, an understanding that issues in sustainable development consist of diverse multiple elements that exhibit unpredictable properties as they evolve (Preiser et al. 2018). This means that the issue of disasters in historic districts cannot be seen only as a conservation or an engineering issue and must involve multiple expertise and perspectives. Within a collaborative environment, sustainability issues are tackled holistically by relevant stakeholders and experts in what is called the transdisciplinary approach.

That necessitates the involvement of conservators, archaeologists, architects, government officials, enterprises, research institutions, and residents, among others. Each of these contributors would have a different perspective on how to frame the problem or how to solve the issues. Diversity and plurality in opinions and approaches to the same issue can open opportunities for more real-world solutions to real-world problems (Wehrden et al. 2017). Any assessment (as presented in the next section) must then be conducted by relevant experts while working together with the community for both ascertaining the value of cultural assets as well as the risks threatening the district.

2.2 Assessing Values and Vulnerability

There are several methods for assessing value in cultural heritage sites, such as that of De la Torre (2002). With multiple approaches available for implementation, attention must be given to the resources available to the context in question. It may be necessary to consider the skills needed in carrying out an effective assessment as well as the financial burden linked to such activities.

The framework for determining heritage significance outlined by Havinga (2019), within the context of sustainable refurbishment, is especially useful. The investigation deals with the specifics of what can be altered in the spirit of renovating cultural assets for the purpose of sustainability. In the present paper the authors argue that this approach could also be extended to PDRP, due to the intended post-disaster recovery activities that may change or intervene in the preservation of valuable cultural assets in historic districts. PDRP invites cooperation among diverse experts, which is also aligned to the principles of transdisciplinarity inherent to this approach. While the method is meant to be mixed, there is considerable focus on qualitative data gathering methods like expert interviewing, which leads to eventual quantification through scoring. The intended outcome of this approach is to determine what values are being protected and prescribing what interventions can be made to the cultural assets. Where PDRP is concerned, such information is to be shared with stakeholders in order to achieve a consensus of what action can be taken in the recovery of the historic districts in question, should a disaster occur.

Similarly, there are a number of available approaches for assessing the vulnerability of historic districts, focusing particularly on cultural assets, such as Romão, Paupério, and Pereira (2016), D’Ayala et al. (2016), Novelli et al. (2015). These assessments vary in degree of technicality and scope but may prove useful for specific contexts. Collaborating institutions must revisit their technical and financial resources, among others, to determine the most appropriate method for their building typologies, cultural contexts, and timetables.

The concept of multi-hazard risk prioritization framework for cultural heritage assets is of particular importance to the objectives of the present research (Sevieri et al. 2020). A prioritization scheme derived from surveys could inform stakeholders about structural vulnerability at a “refined” level and fitting to concerned contexts. This method also endeavors to integrate the intangible cultural value of cultural heritage assets into its prioritization scheme. It thus serves as an effective complement to a more robust assessment of significance of cultural assets as proposed in the previous section, but with focus on quantitative information. Carrying out both assessments within a transdisciplinary approach can provide a more accurate and robust disaster scenario to be used for stakeholder decision making (discussed in the next section).

2.3 Disaster Imagination Game (DIG)

DIG is a noteworthy tool for engaging stakeholders in pursuit of PDRP. It takes its inspiration from the Commanding Post Exercises of the Japan Self Defense Force (Yanagawa et al. 2016). Essentially, this method enables visualizing a disaster scenario by inputting information on a map. Traditionally, this is done with parchment paper superimposed on a map, though technology has been developed to provide more detailed information and visual aids using Geographic Information Systems (GIS) like ArcGIS, which allows several layers of information to be superimposed on base maps.

Visualizing a disaster scenario aids stakeholder to decide on specific actions to be taken before, during, and after a disaster occurs. PDRP is ideally conducted during the preparation phase of the disaster risk management framework (Coetzee and Van Niekerk 2012). In order to have productive discussions, DIG simulates the response, recovery, and mitigation phases of a potential disaster (see Figure. 1). The more accurate the prediction, the more specific discussions can be. However, considering that precision in predicting the impact of a disaster is difficult, effort in getting as much information and presenting it during DIG would be enough to initiate talks.

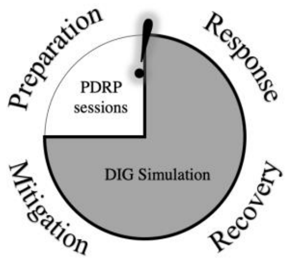

Figure 1. Situating Pre-disaster Recovery Planning in the Disaster Risk Management Framework (Figure by the authors, following the DRM framework by Coetzee and Van Niekerk 2012)

3. Methodological Framework Proposal

The following proposed framework capitalizes on established guidelines (see UNISDR 2012; FEMA 2017; UNESCO 2013; Mauser et al. 2013), which were reimagined to form a methodological framework consisting of three circular levels (see Figure. 2). PDRP is the centerpiece, with the management process in the next level. The last level reflects involvement of academics and stakeholders within a co-design and co-production environment.

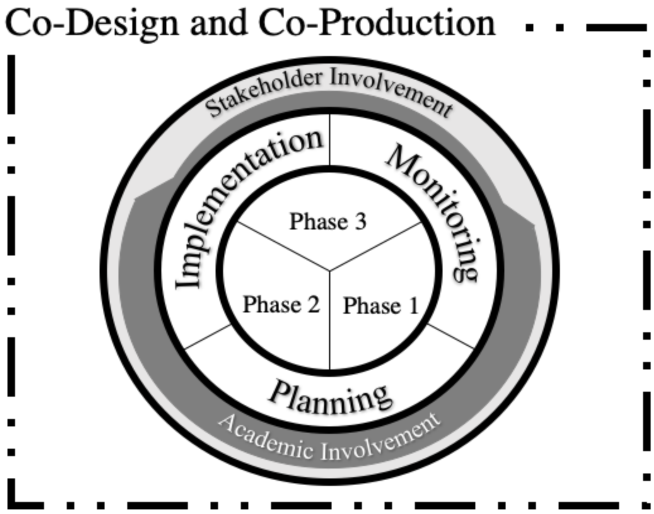

Figure 2. A Methodological Framework for Pre-disaster Recovery Planning in Historic Districts (Figure by the authors)

PDRP in the context of CH may be divided into three phases: data gathering, negotiation, and institutionalization. Phase 1, data gathering, requires the assessments of the site's values and vulnerabilities. Regardless of the method by which values and vulnerabilities are determined, its accuracy and completeness must serve the purpose of visualizing and imagining the disaster scenario for later phases of this process. A balance between accuracy and speed of the assessments should be pursued in order to accommodate feasible costs and timelines. There should be a clear picture of what the disaster scenario may look like the resulting conditions post disaster, which sets the context of the DIG.

Phase 2, negotiations, consists of the DIG and a platform for open discussion. The results of the assessments in Phase 1 will be used for setting up the disaster scenario of the DIG. Ideally, all stakeholders of the historic districts should be present for the DIG to ensure inclusivity and plurality in opinions for the open discussion. A successful DIG would reveal biases of the stakeholders, the needs of the community, the priorities of the stakeholders, and more importantly, the points of conflict and bottlenecks for any pre-disaster plan that would be adopted. These points must be clarified through a series of facilitated group discussions. By the end of these talks, a decision to formalize the policy must be made, in order to initiate Phase 3.

In Phase 3, institutionalization, stakeholders and the decision-making authorities must collaborate to enact policy. Once the policy is adopted, it must then be implemented by the appropriate agencies (ex. cultural agencies, disaster councils, local associations, etc.) along with its implementing rules and regulations. All these three phases must occur simultaneously with the heritage management process.

Any cultural heritage management system (UNESCO 2013) consists of a cycle of

planning, implementation, and monitoring. It is positioned in between the phases to emphasizes how smooth and interrelated the elements of the processes are, and blurs where the process begins and ends. For example, Phase 3 occurs in the implementation and monitoring stages due to the nature of policymaking and the evaluation that takes place as a policy is enacted. In summary, attempting PDRP in historic districts is a constant effort to plan, implement, and monitor mutually agreed upon actions, which are negotiated among key stakeholders.

Finally, the third layer of the framework situates the level of involvement between the stakeholders (including practitioners) and the academic community (here defined as experts with necessary technical skills). Due to the indispensable and technical nature of data needed in Phase 1, the academic community is expected to take on a larger role, where stakeholders are welcome to participate as resources and co-implementers of knowledge for localization of data within a collaborative spirit. In Phase 2, equal involvement is necessary between academics and stakeholders. Phase 3 shows a transition to the larger role practitioners would have, due to the nature of the policymaking process.

4. Conclusion

The present research aimed to offer an actionable framework for customizing PDRP to the needs of cultural heritage. By drawing inspiration from established literature, a framework for implementing PDRP in historic districts is proposed. Although the framework is limited by its exploratory and theoretical nature, it could provide a possible pathway for conducting PDRP in the context of cultural heritage.

While the authors are currently applying the framework to a case study, simultaneous applications by cultural organizations or academic institutions around the world would provide clarity in the validity of the approach. Multiplicity in application could create a network of historic sites with a pre-disaster plan in place, and thus further collaborate in knowledge exchange. From there, comparative studies could establish this proposed approach as an alternative to existing efforts for historic preservation.

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6.

ARCTIC AND ANTARCTIC HERITAGE AT RISK, 2020

Dr Bryan Lintott

Secretary-General ICOMOS International Polar Heritage Committee; Scott Polar Research Institute, University of Cambridge, UNITED KINGDOM; University of Tromsø

Abstract

The Arctic and Antarctica are the frigid realms around which our world revolves. This paper reviews polar cultural heritage in the contexts of geography, climate, environment and governance. These regions are experiencing rapid climate change; an anthropogenic phenomenon as the Earth was in a cooling phase that humans have reversed with industrialisation (NOAA 2001). The risks to polar cultural heritage are examined in terms of the natural environment, and direct and indirect anthropogenic impacts. Central to this challenge is the need to record and monitor archaeological areas, historic sites, monuments and associated artefacts, to inform risk preparedness. Responding to these risks is considered in terms of current projects and potential endeavours. In addition to a literature review and field observations, this paper is based on the informative and insightful contributions made by numerous colleagues, especially members of the ICOMOS International Polar Heritage Committee (IPHC).[4] Two cases are reviewed: the 19th-century shipwrecks HMS *Erebus* and HMS *Terror* in Nunavut, Canada; and Swedish explorer and scientist.

O. Nordenskjöld's former base at Snow Hill, Antarctica. In conclusion, polar cultural heritage is at the forefront of climate change and can inform broader global heritage at risk policy, planning and practise.

Keywords: Antarctica, Arctic, Climate, Heritage, Governance

[4] Specialised papers on polar heritage at risk are contained in the proceedings of the ICOMOS International Polar Heritage Committee (IPHC), 2014 conference on 'The Future of Polar Heritage. Environmental challenges in the face of climate change: detection and response'. Copies can be requested at IPHC@ICOMOS.org.

1. Introduction

The polar regions are fundamentally different. The Arctic is centred on a frozen ocean surrounded by nation-states with a diverse range of indigenous peoples for whom the north is home and, comparatively, recent communities – both permanent and transient. A fundamental feature of the terrestrial Arctic are large areas of permafrost, ground that remains frozen all year. Arctic governance is enacted through national law, regional agreements and, in particular, the United Nations Convention on the Law of the Seas (UNCLOS). The High Arctic is the domain of the Polar Bear. In contrast, Antarctica is a frozen continent surrounded by a hostile sea with no permeant population or history of an indigenous presence. Several nations claim areas of Antarctica, but all claims are on hold under the Antarctic Treaty (1959). Antarctica is governed through consensus by the treaty parties, as a region of peace, science and environmental stewardship. Antarctica is at the physical extremity of humanities' endeavours on Earth, and reveals our shared humanity when confronted by a region that is aesthetically profound yet fundamentally dangerous. The penguin, a flightless aquatic bird, is the iconic creature of the south. Both regions have cultural heritage from exploration, science and technology, economic activity and intangible culture that is at risk. The Arctic also has the legacy of wars, 'hot and cold'. The physical reality is that polar historic structures, sites and monuments and archaeological sites are in a hostile natural environment, many are threatened through climate change, increased and in some cases uncontrolled visitation, and unauthorised or criminal activity.

2. The Arctic

2.1 Natural Environment and Hazards

The Arctic has a diverse range of climates from areas with trees on the Eurasian and American Arctic landmasses to areas devoid of any tall flora, the ice-clad areas of Greenland and other northern islands and archipelagos, and the Arctic Ocean and seabed. The region experiences extreme winters and, comparatively, warm summers during which flora and microbiota, and fauna are active. Polar bears are curious and powerful animals that have damaged and destroyed structures. Sea and river ice can be shoved ashore, scouring sites and crushing structures within its path.

2.2 Climate Change

The Arctic is profoundly altered by climate change. The extent and depth of sea ice are reducing, and within decades the Arctic Ocean will, effectively, be ice-free during summer. Climate change in the Arctic is in a feedback loop when sea ice, which reflects the majority of the sun's energy into space is replaced by a clear ocean that absorbs the

majority of the energy - further reducing the growth of winter sea ice. The situation is exacerbated by warming of the Eurasian and North American landmasses. In recent decades, permafrost temperatures, in which many structures have their foundations, have risen between 0.5°C and 2°C; and, in recent years, Siberia has experienced heatwaves and large-scale fires.

2.3 Anthropogenic impacts

Many historic structures and associated artefacts that were previously located within the comparative safety of the ice, permafrost or cold water are now exposed to the increased risk of damage or destruction (Hollesen, et al. 2018, 573–586). Increased storminess poses a moderate to severe risk to sites and structures while the addition of waves, surge events, above and below the waterline, or ice shove (Mahoney 2004) that can be devastating. The coherence of silty sand and soil ground, upon which many coastal sites and structures are located, is at risk when exposed to water (from run-offs, streams and rivers and the sea) and wind and can erode rapidly. These processes can also occur, albeit more slowly, to moraines of glacial regolith and rock. Sections of Arctic coastline are being eroded at a fast rate, with many potential archaeological sites being swept into the sea. However, other factors can influence erosion, such as ‘protective dunes or gravel ridges’ demonstrating the point that ‘all erosion is ultimately local’ (Mason 2014, 45-47. Barr, et al. 2012, 5). In the majority of the Arctic, flora (trees, shrubs and grasses) are growing further north and at higher elevations (IPHC 2014, Chapter 28. Rees, et al. 2020). This growth can cover archaeological sites, with root structures damaging artefacts and disturbing the stratigraphy. Arctic tourism operates in three ways. The first is organised tourism with reputable operators who respect human culture on an ethical basis and also appreciate its economic value through sustained management and care. Secondly, private individuals venture into the Arctic and in some instances, engage in damage, destruction and looting. Finally, there are the people employed by the government or industry in the Arctic, and Antarctic, who during their spare time may visit historic sites and monuments. Usually, these visitors abide by the highest standards. The thawing of Siberian rivers bank permafrost allows thieves using high-pressure hoses to scour the riverbank in the hopes of exposing mammoth ivory. The most extensive collections of ivory are archaeological sites, with the resultant destruction of the archaeological record (Pitulko 2014, 77-79).

2.4 Responses

The enormity of the sub-Arctic and Arctic and the complexity of environmental changes, e.g. the treeline is advancing at different rates in different ways (Rees 2020),

requires remote sensing and ground-based validation to monitor environmental risks ranging from coastal erosion to changes in vegetation. Given the scale and range of risks, the heritage community is confronted by the challenge of aspiring to have sites retained in-situ with their associated structures and artefacts, while the reality is that inaction may result, by omission, in their being damaged or destroyed. Additionally, access to and work in the Arctic is expensive and dangerous. Increasingly, the indigenous peoples of the north are acknowledged and respected for their essential knowledge and expertise when evaluating climate change (IPCC 2014, 1583), and developing responses to the risks posed to cultural heritage. There are also more, comparatively, recent communities that have been established in the Arctic who have gained experience and knowledge of their respective regions.

2.5 Case study

Knowledge from indigenous communities in Nunavut, obtained in both the nineteenth century and present day, informed the successful search for the wrecks of HMS Erebus (figure 1) and HMS Terror, two ships lost during the 1845 Franklin Expedition in search of a Northwest Passage. The local community now have a central role in protecting these shipwreck sites as Guardians, and retain traditional indigenous use of the sites which are legally protected under Canadian federal law (Parks Canada 2019, A and B). The United Kingdom has ownership of a selection of artefacts from these Royal Navy ships, with the remaining artefacts being jointly owned by Parks Canada and the Inuit Heritage Trust,

> *'The artifacts from the Wrecks of HMS Erebus and HMS Terror National Historic Site will be protected based on Inuit Qaujimajatuqangit (Inuit knowledge) and the principles of cultural resource management, including the highest standards of collection and conservation. The jointly-owned artifacts will be presented from an Inuit perspective and every effort will be made to display them within the Nunavut Settlement Area' (Parks Canada 2019. B).*

Figure 1

HMS Erebus, 2018. Part of the upper deck along the starboard side of the hull showing where a section of deck planking had been forcibly dislocated from the deck beams due to presumed storm-induced water movement. Note the relative absence of vegetation on the newly exposed upper surfaces of the deck beams and beam shelf, and the movement of the two pulley sheaves into the newly exposed zone.5

Reduced sea ice, in certain areas, may result in changes to currents, and storm-induced turbulence through the water column that kinetically impacts underwater sites, damaging shipwrecks and distributing artefacts.

Climate change is also allowing invasive fauna, flora and microbes to migrate north and become established in the Arctic. Informing and influencing decision-making processes requires remote sensing, onsite monitoring and regular inspections.

The 'REMAINS of Greenland: REsearch and Management of Archaeological sites IN a changing environment and Society', a cooperative endeavour between The National Museum of Denmark, The Greenland National Museum and Archives and Center for Permafrost (CENPERM) at the University of Copenhagen has produced comprehensive research on the risks to Greenland's archaeological heritage.[6]

3. Antarctica

3.1 Natural Environment and Hazards

Antarctica is the windiest and coldest continent on the planet, with over 99% covered by ice and snow. Structures and artefacts built on the ice usually become covered in snow, and then embedded in the ice that moves inexorably towards the ocean, where within calving icebergs the remains will be deposited on the seabed as the iceberg melts.

[5] Image and text courtesy of Parks Canada Parcs Canada. Photograph 89M09531, Ryan Harris. Text, Johnathon Moore.

[6]Website: https://www.remains.eu/index.html. Report: https://online.flowpaper.com/776c0763/Smartrapport/#page=1

Sites and structures on solid ground are exposed to numerous risks. The Terra Nova Hut[7], located on Ross Island from an expedition led by Captain Robert Falcon Scott RN, is exposed to freeze-thaw cycles, high winds that scour the wooden hut with volcanic scoria and ice crystals, sea spray that deposits salt on the structure, is close to an ice tongue that could collapse and cause a tsunami, and located at the base of an active volcano. Antarctic wildlife can also cause damage and destruction, ranging from Skua gulls tearing open containers to seals occupying sites and structures, and the accumulation of layers of acidic and pungent penguin guano. A myth of timelessness is associated with Antarctic heritage with clichés such as ‘frozen in time’, ‘time has stood still’ and ‘just as they left everything’. Whilst there are valid reasons for Antarctic heritage sites evoking powerful emotions, the well-known sites, such as the Terra Nova Hut, are carefully curated structures and artefacts which have cost millions of dollars to conserve and interpret. Artefacts may remain frozen in ice, permafrost or be preserved underwater, but when they are exposed to the atmosphere, they are at risk of rapid deterioration or destruction.

3.2 Climate Change

In the Austral summer of 2019-20, a record temperature of 18.3ºC was recorded at Argentina’s Esperanza Base at the north of the Antarctic Peninsula (NASA 2020), continuing a trend of increasing temperatures on and around the Peninsula and other areas such as the Ross Sea. Globally, this is of concern as Thwaites Glacier is in a warming area; if this glacier collapsed the inland ice it holds back would begin to flow into the World Ocean causing a significant increase in sea level (Scambos, et al. 2017).

3.4 Anthropogenic impacts

Reduced sea ice has allowed ships to sail farther south. In 2010, private French sailors damaged Wordie House (Historic Site and Monument 62). France pursued and punished the perpetrators (France, 2011).

3.5 Responses

Antarctica is remote, expensive to access, and emergency assistance may be delayed by severe weather. Responding to these challenges requires resources and endurance. In addition to government-supported access, the Antarctic tourism industry can support heritage endeavours with transportation for conservation teams, and by encouraging passengers to share images that have been taken of cultural heritage sites over the years.

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[7] *Terra Nova* was the expedition's ship.

These can be used to evaluate changes in the structure/s, artefacts and local environs.

3.6 Case study

Dr Otto Nordenskjöld's Swedish Antarctic Expedition, 1901–03, established an overwintering science base hut (figures 2&3) on Snow Hill Island. Their support ship, Antarctic, was unable to reach them the following spring due to impassable sea ice, then was crushed and sunk. The Argentine ship Uruguay rescued the expedition survivors (Headland 2009, 233).

Figure 2. Physical interventions have been attempted to stabilise the moraine on which the hut is built.

The hut is located in a rapidly warming area of Antarctica. To inform future decision making, Swedish and Argentine heritage experts, logistically supported by Argentina, have commenced a comprehensive recording and monitoring programme that included: photogrammetric and Lidar surveys, installation of an automatic weather station (AWS) and temperature and humidity sensors in the huts.

Figure 3. Snow Hill Island during summer, showing the collapse of the moraine from

the permafrost warming, and erosion from flowing water. [8]

Utilising historical images and data, and a data set compiled in the coming years, informed decisions can then made on potential stabilisation techniques or other courses of action. Central to this project will be understanding, ‘the interaction between the climate, the permafrost, the soil and the hut’ (Avango and Fontana 2020).

Since the 1950s, New Zealand has undertaken the preservation of Captain R.F. Scott’s RN and Sir Ernest Shackleton’s expedition huts on Ross Island. This multi-decadal endeavour has resulted in a wealth of experience and expertise, which has informed other Antarctic heritage projects (New Zealand 2015).

4. Conclusions

The peoples of the north embody exceptional levels of human resilience, and over centuries or millennia, have lived sustainably in the Arctic. The heritage conservation decisions that these communities make should be respected and resourced accordingly. There are also other communities in the north to be respected and engaged within their respective heritage endeavours.

The Arctic’s scientific, industrial and military heritage provides historical information, and can provide baseline scientific data on regional and global environmental impacts; Antarctic heritage relates to two distinct endeavours: the heritage associated with the historical and ecologically devastating commercial exploitation of seals and whales, and the heritage of exploration, peace, science and environmental stewardship. The remains of these endeavours are at risk from the environment, ‘clean-ups’, lack of resources for conservation, and damage and theft; Arctic and Antarctic cultural heritage is at risk from anthropogenic warming that has increased the melting of ice in the polar regions and other areas of the cryosphere. The resulting increase in sea level and water content in the atmosphere is impacting heritage on a global scale; The IPHC and its members, and other heritage colleagues, are engaged with polar heritage at risk. Their ongoing analysis and fieldwork are central to risk preparation, classification, identification and response.

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[8] Figures 2 and 3 courtesy of Dr Pablo Fontana and Professor Dag Avango.

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7.

FACING CLIMATE CHANGE: THE IMPORTANCE OF PROTECTING EARTHEN HERITAGE TRADITIONAL KNOWLEDGE

Masoud Nakhaei Ashtari
GExpert member of ICOMOS-ISCEAH and Focal point at ICOMOS-CCHW,
Pasargadae World Heritage research center, Iran

Abstract

Climate change is recognized as a threat to cultural heritage, especially the earthen heritage, due to the changes in rainfall patterns, humidity, and temperature, as well as increasing the risk of extreme climatic events and natural disasters. This issue raises the attention of scholars for evaluating adaptation strategies to the risk of climate change. Traditional knowledge and awareness of ancient science is introduced as one of the key strategies in adapting cultural heritage. However, the less addressed issue is the problem of forgetting traditional knowledge and technical skills due to the lack of using traditional materials such as earth in today's construction cycle and the modernization of the material production process, which has led to the cessation of knowledge transmission across generations, lack of internal creativity and experimentation, and the absence of professional masters and skilled workers. One of the most important challenges to face is the difficulty concerning the sustainable conservation and adaptation efforts. Incorrect preparation and execution of earthen materials in the lack of sufficient technical skills have led to incomplete maintenance, increased costs and also increased erosion against climate threats. Often, training of technical workers in the field of earthen material has been underestimated by policymakers in cultural heritage development programs. Therefore, a training program also with comprehensive, targeted, systematic, and long-term approaches should be considered, not only for the conservation of cultural heritage but also for local communities.

Keywords: Earthen Heritage, Climate Change, Adaptation, Traditional Knowledge

1. Introduction

The impact of climate change on cultural heritage has been widely reviewed in recent years including several research methods and diverse disciplines for risk assessment, disaster risk mitigation, and resilience (*Shirvani-Dastgerdi et al. 2020; Sesana et al. 2020, 2019, 2018; Ravankhah et al 2019; Neto & Patrikakis 2019; Garcia 2020; Daly 2014; Howard 2013*, *McIntyre-Tamwoy 2008*). However, climate change risk assessment of earthen heritage and sustainable adaptation strategies are still needed to address (*Fatoric & Seekamp 2017)*.

On the other hand, climate change adaptation is considered as a controversial issue in the field of cultural heritage (*Philips 2015*), especially for earthen heritage and its inherent vulnerability. A very limited number of research studies have examined the obstacles to adapt earthen sites to climate change (*Sasana et al. 2018; Cassar 2016*). Lack of capacity to understand climate change data, lack of technical skills to develop and implement climate adaptation plans, the concern of possible loss of integrity due to adaptation measures, and high-cost of implementing strategies are the main obstacles of proper heritage conservation against climate change (*Fatoric & Seekamp 2017*).

In recent years there has been a growing awareness that scientific knowledge alone is inadequate for solving the climate crisis (*Finucane 2009*). In particular, the knowledge of local and indigenous peoples is increasingly recognized as an important source of climate knowledge and adaptation strategies (*Garcia 2020, Brooks et al. 2020, Hosen 2020, Sharifi et al. 2020, UNESCO 2008, Jigyasu 2002*). Furthermore, the traditional knowledge approach could be introduced as one of the low-cost strategies in the long-term sustainable mitigation and adaptation of cultural heritage against climate change. However, the less addressed issue is the problem of forgetting traditional knowledge and technical skills due to the discontinuance of knowledge transmission across generations, lack of internal creativity and experimentation, and the absence of professional masters and skilled workers. The traditional knowledge of local people as a sustainable tool for adaptation and mitigation, is often underused by science, despite its significance in facing climate change. The potential of traditional knowledge in respond to climate change are highlighted by global policy debates and researches (*Hosen et al. 2020; Javier X et al. 2015; Nakashima et al. 2012; Alexander et al. 2011*).

Indigenous knowledge was acknowledged in the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) as 'an invaluable basis for developing adaptation and natural resource management strategies in response to environmental and other forms of change' (*IPCC, 2007*). *Jigyasu* (*2002*) investigates the past and present status of local knowledge, skills, and capacity of rural communities in India and Nepal for reducing their vulnerability to earthquakes. In this research, losing local knowledge and capacities is pointed out as one of the main challenges for

reducing disaster vulnerability. *Bhatt* (*1999*) mentioned that the South Asian region has a wide range of knowledge, skills, and initiatives, many of them innovative and vibrant, that aim and achieve a reduction of vulnerability and building capacity at the grassroots level. Richards (1994) emphasizes experimentation as an important aspect of local knowledge, and thus makes a claim that local knowledge is scientific.

2. Climate Change Impacts on Earthen Heritage

The effect of climate change on cultural heritage especially earthen heritage is multiple and are associated with unusual and more variable weather patterns. Climate change risks are mainly including high temperatures, flooding, intense precipitation, more intense hurricanes, winter storms with higher wind speeds, lower barometric pressure, earthquake, drought and frequent wildfires (*Cassar, 2009; Heathcote, et al. 2017; Wagner et al. 2014, Horowitz 2016*). However, climate change effects on earthen material are different from other building materials that are less addressed in research studies (*Brimblecombe et al. 2011*).

Regarding the inherent weakness of earthen structure to moisture, the main catastrophic climate events are atmospheric moisture change which raises the risk of flooding, changes in rainfall pattern, water-table levels, soil chemistry, groundwater, humidity cycle, increase in the wetness time of material and salt chlorides. Moreover, it can cause a loss in stratigraphic integrity, unstable subsoil, ground heave, and subsidence (*Cassar 2009; Jigyasu 2012, Colette et al. 2007*). An intense flood may cause sudden destruction of earthen structures or damage the underground archaeological evidence due to changes in the soil water level (*Garcia 2020*).

In contrast, a higher temperature may have only a small effect on earthen sites; however, it can intensify in several ways. Extreme temperature can lead to drought and dryness which increases the rate of sand-storm, soil erosion, and thermoclastic deterioration, as well as the rise of wildfire risks in the archaeological areas. Wind-driven sands and rain, have one of the most aggressive effects on earthen structures and cause massive façade erosion in dry areas (*Cesar 2009, Sabbioni et al. 2009, Brimblecombe et al. 2011*).

3. Traditional Knowledge of Earthen Heritage

> *“Local knowledge consists of knowledge and practical capabilities which emerged from local conditions and natural and social surroundings, and which have often been tested over a long period of time and are integrated into a larger cultural context” (Hobart 1993, 1).*

This knowledge reflects the interaction between communities and their environment through their history, providing a sense of identity and continuity and promoting respects for cultural diversity (*UNESCO 1972*), which is not only limited to its physical and material form, rather related to people, place and time, and develops as a result of a dynamic process (*Thakur, 1998*). Local information systems are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems. This continuous process of experimentation, innovation, and adaptation enable local knowledge to blend with science and technology as well (*Flavier 1995, Jigyasu 2012*).

The most vital part of earthen construction is directly related to the knowledge of traditional architects or professional masters in dealing with earth and their perceived of climate risks. Their experience in recognizing ready-to-use mud, adobe preparation and application methods is entirely based on their tacit knowledge and practical experiences, as well as, their risk-taking, creativity and decision-making in choosing methods and materials that has ensured dynamism in earthen constructions (*Rahimnia et al. 2013*). Their experience over the years, along with climate change, has provided the base for creativity, the use of indigenous capacities, and best practices; which can be considered as a practical factor in today's climate change adaptation.

4. Challenges of Forgetting Traditional Knowledge

Today, the earthen heritage traditional knowledge is at risk of forgetting by the range of problems. Regarding the above context, the main questions are: Which factors contributed to the loss of local's faith in earthen material? The damage to the earthen structures is actually enhanced by previous deterioration, or it is a failure of the system or a maintenance problem. Understanding of why and how earthen materials turn out to be inappropriate or unusable, is essential to realizing the process of forgetting traditional knowledge, and can empower locals to reclaim their knowledge and appreciate its usefulness.

Imitation of western models of dwelling and the catastrophes of climate change in earthen cities lead to displacing and immigration of locals in the fear of massive destruction (*Al-Masawa et al. 2018*). Due to declining demand of earthen material, traditional architects and masters tended to work with new construction material. Remaining local residents in earthen cities found it difficult to afford the annual maintenance of their houses because good quality materials had become too expensive and traditional masters and workers had become scarce. Instead, they were turning towards more resistance material such as concrete or repairing their house with unsuitable material (*Brooks et al. 2020*). Consequently, earthen construction lost their function and gradually abandoned by locals. Earthen neighborhoods became the

residence of low-income families and symbolized as poverty.

In summary, the main issues and effective factors in the context of forgetting earthen traditional knowledge are:

- Modernization of construction methods and building materials
- Loss of faith in earthen construction due to the massive destruction caused by rain or flood
- Difficulties to afford the annual maintenance of houses using traditional methods
- Incorrect preparation and execution of earthen materials in the lack of sufficient technical skills which led to incomplete maintenance, increased costs and also increased erosion against climate threats
- External interventions and changing the identity of the earthen structure
- Abandoning earthen building and turning earthen neighborhoods into unlivable places, symbolized as poverty
- Abandon of many traditional maintenance practices due to lack of resources and discontinuity in the knowledge of traditional skills
- Lack of traditional architects, masters and skill workers
- Increasing social and economic inequity
- Weakening of local governance
- Imitation of western models of dwelling

5. Discussion

The traditional architects, along with inheriting the knowledge and experience of the previous generations, had a holistic look at the construction and maintenance methods of earthen buildings with less disharmony intervention. The knowledge of the past generation has not been merely imitated and has always been associated with innovation based on climatic, social, and economic conditions. The traditional architect by using locally available resources, in addition to providing the feasibility of low-cost and long-term maintenance, respects their environment by using reversible material to the natural cycle. On the other hand, traditional techniques were based on climate-friendly patterns, which in addition to preserving natural resources, protected the structures from adverse climatic conditions. The transfer of these traditional knowledge has always taken place through the traditional master-pupil system.

In the traditional master-pupil system, all the levels of selection, talent identification, teaching method, and educational planning were adjusted by the masters and according to the pupil's ability. The educational system was run entirely by the private sector and

according to the needs of society. The promotion of pupils to the master stage was based on constant care and inspection. The biggest weakness of this system was the lack of documenting and recording this information and verbal transfer of knowledge to each other.

As mentioned earlier, the main factor in forgetting earthen heritage traditional knowledge is the abandonment of earthen buildings due to modernization of construction material, massive destruction, and the high cost of earthen houses maintenance, and also scarce of masters. On the other hand, the efforts made to revive earthen heritage traditional knowledge in recent years have not been as resultful as expected. Because most attempts to revive traditional knowledge are more focused on the academic sector of society, both theoretically and practically. While earthen heritage traditional knowledge is implied by masters during the work and new experiences were added to it due to facing obstacles and problems. Furthermore, how implicit knowledge learned by specialists (theoretical and practical) can be transferred to masters, while the implementation process will be done just by masters, both for maintenance and for the new construction.

In this regard, the main facing challenges are the disconnection between indigenous architects or masters and new needs based on the climate conditions ahead, and also linkage system between scientific communities, practitioners and traditional masters/pupils.

For this reason, in addition to education at the academic level, builders, masters and even the local community must receive their own education. For this purpose, the existing techniques of earthen architecture in dealing with climatic conditions must first be identified. Moreover, it should be evaluated how these teachings can be used in adaptation/mitigation strategies. At the final stage, it should be seen which of these methods need innovation according to the forthcoming climate change, and how it could be possible to bridge the past knowledge and future needs. Regarding the above context, the following steps need to be addressed:

- Externalization and documentation of tacit knowledge of traditional architects and masters
- Practicalization of tacit knowledge by understanding the related-issues of traditional architecture and material knowledge for training system
- Interconnecting the tacit knowledge and conservation science
- Returning dynamism to the traditional knowledge cycle by internal creativity and experimentation

- Evaluate and monitor the implemented methods and use modern knowledge to eliminate defects

6. Conclution

There are still many shortcomings in tackling climate change and fostering the resilience of cultural heritage. Limited understanding of climate change data, lack of climate change adaptation programs, disconnection of local communities and heritage, ineffectiveness of studies and high costs of implementation strategies as the main obstacles to facing climate change need more detailed assessment. However, many steps have been taken to raise awareness, develop studies, adaptation initiatives, recovery of traditional knowledge and practices, and in overall, joint efforts at different levels to document and protect heritage. Utilizing indigenous capacities including knowledge, experience and participation can play an important role in the sustainability of adaptation approaches. In this regard, more emphasis should be placed on knowledge transfer, as practitioners should be able to turn research into practice by supporting protocols and guidelines. There is a particular need to develop novel modes for transferring knowledge to practitioners. Planning adaptation to climate change requires a holistic assessment of exposure and adaptive capacity based on both traditional and scientific knowledge. Integrating traditional and scientific knowledge, especially in the context of a rapidly changing climate, is imperative for a better understanding of and improving adaptation strategies for impacts related to climate change.

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8.
HUMAN SETTLEMENTS ROLE TO MITIGATE CLIMATE CHANGE

Arch. Paolo Motta
ICOMOS Italy member, CIVVIH Scientific Committee member, ICTC Scientific Committee member, ICOMOS- SDG Working Group member, EURISPES-BRICS Laboratory member

Abstract

Purpose of this article is to underline the relevance that human settlements have on climate change and the negative impacts produced by the actual uncontrolled urbanization toward metropolises and megacities. The analysis of the actual situation of many of these huge urban agglomerations and the most evident impacts highlight the need of balance between human settlements and environment, the importance of a human presidium spread on territories, and the opportunity offered by the ongoing great connectivity infrastructure projects to mitigate urban concentration and revamp minor settlements. There fore the proposed actions are relevant as they can represent a tool to reduce the rising trend of un ruled use of land and resources by huge megalopolis & metropolis worldwide and at the same time to enhance human settlements in rural and marginal territories. This will also help the protection and valorisation of cultural heritage both tangible (patrimony) and intangible (traditions), the preservation of traditional landscapes and of the natural soil, water, forest resources. Experience of metropolis, expected to grow in number and size in short future, is mainly negative and the long-term impacts unpredictable, but already atmospheric pollution and water shortage are rising, with no defined intervention strategies. Wild urbanization, without any respect of the existing peculiarities and possible sustainability, is determining permanent damages for the environment, being one of the main climate change responsible.

Keywords: Settlements, Presidium, Territories, Patrimony, Environment

1. Urban Settlements & Climate Change

For many centuries human settlements have coexisted in relative balance with the territories surrounding every single city and village. Following the various industrial revolutions and the need to have workforce settled not far from the production plants, started a progressive and increasing urbanization process which, however, until the middle of the last century was acceptable with limited impact on the environment.

The exponential growth of urban areas and productive settlements of the last decades, accelerated with the birth of huge metropolises and megacities in all continents, has definitively broken the previous fragile balance; and the impacts that urban areas have on climate change go far beyond the 2% of the planet surface they occupy. Air, soil, aquifers pollution and environmental damages produced by big cities are evident everywhere and still rising, despite the repeated recommendations expressed by many international organizations and reaffirmed in the objectives of sustainable development of the UN HABITAT Agenda2030. (1)

In fact, since last century urbanization has been growing without any real opposition and now is accepted that urbanization process as unstoppable, weak or late oppositions till now failed, and urgent mitigation measures must be evaluated and implemented to reduce negative effects on pollution, environment, land-use and progressive natural resources shortages, by reinforcing rural habitat and retain the smaller settlements inhabitants.

Experience of metropolis, expected to grow in number and size in short future, is mainly negative and the long-term impacts unpredictable, but already atmospheric pollution and water shortage are rising, with no defined intervention strategies. Wild use of territory, without any respect of the existing peculiarities and sustainability, is determining permanent damages for the environment, as one of the main climate changes responsible.

Is therefore urgent a new vision to reduce increasing urbanization processes and favour the presence of human settlements anyway and wherever possible, saving local characteristics, cultural traditions, tangible and intangible patrimony, and any other necessary elements to assure sustainable territorial development and environment preservation.

Cultural heritage, especially natural and landscape sites, but not only, being also tangible patrimony directly affected by climate change, need that human presence remains spread over the territories, as permanent presidium on the environment through agriculture, ground retention, forest care, water regulation, and is necessary to restore all those activities that for centuries kept the balance between manhood and nature.

Current technologies can provide effective tools in achieving a sustainable territorial reuse and consequently reduce climate change through a spread network of compatible

infrastructures, communication systems, renewable energies, and also play an increasing role in enhancing minor settlements, protecting natural environment, and preserving patrimony.

Minor cities, towns and rural settlements also cover a necessary function of human presidium on the natural environment, particularly evident in rural / marginal territories. Any territory needs different levels of protection and enhancement, articulating the degree of transformation through those quality parameters that the original inhabitants apply. From the implementation of a technology supported land-use of neglected/marginal territories, environment will have positive returns also on local economic development by facilitating the permanence of inhabitants in their traditional settlement and the correct use of rural areas. Such a constant control and maintenance of the environmental resources reduces the risks of natural disasters such as floods, forest fires, desertification and so on.

Attention on these issues has globally risen since the Rio 1992 Conference, increasing till the 2016 UN-Habitat III Conference, where AGENDA 2030 was approved, with the 17 Sustainable Development Goals to be achieved for that date (1). But also, in this document are provided partial and doubtful recommendations about urbanization, just general guidelines in Goal 11, but without operative details, nor a specific approach is found that can revamp the priorities inherent the ecological quality, sustainability and resilience of cities. Similar poor attention is given up to date by most other international institutions, including the E.U., lacking a serious debate on the important urban development topics.

2. Envisaged Measures

Among the 17 Sustainable Development Goals and objectives are relevant those related to infrastructure, cities and human settlements related, as in "Goal 9- Build resilient infrastructure, promote sustainable industrialization and foster innovation " that states that:" *Sustainable transport achieves better integration of the economy while respecting the environment. improving social equity, health, resilience of cities, urban-rural linkages and productivity of rural areas*" *(2)* and in "Goal 11 -Make cities inclusive, safe, resilient and sustainable" - where indicates as objective 11.A)*:" Positive economic support, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning" (3).* But there is not emerging an approach capable of re-launching the priorities inherent to the ecological quality, sustainability and resilience of cities, in light of the most recent developments in the green economy, the economy of sustainable development, the circular and bio-economies.

Close interrelation between mankind and the environment is, after these months of lockdown, clearly visible from the satellite photos, related to atmospheric pollution, which has fallen enormously everywhere due to the decrease in industries and traffic, previously an almost permanent phenomena in many of Asian megacities. Huge urban concentrations highly impact on climate, as all cities are heath islands and, also if globally their surface covers only the 2% of the planet, they are responsible for the about ten times more percentage on climate change. For example, due to wild urbanization and the immense building development of the last decades, the Indonesian capital Manila is slowly sinking and flooding; so, the administrative function will be moved to reduce the actual immigration flows. The informal settlements that surround globally many metropolises offer inhuman life conditions under every aspect: overcrowding, lack of water and sanitary networks, waste, air pollution. Significant examples are in India, that hosts 13 of the world's 20 most polluted cities, affecting over 140 million people, based on a 2017 study, where pollution in the slums has increased reaching intolerable levels and determining serious lung diseases (4).

3. Pandemic & urban impacts

This pandemic and the lockdown of almost all urban areas has highlighted their influence on the environment and climate, where forced stop of daily activities produced a general decrease in pollution indices and the return in just a few months to the environmental levels of several years ago it is a clear sign. the renewed presence in the urban areas of birds and wild fauna, as well as fish in the waters of the city waterways, is another consequence of a reduced anthropic activity in this period.

In relation to the actual pandemic, reports from almost all countries show that Covid/19 grows where is a greater human concentration, as it is obviously more difficult to reduce its spread in large urban agglomerations than in smaller settlements. Updated data arriving from: "slums in India, "townships" in South Africa, "favelas" in Brazil, and in all other informal settlements, are confirming the difficulties to detect the contagion and to implement in those overcrowded contexts containment and social distance, measures that work better in smaller settlements. This is not the only pandemic or epidemic that has occurred in recent years, before were Crazy Cow, Ebola, SARS, MERS, Aviary, Porcine flu etc, nor will it be the last, given that all forecasts agree that will be faced more and more recurrent similar events, caused by man himself, as a consequence of the climate change. The lockdown, involving many countries globally in about two months, had relevant positive returns on the environment, restoring the natural values of many years ago.

This confirms that, if are applied different territorial and urban development models. the Sustainable Development Goals for climate change can be reached in the expected

medium-term. This pandemic is also highlighting the values of smaller agglomerations, on one side for the easier containment and monitoring of the contagion and on the other the greater solidarity, cooperation and assistance among the inhabitants, who have a stronger social cohesion. For the previous considerations, the revival of the role of smaller cities and towns is not only possible but fundamental, as one of the tools to mitigate urbanization processes and keep inhabitants spread on vast territories, also as the human presidium of the natural environment, that climate change makes it increasingly necessary.

4. Mitigation Actions

The actual events should trigger a profound reflection on the model of urbanization itself and the need for an overall revision of the entire process, based on obsolete postulates and paradigms, that were defined almost a century ago in a very different context. The model of maximum proximity between home and work, a requirement for a considerable percentage of inhabitants, is now overcome by the new modes of home-working, e-learning, telemedicine, online-shopping and anything else made available by new technologies. The needs of mobility have changed thanks to logistics, home deliveries and an efficient transport system that, with the high-speed train networks, have shortened the journey times between rural areas and urban centers where most of the superior services remain concentrated.

Modern technologies can provide effective tools for a renewed settlement model through the revival of human scale settlements, revitalizing and interconnecting disseminated towns and rural settlements, who offer adequate daily life-size and social cohesion among inhabitants, reducing the rising urbanization pressure towards massive megacities.

A network of smaller cities can't be replied elsewhere, not in large and always scarcely populated areas, but is applicable in a short time successfully in those territories where previously settled inhabitants have been emigrating. Is therefore necessary assume a completely different evaluation of minor cities and rural settlements role in defining the future territorial development as mankind landmarks on the territory, capable to mitigate the actual rise of new metropolis and megalopolis especially in emerging countries of Asia, Africa and Latin America. This new approach also modifies how to deal with the urban and territorial planning because it highlights the inadequacy of the existing rules that mainly identify some areas to be constrained and others transformed, through the provision of mainly quantitative tools as the zoning, without the necessary holistic approach integrated with other fundamental societal parameters, as those taken in account by the principles of SQA social quality approach.(5)

For these and other reasons is a priority need to focus on the enhancement of the characteristic elements and of the local urban/territorial assets (cultural, environmental, historical, etc..), to promote a strategy of long-term growth that will include agriculture, craftsmanship, advanced technology and every activity linked to local culture, with actions shared with all actors. Such a holistic approach as integrated territorial planning is not only necessary but adds value also to territories surrounding urban settlements, entirely considered as complementary asset to be protected and enhanced, overcoming the old traditional division and reducing inequalities between and urban and rural areas.

5. Conclusive Remarks

As previously stated, Covid-19 pandemic has highlighted the inadequacy of the current urban settlement model, accepted as the inevitable urbanization trend of mankind in the coming decades. Hence the need to identify alternative hypotheses, now even more possible thanks to new technologies. This difficult situation in which the whole planet is affected, when ended will certainly have significant consequences in many sectors not only on the economy, whose recovery will certainly not be fast. Forecasts from diverse sources all coincide that the impact of the epidemic will be higher that one of the Great Depression of 1929 and the entire process will take some years. Hopefully can be expected also positive impacts on many aspects of current globalized consumerist model, probably both for the pandemic truly global scale and for the massive anticipated use of new communication and technologies, with repercussions on the daily lifestyle will be relevant and permanent. The Covid/19 crisis clearly put in evidence the possible reduction of daily commuting, the availability of internet learning and home working, the efficiency of e-shopping and many other issues that can determine radical changes in transport, mobility and logistics, with a visible reduction, just in few weeks, of atmospheric and other pollutions in the big urban concentrations. Then the reduction, for a time still not foreseeable, of the national GDP of most countries worldwide, accompanied by a sensible reduction of incomes for large categories of population, will determine the consequent cut in many consumptions so far considered essential, which proved be superfluous. This "new normality" and the accelerated epochal change based on the widespread use of technologies in all sectors, can favor a desirable modification of the current global financial and economic rules, that are still based on 70 years old rules, established in a profoundly different context by the western countries. Accepting then that urbanization process is now unavoidable, as weak or late previous opposition failed, still measures to mitigate the ongoing trend must be evaluated and implemented as soon as possible to reduce negative effects on pollution, environment, land-use and natural resources shortages, with actions oriented to revamp the rural territories and retain or resettle inhabitants...

The negative impacts of large urban concentrations on climate change are confirmed dramatic and put in evidence by the pandemic lockdown that reduced drastically all the anthropic causes. Increasing urbanization affects the entire social and economic context for many inhabitants with the increase in the size of the cities where integration, social cohesion and the quality of daily and overall life are worsening. To this must be added all the sanitary and health disadvantages that the pandemic has brought to light, with greatest contagion in overcrowded metropolitan areas, due to the inevitable concentrations in the transport networks, shopping centers, working and service spaces all over.

So, this exceptional situation represents an opportunity for a profound reflection, that can no longer be postponed, on current wild urbanization processes and settlement models that can be reviewed by the widespread use of renewable energies with the objective of reducing anthropogenic impacts both on environment and on climate change. The revaluation of traditional typologies, with spaces and orientations strictly related to the surrounding context, the use of natural and recyclable materials and environmentally friendly construction technologies are certainly an additional element to recover the lost balance in reasonable time.

This process will also positively reflect on the entire patrimony and heritage, both tangible and intangible, by re-evaluating and protecting monuments, urban spaces, natural landscapes, threatened by unbridled development, as well as recovering the intangible values and traditions still maintained by the inhabitants of the smaller towns. The achievement of the SDGs of the 2030 Agenda and in particular, as regards the urban areas of the objective n ° 14, is possible with a vast initiative shared globally and ICOMOS with all its scientific committees, which embrace multiple sectors involved, can consciously assume a leading role in raising awareness, information and coordination, and promoting a global campaign together with UN-HABITAT and other international agencies.

Biography

Architect specialized in Territorial and Town Planning, in the last fifteen years focused on Sustainable Urban and Integrated Development strategies and policies, with a holistic approach not only technical, but also with economic and financial evaluation, plus social and environmental issues. Acquired international experience for analyzing and assessing the multicultural contexts and issues. In the last years increased attention to historic patrimony, cultural heritage, sustainable tourism issues and identification of related new operational operational tools.

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9.

HOMO GRAVITAS PRAISES WORLD HERITAGE

Ramiro Sofronie
Prof Emeritus, PhD, DHC, UNESCO Chair #177, Bucharest, Romania

Abstract

The paper deals with the stability prospects of human society in the existing conditions of population growth. The twentieth century concluded with great scientific and technological performances. This is why the coming of the second millennium was enthusiastically greeted around the World. The answer received in return from the twenty-first century was not as optimistic as expected. Even in 2001, Hawking mentioned that a highly developed society may become unstable and destroys itself. In the same year, on the very 9/11, when in New York the twin towers of WTC failed, the UNESCO House in Paris hosted the International Millennium Congress, where the works of sculptor Brancusi disclosed the gravitational structure of human nature. Then, in 2004, ONU published the trifurcate graph of population growth. One year later Hawking announced that the nature of gravitational force remains undisclosed. Consequently, the unification of the four fundamental forces of the universe failed. Twelve years later, in 2017, Hawking claimed for the assistance of the World Government against the threatening of Artificial Intelligence that he has identified then. That was the year when *homo gravitas* was created. Three years later the world population reached 7.8 billion, while large inhabited territories are exposed to severe human impact on the environment. The gravitational nature of *homo gravitas* was physically proved. World Heritage conserved by UNESCO is praised by *homo gravitas* for supporting its gravitational emancipation. That quality confers *homo gravitas* the aptitude of *mirroring* discovered by Plato and illustrated by the Greek Legend of Narcissus. Sculptor Constantin Brancusi by its Endless Column disclosed that by repeated congruencies or mirroring the state of innocence is acquired. A society based on *homo gravitas* can reduce the growth of the population, restore the environment, and ensure its stability.

Keywords: Congruence, Contemplation, Innocence, Mirroring.

1. Introduction

After 1750, the year consecrated to the Industrial Revolution, the whole human society has radically changed by progress. In a short time, nothing remained like before. After two centuries, at the end of the second WW, the question of stability aroused. Since equilibrium is the fundamental law of the universe, to which the Earth belongs, Bertrand Russell was consulted. His lecture, delivered at the Royal Society of Medicine, London, on November 29, 1949, was entitled “Can a Scientific Society be stable?” By scientific he understood multilaterally advanced. After physical, biologic, psychological analyses, he affirmatively concluded with four conditions:

1) Single World Government; 2) equal prosperity; 3) low birth rate, and 4) free individual initiative. Severe, but not impossible, he finally admitted (Russell, 2016).

In the same period, the world population increased about five times. People were not uniformly distributed on Earth’s surface, but located around the places with available living resources. Since the growth rate was rather high in a short time those locations became as crowded as beehives or anthills. Surviving in such locations is a great challenge. The Italian mathematician Carlo M. Cipolla regarded this fact from a microbiologic perspective. He identified a kind of human being who seems responsible for all the unhappiness of society. This is why, in his book published in the year 1988, syntagmatic *dramatis persona* was euphemistically adopted for it. That person is producing damages to society without getting any profit for oneself. Considering the human crowds as mathematical sets Cipolla elaborated five governing laws. The first one states that the percentage of existing such people is σ%=const., but always it is sub-estimated by society. The second law states that the feature of being a *dramatis persona* is hereditary, and therefore like Providential. The third law states that only four categories of people do exist: helpless, intellectual, malefactor, and *dramatis persona*. The fourth law blames the association of the first three categories of people with the last one an irresponsible and dangerous person. Finally, the fifth law affirms the *dramatis persona* is the most dangerous type of human, and as a corollary, it is more dangerous than a malefactor. Dickens and Schiller also condemned the *dramatis person* (Cipolla, 1988). In reality, according to Newton’s Law III of reciprocal actions, London 1687, the *dramatis person* not only cannot be disregarded, but its presence is necessary for the balance of society.

2. The twenty-first century

The human of the twenty-first century appeared much changed. It looked like the sky opened, and a quantum jump occurred. The interest in progress and development was great. Then, Hawking hoped that his proposal to unify the three fundamental forces of the universe, i.e. electromagnetic, strong and weak forces, with the force of gravity to

become validated. It was supposed that his Grand Unification Theory would open a brilliant future for humans (Hawking, 2001). In the same year, on 9/11, the twin towers of WTC in New York were unexpectedly thrown down. By coincidence, on the same day, the UNESCO House in Paris hosted the International Millennium Congress "*More than two thousand years in the history of Architecture, Safeguarding the structures of our architectural heritage*." Two special papers were presented then, one on the Leaning Tower of Pisa and another on Brancusi and his obsession with gravity (Sofronie, 2001). Several years later Hawking declined the Grand Unification Theory, and the gravity force further remained as enigmatic as ever (Hawking, 2005). Regarding population growth, he mentioned that it cannot continue indefinitely. Sometimes, when a civilization reaches a high stage of development, it becomes unstable and destroys itself. The reaction of the United Nations Organization to that statement was prompt. They immediately published a map edited in 2004 with a point of trifurcation. Since that point was located exactly over the year 2000 the reaction of public authorities was expected, but nothing happened. Life continued undisturbed, at least the public one. In the meantime, Hawking started an open conflict, extended over several years, about the threatening of Artificial Intelligence on human society. The evolution of conflict was so bad that in the year 2017 Hawking publicly asked for the support of the World Government. The request was so categorical as such an authority would really exist and officially work. It was seen then the great authority Bernard Russell had over Hawking's conception. Besides that, a particular case, before and after that eminent scientist, thousands of governments did exist, and also during his time, a score of voices claimed the uncontrolled growth of population. Nobody and no one did anything practical. Only words and empty words. In the above-mentioned circumstances, *homo gravitas* was created. The original identity of humans, lasting since Oedipus' time, was then restored. That simplified model of humans was later presented to the 19th ICOMOS General Assembly in New Delhi, India. It was a first attempt to find a solution for population growth.

3. The point of trifurcation

The level of 7.8 billion reached in this year 2020 seems according to the chart below a bearable limit. From this date on something to reduce the population growth should be done. The available capacity of the environment should be also carefully considered.

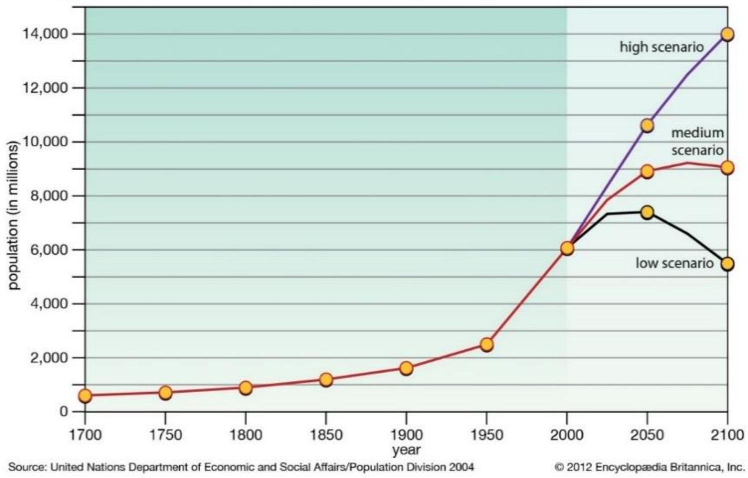
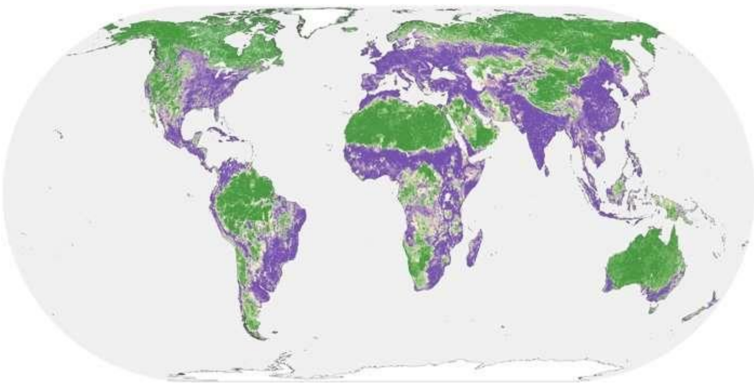


Chart. *World population (1700-2000) and population projections (2000-2100)*

4. Human impact on the environment

As long as, in the map below, the total green area is a bit larger than the purple one there are hopes for recovering. An intelligent project on the path of reason is expected.



World Map. *Low human impact areas in green, with purple showing areas of higher impact (Source: RT).*

5. Homo gravitas

Conscientiousness checked by the winged monster in Oedipus' Legend consisted of the inoculation of a quantum of gravity in the human brain (Sofronie, 2017). In that way, humans received an immortality status. Since then human life appears like the span between birth when the brain is connected to gravity, and death when the brain is disconnected. Both life and death are verbs or processes, not substantives. With inoculated gravity, humans became independent bodies of the universe in their connection with the environment. For instance, to humans, the Principle of minimum constriction of Gauss-Hamilton no longer applies like to animals, automatically. Humans are obliged to minimize their actions by themselves. Since 1932 Mircea Eliade at only 25-year-old noticed this privilege of humans only. Once the gravity was located in the brain it started to generate thoughts. It seems they are very tiny material particles charged with gravitational energy. Most of the thoughts are used for thinking and

therefore they are very welcome. Besides, plenty of unwanted thoughts are released. Often, in the case of mature people, males and women, they are chaotically circulating without any control. The process of concentration, for instance, is thus disturbed. However, the small children, aged between 1 and 3 years e.g., are not disturbed by such thoughts, and their faces radiate of innocence. Everything for them seems psychedelic. This miracle happens because the children are only contemplating around, without exchanging any energy with their environment. Scientifically, this passive phenomenon by which the image is detached from the gravity that has generated it was called mirroring. It is hereditarily inherited and called essential because is persisting. Scientifically, the mirroring was discovered by Plato (c.427-347 BC), (Plato, 1993). It is also well known from the Greek Legend of Narcissus. According to an old story, the emperor Shah Jahan regarded the Mausoleum of the Taj Mahal in Agra, India, before its completion in 1653, through a real mirror. Only in that way, the image was not deformed by human eyes. Mature people are apt to learn contemplation by meditating. Any self-identification with bodies and objects existing around is avoided. Homo gravitas has already learned the lesson of contemplation. It is practiced always in present time, here and now, never in the past or future. The mirror never keeps in its memory any images; they are abandoned forever. However, the image is following the mirror-like shade. The mirror is displaying the truth only, without alteration. By regularly practicing contemplation, mental health is achieved.

6. World Heritage

From a gravitational perspective, the World Heritage preserved by UNESCO consists of three cultures: 1) Megalithic, based on menhirs, dolmens, and cromlechs; 2) Adaptable, based on stone or brick masonry and wood as materials, and geometry for shaping and 3) Creative, based additionally on iron or steel, reinforced concrete, and glass. For each historic period, a specific gravitational architecture resulted and it was accordingly conserved (Sofronie, 2020). All the existing physical vestiges, real in 3D, and touchable, are expressing a single truth by facts and not by words: human nature is essentially gravitational. Gravity is the single true identity of humans. This is why these vestiges are unique and irrecoverable, therefore worth to be properly preserved. For instance, the Eiffel Tower in Paris is a memorial devoted to gravity. It was shaped by a gravitational governing law. The Pyramid of Cheops in Giza, Egypt, has the same memorial function and is governed by an identical physical law. The difference between the two shapes is made by construction materials, iron, and stone, respectively. There is also a similarity between the Endless Column and Babel Tower. The difference is made in this particular case by the shaping scale of 1:100. This is why homo gravitas is unconditionally praising the World Heritage (Lopez, 2002).

7. Gravitational introspection of Brancusi

Surprisingly, the Kiss is representing the duality of human bodies, simultaneously consisting of male and female like in the Oriental Culture yang and yin. However, in this case, the couple is projected on the vertical of gravity (Figure. 1). The Wisdom of the

Figure 1. The Kiss 1907

Earth is referring to the content of gravity in the brain (Figure.2), while Bird in Space suggests that the gravity was already defeated by the flight (Figure. 3).

Figure 2. The Wisdom of the Earth 1907

Figure 3. Bird in Space 1919

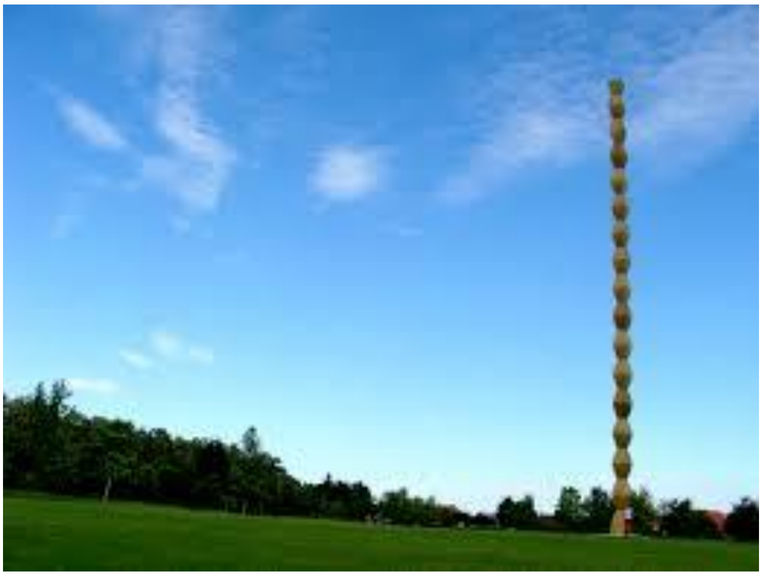


Figure 4. Endless Column 1938

Finally, the Endless Column is disclosing its great secret that by repeated congruencies or mirroring the innocence can be acquired (Paun, 2001) (Figure. 4).

8. Conclusion

The twenty-first century is devoted to the emancipation of *homo gravitas* by mirroring. The opportunity for recovering its natural innocence is due to Brancusi. As long as the growth of the population is concerned, in the beginning, it should be carefully lowered. Then, after the mid-century, strongly reduced according to the attached graph. Simultaneously, the environment should be gradually restored to its original proportions. That will provide human society with the necessary stability. As concerns Cipolla's five laws they shouldn't be ever forgotten. They are true, indeed. To throw down the twin towers of TWC in New York and then to close indefinitely Planet's mouth with a mask is proof. More cynically couldn't be.

Acknowledgments

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10.

EXPERIMENTAL EVALUATION OF WATER SHIELD SYSTEM WHICH SPRINKLES LIMITED WATER TO FAÇADE OF WOODEN NARROW STREET FOR CONTROLLING SPREAD FIRE IN HISTORIC CITIES

Takeyuki OKUBO[1], Tomotaka NAKAYABU[2], Dowon KIM[3]
[1] Professor, Ritsumeikan University, Dept. of Civil and Environmental Engineering
[2] Officer, Tokyo Metropolitan Government
[3] Associate Professor, University, Dept. of Civil and Environmental Engineering

Abstract

In high densely areas of wooden cultural city, it must be difficult to control spread as large-scale fire after earthquake etc. Water Shield System (WSS) is a kind of firefighting equipment that sprays adequate water to the surface of wooden walls facing toward spread, reduce the temperature from radiant heat and decrease the speed of fire spreading across narrow streets in traditional high densely areas.

This study aims to develop an actual water spray nozzle which can sprinkle for a wide range of area and to evaluate the effectiveness for fire spread control in real scale experiment using model of traditional wooden townhouses' facade. For that purposes, multi holes nozzle was developed for adequate water distribution profile and experimental estimation was held with gas burner unit and real scale wooden model.
The surface of traditional wooden buildings was quickly burnt down because of radiant heat from gas burner unit, but with the water spray by WSS, same surface couldn't burn for long time. The effectiveness of EWSS was shown for controlling fire spread in wooden traditional district of every historic cities.

Keywords: Water Shield System, Spread Fire Control, Water Spray Nozzle, Real-Scale Experiment, Flammable Historic Cities

1. Introduction

1.1 Background of the research

Massive earthquakes are expected to strike Japan in the near future, and in particular, historic structures in highly dense towns as in Kyoto are likely to suffer tremendous loss of both lives and culturally valuable and unique structures due to the spread of fire. This type of damage has been witnessed during the Great Hanshin earthquake when most of the buildings with traditional streetscapes were damaged due to the spread of fire that occurred immediately after the earthquake. Historic streetscapes feature narrow streets that do not provide access to emergency vehicles. In addition, an earthquake can cause buildings to collapse, resulting in road blockage and isolation of the affected area, thus, disabling access for firefighters. It is also difficult to implement conventional fire prevention methods, including fireproofing of buildings, widening of roads, etc. in the Preservation Districts for Groups of Traditional Buildings. Hence, there is an urgent need for practicable measures for preventing the spread of fire without destructing these cultural streetscapes.

Previous experimental research conducted by Okubo et al.[1)] proves that fire can be resisted temporarily by sprinkling a certain amount of water on wooden surfaces of buildings. On this basis, the Water Shield System (WSS) has been designed to prevent fire from spreading in highly dense areas of wooden cultural cities (Refer to Figs. 1 and 2). In an experiment, Horiuchi et al. used the water sprinkler system to prevent the fire from spreading[2)]. Since this system sprinkles water from the bottom to the back of the eaves, it does not cover the entire wall surface. The present research offers a system that sprinkles water from a water spray nozzle to the entire surface of wooden walls on the other side of the fire. In this way, the performance of the proposed system is similar to that of a fire-proof wall as it suppresses the spread of the fire on the other side. It can be effective in suppressing the fire spread across the blocks with limited water since it can operate in narrow roads commonly found in historic towns even under hot conditions that are too harsh for the firefighting team.

Until now, we have conducted a study on water spray nozzle that suits WSS to achieve the practical use of WSS in our prior research[3)]. When water spray was experimented using conventional nozzles and their combinations, it became evident that no existing nozzle can widely and effectively sprinkle water on the wall surface as required for fire spread control. However, no study has not been conducted for water spray on uneven wall surfaces also in the space under eaves which are vulnerable to fire. Thus, demonstrating its effectiveness for fire control in a realistic environment is cited as a major issue.

Figure. 1 Image showing WSS startup

1.2 Research objectives

This study aims at developing an efficient water spray nozzle, which is the central element for WSS. We will handle the following two main points.

① Development of a nozzle that can deliver the performance required for WSS

We will develop the prototype of a special nozzle which can exhibit adequate water spray performance as specified in Chapter 2 while measuring the amount of water sprinkled on the wall surface.

② Evaluation of the effectiveness of nozzle developed in real-scale experiment towards controlling fire-spread

Water spray will be performed with the prototype nozzle while heating a real-scale model under the assumed fire-spread environment. Following the experiment, the effectiveness of the proposed nozzle in fire-spread control will be evaluated based on the measurement of temperature increase on each wall surface.

2. Development of special water spray nozzle for WSS

2.1 Specification setting for water spray nozzle applicable for WSS

Okubo et al.[3)] have conducted studied sprinkling water required for WSS nozzle; they have also examined the water sprinkler method, the effects of damage to buildings by water pressure, and the specifications of water spray nozzle combined with conventional existing nozzle. The results of these studies are summarized in Table 1. Considering the safety factor, 2 L/m2/min has been set as the amount of sprinkling water required for fire-spread control, and the target of 2 L/m2/min or above is set as the amount of sprinkling water (Hereinafter, referred to as the required amount of sprinkling water on wall surface) for the nozzle on wall surface. Further, the fixed type

sprinkler method will be implemented. Damage by water pressure is not considered in this study since it has been demonstrated that there is less chance of damage to surface of wooden buildings due to water spray pressure. With respect to the specifications of water spray nozzle, we manufactured a porous nozzle so that one nozzle is provided with multiple outlets to ensure its easy installation in less space. Since the water nozzle will be used in historic towns, the aspect of landscape was considered while designing the nozzle.

Table 1 Results of the study conducted on specifications in prior research

Specification study items	Study results
Study on required amount of water for sprinkling	It is shown that an amount of 2 L/m^2/min is required for sprinkling considering the safety factor, and a minimum of 3 seconds should be considered as sprinkling time as against 5 seconds of non-sprinkling time (In this case, non-sprinkling time is not taken into consideration since a fixed type sprinkler method is used as below).
Study on water sprinkler system	We identified a need to conduct a study on fixed water spray method since automatic swinging water spray method tends to be less efficient in terms of reducing non-spray time.
Study on damage by water spray impact	It is demonstrated that there is less probability of damaging traditional wooden surfaces due to water spray pressure.
Study on the specifications of water spray nozzle	We measured the spatial distribution of water that can be sprayed depending on the type of existing conventional nozzles and conducted a study on the combination of nozzles. The study has made it evident that, regarding reachable distance, it is favorable to use a combination of nozzles so that it can sprinkle the water at a rate of 2 L/m^2/minute or above in straight discharge of water from variable spray nozzles. Hence, there are limitations in compactification when a combination of existing conventional nozzles is used.

As a futuristic measure, our study will aim at location planning for highly dense areas of wooden cultural cities such as Myoshinji temple, Kiyomizu Area in Kyoto, etc. so as to set the spray height from water spray nozzle at 6 m while taking into consideration the standard height of a wooden wall for 2-story traditional townhouses commonly found in the streets in such areas. Further, we will set the horizontal distance from the nozzle position at the edge of the road connecting the outer wall surface at the opposite side where the water is to be sprinkled (Hereinafter, referred to as nozzle distance) at 5 m considering that the nominal width of public roads is required 4 m at least in Japanese regulation. If the nozzle is installed in the middle of the road, it will have accessibility to 10 m wide roads with 2 lanes. With respect to spray width, the wider we set the spray angle in horizontal, the more reachable distance from the nozzle till the wall surface will be needed. Consequently, this may result in unnecessary increase in water that does not reach the wall surface. Accordingly, we have set a horizontal spray angle of the nozzle at 90° as one of the yardsticks to enable water spray in an extensive range. In this way, the spray width will be 10 m when the nozzle distance is set at 5 m from wall surface. It will be ensured that the nozzles are installed at an interval of 10 m to prevent any overlap between the adjacent spraying width ranges. (Refer to Figure. 2) The

installation height will be set at ground level as 0 m to ensure that water can also be effectively sprinkled behind the eaves from downwards.

As for water discharge flow rate, since spray width and spray height are set respectively at 10 m and 6 m, the total area of the target wall surface will be 60 m2 and the required amount of water sprinkled on the wall surface will be above 2 L/m2/minute. Thus, it will become necessary to set the minimum water discharge flow rate at 120 L/min for each nozzle. However, the maximum water discharge flow rate will be set at 500 L/min to consider the regular water capacity of Japanese city water system and just to be on the safe side to prevent the wastage of water considering that the entire water released may not reach the wall surface. Coming to water discharge flow rate, if we can confirm the sufficient amount of water to be sprayed on the wall surface during the manufacturing of water spray nozzle, we will reduce the amount of water accordingly. As for water discharge pressure, 3000 t of water is accumulated in the firefighting water tank to provide protection from spread fire in Kiyomizu area in Kyoto, which is a typical example of highly dense areas of wooden cultural cities, assuming that water is sprinkled from the pressure due to gravity. For this purpose, it becomes necessary to operate at a low water discharge pressure so that water can also be sprinkled in areas where the height difference with firefighting water tank is smaller. Hence, the water discharge pressure will be set at 0.25 Mpa considering about half of the firefighting equipment like regular hydrant as a standard.

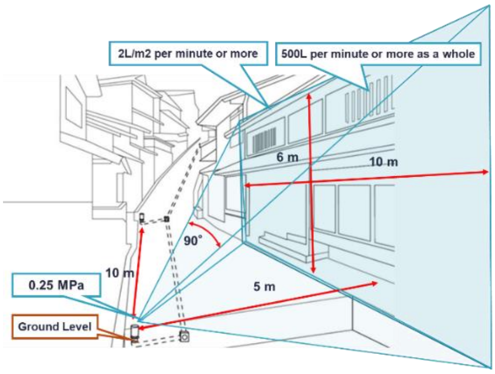


Figure. 2 Image for the installation of WSS

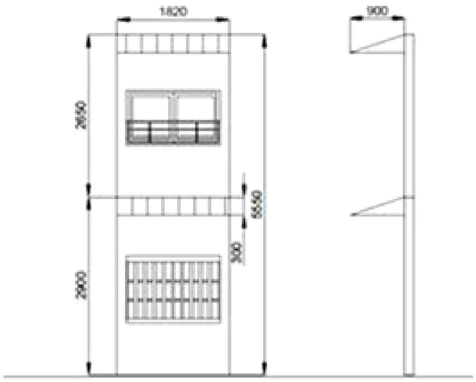


Figure. 3 Real-scale model of wooden house

2.2 Study on water spray for experiment using real-scale model

A study will be conducted on water spray for real-scale wooden exterior walls to re-create the real environment for installing WSS in town areas. Since it is particularly essential to examine water spray on uneven areas such as space under the eaves, wooden frames, etc., which are commonly noticed in traditional houses, the real-scale model used for the purpose of water spray is a replica of 2-story traditional townhouse (Refer to Figure. 3). Further, a pilot water spray nozzle was manufactured for this study in accordance with the specifications set previously in 2.1.

However, when preliminary experiment was conducted by spraying water on the real-scale model, it was visually confirmed that insufficient water was sprinkled under the eaves. Since it became evident that it is not possible to sprinkle sufficient amount of water under the eaves which are vulnerable to fire-spread, we developed a water spray nozzle with specifications appropriate for traditional townhouses and designed a nozzle in accordance with a typical 2-story building with eaves at a height of 2 m to 3 m and 5 m to 6 m so that it can sprinkle plenty of water under the eaves when compared to other areas. (Refer to Figure. 4) We consolidated the specification settings for water spray nozzle developed into Table 2.

2.3 Measurement of quantity of water for sprinkling on wall surface

We manufactured the water spray nozzle according to the specifications in Table 2 and measured the amount of sprinkling water on the wall surface, practically.

Table 2 Specification setup for spray nozzle suitable for WSS

Nozzle specifications	Item	Contents
Design	Shape	Porous
Installation requirements	Nozzle distance	5 m (10 m can also be covered if installed in the center of the road)
	Spray width	10 m
	Spray height	6 m (Assuming 2-story traditional townhouse as a whole)
	Installation interval	10 m
	Installation level	0 m (Embedded into the edge of the road)
Spray performance condition	Required amount of sprinkling water on wall surface	2 L/m^2/min or above (Intensive sprinkling under the eaves)
	Water discharge flow rate	500 L/min or less (Scheduling reduction with due verification)
	Water discharge pressure	0.25 MPa

(1) Test method

In the case of measurement of the amount of sprinkling water on the surface, we arranged 7 water collecting panels of 1 m × 1 m in perpendicular direction as shown in Figure 5 and developed the equipment that can separately collect the water on each panel that runs down along the gutter. As for the test conditions, we set installation level at 0 m above the ground. The nozzle distance from the water collecting panel was set at 5 m and water discharge pressure at 0.25 MPa in order to meet the installation requirements of the nozzle. Measurement time was set at 1 minute. Further, since the spray width with one nozzle is assumed as 10 m, we used 2 nozzles and fixed the intervals between the nozzles at 10 m in order to have accurate data on the water spray condition between the adjacent nozzles. Based on the result of the preliminary experiment, the quantity of water discharged from the nozzle was reduced to 460 l/minute per nozzle. At the time of measurement, we fixed the position of the water

collecting panel and calculated the distribution of sprayable water on the entire target area by parallelly moving the position of the 2 nozzles by 1 m each from side to side.

Figure. 4 Special nozzle developed

Figure. 5 Seven water collecting panels for measuring the amount (Arrow direction)

Table 3 Result of amount of water sprinkled on the wall surface (Unit: L/m2/min)

	Left 4-5 m	Left 3-4 m	Left 2-3 m	Left 1-2 m	Left 0-1 m	Right 0-1 m	Right 1-2 m	Right 2-3 m	Right 3-4 m	Right 4-5 m	Average
7-8 m	0.07	0.02	0.08	0.02	0.05	0.06	0.27	0.11	0.69	0.25	0.16
6-7 m	3.89	0.69	2.37	3.88	2.73	2.86	3.02	3.29	3.52	2.24	2.85
5-6 m	10.2	2.73	3.48	3.74	6.31	4.72	3.25	3.62	4	4.77	4.68
4-5 m	4.19	3.66	2.7	2.08	4.24	3.53	2.27	2.62	3.21	6.12	3.46
3-4 m	6.47	5.85	3.84	5.04	5.01	6.59	4.77	3.93	5.37	10.29	5.72
2-3 m	4.25	6.45	3.57	2.34	6.38	4.97	3.95	4.45	5.93	10.12	5.24
1-2 m	1.74	3.88	1.35	0.9	2.1	1.77	1.81	2.24	3.79	6.23	2.58

(2) Results

Measurement results for the amount of water sprinkled on the wall surface are consolidated into Table 3. The amount of sprinkled water of 2ℓ/m2/min or above was observed in the areas at heights of 2-6 m. Further, it is possible to heavily sprinkle water on the eaves' elevation since the quantity of water sprinkled on the wall surface is more at heights of 2-4 m and 5-6 m when compared to other heights on the average. At the heights of 6 m or above, since water is sprinkled on the tiled roof, which is non-flammable, it is judged that one area found to be below the amount of water sprinkled on the wall surface may not be a cause for concern. Moreover, water sprinkled is lower than the specified value even in the case of lower parts till heights of 1-2 m. But since most of the water which is sprinkled upwards fall drops-wise on the surface, it is judged

that there are no issues as far as substantial amount of sprinkling water is concerned.

After verifying the above results, we decided to conduct a experiment for WSS using a nozzle that achieved the amount of sprinkling water on wall surface as per Table 3.

3. Study on heating appliances to re-create actual fire environment

3.1 Overview of heating appliance

We will perform a real-scale experiment on water sprinkling while carrying out heating on a real-scale model in the re-created environment in which fire is spread in order to evaluate the effectiveness of the water spray nozzle developed in Chapter 2 in controlling fire spread. In this connection, we need a study on the heating appliance that can re-create the heating environment at the same level as the heat produced when fire spreads from the surroundings. For this experiment, we chose a propane gas burner instead of an electric heater considering the risks such as electric leakage etc. which may occur due to water spray.

3.2 Experiments performed for the study of heating appliances

(1) Test overview

We will measure relations between horizontal distances between the heating appliance and the test object and temperatures received by the test object and confirm at what distances the heated environment equivalent to one exposed to spreading fire is re-created when using a gas burner. Since there is no indicator to determine standard criteria to prevent the spread of fire which ought to meet the fire control requirements at the time of real fire spreading, this study aims at “ensuring fire-proof performance on a temporary basis by sprinkling water on exterior wooden wall surfaces”. As for the heated environment to evaluate the effectiveness for fire spread control, we used the condition wherein “the temperature exceeds 842°C after a lapse of 30 minutes” used in testing furnace temperature setting as required for fire resistance test (ISO834)[4], which is one of the standards for external force used in performance verification test for building components.

(2) Test method

We will use propane gas burners as heating appliances and Type K thermocouples for measurement of surface temperature. Then, the horizontal distance between the heating appliance and thermocouple will be brought closer by 5 cm gradually so as to measure the temperature of the thermocouple continuously while repeating the cycle heating for 30 minutes each time.

(3) Measurement method

The temperature of the thermocouple will be recorded in data logger until it attains the final equilibrium temperature after the gas burner gets ignited.

(4) Judgment method

While changing the horizontal distance, we will measure the temperature of the radiant heat emitted from the gas burner directly by thermocouple. If this heated temperature exceeds approximately 850˚C after a lapse of 30 minutes in conformity with the standard heat curve, it is considered that heating is carried out under the same condition as that of fire-resistance test. Then, we will identify the horizontal distance between the test object and heating appliance at which this requirement will be satisfied.

3.3 Results

The results of the experiment (Figure. 6) showed that the temperature of 850˚C, which conforms to the standard heat curve, can be achieved when the horizontal distance between the thermocouple and heating appliance is maintained at 75 to 80 cm. To be on the safe side, 75 cm is the appropriate distance to satisfy the heating condition. Still, during the experiment, if the distance is reduced, the gas flame could have directly reached the test object due to the direction of wind, which may lead to the risk of deviating from the condition specified in ISO834. Hence, we decided to set the horizontal distance between the heating appliance and test object at 80 cm while taking into consideration the distance that does not cause direct heat despite the experimental results favorable to 75 cm. In order to re-create the heated environment in the whole area similar to that of fire spread using this gas burner, we manufactured a heating appliance (70 cm in all four sides) with 9 gas burners aligned in the shape of square and kept away at a distance of 35 cm from each other. (Figure. 7) This distance of 35 cm was set after our preliminary experiment confirmed that this distance does not cause direct interaction between adjacent flame surfaces.

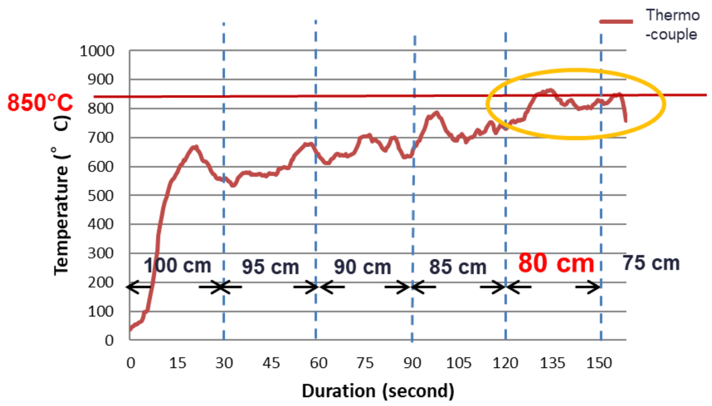


Figure. 6(L) Graph of the distance away from gas burner and received temperature

Figure. 7(R) Heating appliance manufactured for experiment purpose

4. Evaluation of the effectiveness of water spray nozzle in fire spread control by real-scale experiment

4.1 Experiment overview

We will perform a real-scale experiment to evaluate the effectiveness of the water spray nozzle and heating appliance in controlling the real fire spread in an actual environment.

While heating the models of traditional wooden townhouses approx. at a width of 1.8 m and the height of the actual houses in the assumed fire spread environment, water will be sprinkled thereon from the nozzle simultaneously so as to confirm the effectiveness for fire spread control in real scale. Then, in order to evaluate the effectiveness, we will carry out visual check and also install thermocouples on the outer wall surface of the wooden structure to record the changes in temperature at each part due to temporal changes.

Figure. 8 Experimental equipment on the whole

4.2 Equipment setting

(1) Real-scale model

We will manufacture real-scale wooden model at a width of approx. 1.8 m and at a height of 6 m using cedarwood (with a normal thickness of 1.2 mm coated with water repellent-treated Xyladecor, which is widely used in traditional wooden constructions). Since it is required to retain the characteristics of traditional wooden structures, the real-scale model should re-create the exterior wall surfaces of traditional wooden townhouses as far as possible such as eaves, windowpane plaid, paneled outer walls (shitami itabari style or wooden board siding with battens), etc. Further, in order to

check the effectiveness of the system for fire spread control in the space under eaves, which is considered vulnerable to fire, fire-proof boards (6 mm calcium silicate board) will be stuck from below onto the eaves soffit between the rafters. In this manner, a real-scale model incorporated with fire prevention measures for the space under eaves will be prepared with due attention to the appearance.

(2) Heating appliance

The 9 gas burners as developed in Chapter 3 will be unitized into a set, which will be used as the heating appliance. Gas supply pressure will be maintained at 0.35 MPa (constant) for all the 9 gas burners in order to ensure even heating conditions. It should be noted that since the head part is covered with a cylindrical cover, it will not have any effect on combustion even if water splashes over the burner. The horizontal distance between the heating appliance and test object will be set at 80 cm as was examined in Chapter 3. The distance from the outer wall surface will be fixed at 80 cm without giving a thought to projections like handrail and window grating, etc.

Based on preliminary experiment, we set the height of the heating appliance which is closest to the area under the eaves and considered as vulnerable to fire but where the flames do not approach directly to the surface under the eaves. As a result, it became clear that it is necessary to maintain at least a distance of 70 cm downwards from the space under eaves since the gas flames tend to turn upwards.

Based on the above, we decided to set the height for 3 areas in total for heating such as upper section, middle section and bottom section as shown in Figure. 9. In other words, ① Upper Section: Set the top end of the heating appliance at a height of 70 cm downwards from the space under the eaves on the 2nd floor so as to re-create a vulnerable situation mainly under the eaves on the 2nd floor; ② Middle section: Set the top end of the heating appliance at a height of further 70 cm downwards from the area heated in the upper section so as to re-create a dangerous situation including projections (handrail grating); ③ Bottom Section: Set the top end of the heating appliance at a height of 70 cm downwards from the space under the eaves on the 1st floor so as to re-create a dangerous situation particularly under the eaves on the 1st floor.

(3) Water spray nozzle

Water will be sprinkled using the water spray nozzle developed in Chapter 2. As for installation requirements, the installation level will be set at 0 m above the ground, nozzle distance at 5 m, water discharge pressure at 0.25 MPa and amount of water discharged at 460 ℓ/min in accordance with the nozzle specifications. Since the spray width is estimated up to 10 m per nozzle, we will install 2 nozzles at an interval of 10 m and arrange the real-scale model in the middle. The purpose of installing the model for evaluation in the middle of 2 spray nozzles is to avoid impaired water spray on the wall surface that occurs due to the gas burner unit. To obtain worst-case assessments, it

is assumed that the water spray becomes relatively unstable because of the farthest water spray distance from each nozzle.

(4) Thermocouple

As an indicator to evaluate the effectiveness for fire control, we will provide a small aperture towards the surface from the backside of the real-scale model and arrange the thermocouple through wiring in such a way that the thermocouple is in contact with the wooden surface in order to confirm the trend of temperature increase on the wooden surface of the real-scale model.

As the basic setup for arrangement, 9 thermocouples per set will be aligned in the shape of 70 cm square at an interval of 35 cm between each two in correspondence with the placement of burners of the heating appliance. In the Figure. 9, 3 observation points (CH) in the upper row are highlighted in yellow, 3 observation points in the middle row in green and 3 observation points in the bottom row in blue.

Since the heating appliances are arranged at the heights of upper, middle, and lower sections of the real-scale model as is discussed in b), it is essential to install the thermocouple accordingly. In other words, the heating appliances are installed: ① in the upper section so that the upper end of the set of 9 thermocouples is located under the eaves of the 2nd floor in order to intensively measure the space under the eaves with worst spray conditions; ② in the middle section so that each of the 9 thermocouples per set is located in front of each burner in order to measure direct radiant heat; and ③ in lower section so that the upper end of the set of 9 thermocouples is located under the eaves of the 1st floor in order to intensively measure the space under the eaves with worst spray conditions (since the appliances are fixed in the same location even when installing the fire-proof board, the location is concealed due to the thickness of the board). (Figure. 9)

4.3 Experiment Method

The measurement time will be 5 minutes to 10 minutes maximum, and the experiment will come to end once the temperature of the wooden surface, which is measured with thermocouple, almost reaches an equilibrium temperature. The experiment will be stopped if we observe, within 5 minutes, an ignition likely to expose surrounding buildings to danger.

The experiment will proceed in the order of: ① installing the thermocouples in the real scale model; ② adjusting water discharge pressure and amount of water release; ③ stopping water release at once; ④ igniting the gas burner; ⑤ starting releasing water again; ⑥ transferring the tower equipped with gas burner to the specified

location; and then ⑦ heading the model and continuing measurement till the ignition is observed or the temperature reaches final state of equilibrium.

Test contents include 3 cases: a verification test to compare temperature changes based on the presence/absence of water spray; a verification test to confirm temperature changes in each part depending on the heating positions under water spray; and a test to compare temperature changes in each part depending on the implementation of fire-proof board under the eaves. Test details are consolidated into Table 4.

Table 4 List of Test Details

Test	Heating position	With or without fire-proof board	Distance between heating appliance and test object	With or without water spray
1	Lower Section	Without	800 mm	With
2	Lower Section	Without	800 mm	Without
3	Lower Section	With	800 mm	With
4	Upper Section	Without	800 mm	With
5	Middle Section	-	800 mm	With

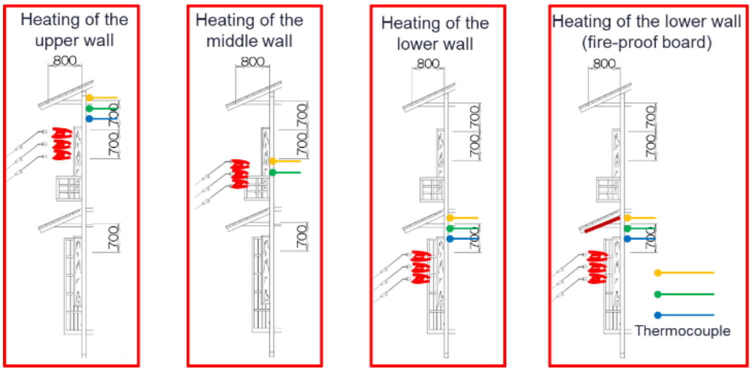


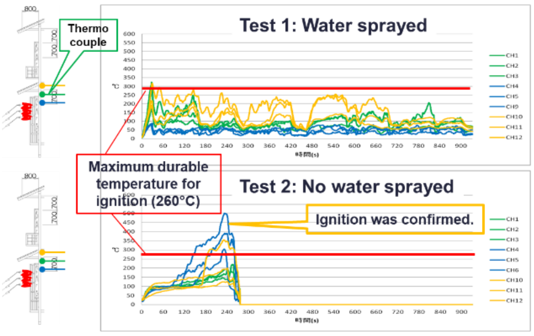
Figure. 9 Heating positions at upper, middle, and lower sections and arrangement of heating appliances and thermocouples (Height profile)

4.4 Results

We will describe the results based on the temperature changes in the Tests 1 to 5. Note that 260˚C [4)] was set as one of the yardsticks to determine the risks of ignition as it is considered as the ignition threshold temperature for wood.

When it comes to comparison of temperature changes based on the presence/absence of water spray, it is demonstrated in Test 2 (without water spray) that the temperature exceeds 260°C, which is the ignition threshold temperature for wooden structures and flames can be noticed even by visual observation for approximately 1 minute. On the

other hand, in Test 1 (with water spray), temperature increase is suppressed and does not lead to ignition despite flickering temperature. (Figure. 10)



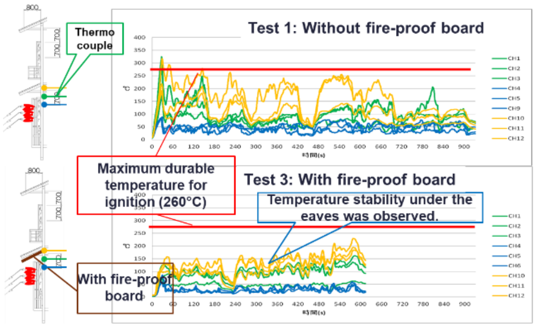


Figure. 10 Comparison of temperature depending on the presence/absence of spray

Figure. 11(R) Comparison depending on the presence / absence of fire proof board

Next, we compared temperature changes caused by implementation/non-implementation of fire-proof measures (fire-proof board) under the eaves. (Figure. 11)

The comparison of the results of Test 1 and Test 3 reveal the difference in temperature in the upper row (yellow), which is the survey point for the space under the eaves. In Test 1, where the fire-proof measures are not implemented for the backside of eaves, there is a rise and fall in temperature of the observation point for the backside of eaves, whereas in Test 3, though the temperature of the observation point is higher than the other points, it gets stable at a value lower than Test 1. It is evident from the above that the fire-proof measures at the space behind the eaves suppress the temperature increase and further enhances the effectiveness of WSS in preventing the fire spread.

Lastly, we will compare temperature changes at each part depending on the heating position (Figure. 12: Refer to Test 1 in Figure. 10 and 11 for lower section).

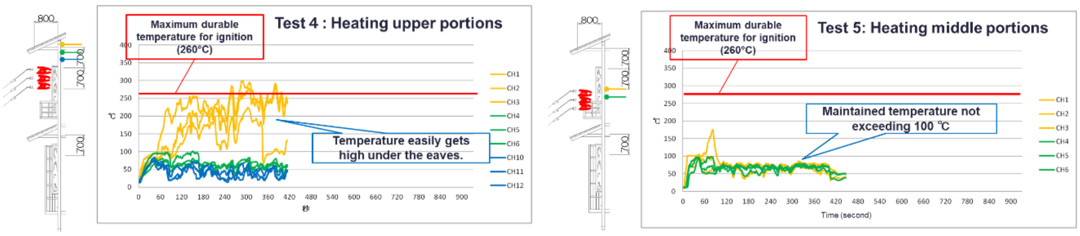


Figure. 12 Comparison based on the difference in heating position under water spray

If the heating position is in the middle section (Test 5), there is no such area under the eaves which is prone to high temperature. Hence, it becomes stable almost at a value that does not exceed 100°C during water spray. In Test 5, no temperature of an observation point for the lower row (blue) is recorded. It is because the position of this observation point overlaps with that of a supporting scaffold at the backside of the model, and thus, in reality, no observation point as such could be secured. On the other hand, when it comes to the upper section (Test 4) and the lower section (Test 1), the space under the eaves partially tends to attain higher temperature when compared to other observation points, and we observed that the temperature exceeded 260°C at some

points. However, since water spray was carried out in the surroundings of the observation points where the temperature exceeded 260°C, it did not lead to ignition; even if ignition took place, it was put off within 10 seconds due to water spray.

5. Summary and challenges in future

In this study, we developed a water spray nozzle that can sprinkle water for a wider range of areas and, in particular, under the vulnerable eaves intensively compared to conventional nozzles and secure water quantity required for preventing fire spread with a view to contribute towards the development of WSS designed to suppress fire spread over streets in highly dense areas of wooden cultural cities. Further, we evaluated the effectiveness of this nozzle in fire spread control in real-scale experiments using the model of traditional wooden townhouses while carrying out heating in assumed fire-spread environments and measuring temperature changes on the outer wooden wall. In this way, we could demonstrate the effectiveness of the nozzle of WSS for fire-spread control in the real-scale experiment.

In addition, since WSS is installed in outdoor environments, there may be a risk of not maintaining the required amount of water for a certain period of time due to the impact of strong winds. In this connection, it was also demonstrated that fire-proof measures such as fire-proof boards, etc. also prove effective for the spaces under the eaves which are vulnerable to fire. It is also advisable to refer to the study conducted by Suzuki et al.[5)] in future for fire-proof specifications for spaces under the eaves taking into consideration the city landscape.

Our future challenges include development of more effective nozzles that ensure the required performance even the case of changes in wind direction and wind speed, and improvement of the internal structure, etc. in an attempt to reduce the required amount of water.

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11.
SUSTAINABILITY AND HERITAGE PRACTICE IN THE BUILT ENVIRONMENT

Jean Rice and Dr Noni Boyd
Australia ICOMOS NSCES

Abstract

This paper promotes the Australia ICOMOS National Scientific Committee on Ecological Sustainability (NSCES) Practice Note *Heritage and Sustainability 1: Built Heritage*. Our purpose is to contribute to the debate on sustainability, hijacked by big business and the construction and finance sectors, by bringing attention to the value of the work of the heritage community and the relevance and importance of heritage conservation and preservation of our shared cultural heritage in sustaining our cultures across the world.

The method explored the similar objectives of heritage conservation and sustainable development, however the pursuit of one should not be at the expense of the other. When assessing the sustainability benefits of demolishing or retaining an existing building we should ask what would be wasted if this place were to be demolished? The greenest building is the one that is already built.

Conserving and adapting heritage places can contribute to energy conservation and reduce carbon emissions by minimising demolition and construction waste and the need for production and transportation of new materials. Conservation provides economic, social and environmental benefits to owners and developers, and contributes to meeting environmental ratings and regulations.

The resulting Practice Note promotes the conservation of heritage places as part of the protection and sustainability of the world's increasingly scarce resources, and the recognition of the sustainability inherent in heritage practice.

We conclude that in Australia more work is needed to broaden 'ratings tools', and to influence and change government practice and policy. Such tools in Australia focus on new buildings and not the benefits of retaining existing. Reusing materials when structures can't be retained is another aspect to pursue. Whatever individual efforts we make, societal change and Government action are necessary to proactively and urgently address climate change.

Future work could survey and promote effective models for facilitating reuse. The approach for the built environment should be in line with the UN Sustainable

Development Goals (SDGs) and internationally set targets for 2030. Adopting a more considered approach to the resources that comprise the built environment is a shared responsibility and many traditional cultures and structures demonstrate the way forward to reduce our carbon footprint and live sustainably.

Keywords: Sustainable Heritage Conservation Adaptation Reuse

1. Introduction

ICOMOS & UNESCO are both working to actively make sure that cultural heritage is recognised and addressed as part of the internationally recognised Sustainable Development Goals (SDGs). Conservation of heritage places contributes to the UNESCO Sustainable Development Goals, in particular *Goal 11, Making cities and human settlements inclusive, safe, resilient and sustainable and Goal 12, Ensuring sustainable consumption and production patterns.* The Australian ICOMOS National Scientific Committee on Energy and Sustainability (NSCES) has recently produced a Practice Note on Heritage and Sustainability that is part of the suite of practice notes that accompany the Australian Burra Charter. Whilst the Burra Charter has been adopted as an industry standard, the idea that heritage conservation is inherently sustainable is still not widely understood. In Australia there is constant pressure for urban renewal and the replacement of existing building stock rather than the adaptation of the existing building stock to meet current needs. In the 2018 Australian Sustainable Development Summit one of the areas identified as underperforming in relation to meeting the UN Sustainable Development Goals was the area of sustainable building. There was no mention of retrofitting or adapting existing building stock.

The purpose of the Australia ICOMOS NSCES practice note is to promote the benefits and importance of the conservation of heritage places as part of the ongoing protection and sustainability of the world's increasingly scarce resources, and to promote recognition of the sustainability inherent in heritage practice. The question that is not being asked often enough is "What would be wasted if the existing building or place were to be demolished?"

The concept of sustainability and sustainable development follows an approach of conserving the environment and earth's limited resources, understanding cultural and social values and improving economic benefits for future generations. These principles are aligned with the Australian Burra Charter approach to heritage conservation, which stresses an approach of care and maintenance to the place rather than replacement of fabric. Adaptation for new uses should involve minimal change to elements identified as being culturally significant and be confined to areas and fabric of lesser cultural significance.

Sustainability (as set out in the Brundtland report) involves integrating economic, environmental, cultural and social objectives in long-term development strategies to meet the needs of the present without compromising the ability of future generations to meet their own needs.[1]. The Australia ICOMOS NSCES Practice Note *Heritage and Sustainability 1: Built Heritage* advocates that the conservation of existing cultural and natural heritage reduces environmental impacts and carbon emissions and utilises increasingly scarce resources in a responsible and sustainable way by:

- *Minimising construction waste by reducing the demolition cycle, ensuring building are adapted and retained until the end of their useful life;*
- *Reducing carbon emissions by minimising the energy needed to demolish and reconstruct;*
- *Retaining the embodied energy of existing structures and landscapes, recognising the environmental cost already paid;*
- *Continuing the life of building materials that can no longer be sustainably sourced;*
- *Continuing to utilise buildings designed to operate using passive environmental control;*
- *Contributing towards maintaining a community's sense of place in a rapidly changing world and*
- *Continuing traditional skills and practices, many of which have low environmental impacts.*[2]

Heritage conservation practice and the broader sustainable development goals have very similar objectives, however the pursuit of one goal should not be at the expense of the other. The current focus in Australia on urban renewal and the erection of new 'sustainable' buildings is frequently at the expense of the historic built environment. Carl Elefante's often quoted mantra that *"the greenest building is the one you have already got"*[3] is little understood in the development industry, where short term profit and short lifespan buildings are the aim, perpetuating a cycle of continual redevelopment.

2. Reducing Carbon Emissions

Conserving and adapting heritage places can contribute to energy conservation and can also reduce carbon emissions by minimising demolition and construction waste and

[1] Bruntland report, 1987

[2] Australia ICOMOS NSCES Practice Note Heritage and Sustainability 1: Built Heritage, 2019

[3] Elefante, 2007

the need for production and transportation of new materials. Whilst there have been a number of international publications that consider our ‘Carbon Future’, including the scoping study for English Heritage, *Understanding Carbon in the Historic Environment*[1], there has been little targeted research into the life cycle characteristics of the range of materials used to build heritage structures, including masonry, terracotta, timber, metals (wrought iron, cast iron, steel, bronze, aluminium and alloys). This detailed research is needed to inform life cycle analysis, so that the carbon emissions of materials and structures over their entire life span can be determined.

One of the two case studies, undertaken by Dublin based Carrig Conservation International in their 2019 study, compared a refurbishment of a typical British residential building, a Victorian era terrace house, with a new residential building (new build). The life cycle carbon emissions of the existing building were lower. An important point made in this study is that if the refurbishment is undertaken with increased energy performance in mind, then in addition to lower carbon emissions comparable energy performance can be obtained to a new build. Victorian era terrace housing is not only widespread in Great Britain, but throughout British colonies and this approach can be applied to other row housing stock that is still in use - often upgrading kitchens and bathrooms but retaining principal rooms, hall and staircase etc.

Figure.1 Pembroke Terrace, a Victorian era terrace in Surry Hills Sydney. Photographed in c1870 by Pickering and which survives today, partly concealed by trees. Source: State Library of NSW, GPO 1 – 05296, digital order no. a089519

3. Retaining Embodied Energy

The embodied energy of an existing building is rarely a consideration when the decision is made by a Local Council or Government Agency to demolish or allow the demolition of a historic structure. Retaining the embodied energy of existing structures recognises an environmental cost already paid. In addition to the retention of historic building stock, historic buildings often contain building materials that can no longer be sustainably sourced such as old growth timbers, rare building stones and locally produced bricks and tiles. Durable materials that can no longer be sustainably sourced,

[1] Carrig Conservation International 2019

such as marbles and granites and rainforest timbers, were widely used in the past. These increasingly rare materials can have a long lifespan if well maintained and should be salvaged and reused.

An example of the loss of embodied energy is the removal of the internal structure from historic warehouse buildings and the replacement with a concrete structure. Many of the substantial masonry warehouses erected in Sydney, New South Wales, from the 1860s onwards were demolished in the 1960s, following the lifting of height restrictions. The warehouses that have survived have substantial hardwood post and beam structures designed to remain standing in the event of a fire, Australian hardwood proving more effective in resisting fire than steel. Timber floors can be upgraded to a required level of fire rating rather than needing replacement by a concrete slab. Hardwood timber posts can also be retained, thus allowing for the overall warehouse character and volumes to be retained and the new uses such as offices inserted within.

More research into quantifying the embodied energy inherent in heritage structures is needed. Having this research would allow for the inclusion of the loss of this embodied energy as environmental cost and allow councils to factor this cost into their assessment. Work is currently being undertaken by the Green Building Council in Australia to include existing buildings as a credit in their 'Greenstar rating' system which will assist in encouraging the adaptive reuse of buildings.

Figure.2 Eveleigh Carriage Workshops in Sydney have been adaptively reused as a contemporary performing arts centre called Carriagworks. The masonry exterior and steel roof have been retained and new structures inserted within. Source: Authors

4. Minimising Construction Waste

Associated with the retention of embodied energy is the aim of minimising construction waste. All available measures for conserving and/or reusing valuable existing material should be considered in addition to using sustainable new materials such as timber certified as being sustainably sourced, recycled aggregate concrete and

recycled stone and brick for landscaping (and other works where structural integrity is no longer an issue). Reducing the demolition cycle ensures that buildings are adapted and retained until the end of their useful life. This cycle of demolition and rebuilding should be compared to cities such as London where there are numerous areas with Georgian building stock still in use as professional chambers and as residences. In Sydney this form has largely vanished in the Central Business District (CBD) where similar Georgian era townhouses have been demolished and new structures built twice or even three or four times over.

Salvaging building materials has become a viable industry in certain countries, to the extent that the salvage dealers are like antique dealers, with trade shows, regular publications and professional networks. In countries such as Vietnam and Cambodia almost the entire range of building elements is salvaged from demolition sites. The reuse of building components and materials is very extensive in Third World Countries. The novels of Charles Dickens describe the existence of a similar economy in London in the nineteenth century, an economy in which nothing was wasted. Vanished occupations such as *mudlarking* and *picking oakum* record this economy of salvaging and recycling. Today whole buildings are demolished using heavy machinery, rather than being 'unbuilt', and the materials taken to the rubbish tip, with little thought for environmental impact. The 2019 study *Heritage Counts – Re-Use and Recycle to Reduce Carbon*[1], notes that

> *When construction, transportation and buildings' electricity use are taken into consideration, the built environment sector is responsible for up to 42% of the total Greenhouse Gas (GHG) Emissions in the United Kingdom. However, little effective action has been taken in the built environment to date … there is an acute need to substantially step up action to cut emissions from buildings.*

Retrofitting existing buildings in a manner that improves their environmental performance rather than 'new builds' will contribute to lowering carbon emissions and allow for the retention of local character and building forms.

[1] Historic England 2019

Figure.3 At T house in Saigon, architects Kientuc O have added a conservatory made from recycled glass. Source: Authors

5. Continuing Traditional Skills

With the globalisation of the supply of pre-processed building materials came a decrease in the range of building trades and trade skills. In Australia processing of materials, stone in particular, is now frequently undertaken off shore and the cut sections are shipped by container. Numerous local quarries, brick and tile works, lime and charcoal kilns have all closed in areas where the raw materials still can be found, as production has shifted. It is now close to impossible to locally source matching traditional building materials in Australia. Historic buildings are often repaired using imported materials that replicate the originals.

To conserve historic building stock there is a need to continue to teach and develop traditional skills and practices. Traditional building materials are available in Australia and should be sourced locally, without the need to import materials from the northern hemisphere. Traditional building skills and practices frequently have low environmental impacts and involve working by hand. There is a growing interest in 'low tech' building materials and techniques, not necessarily as a result of an interest in maintaining building techniques, but as a result of a growing interest in creating healthy buildings with good indoor air quality.

6. Passive Environmental Control

Historic building stock often employed appropriate built forms that evolved to suit the particular climate zone, used locally sourced building materials and was designed with passive environmental control. The choice of form and materials evolved to suit the climate of the particular area in which buildings were erected and used building materials available locally. Natural ventilation, cooling, sunshading and thermal mass

provide long-term benefits in terms of lower energy usage.

Traditional buildings (including heritage buildings) were often designed with passive rather than mechanical ventilation and may have the added benefit of the high thermal mass of masonry walls and chimneys. Supplementary heating or cooling can be provided however this should not be at the expense of, or reduce the efficiency of, passive means of environmental control. Rather, how the building was designed to operate needs to understood so supplementation can take full advantage of all the passive measures, thus limiting additional energy consumption. The operation of existing passive ventilation, sunshading and heating should be part of the analysis of existing building fabric.

Public chambers such as nineteenth century courthouses and parliamentary chambers were designed with operable ventilation that could be adjusted depending on the temperature. Sealing these chambers so that they permanently need air conditioning, rather than allowing for openable windows and occasional supplementation in hot or cold weather, is not be cost effective as the running costs increased considerably. More recent retrofitting projects have included a balance, retaining operable windows to give the occupants a degree of flexibility and choice regarding airflow from the exterior.

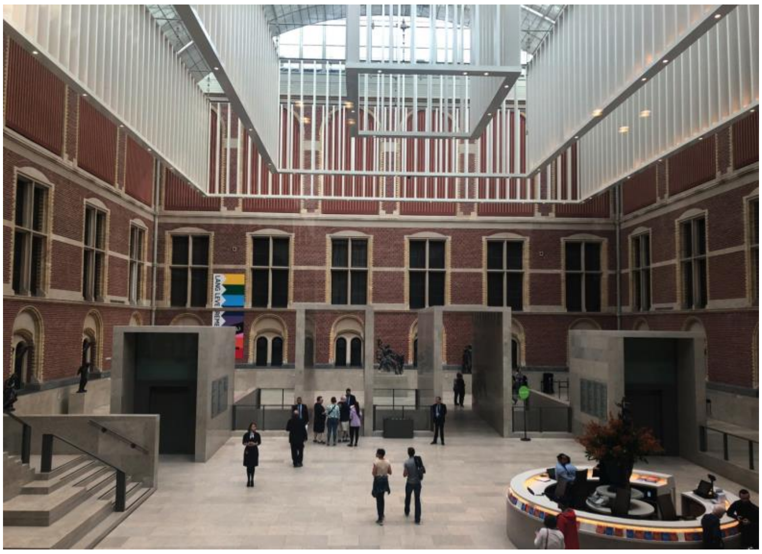

Figure.4 At the Rijksmusem in Amsterdam a new entry was inserted into former courtyards with a large central climate-controlled atrium retaining the original and inserting new windows opening into the space and natural light. Source: Authors

7. Maintaining A Community's Sense of Place

The retention and retrofitting or adaptive reuse of buildings that have not reached the end of their useful life not only reduces construction waste, but also contributes towards maintaining a community's sense of place in a rapidly changing world. There are numerous examples world wide of landmark buildings that have been adapted from one use to another, the Louvre in Paris, formerly a royal residence and now a museum and

gallery, being one of the most widely known examples.

By retaining the existing building, yet modernising services and improving accessibility, major public buildings such as the Rijksmuseum in Amsterdam continue to play a part in daily life. Interventions have been undertaken to allow the main public spaces to continue to operate as such. A balance has been achieved between the need to upgrade the building to meet the environmental standards, needed to preserve the works of art that are on display, and the need to maintain the overall historic form and appearance of the Museum and its principle public galleries.

In retrofitting public buildings modern servicing requirements for data, air conditioning, heating and lighting can be provided within the existing building without compromising the major spaces. In the case of Parliament House in Sydney, a complex of buildings literally cobbled together in the 1850s by a fledging Government that had no funds, a salvaged prefabricated church and the former hospital pavilion still form the heart of the complex. These buildings continue to operate, and have been carefully maintained and upgraded over the years.

Conservation areas and historic town designations are ways in which historic residential building stock, as well as churches, shops and public buildings such as schools can be retained. The degree of success is dependent on the degree of control over the demolition and replacement of buildings. The current controls for Conservation Areas, such as the waterfront suburbs of Balmain and Birchgrove in Sydney, require the main roof form of the historic building stock to be retained, thus retaining the character of the streetscape. In the treatment of the rear wings there is a greater degree of flexibility, and this is where modern kitchens and bathrooms can be inserted and additional floor space provided.

8. Implementation

Works to historic building stock need to be carefully considered and the nature of the existing form, structure and plan understood, so that any interventions enhance the character and operation of the place in terms of daylight and ventilation. Possible interventions, depending on the heritage significance, to allow historic building stock to continue in use in a sustainable manner include:

Prevention of air leakage to/from the building structure without compromising the ability to open windows when required;

Introduction of passive cooling and increased ventilation and the ability for users to control ventilation;

The careful introduction of new sustainable or renewable energy sources (eg solar, geothermal, wind);

Implementing rainwater collection measures including the introduction of non-potable water / greywater harvesting;

Insulation of services pipes/ducts to prevent freezing, heat loss or temperature increase;

Provision of adequate insulation to reduce loss of heat and prevent heat transfer through roofs, walls and floors without sealing the building, thus allowing the building to breathe and preventing excessive moisture build up and mould growth;

Improving the performance of individual building components such as the use of solar glass, vacuum glass, thermal insulating shutters, where these could have a minimal impact in a conservation project; and/or

Controlling sun access and sun shading to limit heat build up or utilising the heat from the sun and thermal mass to heat an internal space (depending on the climate zone).[1]

9. Conclusion

The existing historic built environment should be seen as a resource or asset to be carefully maintained for the future generations, taking care to retain the unique character of individual buildings and places that contribute to a community's sense of place and contribute to the visitor experience of tourists. To conserve scarce planetary resources concepts of stewardship and asset management should replace rapid cycles of profit-driven urban renewal. We need to continually be asking ourselves, what would be wasted if this place were to be demolished? The erection of buildings with short life spans using materials that have a high energy cost in both their production and transportation is frequently at the expense of historic buildings stock. Comparisons undertaken in England and Ireland between retrofitting / refurbishment and new builds are proving that, in terms of reducing carbon emissions and construction waste, adapting existing building stock out performs new builds. To slow the rate of climate change, a more concerted approach needs to be adopted to maintain and repair the building stock that we already have and where necessary carefully adapt it for modern use. The Australia ICOMOS NSCES Practice Note *Heritage and Sustainability 1: Built Heritag*e was prepared to broaden the understanding of the benefits of adaptive reuse and to encourage the adoption of a sustainable approach to the treatment of the built environment. The Practice Note can be found on the Australia ICOMOS website by searching on the term "Practice

[1] Australia ICOMOS NSCES Practice Note Heritage and Sustainability 1: Built Heritage, 2019

Note Heritage and Sustainability Built Heritage”.[1]

Acknowledgements

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12.

FOSTERING AND SAFEGUARDING A SUSTAINABLE HERITAGE FOR ALL: "*CONSERVATION OF THE CHENG MEI ANCESTRAL HALL, TAIWAN*"

Queenie Lin[1], Tsung-Hung Li[2], Ku-Shan Shih[3], Yin-Chun Wei[4]

[1] Consultant/PhD Candidate, Tinghsin Hote Foundation/
Taipei National University of the Arts

[2] Collection and Research Section Specialist, Cheng Mei Cultural Park

[3] Supervisor of General Affairs Section, Cheng Mei Cultural Park

[4], Founder, Tinghsin Hote Foundation

Abstract

The Cheng Mei Ancestral Hall (1885) locating in Yongjing, Taiwan is the Wei family estate built adjacent to one of the biggest irrigation systems in Taiwan, Babao Canals. In addition to the environmental hazards like humidity fluctuation, salt efflorescence, and pest infestation, as well as other threats due to climate change naming heavy rainfalls and frequent typhoon visits, this County-designated Historic Building endured overloaded occupancy and negligence of maintenance over the past centuries, which caused severe structural deterioration and losses of movable cultural heritage. The disastrous 921 Earthquake in 1999 was the last straw to devastate the Hall, however, this united the Wei family and initiated a comprehensive conservation plan to prevent their ancestral home from further destruction.

This research aims to analyze how the conservation work and risk mitigation help to reduce the impact of future disaster, and subsequently prolong the life of the mansion and extend the family legacy, while safeguarding the tangible and intangible heritage in Taiwan. For instance, various innovative preventive measurements were formulated to build greater resilience, such as introducing a new supportive foundation and redesigning waterway routes for suitable drainage and protection. Moreover, other risk reduction and preparedness measures were also applied, such as the moisture insulation mechanism for bamboo wattle and daub walls to provide an adequate barrier against moisture, as well as a seismic mechanic design for the joints between stone pedestals and wooden pillars in response to the frequent earthquakes in Taiwan.

Through its disaster risk and maintenance management plans abiding the Sustainable Development Goals (SDG), the restored mansion, now hosting the Cheng Mei Cultural Park, works to improve capabilities by fostering innovative approaches and viewpoints on heritage conservation and natural preservation. Meanwhile, the Tinghsin Hote Foundation also promotes the sustainable use of heritage for resilient land utilization by cooperating with the local community and traditional knowledge in order to maintain sustainability with the regional identity and transformation of Yongjing.

Keywords: Safeguard, Resilience, Mitigation, Building Back Better, Sustainable Development Goals (Sdgs)

1. The Cheng Mei Ancestral Hall and Conservation Concerns

The Cheng Mei Ancestral Hall (Figure. 1) located in Yongjing Township, Changhua County is the family mansion of the renowned Wei family from central Taiwan. In 1885, it was built adjacent to one of the biggest irrigation systems in Taiwan, the Babao Canals, allowing the Wei family to thrive with the Canal.[1] The mansion was built in traditional building methods, which are fusions of Han Chinese, Hakka and local Taiwanese tradition. It was built according to the family's emotional cohesion, which not only creates an environment to nurture the offspring and to act as the social and cultural centrum for the local community, but also portrays outstanding craftsmanship and cultural significance. It is a unique fusion of Hoklorized Hakka (fulao ke, 福佬客)[2] culture and architecture, which is considered as one of the best historical residential

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1 For details of the construction of the Cheng Mei Ancestral Hall, please refer to Wei (2008: 55–106) and the Institute of Taiwan History, Academia Sinica (2015: 241–258).

2 Hoklorized Hakka culture is a unique hybridization of two ethnic groups of Hakka and Hokkien (from Minnan, Southern Fujian Province) in Taiwan, which is ethnical of Hakka origin but is completely integrated with the Hokkien society, language and lifestyle. It formed when the Hakka immigrants first moved to the Hokkien people occupied areas, and the Hakka people started adopting their languages and customs to the Hokkien culture for protection and other social benefits. Therefore, a fusion culture is created and these Hakka people are not easy to be distinguished from the Hokkien people as they are using Hokkein dialects as well, hence a large number of Hoklorized Hakka people are not aware of their Hakka origins. The difficulty to identify and remember the Hakka roots has resulted in tremendous loss of original Hakka culture and awareness for the Hoklorized Hakka families. However, the Cheng Mei Ancestral Hall is one of the rare cases that the family's Hoklorized Hakka culture has been identified, researched, preserved and interpreted through the conservation process, therefore it has become a critical witness of the Hoklorized Hakka culture formation. For further research on the Hoklorized Hakka architecture features and representation at the Cheng Mei Ancestral Hall, please refer to: Lin, Q. and Huang, H. (2020).

estates in Taiwan, and therefore the mansion was designated as a County Historical Building of Changhua in 2008 for its historic and cultural value.

Like other historic residences, the Cheng Mei Ancestral Hall had its ups and downs over the past century. Some examples include enduring overloaded occupancies and negligence of maintenance, as well as environmental hazards such as humidity fluctuation, pest infestation, heavy rainfalls and frequent typhoon visits, especially suffering from severe deterioration over time due to the rising dampness from high levels of groundwater around the Canal. The disastrous 921 Earthquake in 1999 was the last straw in devastating the Hall, however, this united the Wei family and led to the creation of a comprehensive conservation plan to prevent their ancestral home from further destruction.

The documentation and condition survey started in 2005, and the actual conservation process took place between 2009 and 2012. The project included the preservation and restoration of remaining houses at the ancestral hall, as well as the conservation and reconstruction of collapsed areas. Besides series of family and regional history research along with intensive conservation appraisals, the restoration work and risk-mitigating preventive measurements had not only prolonged the life of the mansion and safeguarded the traditional artisan skills, but also extended the family legacy and created valuable cohesion for the family, while successfully safeguarding the tangible and intangible heritage in Taiwan and facilitating regional regeneration of Yongjing area.[1]

Figure.1 The Cheng Mei Ancestral Hall (after conservation) and surrounded Second Babao Irrigation Canal in Yongjing, Changhua. Source: Tinghsin Hote Foundation

2. Identifing The Threats

The Cheng Mei Ancestral Hall is situated in the subtropical zone in Taiwan, which

[1] Information regarding the survey, the condition before the conservation, and the methods used in the conservation of the Cheng Mei Ancestral Hall is retrieved from a series of unpublished notes, meeting memoranda and reports from 2005–2012 by the authors with permission of the Tinghsin Hote Foundation.

comes with high temperatures almost all year long, and high humidity brought by frequent and heavy rainfall. The environmental factors are the main causes of deterioration (Tabke 1), and there are also other threats responsible for the degradation: structural (Tabke 2), biological (Tabke 3), and social factors (Tabke 4). Before the conservation, structural safety inspections and material analyses were carried out in order to tailor suitable conservation techniques for the serious ground settling problems and provide a stable foundation for the whole compound. Properties examinations on each material were also carried out to determine which areas or structures need to be reinforced, and decide which components are suitable for reused and confirm their anti-seismic performances. For instance, besides based on the timber frame masters' experiences, non-destructive ultrasonic tests were applied to determine whether each piece of timber can be reused.

Tabke 1 Enviromental factors affecting the condition of the heritage property

I. Low-lying site

The original low-lying site and high ground water content pose threats to the stability of the estate and causes severe deteriorations.

II. Ground settling:

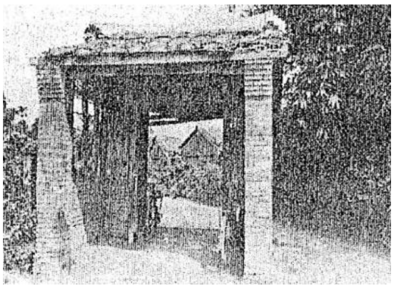
Some walls and ridges were torn due to foundation subsidence caused by ground settling. The over pumping of groundwater in the Changhua area also intensifies the ground settling.

III. Earthquake:

Many structures were seriously damaged after the 9/21 earthquake in 1999: The left outer wing collapsed and the roof of the right wing collapsed.

IV. Typhoon:

The courtyard gate was destroyed by Typhoon Wayne in 1986.



V. Extreme weather conditions—heavy rain or flood:

The low-lying site and more and more frequent torrential rains have brought floods to the estate. E.g. The flood at the courtyard of the Cheng Mei Ancestral Hall after Typhoon Kalmaegi in 2008:

VI. Moisture fluctuation and ground dampness:

Many deteriorations caused by moisture fluctuation and ground dampness occurred: Distortion, salt efflorescence, flaking paint layers on wooden structures. E.g. Salt efflorescence on timber structure:

VII. Direct sunlight:

Long term exposure to direct sunlight has caused deteriorations such as flaking, stained, cleavage, paint loss or discoloration on polychrome wood or mural paintings.

Source: by the author.

Tabke 2 Structural factors affecting the condition of the heritage property

I. Insufficient foundation:

The original foundation was only filled with earth that is insufficient for supporting. The foundation subsidence is evident around heavy loaded columns and walls.

II. Roof leakage:

Large amount of water damage of the timber structure caused by roof leakage:

III. Material deterioration—deformation of wooden truss:

There are often cracks and insufficient bonding between the brick wall and the timber system.

IV. Material deterioration—Salt migration:

Salt efflorescence, and leaching of materials have occurred on flooring tiles.

Source: by the author.

Tabke3 Biological factors affecting the condition of the heritage property

I. Termite infestation:

The high humidity content has attracted termite infestation on wooden structures.

II. Fungal infestation:

The high temperatures and dampness have caused fungal infestation on wooden structures and painted surfaces.

Source: by the author.

Tabke4 Social factors affecting the condition of the heritage property

I. Negligence or lack of maintenance:

Before the conservation, most family members had moved out overtime, and there was only one household living in the compound for 19 years. Hence it is hard to maintain unoccupied buildings.

II. Negligence or lack of maintenance—Theft:

Many exquisite wooden carvings were stolen. E.g. The exquisite lion polychrome sculpture and other wooden carvings was stolen:

III. Improper alteration—roofing tile replacement:

The roofing tiles were replaced with red Japanese style roofing tiles.

IV. Improper alteration—using cement replacing original materials:

The cement was often used for repairing original materials. E.g. The original stone plinth was repaired with cement filling.

V. Living habits—incense burning:

Many indoor paintings are stained, discolored and flaking due to the excess incense burning for religious rituals.

VI. Ownership issues:

The scattered landholdings have caused the lack of management for most of the property, especially the unoccupied buildings.

Source: by the author.

3. "Building Back Better"

3.1 Elevation of the foundation

The Cheng Mei Ancestral Hall is situated in the alluvial fan of Changhua Plain, while the ancient name of the site of the mansion, Nan-gang-Xi (湳港西, west muddy plain) suggests the high water content soil characteristics (Zhang, R., 1995). The temperatures are high all year long and the distinction between the wet and dry seasons have become more and more evident due to climate change. In addition to the ground settling and high ground water content which posed threats to the stability of the estate and causes severe deteriorations, the low-lying site and the clay layer (7 m) also attracted frequent floods during torrential rains. Therefore, the whole structure, including the timber truss system and brick masonry, was disassembled, carefully labeled and recorded, reinforced and then restored accordingly while maintaining its authenticity (Figure. 2 & 3). To solve this problem and increase greater resilience, the whole compound foundation was raised 48 cm and a 50cm-thick reinforced concrete foundation was installed to strengthen the foundation structure and reduce the impact caused by uneven

geological settlement (Figure. 4 & 5). It aims to reduce the disaster risk and prevent further losses may cause by ground subsidence, dampness, fluctuation of humidity, flooding and frequent earthquakes, in order to be prepared for the future. The design also reserved space for subsequent piping/electricity systems in order to avoid further openings of the foundation in the future, and thereby reduce leakage possibilities. This preventive approach is coherent to the "Building Back Better"[1] concept that is to improve the low-lying site and ground settling issue; the new supporting foundation mitigates the impact of future disasters that could contribute to environmental sustainability and resilience of the heritage place. After the completion of the conservation, although the extreme weather has become more and more evident and constantly posed threats to the Yongjing area, at Cheng Mei Ancestral Hall there were no more flooding occurrences and the dampness was improved.

Figure.2 The structure was first disassembled during conservation. Source: Tinghsin Hote Foundation

[1] The "Building Back Better (BBB)" concept is the use of the implementation of well-balanced disaster risk reduction measures for recovery, rehabilitation and reconstruction phases after a disaster, and to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment. It was was first officially used in the United Nations' "Sendai Framework for Disaster Risk Reduction Document", which was agreed on at the "Third UN World Conference on Disaster Risk Reduction" in Sendai, Japan, 2015. For further explanations please refer to UNISDR, 2020: 11; Building Back Better (BBB) https://en.wikipedia.org/wiki/Building_Back_Better, accessed 17 Sept. 2020; United Nations Office for Disaster Risk Reduction, 2017; Hallegatte, Stephane et al., 2020.

Figure.3 The original materials were carefully labeled and recorded before disassembled, and then stored accordingly before reuse. Source: Tinghsin Hote Foundation

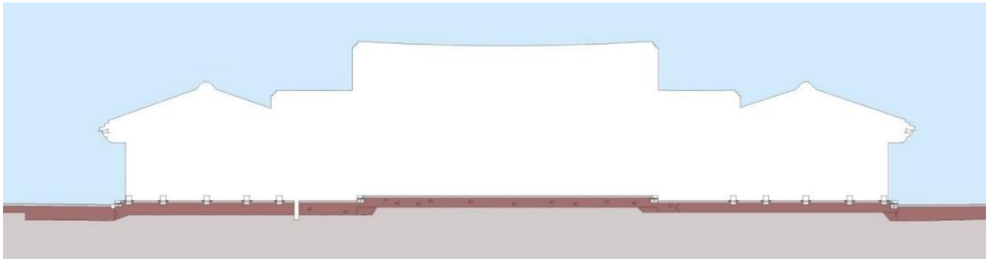


Figure.4 In order to prevent the rising dampness from the high content of ground water, the foundation was elevated by 48cm during the conservation, the new foundation for the whole compound is shown in brown color, keeping all building heights and sequences in their original states. Source: Tinghsin Hote Foundation

Figure.5 The new raised foundation reserves space for future piping/electricity system. Source: Tinghsin Hote Foundation

3.2 Preventive waterway route design for suitable drainage and protection

Another implementation for disaster risk reduction measure was to redesign the water route within the compound to create better drainage and resilience to reduce the vulnerability and impact of future disasters, also to reach a better coexistence with the Canal (Figure. 6). The ground ditches were redesigned in accordance with the rainfall passage along the roof, which allows the rainfall drains immediately and minimize the moisture content of the roof and indoor microclimate. Additionally, the waterway route has been redesigned to comply with *Feng Shui*[1] principles for better energy flow. Therefore, the overall water flow and draining ability were greatly improved, which lower the threats caused by moisture, and preserve the building in response to the risks caused by the canal water and extreme weather conditions due to climate change.

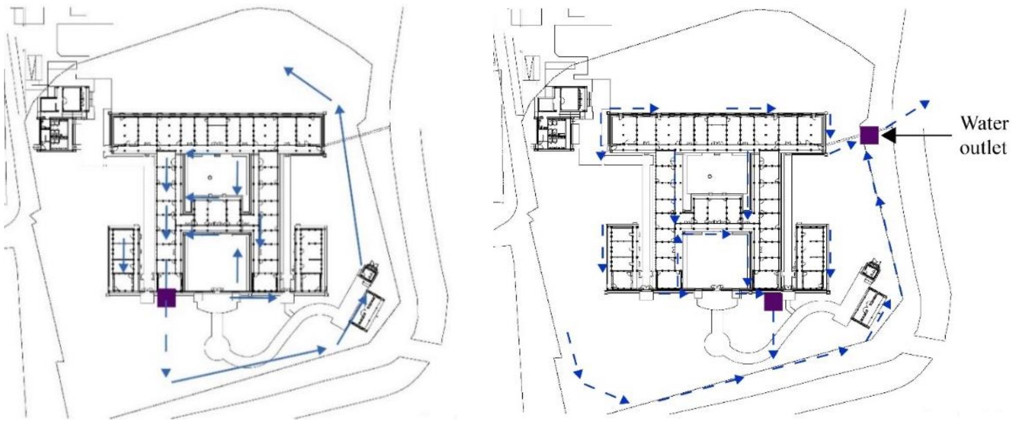


Figure.6 The original and redesigned waterway route and drainages after conservation; Left: The original drainage route before conservation; Right: The water route after conservation Source: Tinghsin Hote Foundation

3.3 Restoring with Resillent and Sustainable Materials: Timber Preparation

Many original timber structures deteriorated severely mostly due to the dampness and termite infestation. Fluctuation of moisture content is always the worst enemy to timber structures, therefore special attention was paid for controlling the moisture content and stability of timbers. The carpentry master was in charge of material quality control, and all timbers were prepared in traditional method and naturally dried for 2 years in advance in order to assure the moisture content under 20% that would minimize the termite infestation probability (Figure. 7). Much more durable timbers such as Taiwan cypress (hinoki) and Cambodian teak were chosen to replace the original

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[1] Feng Shui (風水), literally means 'wind and water', is a traditional geomantic practice that comes from China, allowing energy forces to harmonize individuals with their surrounding environments.

degrading China fir during conservation, in order to prolong the life of the timber structure and achieve material sustainability.[1] All components were examined individually before conservation, and new materials were only applied when the original materials were tested insufficient, while abiding the principles of enhancing the structural strength without altering the appearance to ensure the authenticity, as well as to ensure the buildings last for at least another one hundred years. At that time of conservation, the public sectors usually used fir as the restoration material due to the budget restrain, and they applied chemical wood antiseptic as a custom to prolong the timber durability. However, the chemicals not only harm the woods but also cause health hazards concerns. This project had brought in forestry experts to advise on the choice of new timber materials, combining with the traditional carpentry's wisdom to prepare timbers during the spring to obtain the finest timbers.

Figure. 7 The carpentry master was in charge of material quality control and all timbers were prepared in traditional method and naturally dried for 2 years in advance in order to assure the moisture content under 20% that would minimize the termite infestation probability. Source: Tinghsin Hote Foundation

[1] The original timbers were mostly Taiwan cypress that were popularly used during the Japanese ruled period; and China fir that is commonly used in Han Chinese architecture in Southern China. The Taiwan cypress parts were restored or replaced with the same material; however, since the China fir components have mostly decayed and have termite infestation, they were replaced with Cambodia teak that accommodates the hot and humid weather in Taiwan more easily in order to withstand the termite infestation and extend the longevity of the buildings. Since forest cutting was banned since the 1980s, all timbers for construction have to be imported.

4. Mitigation Treatments for Future Threats

4.1 Reinforcement between the Wooden Truss and Brick Wall Structure

In order to fortify the attachment between the timber framework and wall structure, and to prevent future cleavage, several traditional Han Chinese construction techniques were converted for further reinforcement and prevention of frequent earthquakes in Taiwan: a long bamboo frame and a bamboo braid mesh are inserted into cavity walls (Figure. 8); also, at the joint of wooden column and masonry walls, a shear mechanism is affixed to the wood (Figure. 9).

Figure.8 The long bamboo frame and bamboo braid mesh are inserted into cavity walls for better attachment between timber frameworks and walls. Source: Tinghsin Hote Foundation

Figure. 9 A shear mechanism between the wood column and masonry wall for reinforcement. Source: Tinghsin Hote Foundation

4.2 Moisture Insulation Mechanics for Bamboo Wattle and Daub Walls

Following the ancestors’ wisdom using local natural materials, the traditional Chinese building technique—bamboo wattle and daub walls (Figure. 10), the earth construction technique combining woven bamboo splits with clay provides the Cheng Mei Ancestral Hall with good ventilation, heat and cold tolerance and proper weather acclimatization. However, this traditional material has degraded and become less and less resistant to the rapid heat and humidity fluctuation under the accelerating climate change, therefore preventive mechanisms were added to the traditional techniques in order to increase stability and prolong the life of natural materials. Among them, a unique invention of moisture insulation mechanism is one of the easiest to install and is less aesthetically intervening in the natural materials. This set of moisture insulation mechanics for timber structures uses brass sheets as a barrier, inserting between the bamboo wattle and daub walls and timber pillars, which is designed to provide an adequate barrier against the rainwater or high moisture content from the surrounded canal penetrating through the joints between walls and pillars, which are usually the most vulnerable spots for leakage or moisture accumulation (Figure. 11 & 12).

Figure. 10 The original bamboo wattle and daub wall that is degrading. Source: Tinghsin Hote Foundation

Figure. 11 The new water insulation mechanism installed during conservation. Source: Tinghsin Hote Foundation

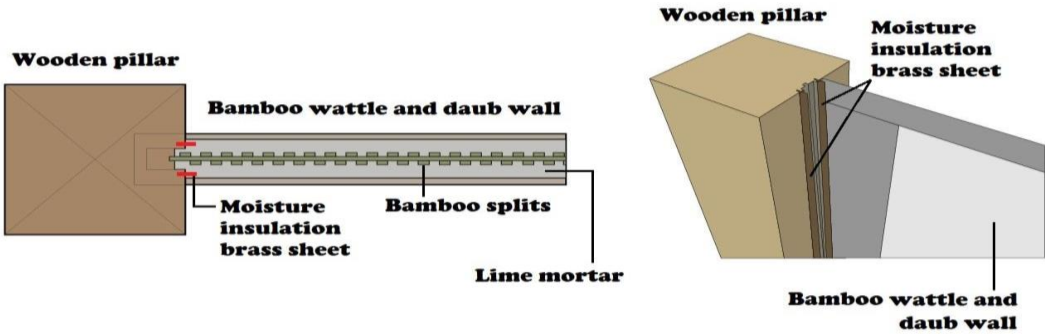

Figure. 12 The moisture insulation mechanism between bamboo wattle and daub walls and timber structures. Source: Tinghsin Hote Foundation

4.3 Plinth Improvement

Just like the moisture insulation mechanics for bamboo wattle and daub walls, all new mechanisms were concealed within the structure and did not affect the original appearance. The structural mechanism of the wooden column–stone plinth–stone stylobate was also improved while maintaining the original appearance and materials. The stone plinth was embedded in a stone stylobate tray to improve anti-seismic performance; and a brass cylinder (9 x 4.5 cm) was inserted between the wooden column and stone plinth as a floated joint to improve the resistance to lateral forces (Figure. 13-15).

Figure. 13 Before conservation: Timber column misplaced on the stone plinth and the cracking of the stylobate are due to distortion caused by moisture fluctuation. Source: Tinghsin Hote Foundation

Figure. 14 After conservation: the improved wooden column–stone plinth–stone stylobate structure. Source: Tinghsin Hote Foundation

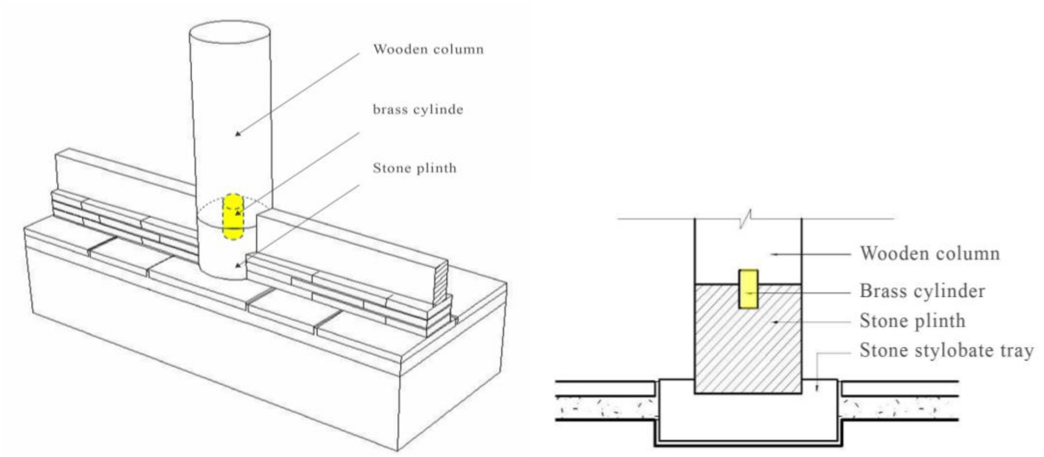

Figure.35 The improved structural mechanism of the wooden column–stone plinth–stone stylobate. Source: Tinghsin Hote Foundation

5. Management of Sustainable Development at Cheng Mei Cultural Park

By extending the owner Wei family's legacy, the restored Cheng Mei Ancestral Hall

now hosts the Cheng Mei Cultural Park that is open to the general public since 2013. It consists of the restored historic structure as a house museum, and the Garden He-De built in 2014-2015 commemorating the Wei brothers' father, adding an elegant touch to the museum landscape and celebrating the cultural landscape of plant industry and agriculture in Yongjing. The adoption of new uses of a museum for the old buildings while retaining their heritage character and the family's sense of place has contributed significantly to the local economy and sustainable development.

5.1 Management and Risk Mitigation Plans according to SDGs

Abiding the legal provisions for the cultural heritage preservation for conservation: "*Cultural Heritage Preservation Act of Taiwan*", and after the completion of the restoration in 2012 and more than three years of trial operations, two sets of conservation and heritage management plans were set up in order to protect the built heritage and landscape at Cheng Mei Cultural Park: *The Management Manual of Chang-hua County-designated Historical Building—the Cheng Mei Ancestral Hall*, 2016 and *The Contingency Plan for the Cheng Mei Ancestral Hall*, 2018. These plans respond to the need to take strong and decisive actions to address climate change and its impacts on heritage through both mitigation strategies that reduce the effects of climate change and adaptation strategies to cope with its unavoidable consequences. Through these risk and maintenance management plans abiding the Sustainable Development Goals (SDGs), the Cheng Mei Cultural Park has worked hard to improve capabilities by fostering innovative approaches and viewpoints to heritage conservation and natural preservation. The past eight-year period not only examined the conservation technology and material selection, but also allowed the Cheng Mei Cultural Park to accumulate copious valuable experiences in the practice of SDGs and the regeneration of Yongjing.

5.2 Paint Color Recording and Accelerated Aging Test

During the conservation, detailed color information of each ornament or painted structure is recorded carefully using the Pantone color chart for future reconstruction (Figure. 16). Before setting up the tone for the whole compound, the basic tone of the original wooden surface was first measured and simulated on the computer. Besides color reconstruction, all decorative ornaments were reconstructed digitally for adjustments beforehand, and Sol-silicate mineral paints from KEIM and LIVOS, Germany were selected due to their stability and durability.

Figure.46 The main tone of painted finishes is red and blue: red for outdoors and blue for indoors. Source: Tinghsin Hote Foundation

A follow-up accelerated aging test of the paint layers was carried out between 2017-2020 in order to provide more references for maintaining the authenticity and long term preservation (Figure. 17 & 18). This ongoing experiment aims to find alternative paint sources from local suppliers which accommodate the local environment in Taiwan, instead of constantly using paints imported from Germany for sustainability and budget concerns. The current results suggest that in order to extend the durability of paint layers, the wooden surfaces should be re-varnished every two years due to the high humidity and temperature, and long-term sunlight exposure in Taiwan, as well as the increasing climate change conditions.

Figure. 17 Accelerated aging test of various paint sources. Source: by the author.

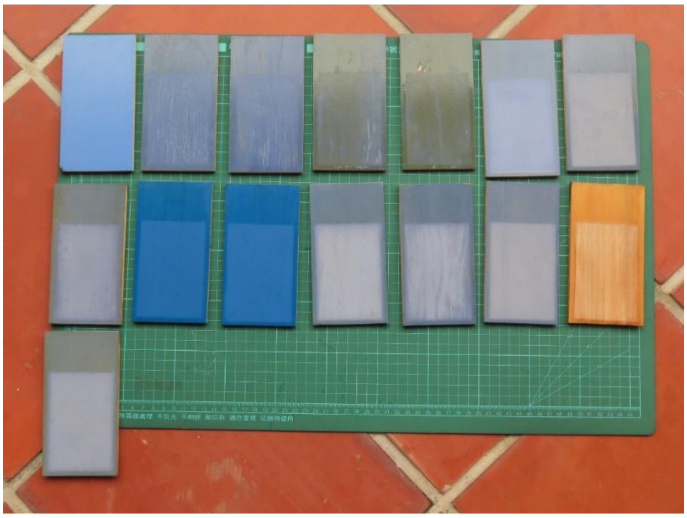

Figure. 18 Accelerated aging tests of the paint layers. Source: by the author.

6. Conclusion

The restored Cheng Mei Ancestral Hall continues its original role as the key location for uniting the Wei family; besides keeping the original function of ancestor worshipping and family gathering, other spaces are open to the public as exhibition rooms for cultural preservation and advocacy. Notably in order to manage and ensure the quality and smooth progress of the conservation, a Techniques Reconstruction Zone (Figure. 19) was designed for a better understanding of not only the construction methods but also the possible degradation process and measurements in response. A 1:1 scale model of the most complex joint areas was built to study the points between two eaves that are most likely to leak, and after the conservation, it is preserved as an architectual preservation learning zone. As one of the first private sectors in Taiwan to lead the conservation of architectural heritage independently, the Cheng Mei Cultural Park has become the conservation knowledge exchange center in central Taiwan. The conservation project and the subsequent regional regeneration of the Yongjing area made the Cheng Mei Ancestral Hall a social and cultural center for the local community. The Cheng Mei Ancestral Hall was opened for professional visits during the conservation process, and it continues to host various programs on tangible and intangible heritage preservation, aiming to provide Yongjing and Taiwan with a cultural and conservation learning center, as well as to promote public awareness about sustainability (Figure. 20). As a private-sector organization in Taiwan, the Tinghsin Hote Foundation is on its mettle to create new responses for the emerging challenges, and is continuously strengthening the means of implementation and revitalization of the global partnership for sustainable development, promoting Taiwanese cultural heritage to the international community, in order to preserve the cultural heritage on a global scale.

Figure. 19 The Techniques Reconstruction Zone at Cheng Mei Cultural Park. Source: Tinghsin Hote Foundation

Figure. 20 Traditional construction technique workshops for the younger generation: Bamboo wattle and daub wall workshop, 2015. Source: Tinghsin Hote Foundation

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13.

CAPACITY OF WORLD HERITAGE TEMPLES FOR USING AS EVACUATION PLACES AND SHELTERS AGAINST TO THE TOURISM HAZARD: A CASE STUDY FOR POST-EARTHQUAKE RESPONSE IN KYOTO, JAPAN

Dr. Dowon Kim[1], Prof. Takeyuki Okubo[2], Hiroki Shimizu[3]

Asst Professor, Dept. of Civil and Environmental Engineering, Ritsumeikan University
Professor, Dept. of Civil and Environmental Engineering, Ritsumeikan University
Nippon Telegraph and Telephone West Corporation

Abstract

This case study focuses the capacity of the temples for using as evacuation places and shelters near the Kyoto station. There are two big temples which are Nishi Hongan-ji and Higashi Honagan-ji. These two temples are both Buddhism temple which have more than 40,000 m^2 of site area with open spaces and have traditional wooden structures. The biggest structure of Nishi Hongan-ji is the Main Hall of which dimensions are 62 m x 48 m with a height of 29 m. A main purpose of the hall is to invite believers to sit and make a Buddhism service in the hall. To-ji also has the buildings which are having purpose for making service. Japanese traditional temple has the important function of the assembly place or hall so that these potentialities can support the over tourist evacuees to stay for the first stage after post-catastrophic disaster. We could evaluate the potentiality of post-disaster response resources existing and the management system by the result of the investigation for the community activities and both indoor and outdoor spaces of the temples.

Keywords: Evacuation Place, Shelter, Built Heritage, Stocks, Facilities and Supplies

1. Introduction

1.1 Background of the Research

Kyoto, which is the home to many world heritage sites and important cultural properties, is known for its unique historical cityscape and, thus, is visited by numerous tourists every day. In FY2014, an estimated 83.75 million tourists visited the city; this is the highest ever footfalls recorded. Japan is called the Disaster Archipelago because of the high frequency of occurrence of disasters. In Kyoto City, there are concerns regarding direct damage from the Hanaore Fault Zone earthquake[1] (magnitude 7.5, maximum seismic intensity 7) and damage from the Nankai and Tonankai earthquakes[2].

When large-scale earthquakes occur, visitors who come to Kyoto for sightseeing, work, or study tend to rush and gather at terminals such as Kyoto Station to return home. This is expected to cause great confusion. Establishing a support system for those stranded around the Kyoto Station due to mass transit disruption after an earthquake or other disaster has become a major issue for Kyoto City.

In order to promote measures to support stranded commuters in the area around Kyoto Station, Kyoto City formed the "Kyoto Station Area Urban Renewal Emergency Development Council, Urban Renewal Safety Assurance Planning Task Force" (hereinafter referred to as the "Task Force") in FY2013 with shrines and temples, large-scale commercial facilities, etc. around Kyoto Station as members. In addition, the members of this Task Force have formulated the "Kyoto Station Area Urban Renewal Safety Assurance Plan"[3], which presents the basic policies and current issues for stranded commuters in the area around Kyoto Station. The actual number of people to be stranded in the area around Kyoto Station is expected to reach 28,000, and the city still does not have enough preemptive measures to manage such a large number of people. Currently, Kyoto City and the members of the Task Force are working together to improve the situation. Currently, shortage of storage space, shortage of supplies, initial response after a large-scale disaster, lack of emergency power supply, collapse of buildings, concentration of traffic, etc. can be cited as measures to be taken for people stranded in the area around Kyoto Station. Moreover, soft measures can be considered by making effective use of things that are in everyday use, by using shrines and temples as disaster prevention bases as in the past.

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[1] Kyoto City Information Center "If an earthquake occurs at the Hanaore Fault."

[2] Kyoto City Information Center "If a Nankai / Tonankai earthquake occurs".

[3] Kyoto City Information Center "Kyoto Station Area Urban Renewal Safety Assurance Plan (6th Edition)".

1.2 Research Objectives

In this study, the area around Kyoto Station, the largest terminal in Kyoto City, where the Hanaore Fault Zone earthquake and the Nankai and Tonankai earthquakes are expected to cause enormous damage, is set as the research area.

By focusing on Higashi Hongan-ji and Nishi Hongan-ji temples, which are the head temples of Jodo Shinshu and are in the area around the terminal, we will evaluate the level of improvement in supplies and energy reserves on using these temples as disaster prevention bases and making effective use of materials and equipment in daily use. There are several Shinshu Otani temples and Jodo Shinshu Hongan-ji temples, which have respectively Higashi Hongan-ji and Nishi Hongan-ji temples as their head temple in the area around the terminal. Thus, we will also investigate the relationship among these related temples and their head temples and the need for these related temples to function as disaster prevention bases and give a consideration to items that can be introduced as measures against stranded commuters.

2. Outline of Research Target and Research Methods

2.1 Earthquake Disasters Expected in the Historical Tourism City, Kyoto

Due to the Hanaore seismic fault, a large-scale earthquake of magnitude 7.5 is estimated to hit Kyoto City in the coming years. The Hanaore fault is a highly linear right-lateral fault that extends from Imazu City, Shiga Prefecture to Sakyo Ward, Kyoto City, covering a total length of 47 km. When an earthquake occurs due to the Hanaore fault, it is expected to have a seismic intensity of 5 or more throughout Kyoto City and a seismic intensity of around 6 in many areas near the city.

In the case of Nankai and Tonankai earthquakes, it is expected that the earthquakes will have a seismic intensity of 5 or more in most areas in Kyoto City and a seismic intensity of 6 or lower in some city areas.

2.2 Outline of the Area Around the Terminal

The area around the terminal is an area designated for planning measures for stranded commuters by the Urban Renewal Safety Planning Task Force, which promotes measures against stranded commuters in the area around Kyoto Station. It includes the urban renewal emergency development area, namely, "Area around Kyoto Station" based on the Act on Special Measures concerning Urban Reconstruction. It covers the entire area around each station in this area, and no specific zoned areas have been set. However, in preparing the first edition of the “Kyoto Station Area Urban Renewal Safety Assurance Plan,” which stipulates basic policies for stranded commuters, one

planning criterion decided was the 1 km radius centered on Kyoto Station[1]. Figure 1 shows the situation around the terminal.

Figure 1. Area around the terminal. Original Image by Zenrin map service. Revised by the Author.

2.3 Research Target and Research Methods

As for the research method, we evaluated and considered items that can make Higashi Hongan-ji and Nishi Hongan-ji temples function effectively as disaster prevention bases. This was done by understanding the current situation of measures for stranded commuters in the area around the terminal and the actions taken by Kyoto City and members of the Task Force after the occurrence of a large-scale disaster, based on the information published by Kyoto City and interviews with Kyoto City.

Regarding interviews with Higashi Hongan-ji and Nishi Hongan-ji temples, we will evaluate the effectiveness of measures for stranded commuters by investigating the facilities and supplies that each large temple can use at the time of disaster. This will be based on the actual cases when water facilities and offerings owned by temples and shrines functioned effectively during the Great East Japan Earthquake.

3. Facilities and Supplies Owned by the Temples

[1] Interview with Kyoto City Planning Bureau City Renewal and Creation Promotion Office

3.1 Facilities Owned by Temples

Currently, in the area around the terminal, the stockpile of drinking water to be distributed to outside visitors is insufficient and needs to be improved. During the Great East Japan Earthquake, the amount of household water required as toilet water was insufficient, and many evacuation centers had to face environmental problems. In this study, in order to improve such issues concerning provision of water, we investigated the water facilities owned by Higashi Hongan-ji and Nishi Hongan-ji temples and examined their possible uses. Table 1 shows the results of the survey on water facilities owned by Higashi Hongan-ji and Nishi Hongan-ji temples. As a result of the study, water facilities that can be used for drinking water are the city water reservoir and well water reservoir owned by Nishi Hongan-ji temple. The total amount of water is 60 m^3, which means 60,000 L of drinking water. Water from the water tank and moat of Higashi Hongan-ji temple and the pond of Nishi Hongan-ji temple can be used as water for household use. The total water volume is about 3,650 m^3. The vast water resources owned by the temple can be used as toilet water while living in temporary evacuation centers.

Table 1. Results of study on water facilities

Temples	Water Facilities	Amount (m^3)	Types
Higashi Hongan-ji	Cistern	850	Daily using
	Well	10	Usage prohibited
	Moat	1,593	Daily using
Nishi Hongan-ji	Cistern: City W.	30	Drinking
	Cistern: Under W.	30	Drinking
	Pond	1,200	Daily using

In order to improve the shortage of portable toilets in the area around the terminal, we investigated the permanent toilets owned by Higashi Hongan-ji and Nishi Hongan-ji temples, which are designated as temporary facilities. Although both temples are designated as temporary accommodation facilities, not all the precincts are designated as such, and only some buildings with accommodation facilities will be provided. Table 2 shows the buildings in the temple precincts that each temple will provide as temporary accommodation facilities and the number of permanent toilets in those buildings. Further, if a permanent toilet at the time of disaster is flush type, then flushed water can reach the sewage by applying water pressure. Since Higashi Hongan-ji and Nishi Hongan-ji temples have a large amount of water resources that can be used as toilet water, permanent toilets can be effectively used as toilets in case of disaster. The "Kyoto City Stockpiling Plan" stipulates provision of 1 portable toilet per 100 persons. Table 2 shows how many stranded commuters can use the permanent toilets provided by the temporary accommodation facilities in the large temples, using this need criteria for

portable toilets. Higashi Hongan-ji temple has a total of 93 permanent toilets, which can be used by 9,300 stranded commuters. Nishi Hongan-ji temple has a total of 25 permanent toilets that can be used by 2,500 stranded commuters.

Table 2. Results of the study on permanent toilets

Temples	Buildings	Types of permanent toilets	Numbers	Available people
Higashi Hongan-ji	Do-ho Hall	Man W.C : 4 Woman W.C : 6	10	1000
	Training Hall	Man W.C : 9 Woman W.C : 16 Universal Design W.C : 2	27	2700
	Daishinden	Man W.C : 15 Woman W.C : 34 Universal Design W.C : 2	51	2200
	Hakushoen	Man W.C : 2 Woman W.C : 3	5	500
Nishi Hongan-ji	Bunho Hall	Man W.C : 8 Woman W.C : 15 Universal Design W.C : 2	25	2500

3.2 Supplies Owned by the Temples

Higashi Hongan-ji and Nishi Hongan-ji temples do not stock up on offerings and offer perishable things to the worshippers. However, Higashi Hongan-ji temple stocks 55 kg to 70 kg of temple ritual rice required for daily service. The total amount of stocked rice could not be determined for Nishi Hongan-ji temple, but it provides 1 sho (1.5 kg) of rice every day. However, since Higashi Hongan-ji temple has a stockpile of temple ritual rice for 3 weeks, Nishi Hongan-ji temple is expected to have a 32 kg stockpile based on the assumption that the latter also has a stockpile equivalent to this period. Since Higashi Hongan-ji temple also has a cafeteria on the precincts, we checked the stockpiled food. Table 3 shows the foods owned by Higashi Hongan-ji and Nishi Hongan-ji temples, and Table 4 shows the stockpiled food in the in-house cafeteria of Higashi Hongan-ji temple. The in-house cafeteria stocks mainly rice, noodles, beans, canned foods, and frozen foods, and we investigated the stocked quantity. The supplementary food provided to stranded commuters in Kyoto City includes biscuits[1] of about 180 kcal per meal. In this connection, we converted the stockpiled food reserved in the in-house cafeteria and the stockpile of ritual rice owned

[1] Interview with Kyoto City Government Finance Bureau Disaster Prevention Crisis Management Office

by the temples into the estimated number of meals using the “Food Database”[1] published by the Ministry of Education, Culture, Sports, Science and Technology. As a result, the food stocked in the in-house cafeteria was effective as a supplement for 1015 meals in total. Also, since Higashi Hongan-ji temple has 55 kg to 70 kg of temple ritual rice, it is effective as supplementary food for 1,050 to 1,340 meals. Assuming Nishi Hongan-ji temple has 32 kg of temple ritual rice, it is effective as supplementary food for about 650 meals. Thus, it became clear that, in total, the temple ritual rice in Higashi Hongan-ji temple, the food in the cafeteria on premises, and the temple ritual rice in Nishi Hongan-ji temple are effective as supplementary food for about 2,715 to 3,065 meals.

Higashi Hongan-ji temple owns two types of curtains, and Nishi Hongan-ji temple does not own anything other than the one currently in use. As the curtains are treated as Buddhist religious objects, there is a possibility that these cannot be used even during a disaster. Both the temples have blankets for worshipers. Higashi Hongan-ji temple has 200 blankets and Nishi Hongan-ji temple has 2,000 blankets, and so they can be used at the time of disaster. Regarding the blankets owned by these temples, one blanket can be used adequately for infants and toddlers. However, when distributed to adults, 2 sheets are needed because even though the width is adequate at 1,300 mm, the height is only 1,000 mm. On the other hand, since each curtain has a width of 3,000 mm, it has a length of 2 people per sheet. But, as with blankets, purple curtain with a height of 1,000 mm cannot be used by 1 adult. When all the curtains and blankets of Higashi Hongan-ji and Nishi Hongan-ji temples are converted into aluminum sheets as per the standard size, they can be used as aluminum sheets (simple blankets) for about 1,160 to 2,265 people.

Higashi Hongan-ji and Nishi Hongan-ji temples do not stock new candles. However, Higashi Hongan-ji temple has a certain amount of stock of residual wax, and Nishi Hongan-ji temple is currently considering the stock of residual wax. Table 15 below shows the results for residual wax stocked at Higashi Hongan-ji temple. Higashi Hongan-ji temple stocks residual wax of 3 types of candles. The residual wax of No. 200 candle, the smallest standard size, has a burning time of at least 90 minutes. Further, the No. 400 candle having a larger standard size has a burning time of 4 to 5 hours even with residual wax. Burning time of residual wax of No. 300 candle, which has size in between these standard sizes could not be ascertained. Accordingly, we take the burning time as average of No. 200 candles and No. 400 candles. The total burning time of these stored residual waxes is 25,140 minutes, which is about 420 hours.

[1] Ministry of Education, Culture, Sports, Science and Technology “Food Composition Database”

4. Outcomes of Capacity Evaluation

In this chapter, we will evaluate the effectiveness of measures taken using facilities and supplies owned by Higashi Hongan-ji and Nishi Hongan-ji temples by crystallizing the issues from the current situation of the preparation system for stranded commuters in the area around the terminal.

4.1 Improvement of Shortfall in Public Stockpiling, Utilizing Facilities and Supplies of Higashi Hongan-ji and Nishi Hongan-ji Temples

This section evaluates the extent to which the shortage of public stockpiling can be improved by utilizing facilities and supplies owned by Higashi Hongan-ji and Nishi Hongan-ji temples. First, Table 3 shows the quantities of facilities and supplies owned by Higashi Hongan-ji and Nishi Hongan-ji temples described in Chapter 3 converted into public stockpiles.

Table 3. Conversion of facilities and supplies within temples into the public stockpile

Stockpiling	Conversion of facilities and supplies within temples into the public stockpile	Total amount
Meals	Higashi H. : 2065~2415 Nishi H. : 650	2715~3065
Drinking Water (L)	Higashi H. : 0 Nishi H. : 60,000	60,000
Aluminum sheets (Simple blankets)	Higashi H. : 160~265 Nishi H. : 1000~2000	1160~2265
Portable toilets	Higashi H. : 93 Nishi H. : 25	118

Then, the number of stocks owned by the temples is added to the current stock in the area around the terminal to calculate the stockpiling shortage after taking measures with the temple facilities and supplies. In addition, we will compare the current stock shortage with the stock shortage after taking measures with the temples to show the improvement rate of stock shortage. Table 4 shows the stockpiling shortage quantity after the measures taken using the temples, and Table 20 shows the improvement rate of stockpiling shortage by effectively utilizing the temple facilities and supplies.

Table 4. Stockpiling quantity after taking measures using temple facilities and supplies

Stockpiling	Max. necessity	Stockpiling (+2 temples)	Stockpiling shortage
Meals	140,000	44,158~44,508	95,492~95,842
Drinking Water (L)	56,000	80,924	0
Aluminum sheets (Simple blankets)	28,000	15,024～16,111	11,889~12,976
Portable toilets	280	341	0

As a conclusion of this section, if the shortage of stockpiling necessary for stranded commuters is improved by utilizing facilities and supplies owned by Higashi Hongan-ji and Nishi Hongan-ji temples, then a 100% improvement in the current stockpiling shortage can be expected for drinking water and portable toilets. On the other hand, stockpile shortage of supplementary food can be expected to improve by about 3,000 meals, but this corresponds to about 3% of the current shortage, indicating an evident need for further improvement of public stockpile. An improvement of about 10% of the total stock shortage of aluminum sheets (simple blankets) can be expected. However, this is still not enough, and thus, further improvement is required for aluminum sheets as well.

Here, we further compare the required public stockpiling quantity currently needed in the area around the terminal with the shortage of stockpiling after taking measures using temple facilities and supplies to determine the shortage level in the area around the terminal even after the temples are used effectively. Table 5 shows the results of the comparison.

Table 5. Improvement rate of stockpiling shortage

Stockpiling	Max. necessity	Stockpiling shortage	Rate of stockpiling shortage
Meals	140,000	95,492~95,842	68
Drinking Water (L)	56,000	0	0
Aluminum sheets	28,000	11,889~12,976	42.5~46.3
Portable toilets	280	0	0

As a result, even when temple facilities and supplies are used effectively, there is a large shortage of 68% for supplementary food and about 50% for aluminum sheets. Although it is necessary to improve regular public stockpiling of drinking water and portable toilets in the area around the terminal, it can be said that improving the stockpiling of supplementary food and aluminum sheets need to be given priority.

4.2 Improvement of Night Environment Using Candles During Temporary Evacuation

This section focuses on the Higashi Hongan-ji temple, which has stockpiled residual wax, and evaluates how much of the night living can be improved for 1,700 stranded commuters housed in Higashi Hongan-ji temple by effectively using candles. Table 6 shows the number of residual waxes in Higashi Hongan-ji temple and their respective burning time.

During evacuation at a temporary accommodation facility for up to 3 days, up to about 36 hours of nighttime life is forced by the time the third night passes. When candles that can burn for about 420 hours are divided into 12 lots, each lot will have a burning time of 36 hours. As a result, stranded commuters housed in Higashi Hongan-

ji temple can support a total of 36 hours of their nightlife by sharing candles divided into about 12 lots. Table 7 shows the percentage of stranded commuters to whom candles can be distributed.

Table 6. Candles stockpiled in Higashi Hongan-ji

Candles (sizes)	Time of candlelight (min.)	Amount	Total time (min.)
200 size	90	60	540
300 size	170	60	10200
400 size	240	60	14400
合計		180	**25140** (420 hours)

Table 7. Candle use percentage

Higashi Hongan-ji	Time of candlelight and numbers of evacuees	36 hours of nightlife by sharing candles divided into 12 lots
Time	420	36 Max. night time for 3 days staying
Evacuees	1700	140

However, a number of people use 1 lot of candles, as when a candle is divided into 12 lots, 1 lot is shared by 140 stranded commuters. In Higashi Hongan-ji temple, further improvement can be expected if in the future, storage space for candles can be secured as much as possible. However, as a large-scale temporary accommodation facility, the temple needs to provide an adequate regular emergency power supply. Further, we evaluated the duration of the candles as a substitute for a flashlight needed in an emergency at shelters. The results show that a flashlight has a maximum continuous lighting time of about 10 hours when using a size D alkaline battery, and hence, the stockpiled candles with a total burning time of 420 hours have a duration of about 42 flashlights.

Acknowledgements

This paper was written based on the interview surveys to the officers of Kyoto city government and two temples (Higashi Hongan-ji and Nishi Hongan-ji) in 2017.

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14.

PROACTIVE COUNTERMEASURES AGAINST GLOBAL WARMING FOR THE CENTRAL TOWER OF BAYON TEMPLE, ANGKOR, CAMBODIA

-How to keep the tall masonry structure by shallow direct foundation upon manmade thick sandyfilled mound for 700 years-

Yoshinori IWASAKI
Ph.D., Dr.Eng., P.E.
Japanese Government Team for Safeguarding Angkor
Geo Research Institute, Osaka, Japan

Abstract

Japanese Government team for Safeguarding Angkor (JSA) started in 1994 and has been studying the various aspects of heritage including soils and foundations, which has been neglected in Angkor since the safeguarding activity started in early 20^{th} century.

Bayon temple was constructed in the late 12^{th} century and locates at the center of Angkor Thom. The Bayon temple consists of three stepped foundation mounds of the mountain type with main tower of 42m in height from the surrounding ground.

A vertical hole at the surface of the top terrace mound was excavated in 1933 at the center of the foundation of the main tower and resulted in finding Buddha statue. The vertical shaft had been filled back after the study. A geotechnical boring was carried out and the filled soil was found in very loose state. The shaft with a diameter and depth of 2.5m and 14m each locates at the very near the foundation stones of the main tower and the loose fill is considered to cause some negative effects, but, amazingly no significant deformations have been recognized around the foundation of the main tower.

The foundation was identified as shallow direct stone and several borings were carried out at the foundation mound.

The secret mechanism of the sandy foundation that has been supporting the heavy load of stone tower is the amazing high strength of sandy filled soils with special characters of grain size distributions. The cored sampled sandy fill was found easily collapsed under water. Global warming is anticipated to cause heavy and long term rainfall resulting weakening the filled foundation towards the failure of the main tower. *A proactive measure of modifying foundation soils beneath the paved stone as to have waterproof layer is being prepared to prevent the infiltration of rainwater into the foundation mound.*

Keywords: Authenticity of Soil and Foundation, Global Warming, Main Tower of Bayon, Filled Mound

1. Brief History

Angkor is the one of the world cultural heritage in Cambodia, which is the remains of ancient Khmer Empire from the declaration of the Empire (802) to the invasion by Siamese (1432) of 600 years in in South East Asia.

The conservation of Angkor started in 1907 by EFEO(*École française d'Extrême-Orient*) of an organization of French government.

Figure 1 Bayon temple, Angkor Thom, Camobodia

EFEO adapted the "Anastlylosis" as the basic method of cosevation for Angkor remains.In 1943 the north eastern side of the slope of Baphuon temple in Angkor Thom had failed in 1943 by a heavy rain. The Baphuon temple was constrcuted by manmade sandy fill as a mountain temple in 34m in height.

In 1960', reconstruction of the manmade mound started, but, failed when the height reached at 5m. EFEO tried three times with the same results in failure and introduced a reinforced concrete retaining wall structure to support the soil mound, which was originally stone masonary wall strcuture. Since then, the RC wall became a common countermeasure in Angkor without any question of the authenticity until at present.

In 1992 the Angkor was registered as the World Heritage and added in the List of "Heritage in Danger." Conservation system was reorganized in 1993 as ICC(Intrnational Coodrdinating Comittee) to approve the member to join and control the proposed countrmeasurs.

Japanese Government Team for Safeguarding Angkor (JSA) was established in 1994 and consists from varius fields from archaeology, to strcutural engineering including geotechniques.Bayon temple is the one of the major sites which JSA has been workong with.

2. Multidiciplenary Approch to characterize the heritage

Archaeological trench along the base of the foundation with horizontal core-sampling underneath the base stone, it was confirmed neither additional stones beneath nor piles are found. The central tower is suppoted by shallow direct foundation.

The basic foundation structure of Bayon is trenched foundation with filled mound of about 14m from the natural ground as shown in Figure-2.

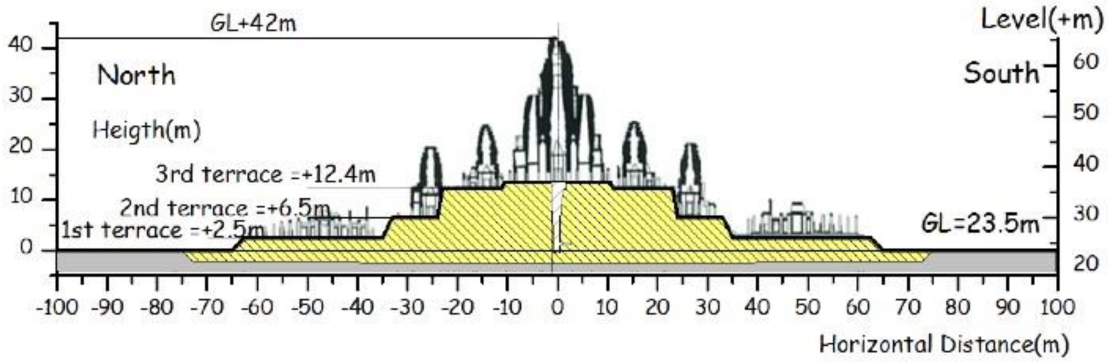

Figure 2 Vertical Section of the sand filled mound, Bayon Temple

If modern structural engineer has a chance to construct such a high masonry tower over 30m in heigt upon manmade sandy fill, he never selects direct foundation to support in sandy fillt. It was mystery for us to realize the fact that the central tower has been standing for more than 700 years without foundation failure in heavy rain condition of squal EFEO excavated a vertical shaft with a diameter of about 2.5m at the center of the base of the cental tower .in 1933. The shaft was backfilled without compaction.

To study the inside structure of the soil mound of the platform, several borings were carried out by JSA. Some results of SPT, N-values at the vertical shaft and the sandy filled mound are shown in Figure.3.

SPT in the vertical shaft, SPT, N-values are less than 4, N<4, which means very loose sand of the refilled sand. However, the original manmade fill shows extra-ordinally large number of N=100-200.

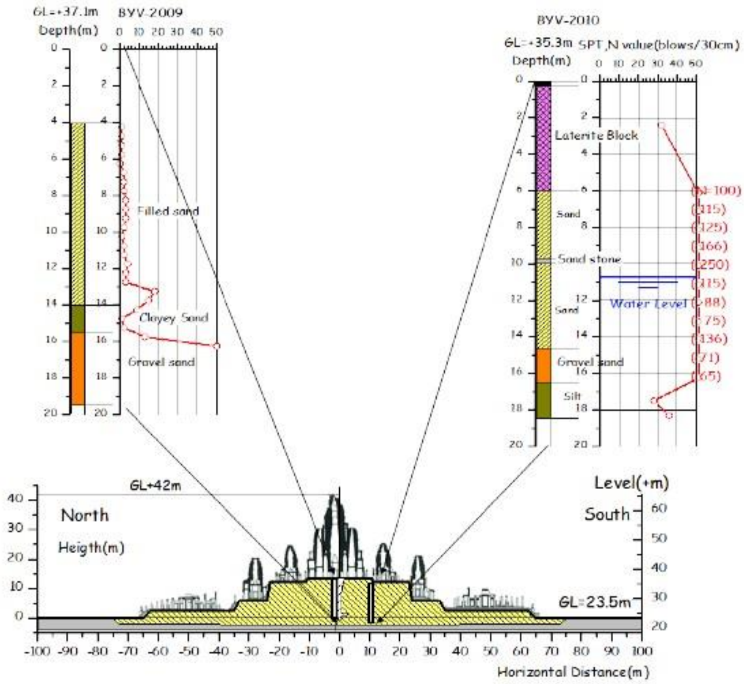

Figure 3 Boring logs for the vertical shaft filled back by French and Original fill

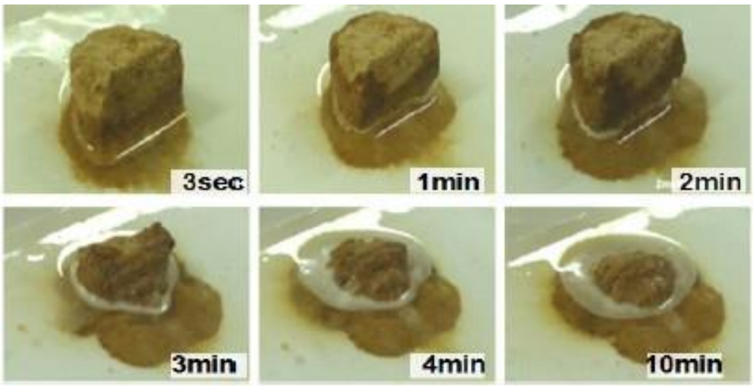

Figure 4 Collapse of stiff sand in water less than 10 min.

When a core sample of the sandy fill was submerged, the stiff sandy soil was found to collapse within around 10min as shown in Figure-4.

3. Why standing for 700 years - Monitoring soil moisture

Several moisture sensors were installed in the platform mound and monitored the change during rainy season. An example of the monitored records is shown in Figure 5, which shows the response of the installed sensors to a heavy rain of squall with a total of about 80mm. The rainwater infiltrates into ground less than a hour with an sudden increase of the water contents in the soil. However, after the rain stop, the moisture gradually decreases and returns to the stable state.

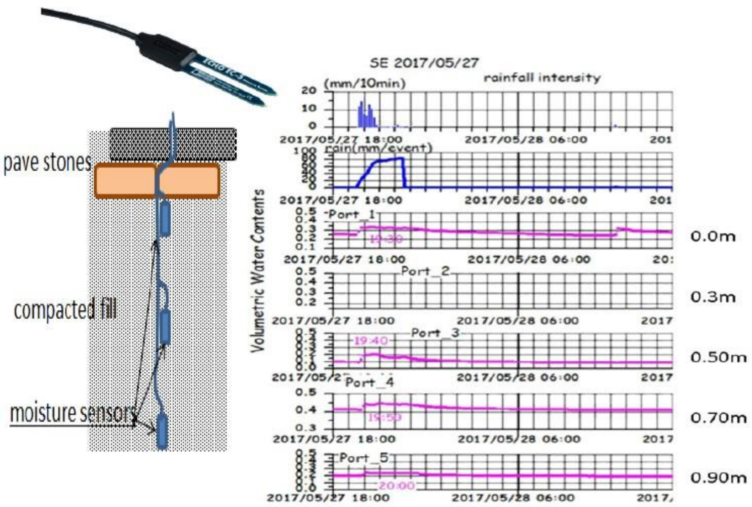

Figure 5 Moisture changes

4. Anticipated Collapse of the Sandy Filled Mound under Global Warming Climate

The pattern of rainfall in the Monsoon climate of South East Asia is called "Squall", which brings very heavy rain but continues only less than a few hours. This type of the rainfall causes the cyclic states from wetting and drying as shown in the monitored case. In the coming global warming period, the much longer period of rain is anticipated and the increase of the water contents continues much longer and finally becomes nearly saturated state of the sandy soil of the platform mound and inevitably reaches collapse of the ground failure of the sandy soil beneath the foundation of the tower, which shall cause the failure of the Central Tower of the temple.

5. Character Defining Elements of the Authenticity of the Stone Structure in Angkor

Both high strength of the sandy soil of the mound in dry state and the shallow direct foundation of the tall masonry tower are the character defining elements of the authenticity of the stone structure in Angkor and shall be preserved.

6. Proactive Countermeasures against the Global Warming

The simplest yet the effective way is to insert an impervious layer beneath the pave stone and the existing soil mound to prevent the rainwater infiltrating into the foundation mound.

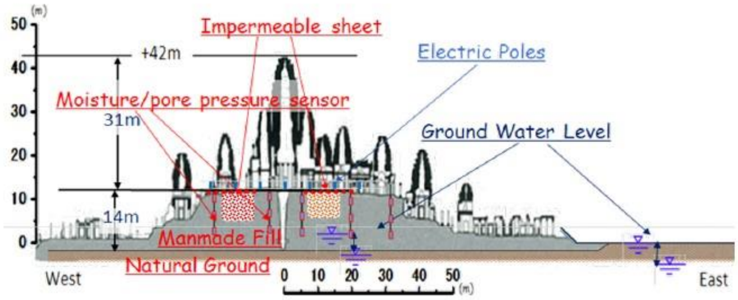

Figure 6 Countermeasures against the Global Warming

7. Conclusive Remarks

A. Foundations are not always regarded important elements of the heritage structures. However, the foundation is one of the important elements of the structures to support as in case of Angkor. Geotechnical engineering was the essential field to cope with for multi-disciplinary thinking.

B. Most of the conservation work starts after the failure of the heritage structure, however, proactive countermeasures should be prepared against the anticipated failures by such global warming as unavoidable situation.

I.

Selected Papers

B. Post-disaster Management, Re-construction, and Authenticity

1.

POST DISASTER RE-CONSTRUCTION AND AUTHENTICITY OF CULTURAL HERITAGE OF RUSSIAN FEDERATION AND FINLAND

Anastasia Martynova
ICOMOS National Committee in the Russian Federation, Saint-Petersburg

Abstract

Among disasters of Cultural Heritage of Russia and Finland, we first talk about fires, caused by human errors. So, 45 historical churches burned down in Russia (from 1985 to 2019). Architectural monuments restored after a fire are single. Good examples are theCathedral in Porvoo, and the Epiphany Church in the village of Prislonikha, Ulyanovsk Region.

Keywords: Fire, Cultural Heritage, Re-Construction, Porvoo, Prislonikha

«...All this is very scary, but you need to realize and restore, in the form it was...»
Nikolay Plastov (grandson of the famous Russian artist Arkady Plastov)

1. Fires of Cultural Heritage, caused by human errors

Among disasters of Cultural Heritage of Russia and Finland, we first talk about fires, caused by human errors. Our goal was to identify cases of post disaster re-construction and authenticity of Cultural Heritage. By systematic approach, it was explored that fires occur regularly among Built environment. So, 45 historical churches burned down in Russia (1985 to 2019). Architectural monuments restored after a fire are single.

Good examples are the Cathedral in Porvoo, and the Epiphany Church in a birthplace of the famous artist Arkady Plastov, in the village of Prislonikha, Ulyanovsk Region, which burned down completely in 2016 and was restored a year later. Since 1990 the Church, built in 1878, was protected by the State (monument of regional significance). It was built and painted by the artist's grandfather Grigory Plastov and his son. The Church was restored on donations over 15 million rubles. Large and small iconostases were restored on money of Nikolai Plastov, Arkady's grandson, and samples of icons were provided from collections of the State Tretyakov Gallery. Ancient icons of the 19th century were donated to the Church by one of the residents of Sursky district. The wood of the Church was treated by fireproof compounds.

2. Epiphany Church in the village of Prislonikha (Ulyanovsk Region, Russian Federation)

The village of Prislonikha was founded in 1672. Originally, the village was called Bogoyavlenskoe, after the name of the first church "in the name of the Epiphany of the Lord." The modern name of the village Prislonikha appeared at the end of the 18th century. The fact is that the village, located at the foot of low hills (ridges), seemed as if "leaned" against them.

At different times, the lands in Prislonikha were owned by Pyotr Vasilyevich Yazykov, Tatyana Ivanovna Sushchova and Mikhail Petrovich Yazykov (grandfather, grandmother and father of the poet Nikolai Mikhailovich Yazykov), as well as a brother of the writer Sergei Timofeevich Aksakov - Arkady Timofeevich Aksakov and Pyotr Afanasyevich Beketov (son of the Simbirsk voivode). In 1722 the landowner Alexander Sergeevich Belavkin built a new church in the village. The Epiphany Church is located in the middle of the village, at the intersection of the Uren River with Moscow post road.

Since 1875, Grigory Gavrilovich Plastov, the grandfather of the famous artist Arkady Alexandrovich Plastov, was a Psalmist at the Epiphany Church. Arkady Plastov will write later: "In his youth, my father, Alexander Plastov, was an apprentice to his father, my grandfather, Grigory Plastov, an icon painter and, I think, an architect."

In 1878, a new church was erected in Prislonikha to replace the old and dilapidated one.

Drawings the temple were made by the icon painter and architect Grigory Gavrilovich Plastov. The Church was set up as a "ship", stretching along one axis from East to West. The painting of the walls and iconostasis was done by Grigory Gavrilovich together with his son Alexander.

The Church consisted of three parts - the altar, the temple itself, the refectory and the bell tower. A log house made of century-old pines was sheathed with wood and painted white, and the iron roof was painted green. The domes of the Temple and the bell tower were made of white tin, and the forged crosses were gilded. Five copper bells were hung in the belfry, the largest of which weighed 72 pounds, and its ringing could be heard for several miles around. "

In 1893, on January 31, Arkady Alexandrovich Plastov, the future famous artist, was born in Prislonikha. He inherited a gift in painting from his father and grandfather. The painter spent his childhood and youth in Prislonikha; his creative path is connected with these places. It is here, in his native village, that world-famous works were created: "The Fascist Flew by", "Harvest", "Haymaking", "Spring".

The Epiphany Church in the village of Prislonikha was built at the end of the 19th century (on the site of the first church), its vaults were painted by Arkady Plastov's grandfather Grigory Gavrilovich.

Figure.1 Arkady Plastov "Thunderstorm over Prislonikha", late 1930 - early 1940 Canvas, oil. 56x73. Collection of the gallery "Art Prima"

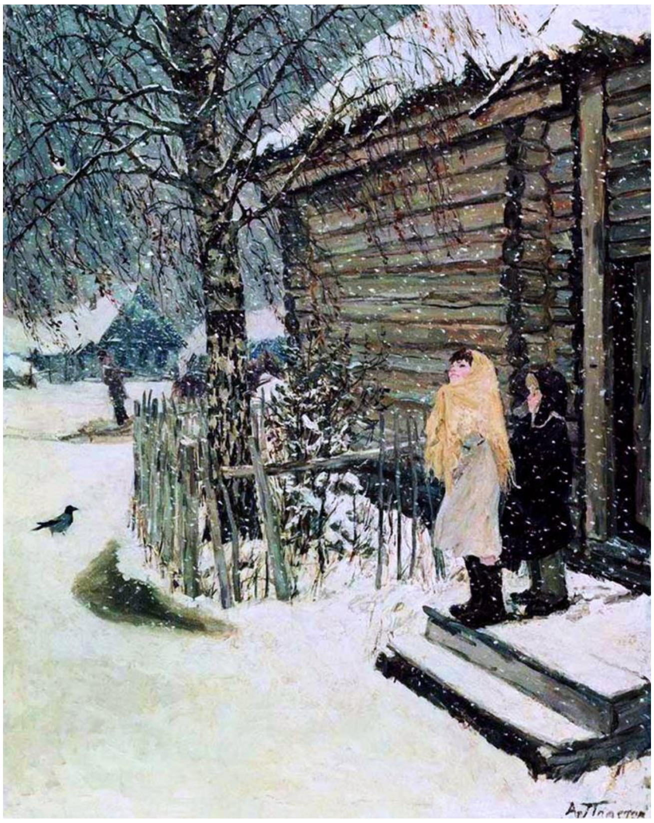

Figure.2 Arkady Plastov "First Snow". 1946 Canvas, oil. 146x113. Tver Regional Picture Gallery, Russia.

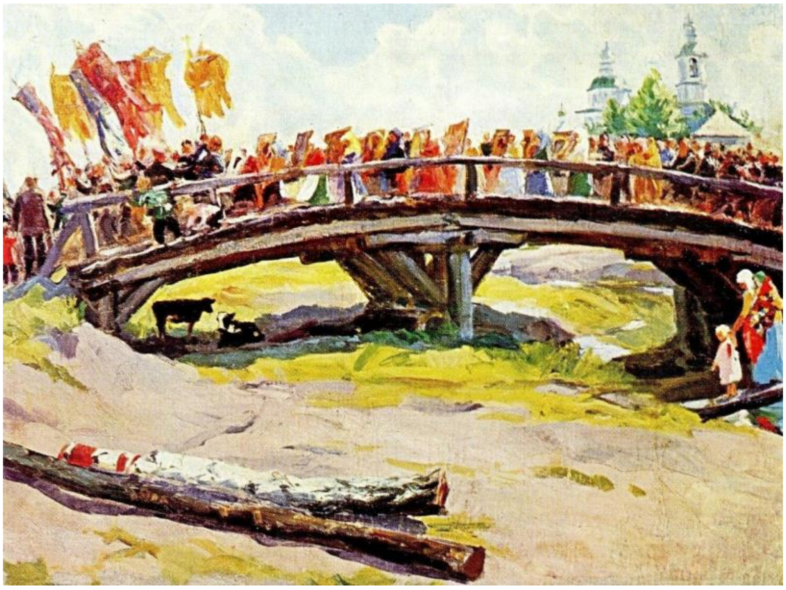

Figure.3 Arkady Plastov "Summer holiday in Prislonikha". Late 1920s - early 1930s Album "Arkady Alexandrovich Plastov", L., "Artist of the RSFSR", 1979. Source: ulpressa.ru [1]

[1] https://ulpressa.ru/2018/01/31/k-125-letiyu-brandergofer-a-a-plastov-zhivi-kak-pishesh-pishi-kak-

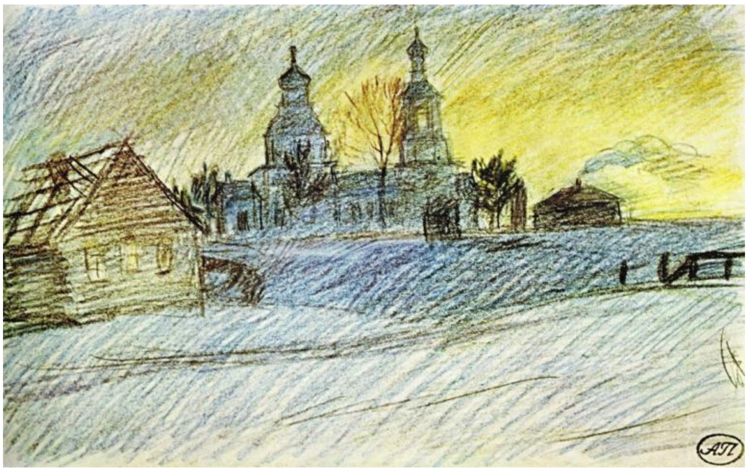

Figure.4 Arkady Plastov "Winter evening. Church in Prislonikha ". 1930s Album "Arkady Alexandrovich Plastov", L., "Artist of the RSFSR", 1979. Source: ulpressa.ru [1]

Figure.5 Arkady Plastov "Artist's yard in Prislonikha". 1940-1945 Album "Arkady Alexandrovich Plastov", L., "Artist of the RSFSR", 1979. Source: ulpressa.ru [2]

The temple has a complicated history: in 1936 it was closed and a collective farm warehouse was madein it. The domes were removed in 1957. Until the end of the 1980s,

zhivesh/ accessed 10 August.

[1] https://ulpressa.ru/2018/01/31/k-125-letiyu-brandergofer-a-a-plastov-zhivi-kak-pishesh-pishi-kak-zhivesh/ accessed 10 August.

[2] https://ulpressa.ru/2018/01/31/k-125-letiyu-brandergofer-a-a-plastov-zhivi-kak-pishesh-pishi-kak-zhivesh/ accessed 10 August.

fertilizers were stored in the building, dust was poured on the altar. In 1987, the head of the Ulyanovsk regional Committee, Gennady Kolbin, decided to restore the Temple to the 100th anniversary of Arkady Plastov. The Middle Volga branch of the “Spetsproektrestavratsiya” Institute has developed a project for the protection of the memorial zone in Prislonikha, which includes the artist's estate and a church with a gatehouse. The original appearance was recreated according to the saved drawings and projects of Grigory Plastov, as well as drawings, watercolors and paintings by Arkady Plastov on church themes. Arkady Plastov's son, Nikolai, who became an artist,, took an active part in recreating of the interior of the temple. Some icons were painted by his hand. The entire iconostasis was made by hands of Nikolai Arkadievich together with the artists A. S. Gordeev and V. K. Dmitriev. On April 1, 1995, the restored temple was reopened. It stood for 21 years. On May 5, 2016, an 18-year-old resident of the village (declared insane) set fire to the church, the building burned to the ground, leaving charred logs from it. He burned down the outbuildings and then doused the temple with gasoline. While the temple was burning, the culprit sat himself opposite and watched. The temple burned down in just 10 minutes. Despite the work of firefighters, not a single icon has been preserved.

A cross on the grave of Grigory Gavrilovich Plastov, who was buried behind the altar of the church, was also preserved next to the charred logs. On the night when the fire broke out, there was no one in the church - it opens only on weekends and holidays. The stove in it was stoked for the last time before the fire before Easter. The 18-year-old boy admitted that he committed arson, and when asked why, he replied: "I wanted to see how it burns." “I have complex emotions - this can be compared either with the destroyed Palmyra, or with the fire of 1931, when Arkady Plastov's entire legacy which he did until the age of 37 burned down. All this is very scary, but you need to realize and restore it, in the form as it was. All measurements, the project have been preserved,” Nikolai Plastov said after the fire. He was one of the first to see the fire - his house is located opposite the Temple. He ran out into the street and realized that he could not physically do anything to help put out the fire. He "immortalized" - photographed the burning temple, which is associated with five generations of his family. The whole village was crying on the ashes. Local residents told about the tragedy with tears: “After midnight, it started toburn ... As soon as we saw it, we rushed to the church. But she, dear, is all in fire ...". While the firefighters were driving, local residents saved the shrines. Dmitry, a resident of Prilonikha, was one of the first to notice the fiery glow and rushed to the temple. He knocked the padlock off the church's front door with a piece of reinforcement and burst in. Through the flames, the man saw a Shrine - the myrrh-streaming icon of the Kazan Mother of God. Dmitry carried it out of the fire and three other bells. In the morning of the next day, Metropolitan Anastasy of Simbirsk

and Novospassk, top officials of the Ulyanovsk region, visited the site of the fire. They assured that the Temple would be restored.

“After the fire, local residents, without conspiring, came to the temple to clear the ruins. Even summer residents who come to Prislonikha seasonally could not stay away and joined the common cause,” says the head of the village of Prislonikha Viktor Kovalev. The dismantling of ruins and preparations of the site for construction continued in a month. After the fire, the restoration of the temple began almost immediately, a special account was opened, and all the work was carried out mainly on donations. The progress of the restoration works was controlled by the regional governor Sergey Morozov. The artist Nikolai Plastov, grandson of Arkady Plastov, took a direct participation in this.

Over 12 million rubles were spent on the restoration of the church. Also, the domes cost about 3 million. The painting and interior decoration, iconostasis, Church utensils, and so on took about 8 million rubles. Most of this was given by the Simbirsk Metropolia. The wood of the restored church has been treated with fire-resistant materials. The frame was made of glued beams. And this was a truly popular construction site. In the temple of the Epiphany of the Lord, the interior decoration was restored, the bells that survived the fire were returned. At the expense of Nikolai Plastov, the grandson of the people's artist A.A. Plastov, the large and small iconostases were restored, samples of icons for them were provided from the collection of the State Tretyakov Gallery. The first icons, collected by the staff of the Ulyanovsk Regional Art Museum throughout the region, marked the beginning of the collection of the Museum of Simbirsk icon painters. Four ancient wooden icons of the 19th century were donated to the temple by a resident of the Sursk region. Also, the restored icon of the Epiphany of the Lord, lost in the fire, took its former place in the Church, the author – Alexander Stepanovich Gordeev, an icon painter, a resident of the Sursky district presented the icon as a gift to the newly restored Church.

Icons and church books were collected and brought from Alatyr and the Ulyanovsk region. Works on the installation of the iconostasis brought from the capital were carried out even at night. The icons were brought from Moscow, the artist's grandson Nikolai Plastov installed the iconostasis.

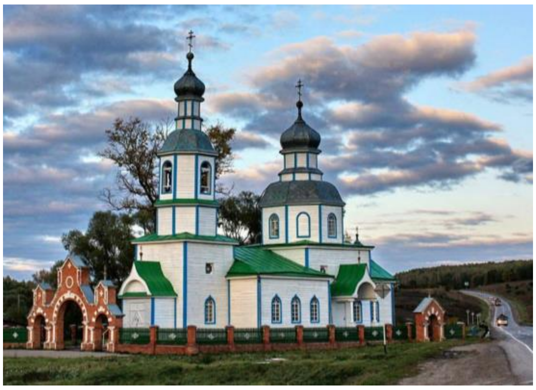

Figure. 6 Church in Prislonikha before the fire

Figure. 7 Burnt church in Prislonikha, Source: simbirsk. city[1]

Figure.8 Restoration work in the Epiphany Church in Prislonikha. August 21, 2017, Source: 1ul.ru2

Figure.9 Ceremonial erection of domes. 14 October, 2017, Source: 1ul.ru3

Figure. 10 Icons in the restored church in Prislonikha, Source: misanec.ru4

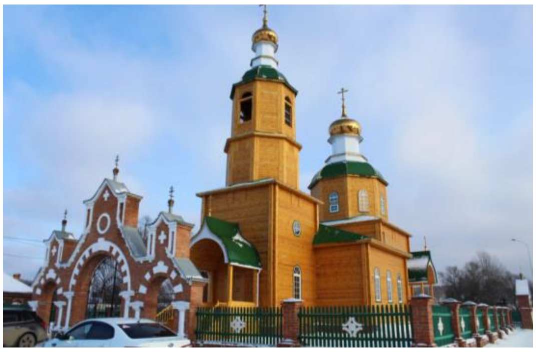

Figure. 11 The restored church in Prislonikha, Source: misanec.ru5

1 https://simbirsk.city/2016/05/05/vse-eto-ochen-strashno-no-nuzhno-osoznat-i-vosstanovit-v-tom-vide-kak-bylo/ accessed 10 August.

2 https://1ul.ru/city_online/obshchestvo/news/k-oktyabryu-planiruyut-zavershit-vosstanovitelnye-raboty-v-bogoyavlenskom-khrame-v-prislonikhe/ accessed 10 August.

3 https://1ul.ru/city_online/obshchestvo/news/na_hram_v_prislonihe_ustanovili_kupola/ accessed 10 August.

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5 https://misanec.ru/2018/01/14/vosstanovlennyj-hram-bogoyavleniya-gospodnya-v-sele-prisloniha-otkroetsya-31-yanvarya/ accessed 10 August.

3. The Porvoo Cathedral in Finland

The Porvoo Cathedral (12th century) is one of Finland's oldest churches. A fire of 2006 destroyed the roof of the Cathedral, remains of the burnt roof collapsed inside damaging the interior and facade. Two years restoration unique works were about 6 million euros. Today, Cathedral is equipped with a fireproof system and security cameras.

The church was originally made of wood. The first stone walls were built between 1410 and 1420, and in 1450 the church was expanded four meters east and six meters south. Before the adoption of Lutheranism in the 16th century, Western Finland was Catholic, Eastern - Orthodox. Then Catholic churches were converted into Lutheran churches. There are many medieval churches left in the country, one of them is this Cathedral, which acquired its current appearance at the end of the 15th century. The Cathedral (originally a Catholic Church) was consecrated in honor of the Mother of God - the Blessed Virgin Mary. After the destruction and fires, the Church was restored more than once. In 1508 it was destroyed by Danish sea pirates, in 1571 and 1590 it was burned by Russian troops. It was restored again and burned again during the Great Northern War in 1708. In our time, in 2006, the Cathedral was set on fire by an 18-year-old local resident, who was convicted of his crime.

For Finland, this temple has a special significance, since it was here in March 1809 that the famous session of the Sejm took place, where the Russian Emperor Alexander I announced the annexation of Finland to Russia as an Autonomous Grand Duchy. This date is considered the beginning of the Finnish statehood. That is why inside the Porvoo Cathedral you can even see a sculpture of Emperor Alexander I. By the way, at the closing of the Sejm, Alexander already spoke Finnish fluently.

In the evening of the same day, a ball was held at the gymnasium, during which the most romantic story in the life of the city began. At this ball, Alexander met the young daughter of the Vice-burgomaster of Porvoo, Ulrika Mellerverd, whose beauty charmed the Tsar. During the dance with Alexander, she dropped her fan in embarrassment. The Emperor picked it up and hid it on his chest. He returned the fan to its owner only after the ball was over. Thus, began a brilliant romance. This story gave rise to a lot of gossip and legends about their relationship. Alexander and Ulrika's relationship continued when the Emperor visited Porvoo again. But even after his departure, Alexander I did not forget Ulrika and after some time called her to the Court, appointing his wife's maid of honor.

After restoration, the Porvoo Cathedral was re-consecrated in November 2008 and services were restored there. It is interesting that in Porvoo, the famous Russian Director Leonid Gaidai shot one of his last films "For the matches" (1980).

Figure.12 The Porvoo Cathedral
Source: ryzhiy-lis.livejournal.com1

Figure.13 The Porvoo Cathedral
Source: rasfokus.ru2

4. Measures to prevent fires as a human error

Fire disaster of the cultural heritage of Russia and Finland is a link in the chain of world losses. The causes of fires are repeated, and must be eradicated. Besides, today there is an underestimation of the resource for the development of society, which is enclosed in the monuments of wooden architecture. That is why, the practical implementation of anti-crisis measures is being realized in this sphere. We live on the same Planet and our Heritage; Culture and our Responsibility are interconnected. All over the world people have learned how to be vigilant with the threats of terrorism, but they have forgotten that fire is a terrible calamity. Every corner of the world has its own burnt Notre Dame. Notre Dame showed that for high-rise buildings around the world, autonomous fire extinguishing installations should be placed in buildings and spires.

Measures to prevent fires as a human error: 1) An open base of architectural monuments; 2) Prohibition of a new construction instead of burnt cultural heritage objects; 3) Responsibility for the owner's; 4) 24-hour video systems; 5) Individual fireproof system for each object; 6) Fireproof treatment of structures.

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2.

SURVIVAL FROM DISASTER: THE NATIONAL HERITAGE NORTH GATE IN TAIPEI

CHIOU, BOR-SHUENN
Taipei National University of the Arts, Taiwan

Abstract

For the past 130 years, the National Heritage North Gate in Taipei City had survived several crises of removal. It came to existence along with the Taipei Walled City in 1884. It has gone through three political eras: the Ching, the Japanese and the Chinese Republican, revealing ideology of governance of poles apart. After a long period of political and social change, it is the only remain of the original walled city.

This paper aims to elucidate how the North Gate came into being, how it was threatened to vanish in face of several disastrously critical moments due to regime transfer and unwise urban development, and how it survived crises as a result of coincidence and of good luck out of the timely appeal for reservation from key figures with a vision. On the whole, it would give a good example and shed light on the issue of survival from disaster for a building of cultural significance.

Keywords: Survival, Disaster, North Gate, Taipei.

1. Introduction

The National Heritage North Gate in Taipei came into being along with the establishment of Taipei Walled City of Chinese Ching Dynasty in 1884 and served as its northern entrance. Taiwan was soon ceded to Japan in 1895 for defeated compensation after the Sino-Japanese War of the previous year. Soon after, the city wall was disastrously removed and turned into a three-lane boulevard on the basis of the Plan of Urban Correction of 1904 and only four of the five gates, including the North Gate, luckily remained. After WWII, the Chinese Nationalist Government took over

Taiwan and in 1966 it remodeled the features of three of the four gates for tourism. The North Gate was spared and kept its authenticity as it was then due to be removed for traffic relief. Fortunately, it survived owing to the appeal from conservation enthusiasts but it was then trapped in the network of automobile causeways and was almost mistreated, though its cultural significance was recognized and it was designated as national heritage in 1983. In 2015 the Taipei City Government promoted the Portal Project of the Western District, which analogized the importance of the North Gate to Taipei to that of the Arc de Triomphe to Paris. Accordingly, the North Gate was finally released from the causeway network in February 2016 and was fully endowed with the pride of cultural significance.

2. The Taipei Walled City and the North Gate

At the beginning of rule on Taiwan, the emperors of Ching China used to overlook this frontier island as dispensable and had never thought it necessary to build any walled city to protect governance.[1] They even supposed that a walled city would run risk of providing a firm fort for rebels and had turned down appeals from local officers and people. For safety, local people and officers often raised fund by themselves to build some expedient versions of fortified enclosure, made of wood, bamboo or earth. The situation had not changed until the occurrence of Mudan Incident,[2] the Japanese punitive expedition to Taiwan, in 1874. The Ching imperial court finally realized the importance of building solid walled city for defense.[3] In 1875 the Taipei Prefecture was established to administer the three counties in northern Taiwan and a firm walled city was allowed to construct to accommodate the administration. The Taipei Walled City was started in 1882 and completed in 1884 and was one of the only few made of brick-stone, which was more solid like a citadel and more permanent. The stone was mostly derived from local quarry and the master craftsmen were recruited from Canton. It was solid enclosure opened with five gates, namely the four cardinal gates together with the Side South Gate. Although the South Gate must be the main entrance of the walled city in accordance with the traditional south facing principle,[4] the North Gate was no less important because the senior officials from the Mainland would come from the north by boats via the Tamsui River and land at this spot. Thus, there used to be a pavilion for receiving officials outside the North Gate. Also, the North Gate was enforced with an enceinte, a U-shaped outer wall. Its name Cheng-en, meaning

[1]Hsiao, Wen-Jie 2018 “Historical confusion about the North Gate: whose triumphal arch?”

[2]“The Mudan Incident”.

[3]Hsiao, *op. cit.*

[4]“The Taipei Walled City: the East Gate, the South Gate, the Side South Gate, and the North Gate”.

inheriting grace, also denoted that the governance of Taipei was connected to the authority of the Ching Empire from the north. Because the Taipei Walled City was located at a swamp area, its foundation was made of cross layers of stone bars piled on horizontal log layer with vertical log stilt underneath. The lower part of the gate building was a stone podium archway with very thick wood doors faced by iron plates. The upper part was enclosed by double brick walls in dark red colour, of which the inner one enclosed a room for the gate guards to stand by, and the outer one was punched with window holes on the north and the south sides, three of them on each, for the gate guards to watch outward. The three were one circular in the middle and two rectangular on both sides. In between the inner and outer walls was a corridor for the swift movement of the guards. On the east and west sides of the outer wall were arch rectangular doors leading to the walk on the city wall, already removed. The gate was topped by slope roofs with graceful curve ridges. So, the gate was aimed at defense apart from circulation and looked very solid with grace of simplicity.[1]

3. Survival from Demolition Threats

The Taipei Walled City was the last one built in Taiwan. Twenty years after its completion, Taiwan was receded to Japan as a defeated compensation for the Sino-Japanese War, and in view of modernization the city wall was removed soon after (1904) and would give way to the construction of three–lane boulevard and the crossing of railway. Originally the five gates were scheduled to remove but only one of them, the West Gate, actually disappeared in 1905. Due to regret of the loss, the rest were spared as a result of the appeal from Japanese intellectuals, which was approved by the first Head of Civilian Affairs of Taiwan Gotō Shinpei (1857-1929). Some sources tell that the intellectuals were headed by Yamanaka Kikori (1882-1947), Librarian of the Governor-General Office 1927-1945. In fact, Yamanaka arrived in Taiwan in 1927, more than 20 years after the four gates were saved. The gates were even designated as historic monuments in 1935 according to the recently ratified *Conservation Act for Historical Sites, Places of Interest and Natural Monuments*[2], and Yamanaka probably had involved in it. It was admirable that the colonizers were willing to acknowledge the cultural significance of the establishment by the colonized and spare its demolition. Such an egalitarian vision without racial bias was remarkable. Therefore, the four gates were almost left intact during Japanese rule, though not much conservation seemed to have been done for them.

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[1] "A report of history: the North Gate—Tour to the heritage buildings in Taipei".

[2] "The North Gate of the Taipei Walled City"; "The Conservation Act for Historic Sites, Places of Interest and Natural Monuments".

The Japanese colonization was over after WWII and the four gates were then in the hand of Chinese Republican government.

The Taipei Walled City was constructed in the style of southern China. Under the scheme of city embellishment, three of the four gates were remodeled in the palace style of the Northern China in 1966 to improve the city scape of Taipei mainly for the promotion of tourism. (Figure.1) The palace style was considered more prestigious and noble and reflected the authority of the central governance of the Republican Chinese. The North Gate luckily remained its original features by coincidence. At that time, an elevated road, called the Chunghsiao Bridge Causeway, was planned, though actually built in 1982. It was to release the heavy traffic jam at the railway level crossing before the train went underground, but would cross exactly where the North Gate stands. So, the North Gate was left not to remodel because it was scheduled to demolish for the causeway. After the appeal for remain by conservation enthusiastic scholars and citizens, the causeway was shifted to spare the gate. Despite the survival, the gate was trapped in a three-dimensional traffic network and the nearest distance between the gate and the causeway was just 60 cm.

Figure.1 The East Gate was remodeled in Chinese palace style in 1960s. *(The author took in 2011)*

Figure.2 The North Gate and the causeway have co-existed for 34 years. *(The author took in 2011)*

Since then, the gate and the causeway have co-existed for 34 years. (Figure.2) Besides, the gate was often mistreated and its wall was covered with poster or painted randomly. Although the gate was designated as a first class (national) historic monument in 1983, the embarrassing situation continued.

4. Return to Past and Lead to Future

It was not until 2016 when one of the urban renewals plans of Taipei City, the Portal Project of the Western District,[1] was put into practice that the North Gate got the chance to resume its free standing. The causeway, more than 750 meters long, was finally removed within seven days in the lunar new year season of 2016. The gate was carefully shielded to prevent from damage caused by the removal work. The railway went underground long before this time and the elevated road had turned to be dispensable by then. For this time, the North Gate was ultimately released from a three-dimensional traffic jungle. Even more, its importance was expected to be equivalent to the Arc de Triomphe of Paris. Following the realization of the Portal Project of the Western District, it was located at the core of an irregular plaza enclosed by traffic roads, officially named the North Gate Plaza.

Figure.3 The North Gate Plaza on the foreground, with the demonstration of stone bars piled for the wall foundation on the left. Still more need to sort out the surroundings. (The author took in 2020)

The plaza was installed with intellectual attractions associated with the gate, which mainly narrated the history of the Taipei Walled City and the North Gate, illustrated with carved words and pictures. Also, the location of the removed city wall and the Western Trunk Line Rail were revealed on the pavement, the construction of the stone

[1]"The Portal Project of the Western District in Taipei City".

foundation of the city wall was exemplified with real fabric of stone bars, the street trees commonly adopted in Ching period (Camphor tree and Liquidambar formosana) and in Japanese era (Bischofia javanica) as well as tea flower (Jasminum grandiflorum) were planted along the walk to remind the visitors of the scenes in the past.[1] Beyond the enclosed roads, the plaza was overlooked by or was easily accessible to several important heritage buildings, including Taipei Post Office (1930), Taipei Railway Workshop of National Taiwan Museum (1919), a Western house on the Futai Street (1910), and a Mitsuibussan barn (ca.1914) nearby. (Figure.3) The Portal Project of the Western District aimed to reorganize the ground road system around the Taipei Main Station, which combines the Taiwan Rail, the Taiwan High Speed Rail, Taipei Mass Rapid Transit (MRT), Taiwan Taoyuan International Airport MRT, city and intercity buses. It would also integrate high rise commercial towers with heritage buildings. For this area, the North Gate would serve as a new landmark. Thus, it would not only regain its past glory, but also play new roles which establish a new front door for Taipei and will lead the city to head toward the future.

5. Discussion and Conclusions

For the past 130 years, the North Gate had survived several crises of removal. It came to existence along with the Taipei Walled City. It has gone through three political eras: the Ching, the Japanese and the Chinese Republican, revealing ideology of governance of poles apart. After long period of political and social change, it is the only original remain, as a result of coincidence and good luck. Apart from historicity and rarity, its beauty of simplicity and solidity has also enhanced its cultural significance, which grows along with the progress of conservation awareness of people in Taiwan, almost in response to world heritage trends. It was designated as a singular heritage building in 1935 (Japanese era) and 1983. Not until 2015 in the Portal Project in the Western District was it praised, evaluated and treated as heritage in an urban context. Never than before did it attract so much attention. Originally it was just a fortified city entrance from the north, at this time it was a focus point on the plaza. Much has been done on the plaza around the gate with installments to tell its history. Still more need to regulate the features of current and future adjacent buildings to make the whole area a harmonious urban coherence. The North Gate was first saved by the Japanese and in

[1]The Garden and Street Light Management Office, "The future landscape of the North Gate Plaza: to review the history of Taipei Walled City and to remake the glory of the North Gate as a new landmark for Taipei"; Hsu,Yu-Chien 2019 "**Revitalization of historical buildings—planning of the North Gate Square".**

return, all the heritage buildings around the gate were built in Japanese era and were saved and conserved by the Republican Chinese government and people after WWII despite the hostility between both sides during the war. The good will to care about heritage was beyond race and nationality. Besides, it is disputable to equate the North Gate with the Arc de Triomphe of Paris.[1] The North Gate was just a city wall gate, not a triumphal arch, like the one in Paris, which was a victorious memorial of war. Also the North Gate plaza is not exactly a circle. However, the Arc de Triomphe of Paris was purpose-built, and would always be there with good care. Instead, the North Gate was always threatened since it was 20-year olds and its survival was more valuable and meaningful.

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[1]Hsiao, *op. cit.*

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3.
THE SIGNIFICANCE OF MANAGING HERITAGE PROCESSES IN TIMES OF CRISIS

Cornelius Holtorf
UNESCO Chair on Heritage Futures, Faculty of Arts and Humanities, Linnaeus University, 39182 Kalmar, Sweden

Abstract

In this theoretical paper, I argue that risk management strategies should give more attention to managing processes and practices of heritage. Cultural heritage is beneficial in society for the many valuable processes it is linked to. It is a set of particular cultural processes and practices through which people engage with society. It can bring people together, make them engage with each other and their values, stimulate learning, enhance well-being, generate meaning, create employment, etc. But cultural heritage also bears risks and can have negative impacts, for example when it divides communities, advances hate and prejudice, discourages innovation and prevents development. Risk management needs to address the risks that might compromise the benefits of what heritage does in society. For example, disruption caused by crises due to conflicts or disasters may stop or interrupt heritage processes and practices. An important task of managing heritage in the aftermath of crises is the challenge of recreating or indeed bringing about heritage processes and practices that promise to benefit the living and their descendants while preventing harm. I argue therefore that risk management strategies should invest more attention to managing processes and practices of heritage for the benefit of present and future generations. Managing heritage processes in times of crisis requires us to embrace change and transformation.

Keywords: Benefits of Cultural Heritage; Future Generations; Heritage Processes; Preservation Paradigm; Reconstruction

1. Introduction

In this theoretical paper, I argue that risk management strategies should give more attention to managing processes and practices of cultural heritage. Much current attention is devoted to protecting heritage by reducing the risk of loss and damage and in that way to safeguard its preservation (e.g. Jigyasu 2013). However, it is widely recognised that the significance of cultural heritage in society does not lie in its tangible fabric but in the benefits and uses of heritage. In other words, the value of cultural heritage is closely connected with what it does in society, and heritage is a verb. Risk management needs to address the risks that might compromise the benefits of what heritage does in society.

2. Benefits of cultural heritage

Evoking the past, heritage can be described as a set of particular cultural processes and practices through which people engage with present-day society and negotiate its future, e.g. in terms of continuity or change. In taking this view, I follow Tolina Loulanski's (2006) functional approach to heritage and Laurajane Smith's (2006) account of uses of the past. Smith calls for discussing "heritage not so much as a 'thing', but as a cultural and social process, which engages with acts of remembering that work to create ways to understand and engage with the present" (2006: 2). Cultural heritage is thus beneficial (or indeed harmful) in relation to the many valuable practices and processes it is linked to. To complicate matters, it is well understood that the values and uses of cultural heritage are not inherent and timeless but change over time according to their social and cultural context.

Heritage can bring people together, make them engage with each other and their values, enhance well-being and generate meaning, foster global collaboration, and increase cultural resilience. Cultural heritage may be used in society to advance social integration, promote lifelong learning, create employment and contribute to sustainable development. But cultural heritage also bears risks and can have negative impacts, for example when it divides communities, advances hate and prejudice, discourages innovation and prevents development. Some uses of the past, e.g. by state authorities and elites drawing on cultural heritage, are problematic insofar as they challenge or marginalise values and identities of marginal or subaltern groups in society. Heritage may be (and has been) used to advance illegitimate discrimination, social exclusion, racism, and divisive political ideologies. Whether positive or negative, the impact of cultural heritage is intimately connected not only with what the heritage represents in relation to the past and who we are as descendants of past generations but also with what it does in the present and who we want ourselves and our descendants to become

(Smith 2006, Harrison 2013, Kisić 2020).

3. Managing heritage processes in times of crisis

Risk management is about the risk that positive values and uses of cultural heritage are prevented or negative ones are advanced, in each case in relation to a particular social and cultural context. For example, disruption caused by crises due to conflicts or disasters may stop or interrupt heritage processes and practices. An important task of managing heritage in the aftermath of crises is thus the challenge of recreating or indeed bringing about heritage processes and practices that promise to benefit the living and their descendants while preventing harm. I argue therefore that risk management strategies should invest more attention to managing processes and practices of heritage for the benefit of present and future generations. Managing heritage processes in times of crisis requires us to move beyond sentimentality about loss and embrace change and transformation (Holtorf 2015, 2018). This requires a development of current approaches.

Heritage loss has most often been discussed in the context of the preservation paradigm of heritage theory, both in the media and among experts. This perspective holds that the heritage sector has a duty to preserve the most valuable parts of the existing cultural heritage because it is an inherently valuable and timeless asset that is not only authentic in its core but also non-renewable, and must, therefore, be safeguarded for the benefit of future generations. The maintenance of the status quo of cultural heritage is widely perceived as being superior to any loss or possible substitution of that cultural heritage (Jigyasu 2013; cf. Holtorf 2015). This is reflected in much of the existing policy of cultural heritage conservation which was created after World War II and is dominated by a concern with preservation of original fabric (e.g. 1964 Venice Charter) and sustaining global conservation for as long as possible (e.g. 1972 World Heritage Convention).

The ultimate aim of the preservation paradigm was to safeguard the cultural heritage of human cultures and thus be able to promote understanding between different people – thereby advancing global peace und intercultural understanding. This has resulted, among others, in a restrictive attitude towards reconstruction where original fabric carries particular weight and the symbolic value of heritage is paramount (Kisić 2020). But a focus on the merits of preservation alone is too narrow as a credible response to situations of heritage destruction, failing to consider adequately the consequences for the people for whom the heritage is being preserved.

4. Cultural heritage is changing

Today, the societal functions of heritage are becoming ever more prominent. Currently, we have 1121 World Heritage Sites, a wide range of legislation and policy for the protection of cultural heritage, and numerous collections of cultural heritage all over the world. Never has cultural heritage been more significant – and better protected – than in the present. But a number of specific challenges have been emerging in connection with a number of global crises that pose pertinent questions precisely on what heritage does in society.

As a professional sector, the community of global heritage experts represented in organizations like ICOMOS needs to find adequate responses to abounding calls, among others, to repatriate movable heritage in the context of decolonization (e.g. in sub-Saharan Africa), to disconnect monuments from racist ideologies promoting white supremacy (e.g. in the US), to remove heritage as a target of deliberate destruction in ongoing conflicts (e.g. in Western Asia), and to mitigate the various impacts of climate change globally. It is no longer sufficient to worry about protecting cultural heritage as such, by reducing the risk of loss and damage, and in that way to safeguard its preservation – as if the current challenges could be adequately addressed by the existence of cultural heritage in the future when in fact we need to address first and foremost the impact of cultural heritage on the people for whom it is preserved.

The risks associated with heritage destruction and loss have often been overstated. In fact, compromised preservation of cultural heritage may not always be a large problem for preserving many of the benefits of cultural heritage in present and future societies. I argued elsewhere that less preservation in the present can nevertheless mean more memory of the past and benefits of heritage in the future (Holtorf 2015). The reason for this claim is twofold. On the one hand, lost heritage may be substituted by gained heritage providing the same (or possibly even larger) benefits in society. As the global history and development of the appreciation, use and management of cultural heritage over the past few centuries demonstrates, the portfolio of valued cultural heritage and the benefits it provides are in fact not a very scarce resource but constantly expanding and transforming. For example, in recent decades in the cultural heritage sector we have not only seen a growing appreciation of cultural landscapes, both in urban and rural areas, but also the emergence of digital heritage and vastly increased accessibility of genetic heritage. These are all new types of heritage used in society providing a range of possible new benefits but of course also associated new challenges.

On the other hand, the benefits and uses of specific cultural heritage objects may not be lost even if it is no longer physically existent in the same way as previously. As the cultural heritage associated with the origins of the human species aptly demonstrates, the potency of cultural heritage in society is not directly linked to its quantity, size or

cogency of associated evidence. Few things can fascinate people, mobilise engagement and generate interest in the past with real impact in society (for better or worse) as much as a single tooth fragment from the oldest Palaeolithic, an inconclusive claim about distant genetic ancestry, or a vague trait of human behaviour connecting modern humans consuming social media with remote ancestors struggling for survival.

5. The challenge of reconstruction

In recent years, the reconstruction of built heritage that has been damaged or lost due to conflicts or disasters has attracted new interest in international heritage management (e.g. ICOMOS 2017). In the light of my present argument, any reconstruction of heritage is best seen not primarily as being about restoring or rebuilding damaged or destroyed physical structures but about rekindling or recreating compromised cultural processes and practices linked to these sites. In some cases, the regular process of restoring and rebuilding built structures may as such be considered as a valued heritage process and cultural practice, as e.g. in South and Southeast Asia where wooden temples and shrines are replaced in regular intervals (Wijesuriya 2001).

Recent topical discussions have rightly taken a larger view, focusing on the overall societal impact of various possible strategies for responding to heritage damage and loss. Attention is increasingly given not only to the fabric of monuments but also to societal functions of heritage (Kono 2019, Holtorf 2020, Holtorf forthcoming). The 2018 Warsaw Recommendation on Recovery and Reconstruction of Cultural Heritage states accordingly that in post-trauma situations, "the overall goal is the recovery of the society".

The preservation of tangible cultural heritage covers only a small section of the multiple ways in which the past is evoked and gains significance in contemporary societies (Holtorf 2012, Holtorf and Fairclough 2013). There are many possible strategies and approaches to be taken in relation to the past and cultural heritage in society, involving for example storytelling (various media and genres), carrying out shared traditions, celebrating religious services, staging site-specific performances and other art projects, creating digital reconstructions and augmented realities, realizing physical recreation, practicing role-play and living history, and designing historicizing or inspired new architecture. All these various practices, among many others, are options of rehabilitation of cultural heritage even in cases of heavy physical destruction (see Holtorf forthcoming for a case-study).

6. Reconstruction and the needs of future generations

It seems obvious but is worth restating that in the cultural heritage sector (as

elsewhere) we have to consider the expected benefits and possible risks for future generations of any actions we take in the present, including the physical reconstruction of cultural heritage. But in fact, not many in the heritage sector concern themselves with the future in any systematic way (Högberg et al. 2017). The aspiration to transmit cultural heritage as a human legacy to future generations is often treated as entirely unproblematic, universally beneficial and to be generally acclaimed. A lack of concern with developments and changes over time and with the implications of anticipated human needs in future societies is prevalent, even though the future motivates conservation in the first place.

A potentially different use and function of cultural heritage in future societies, compared with the present, has hardly ever been considered. The UNESCO *Declaration on the Responsibilities of the Present Generations Towards Future Generations* (1997) is little known in the cultural heritage sector, even within UNESCO, but significant insofar as it explicitly recognises the importance of protecting the needs and interests of future generations. The possible significance of appropriate uses of heritage to respond to the Declaration's concern for "the fate of future generations in the face of the vital challenges of the next millennium" has, to my knowledge, never been comprehensively investigated to date. This is possibly changing, as UNESCO's World Heritage and Sustainable Development Policy (2015) calls for more attention to such issues (Logan and Larsen 2018). It is however not clear yet how exactly the implementation of this policy will lead to informed future thinking in heritage management and what that may mean in practice, for example for the issue of reconstruction (Holtorf and Högberg forthcoming).

7. Conclusions

There is an increasingly apparent need for global heritage policy and planning to integrate socio-cultural dimensions into future strategies of risk management of heritage. In particular, ICOMOS and other heritage organizations need to increase capacity to address the question how the processes and practices of cultural heritage in society can be governed in times of crisis, reducing emerging risks that could compromise the benefits of what heritage does and could do in present and future societies. The cultural heritage sector needs something very different from preserving cultural heritage by safeguarding its assumed inherent and timeless cultural values. A focus on the function of heritage and the uses of the past, as well as their mutability over time, requires to incorporate into policy and practice of heritage management an awareness of the various possibilities and indeed the many opportunities, provided by multiple forms of heritage practices and processes in present and future societies.

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4.
RESTORATION OF THE CHURCH OF THE HOLY TRINITY IN THE VILLAGE OF BELINITSYNO, KHAROVSKY DISTRICT, VOLOGDA PROVINCE

Professor I. K. Beloyarskaya
Vologda state University, Professor of the Department of Architecture and urban planning, state expert, candidate of architecture, Professor, Vologda, Russia

Abstract

During natural disasters and catastrophes, the most vulnerable part of the cultural heritage is architectural monuments – objects of immovable cultural heritage. Changes in the appearance of the monument due to destruction are not always the result of man-made and natural disasters, often it is the activity of people. Regardless of the reason for such activity and the type (conscious and unconscious), unique examples of historical heritage disappear on the scale of universal culture.

At the beginning of the XX century, Russia was a prosperous country with a strong agriculture, an actively developing industry, and a well-established culture that represents a significant part of the world's heritage. Russia was a country in General, with an Orthodox culture. The revolution of 1917 made significant changes in the direction of development of the newly created state, in which everything new, advanced, had to be built on the "wreckage of the old world". In the new socialist state, a huge number of churches were destroyed for ideological reasons, both in cities and in rural areas. The process of destruction of monuments that are not protected by special measures is inevitable.

Currently, most of the monuments that are located on the territory of developing cities or settlements located close to them are being restored. Very rarely pay attention to the destroyed temples, which are located in the rural hinterland. They are restored thanks to the efforts of parishioners and concerned sponsors.

The purpose of the research is to determine the historical and artistic value of the object and justify its restoration. The research method consists in the collection and analysis of historical and bibliographic sources, field surveys of the object, systematization and study of analogues. The result of the study was a restoration project, on the basis of which work is underway to restore the Church of the Holy Trinity. Thus, by restoring one architectural monument, we solve one of the most important problems of society-the preservation of the country's cultural heritage, which is important not

only for people living in the modern world, but also for future generations.

Keywords: Scientific Restoration, Preservation, Authenticity, Viability

1. Introduction

Vologda region is part of a huge territory called the "Russian North". This region, where for many centuries a special original culture was created, which has many differences from the regions of the middle zone and southern territories of Russia, but, at the same time, is an integral part of it. Free people lived on these resource-rich lands.

Until the middle of the XX century, the main building material in the Russian North was wood. At the end of the XIX century in Russia, most of the population was rural. A huge number of villages and villages were in the Vologda province. By the end of the XIX century, almost all rural localities had schools and libraries, which were mostly opened on the initiative of priests at rural churches. There was a special attitude to the Church in rural areas. The Church was a spiritual, cultural and social center for the village. These structures were built with the money of parishioners and donations, and later diocesan funds were allocated. But they started construction, planned the volume of churches, paid for the services of architects and artists, mostly local residents. In the rich Northern villages and cities, temples of considerable size and unique architecture were built. Customers, local residents, did not spare money for temples. After the revolution of 1917, the new government paid special attention to the destruction of churches for ideological reasons (in the context of the struggle against religion). Many churches were destroyed, many adapted to new functions that contributed to the rapid destruction of buildings.

2. Trinity Church

Trinity Church in the village Belenzinho is Karovska area and is located on the hillside between the village and the village Belenzinho of Sogorki on the banks of the river Kubani and flowing into it of the river Volosami. The temple stands by the road Kharovsk-Syamzha.

The cold Church was located on the upper floor, built and consecrated in 1842, and the warm Church on the lower floor was consecrated in 1847. From the clerical records, it is known that the two-story Church with one head, and the completion of the bell tower in the form of a spire (GAVO. ,2). The bell tower was built later in 1867. Later it was redone, and the second consecration took place in 1875. In the cold Church, the throne is one in the name of the life-giving Trinity, and in the warm one, too, in the name of Nicholas the Wonderworker of Myra. The territory of the Church's land was

36 tithes, 2 tithes were allocated for vegetable gardens and farm buildings, and 10 tithes were allocated for arable land (GAVO. ,1). The warm Church was also consecrated twice: in 1879 and 1893. There was a cemetery on the territory of the Church. In the 30s of the XX century, the Church was closed, the bell tower was dismantled for the use of bricks for household needs. The completion of the Church was also destroyed. In the 40s of the XX century, the Church building was equipped with a brewery. In the 60s, the building housed a bakery, which functioned almost until the end of the XX century. After the bakery closed, the building was not used and was gradually destroyed. Since 2016, scientific research of the Church of the life-giving Trinity began, on the basis of which a restoration project was carried out. Currently, the Church is undergoing restoration work under the supervision of the author and scientific Director of the project, Professor Irina Konstantinovna Beloyarskaya.

2.1 Architectural and artistic analysis of the Church

Trinity Church in the village Belenzinho stone, two-storey. The main part of the Church building is a quadrangle of almost square shape. Adjacent to it: on the East side is a semicircular apse, on the West side is a refectory, connecting the main volume with a porch over which rises a bell tower. The conducted historical and archival research allows us to draw conclusions that the Church of the Holy Trinity is a unique example of a religious building in the middle of the XIX century. Trinity Church has the characteristics of a monument, although it is not under state protection. The Church is not mentioned in the scientific literature.

The construction of the Church took place in two stages: the first stage from 1842 to 1867-the construction and consecration of warm and cold churches and the construction of the bell tower, and the second stage of alteration and consecration in 1875. the stylistic solution of the decor, the three-dimensional structure of the temple are designed in the style of classicism.

Classicism (from lat. Classieus-exemplary) - an artistic style in architecture that developed through creative borrowing of forms of compositions and samples of art of the ancient world and the Italian Renaissance (. Kirichenko E. I. ,1978) classicist architecture is characterized by geometrically correct plans, logical and balanced symmetrical compositions, strict harmony of proportions, and extensive use of the order system."The main axis is the main focus. The principle of symmetry and accentuation of the axis is a universal technique and is maintained strictly. Secondary axes obey the main ones" (Kirichenko E. I. ,1978). Classicism in Russia was not uniform. This style spanned the period from the 1760s to the 1840s, after which it was reborn and came to an end, giving way to an eclectic style. Chronologically, Russian classicism can be divided into three main periods: early classicism (1760-1780), strict classicism (1780-

1800), and high or late classicism (1800-1840) (Pilyavskiy V. I.,2003). Late classicism in Russia is also called "Alexander classicism", after the Emperor Alexander I, an enlightened man who was gifted with many talents and did much for the prosperity of Russia.

In the province, the chronological framework for the spread of styles shifted greatly due to the territorial distance from major cities. In the remote lands of the Vologda region at the end of the XIX century, at the same time, in one locality, buildings could be built in the art Nouveau and classicism styles.

The Northern climate led to the construction of two churches in one parish - a warm winter and a cold, unheated summer. In the Church of the Holy Trinity, as in most villages and villages of the Vologda region, both churches were built in the same volume. The warm temple was located on the first floor, and the summer temple on the second floor. The height of the warm temple was lower, but the upper summer temple had high arches, was well lit by high Windows and often had two lights.

Field surveys of the Church showed that the two-story brick building was built in the tradition of classicism. The shape of the Windows of the third tier of the quadrangle, the decorative design of the facades determines the style of architecture of the temple-late classicism. The building plan has a symmetrical composition relative to the longitudinal axis-a longitudinal-axial composition consisting of a temple with an apse, a refectory and a porch with a bell tower. The inter-floor frieze between the first and second tiers runs along the entire perimeter of the building and consists of two simple shelves. The chetverik of the temple acts as a risalit, rusticated in the lower part, in the upper part between the Windows there are blades protruding from the plane. In the main quadrangle of the cold Church, located on the second floor, there is a second light in the form of a three-part window of the Venetian type.

The bell tower, added later, was in the same connection with the refectory of the Church. From the data of the clearing list for 1892: it is said that "there is only one Church, there is a spire on the bell tower” (GAVO.,3)

2.2 pre-Project analysis

Work on a project usually begins with a pre-project analysis. This allows you to gather the necessary information to make a decision, identify opportunities and limitations. The results of the pre-project analysis help determine the direction of further work on the object.

As part of the pre-project analysis, a sociological study was conducted. At the beginning of the research work, the Church had an investor, so the main goal of the sociological research was to find out the new function of the object and solve the question of the need to restore the Church. The survey was conducted among three

categories of respondents: local population, district and city administration, clergy, and specialists in the field of restoration. In the question of the need to restore the Church and adjust the priority of opinion remained for the population, since the Church is maintained at the expense of the local Orthodox community and parishioners. Almost 100 % of the population of the village of Belinitsyna and the surveyed residents of the city of Kharovsk consider it necessary to restore the temple with the restoration of its original function. the clergy are of the same opinion. Experts ' opinions were divided, due to the poor almost ruined state of the Church. Employees of the administration were neutral.

Figure. 1Trinity Church in the village Belyanitsyno. 2016. Photo of the author.

In the summer of 2016, measurements were carried out, on the basis of which measurement drawings were made, with the execution of drawings of plans, facades, sections, architectural details, profile templates, and defective statements. Then detailed photographic images, probing and pits.

Due to the small amount of information about the object of research, considerable work was carried out with analogues of the object of research. Trinity life-giving in der. Shadrino (Sokolsky district), the intercession of the most Holy Virgin in the village of Zamoshye (Sokolsky district), Elijah's Church in the village of Popovka (Kharovsky district), the Church of Nicholas the Wonderworker (Kharovsky district), etc.

2.3 The restoration project and the restoration of the temple

As a result of the pre-project studies, the problems of the object were identified. Main problem: the loss of the spatial structure of the building, the destruction of the bell tower of the Church has lost the role of town-planning dominants, loss, and surviving the destruction of the supporting structures and floor structures: completely destroyed the arch above the main volume of the Church, the lost, the conch of the altar apse ceiling, no vaulted ceiling of the refectory in load-bearing walls pierced huge openings for entry of cars, the base of the bell tower reinerova.

As a result of the inventory of the problems of the research object, questions were raised, the answer to which was the justification of scientific and design solutions.the Main method for carrying out restoration work was the method of complex restoration of the architectural monument.

3. Conclusion

Currently, the architectural monument of the Trinity Church is being actively restored on the money of a resident of the city of Kharovsk. The Church is located within walking distance from the city of Kharovsk in the village of Belyanitsyno. The Church has a parish, which means there is a prospect of use and development. But a small number of so-called "rural churches"have such a prospect.

Figure.2 Trinity Church in the village Belyanitsyno. 2019. Photo of the author.

Churches located in rural settlements where there is still "life": schools, kindergartens, production, are beginning to be restored by the population. Funds are collected, benefactors are located, and state grants are allocated. However, the continuing outflow of population from rural areas forces us to think about the future of these buildings. Undoubtedly the need to save temples, no doubt the temples should be restored, but we must now think on what means they will be in the near and distant future. We need to start solving this problem now through the joint efforts of scientists and specialists of various professions.

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5.
BETWEEN TWO DISASTERS: WESTERN HEMISPHERE

Stephen J. Kelley
FAIA, SE, FUSICOMOS,
Architect and Structural Engineer, Secretary-General of ISCARSAH

Abstract

The response to and preparation for disaster is presented from the North American viewpoint. A general philosophy the built heritage is transitory and the landscape upon which it exists is constantly changing is presented. Hazards encountered in North America and vulnerabilities, some of which are unique to the US are presented. A discussion on risk reduction based on the mitigation vulnerabilities as discussed. The technical approach to diagnosing building problems during times of great trauma such as following a disaster is discussed at length with recommendations for team makeup, dangers in the field, and the advantages and pitfalls of using standardized rapid assessment approaches. Finally, a chronological roadmap is presented in response to the disaster risk management cycle.

Keywords: Hurricanes, Earthquakes, Tornadoes, Floods, Fire, Vulnerability, Risk, Rapid Assessment, Immediate Measures, Medium-Term Measures, Long-Term Measures.

1. Introduction

In North America we are subjected to hurricanes[1] that originate as storms in Africa's Sahara Desert and cross the Atlantic Ocean sometimes making their way through the Caribbean to strike the east and southern coasts of the United States, the Gulf Coast of Mexico and sometimes enter into Canada. The worst hurricane in US recorded history struck Galveston, Texas in September of 1900. Surges and incredible amounts of rainfall that accompany these storms cause flooding. Significant flooding has also occurred along the Mississippi River and its tributaries affecting historic river villages throughout the American Midwest. "Tornado alley" stretches northeastward from Oklahoma to the Midwestern, Southern states and sometimes into the Canadian plains subjected these areas to tornadoes in the springtime (Figure 1)[2]. The West Coast waits apprehensively for earthquakes along a subduction tectonic plate that stretches from Alaska's Aleutian Islands to the Tierra del Fuego at the southern tip of Chile. It is significant to note that the New Madrid earthquake of 1811, the greatest in recorded history, occurred along the Mississippi River where there is not a tectonic plate and this event caused the Mississippi to flow backwards. Finally, North American immovable heritage is substantially constructed in wood, a plentiful resource even today, and thus this heritage is vulnerable to fire.

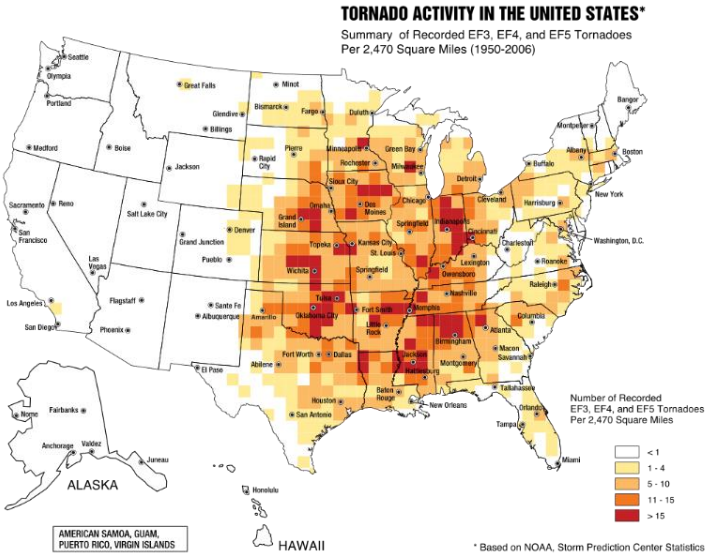

Figure 1 - By FEMA personnel - Image from Federal Emergency Management Agency, a United States government agency, booklet FEMA 320 Third Edition, Section 1, Figure 1.1, page 3, titled Taking Shelter from the Storm: Building a Safe Room Inside your House, Public Domain, https://commons.wikimedia.org/w/index.php?curid=59123381

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[1] The term hurricane is a term specific to the Atlantic Ocean. The term typhoon or cyclone is specific to the Asia Pacific region. However, they are indeed the same thing.

[2]

I am reminded of the words of Sir Bernard Fielden: “Of the causes of decay in an historic building, the most uniform and universal is gravity, followed by the actions of man and then by diverse climatic and environmental factors[1] …” What we learn from years of experience is that the actions of humans to create built heritage is a fight against the forces of gravity. *All monuments will eventually fall down*, and our interventions are designed to keep them from doing so.

Another lesson, particularly when we study global climate change, is that *built heritage is a static element placed in a dynamic landscape*. Rivers change paths, floods leave deposits, land can move and erode away, coast lines and coastal islands move, that which is frozen will thaw, and the ocean levels are presently rising. These landscape changes are driven by the forces of wind, water, earth and fire, and none of these forces are new. Yet our built heritage is unchanging.

Therefore, our reactions should strive towards resilience. Resilience is toughness; the capacity to recover quickly from difficulties. As a Filipino colleague once told me we must “be like the bamboo” that lays flat in the strongest of winds, loses most of its leaves but then pops back up after the storm and continues to grow. Filipinos understand this concept living in the “ring of fire” where they are often subjected to typhoons, earthquakes, and volcanoes.

2. Hazards

Hazards are caused by meteorological, geological, biological and human induced forces. Hazards generally cannot be controlled and pose the danger of injury or harm. Many of these hazards fit nicely within the moniker global climate change. Hazards can lead to disaster, a serious disruption of the functioning of a community which exceeds the ability of that community to cope using its own resources.

2.1 Earthquakes

Due to our understanding of tectonic plates, plate movement, and real-time collection of seismological events worldwide, we have an idea of where earthquakes might occur, but at the present time we have little or no warning as to when they might occur and how much force they will release.

2.2 Hurricanes and Tornadoes

Our understanding of the effects of sudden changes in wind and air pressure along

[1] Feiden, B. M., ***Conservation of Historic Buildings***, St. Edmundsbury Press: Suffolk, UK (1996), p. 2.

with easy access to satellite-based radar allows us to study the movement of hurricanes, but their potential paths are based on climate models and are not always accurate. We know when tornadoes might occur but cannot predict when they will emerge from a cumulous cloud, their path or how big and destructive they will be.

2.3 Floods

We know where they will occur and when, and therefore we generally have warning prior to flooding event. However, flooding events along with the rise of sea levels have become a dynamic element in these times of global climate change and have left built heritage vulnerable.

2.4 Fires

This is the hazard that should be the easiest to predict and therefore mitigate. Still fires can happen almost anywhere and with no warning. The continuing struggle with fire and built heritage reveals that we still have a way to go to harness this hazard.
Most disasters are multi hazard, and the best example in the United States is the San Francisco earthquake of 1906 which left that city vulnerable to fire which consequently cause more damage than the earthquake itself. Contemporary examples would include the Red River flooding of 1997 which incapacitated the firefighters of Grand Forks North Dakota as the historic downtown burned to a shell. A similar event occurred during the 2013 Storm Sandy which swept through New York City. Several square blocks of the Far Rockaways burned to the ground.

3. Vulnerability

Vulnerability is susceptibility or exposure of a community to a hazard or an inherent weakness due to its location, condition or specific characteristics. Vulnerabilities, unlike hazards, can be mitigated. Following is a presentation of technical, social, political and economic vulnerabilities that have been encountered when reacting to a disaster.

3.1 Poor or Inadequate Maintenance

Following the 2010 earthquake which struck Port-au-Prince, Haiti, the author was part of an international rapid assessment team to evaluate 200 of the approximately 300 gingerbread houses spread throughout the older neighborhoods of the city. It was observed that termite damage was significant in many of the houses. Hidden damages

in structures subjected to a trauma such as a seismic event will often reveal themselves as the inception point of collapse.

3.2 Red Tagging

Following the 2005 Hurricane Katrina newly deputized building officials in New Orleans were tasked rapid assessments on a structure-by-structure basis. Many buildings received red tags indicating that they should be demolished. Demolition is much easier than rehabilitation and removes the risk from the inspector of the possibility that a building that has not been tagged will collapse causing human injury. Such liability shedding is a vulnerability that is particular to the United States.

3.3 Inappropriate Repairs and Additions

We observed significant damage to the gingerbread houses in Port-au-Prince due to additions composed of concrete block or reinforced concrete that were seismically incompatible with the original wood frame or unreinforced masonry structures. Seismic actions would cause the original structure and the addition to move unharmoniously causing damage to both.

3.4 Engineering Tendency to Maximize Performance Levels

Performance levels are chosen during the rehabilitation of built heritage based upon the use of the structure. Do we want the structure to be immediately operational, do we want only to prevent total collapse, or do we want something in between? To choose the former will require greater structural intervention than the latter. In the case of a heritage structure "the cure might be worse than the disease." Typical in the US, would be to maximize the performance levels to the detriment of the heritage in order to shed liability.

3.5 Loss of Traditional Knowledge

Our built heritage will often incorporate archaic materials that are no longer available and building techniques that are no longer known (Figure 2). Physical damage from a hazard to such a structure can pose a serious challenge to its restoration.

Figure 2 – Historic cottage in Bay St. Louis, Mississippi following Hurricane Katrina. Like an almost drowned human, the heritage structure regurgitates contemporary materials – drywall, carpeting, particle board and insulation – leaving the original wood plank floors and wood slat walls and ceilings in place and reusable.

3.6 Misinformation from News Outlets and Social Media

This is an excerpt from a newspaper article following Hurricane Katrina: "As residents of New Orleans begin to re-enter the homes and businesses left standing after Hurricane Katrina, many may face an obstacle more pervasive and possibly more dangerous than mud and rotting wood ... trillions of spores … could sicken the 20 percent of the population that has allergy problems, experts say ... 'Even if they could be saved structurally … it probably doesn't make economic sense to do so.'"[1] Such articles painted and unfair pessimistic view of the situation. Yet New Orleans residents scrubbed their houses with bleach and moved back in.

3.7 Advantage Taken by Developers

This is a vulnerability that is also quite common in the US. Opportunities are presented for land at "fire sale" prices for redevelopment after a disaster.

4. Risk

Risk is the choice that is made for potential loss to a community due to a future

[1] Blanket of Mold Threatens Health and Homes by Timothy Williams, New York Times, October 2, 2005.

hazard event. Approaches to mitigating risk can be summarized in the following ways:

4.1 Risk Acceptance

The risk of damage can be accepted as a matter of course by doing little or nothing to address the risk. This may be an appropriate course of action in some cases, for instance, seismically strengthening archaeological ruins in a way that the ruins themselves have been compromised. A decision might be made to only protect persons who visit a site rather than adopt measures so that a structure will incur little damage.

4.2 Risk Transfer

Risk transfer is accomplished through property insurance, so that monies are available to enact repairs. The US philosophy to insurance regulation contrasts with many other parts of the World. The US applies a prescriptive rather than a values-based approach to regulating insurers' financial conditions and market practices, and compliance with these prescriptions rather than the competence and prudence of their management become more important.[1] What's more, insurance continues to be regulated by the state rather than the federal government. The exception is flood insurance, which is a federal government program and is a mechanism to discourage and control development in flood-prone areas.

4.3 Risk Reduction

Risk can be reduced by addressing vulnerabilities. This is the enlightened approach to risk and immovable heritage - the application of appropriate techniques to reduce the likelihood of risk occurrence and its consequences.

The terms *hazard*, *vulnerability* and *risk* are interrelated, as shown in Figure 3. We have little to no control over the *hazard*, but we can address *vulnerabilities*.

[1] Eling, M; R. Klein and J. Schmit; *Insurance Regulation in the United States and the European Union*, November 2009, p. 4

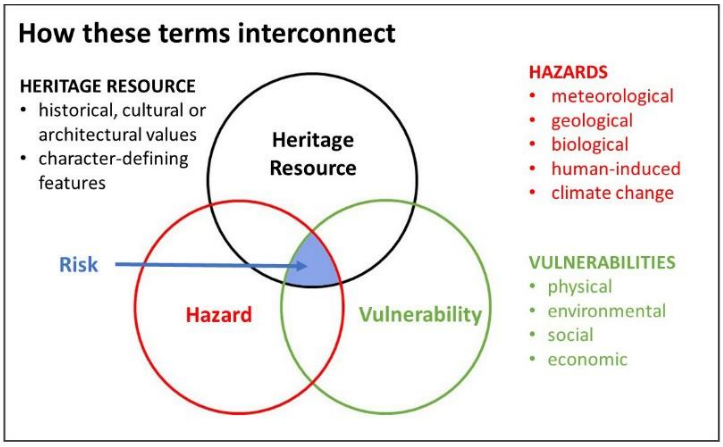

Figure 3 – Venn diagram illustrating how the terms hazard, vulnerability and risk connect.

The Disaster Risk Management (DRM) cycle is well understood. Barbara Mínguez has presented[1] how the DRM cycle could conceivably flatten in the future as we perfect our mitigation and preparedness procedures leading up to a disaster.

5. Heritage Resources

The third circle in the Figure 3 venn diagram is the heritage resource. Understanding a heritage resource is a multi-disciplinary pursuit. Trained architects, engineers and scientists, such as those within the membership of ISCARSAH are well-versed in diagnosing building issues. Conservators, historians, curators, politicians and stakeholders should also be involved. It is best that the technical composition of immovable heritage be well documented prior to a disaster, and the approaches and techniques are described in the *ISCARSAH Principles* to achieve this understanding. However, after a disaster, time for purposeful reflection is lost.

Technical criteria that need to be understood are *building materials*; *building systems*; *building typologies; geography*, *geotechnical conditions,* and *climate*. *Contextual study* of entire neighborhoods may need to be carried out on an informal basis during rapid assessment along with the study of *local capacity* to react and rebuild.

Finally, *culture* – the way of life with him of groups of people in the way they do things – becomes a framework within which a rapid assessment team would operate. All these criteria were studied prior to the World Monuments Fund/ICOMOS rapid assessment team prior to arrival in Port-au-Prince, Haiti in April 2010.[2]

6. Rapid Assessment

[1] Crisis Response and Preparedness Workshop, World Monuments Fund, 21-22 May 2019, New York, USA.

[2] *Preserving Haiti's Gingerbread Houses*, 2010 Earthquake Mission Report, p. 16-37

Rapid assessment of entire communities following disaster is a key to recovery. It is important to point out that the approach to rapid assessment to hundreds of structures under pressure is much different than assessing a single structure for a well thought out treatment - be it conservation, repair, rehabilitation or restoration. Professionals involved in heritage conservation prefer to be deliberative. Consequently, experience and wisdom become essential to adapt quickly to urgent needs and limited resources brought on by the disaster. A seasoned professional is, therefore, essential as part of a rapid assessment team.

A tool used for Rapid Evaluation is in the form of a standardized form. In the US we begin with *ATC 20-1 Field Manual: post-earthquake safety evaluation buildings* and *ATC 45 Field Manual: safety evaluation buildings after when storms and floods*.[1] Such standardized forms should be a starting point and amended to suit the local technical, social and economic criteria. Standardized forms are an efficient method to catalogue the historic resource; develop a snapshot of overall damage; develop ideas for triage, i.e. emergency repairs, prioritize resources; prioritize treatments; develop cost estimates; plan more comprehensive investigations; and begin to address vulnerabilities for the next disaster.

It must be said that in the US, exclusive of institutional resources, we do not excel at planning for the next disaster. This unfortunate truth was brought home during a summer 2019 visit to the recently flooded Elsah, Illinois. My previous visit was in 1993 following significant flooding of the Mississippi River. Meeting with many of the same people I had met 26 years earlier, our discussions were a *déjà vu* moment.

There should be caution regarding standardized assessments. A team that has varying levels of skill the collected data will vary significantly in quality without a standard approach. With a standard approach the data will become more homogeneous but may also establish a ceiling on quality establishing an accepted minimum. Outcome expectations need to be established that are as high as possible. This can be accomplished by frequent inter-team meetings after a full day's work.

There are potential dangers during rapid assessments that must be considered. These include, but not be limited to, building or geological instability; fallen electrical lines; the release of pollutants, toxic chemicals and sewage; exposure to harmful materials such as asbestos, lead and PCBs; exposure to biological growth such as mold and mildew; and danger from human activity brought on by economic desperation or political instability.

7. Roadmap through the Next Disaster

[1] Published by the Applied Technology Council.

Though we could begin our journey on the way forward just about anywhere on the DRM cycle, it is been my experience as an American practitioner at the work begins immediately following disaster and after issues such as rescuing the living in providing food and shelter have been addressed.

Following is a checklist of immediate, medium-term and long-term measures that one would encounter following and earth, wind, water and/or fire hazard that is caused disaster.

7.1 Immediate Measures

- Large scale salvage and storage of furnishings.
- Perform rapid assessments use as a tool for future investigations and implementation of treatment.
- Temporary emergency measures such as bracing, propping or shoring to mitigate instabilities and render sites relatively safe.
- Begin archival research and provide storage for printed documentation which may become damaged.
- Begin geometrical documentation. Geometrical documentation may require refinement when sites are cleared of collapsed debris.
- Triage planning. This is a difficult part of the work where our decisions are sometimes made regarding what built heritage will be salvaged.

7.2 Medium-Term Measures

- More comprehensive investigation and analysis of model structures and sites.
- Technical project planning for proposed treatments.
- Development of informed technical guidelines to light the way for future investigations and treatments.
- Capacity building for local professionals and tradespeople.
- Implementation of essential treatment to significant structures that are still endangered.

7.3 Long-Term Measures

- Continue project implementation.
- Development and delivery of curriculums and workshops.
- Program dissemination of “best practices.”
- Assessment of local construction industries.
- Capacity building for recovery and disaster risk reduction program.

- Revitalize cultural livelihoods that are based on the heritage resource.

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6. THE MEMORY OF DISASTER, AND COMMUNITY-BASED DISASTER MITIGATION RESEARCH ACTIVITIES TOWARDS A SHARED RESPONSIBILITY

Lata Shakya[1], Takeyuki Okubo[2], Dowon Kim[3]
[1] Assoc. Prof., Inst. of Disaster Mitigation for Urban Cultural Heritage (R- DMUCH), Ritsumeikan Univ.
[2] Prof., Dept. of Civil and Environmental Engineering, Ritsumeikan Univ.
[3] Assoc. Prof., Dept. of Civil and Environmental Engineering, Ritsumeikan Univ.

Abstract

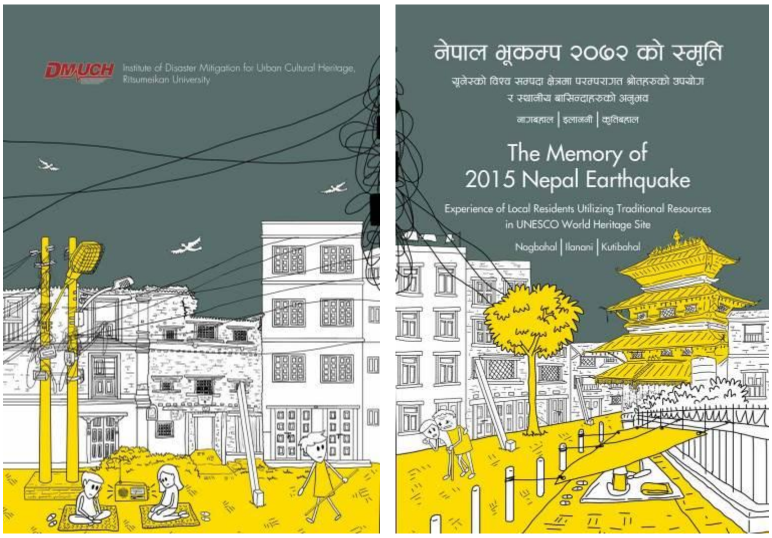
Lesson learning from hazardous experiences and transform these lessons into awareness or capabilities that build future adaptive capacity is significant for Disaster risk management and resilience. This paper provides a case study that attempts to create a documentation of people's experiences during and immediately after the disaster based on the field survey. Our team from R-DMUCH have conducted field survey since 2012 in Unesco world heritage preserved site of Nepal. The field survey includes town watching, disaster mitigation map making, a questionnaire survey of households, workshops with local communities, etc and based on those materials recently we succeed to publish a bilingual (English & Nepalese) book entitled “the Memory of 2015 Nepal earthquake”. The book is published in Nepal with the help of local contributors and supporters of the local community. We organized a book launch program with the support of the local community, and the presence of local government, local Universities and many interested scholars, individuals. This paper describes how the book is created, what are the contents and how we tried to express importance of traditional physical resources as well as human/ social resources for resilient society using original illustrations, how we attempted to get together all the relative stakeholders in one place to promote shared responsibility.

Keywords: 2015 Nepal Earthquake, Historic City, Newar Town, Disaster Memory, Local Community, Shared Responsibility

1. Introduction

Five years have passed since the earthquakes of April and May 2015 in Nepal which killed almost 9000 people. Recovery and reconstruction activities are still on going. After the earthquake, it seemed people's disaster risk awareness is increased but as time goes by, people's awareness and activities for disaster mitigation is weakening. Thus, it is important to make documentation of the victim's experiences such as the fear, the sadness, the difficulties, and the utilized issues during the disaster, to be remembered and shared to all. Documenting the memory is a material to understand the disaster risk, vulnerability of the area/community, and the response capacity of the community. It is also a lesson learning process to develop an efficient strategy of sharing responsibility within related stakeholders towards a resilient society.

We ritsumeikan university, institute of disaster mitigation for urban cultural heritage (R-DMUCH) team has been working continuously with a community of historic city Patan, the Unesco world heritage site, for disaster mitigation planning of the area and recently published a book entitled "the Memory of 2015 Nepal earthquake, experience of local residents utilizing traditional resources in UNESCO world heritage site". It is compiled with local resident's experience as well as the outcomes of the workshop conducted with locals in past. To share the disaster experience widely, the contents are expressed in the illustration and in two language Nepali and English. In this paper, the procedure and aspects of making the book as sharing of disaster memory, lessons learnt form the disaster memory and the attempts for shared responsibility.



Pictur. 1 The book cover. Source: by the author.

2. Outline of study area

The survey area is a block located inside the Unesco world heritage monument zone of the Patan old residential area (Figure. 1). Patan old residential area (ORA) is

developed in the medieval period and its townscape and architecture are known as Newar architecture and a Newar town (Newar is an ethnic group and a local resident of the area). Patan ORA is formed by numerous courtyards, interconnecting each other that shaped a unique urban landscape termed as courtyard style settlement**.** Normally, many of those courtyards have Buddhist religious artifacts (chaitya, Dharmadhatu etc) and even name of Buddhist monastery. The size of courtyards is varying from 20 m^2 to $2500m^2$. In addition of the courtyards, Newar town is also rich in communal spaces like "Phalcha (rest house)" and "Hiti (stone water spout). Newar houses are normally 4 to 5 storied, based on the concept of purity, the living space of the house is divided on each floor, such as the ground floor is used for a toilet/storage room, the first floor is used for a bedroom/guest room, the third floor is used for a family room, and the fourth floor is a kitchen, a prayer room. Newar town not only possesses religious and cultural value but also establishes an important living heritage**.** And it is also noted that the sustainability of these historic courtyards is because of the community based collaborative space management system led by territorial and non-territorial base organization. Normally, tole development committee is territorial base organization and socio-religious organizations such as "guthi", "sangha" and women's organization etc. are the active non-territorial organization.

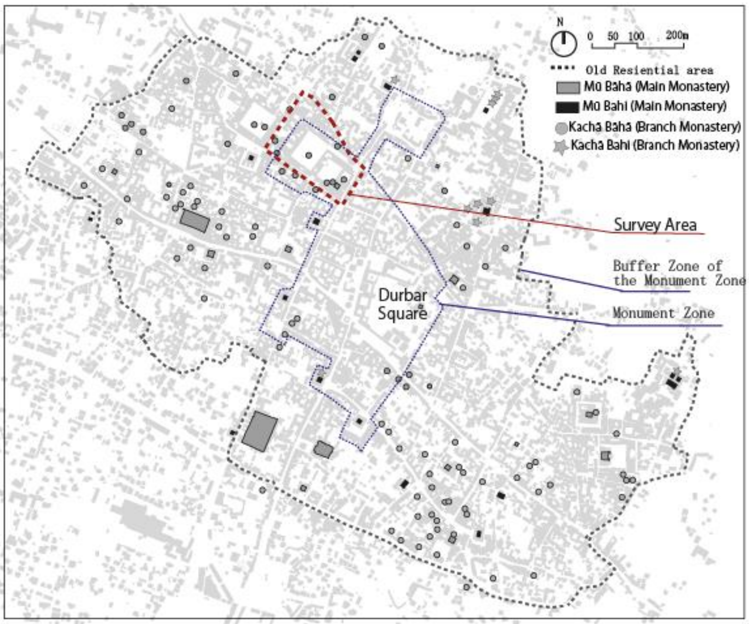


Figure.1 Old residential area and study area of Patan historic town. Source: by the author.

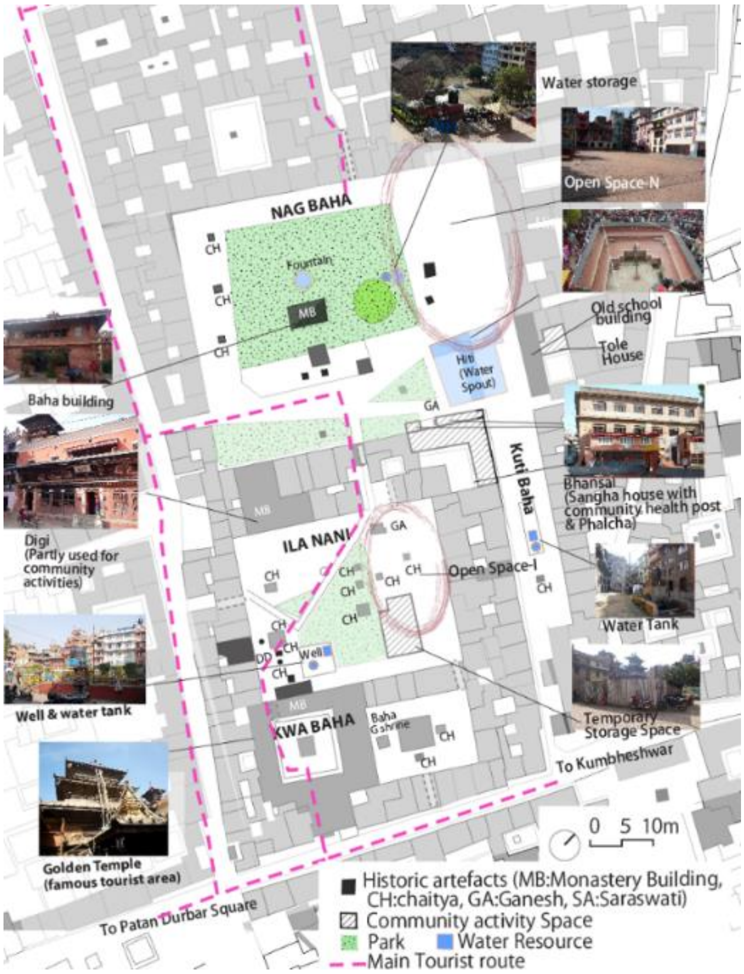


Figure.2 The block of study area. Source: by the author.

In the block of the study area, there are three courtyards, Nagbaha, Ilanani, and Kutibaha, and there exist local community group (Tole development committee, TDC) in each courtyard. In addition to these courtyards, a famous Buddhist monastery Kwabaha (known as Golden Temple), which is also a tourist destination, and several small courtyards are also found in this block (Figure. 2). There are traditional rest house "phalcha", community houses (Bhansal, tole chhe etc) and traditional water resources "Hiti", well etc.

3. The procedure of making the book

3.1 Four aspects for the sharing of disaster memory

The sharing of disaster memory is considered with follwoing four aspects, whom to share, what to share, how to share and who to share.

The disaster memory should be shared with the victims and its new generations to have continuous awareness what they experienced. Considering this aspect, the contents and language are set to make simple rather than make more academic.

The contents of the sharing disaster memory should be connected with real happenings and the actual condition of the area. Considering this aspect, the illustration is created originally showing the traditional courtyards and dwellings as it is. We revisited the site, did several discussions with local working team for selection of the scenes to the illustration. The expression will help to share the value of traditional resources owns by the community and it also expresses their original issues and challenges visually.

The method of sharing disaster memory should be simple, visual-oriented and accessible to all kinds of audiences. Considering this aspect, the contents of victims' experiences are expressed in illustration and text are written in two language.

The disaster memory should be shared by the community, the local education authorities and the government. Considering this aspect, the published books are donated to TDC of the study area, local organizations (Buddhist monastery management organization, women organization etc.), schools of neighborhood areas of the study area and local governmental disaster risk management committees.

3.2 Field survey and local working team

We conducted 55 individual interviews selected randomly from the households of the area and group interview with three TDC members mentioned above. The survey was conducted in November to December 2015. The collected interview data is classified and analyzed with the help of local contributors. We formed local working team to arrange and edit work. The team has 4 local contributors, two of them are architect students who support the illustration part and layout part too. The classification is done based on each post-disaster phases and the interviewees' feelings, challenges, etc. Since the interview was done in local Newari language, we translated all narration to English.

Pic1 Group Interview. Source:by the author.

Pic2 Individual Interview. Source: by the author.

Pic3 Editing of interview contents. Source:by the author.

Pic4 our local working team. Source:by the author.

3.3 Composition of the book

The book is composed of the victim’s experience as it is, and it contains more than 80% of the book. And the remaining part is a column showing the outcomes of our team’s research activities in the survey area, appendix and the few words from contributors.

(1) Contents of "experience of victims"

First, we divided the experiences of the victims into the phases of post-disaster recovery and reconstruction process: a) at the moment of the earthquake, b) immediately after the earthquake, c) during living at evacuation site, and (4) the temporary living period. Among each phase, contents are re-divided into titles such as "first feeling" "first reaction" for phase a), “situation before moving to open space” "the situation when evacuating to open space" for phase b), and "situation of the traditional courtyards", "living condition and response of community", "involvement of community in supporting activities" "Problems during evacuation life" "Positive aspects learned from the evacuation life" "Lessons learned from the evacuation life experience" etc for phase c), and "Use of space after returning home" for phase d).

(2) Contents of "column" showing research results

The authors have been conducting disaster mitigation planning research and disaster mitigation machitsukuri (town development) activities targeting the study area since 2008. We organized workshops with TDC several times and in 2014, we succeed to discover an original “disaster mitigation map” based on town watching and disaster imagination game. We also discovered disaster mitigation measures and stockpile list as a result of our workshops and survey. In the book, the disaster mitigation map, disaster mitigation measures and useful goods during evacuation life are included in the pages of the column part.

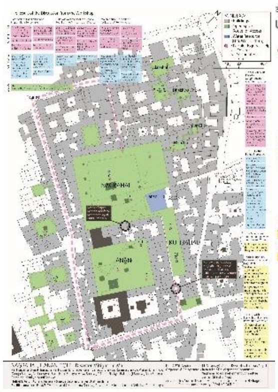
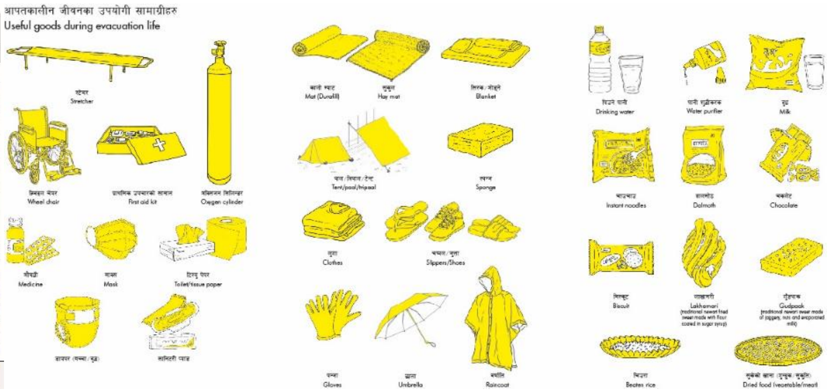


Figure 3 Disaster mitigation map. Source: the book, by the authors.
Figure 4 Useful goods during the evacuation life. Source: the book, by the authors, illustration by R. Manandhar.

(3) Other

Appendix describes the characteristics of a Newar house and classification of courtyards in the study area. In addition, the messages from the authors and local collaborators who have contributed to the series of research and publishing activities were also described.

4. Lesson learning from the sharing of disaster memory

4.1 Vulnerability and Risk assessment of Newar town

Traditional Newar houses are 4 to 5 storied building, composed of timber and brick masonry. Nowadays, it is common to build reinforced concrete (RC) structure with brick masonry infill wall. Most of RC buildings and all the traditional Newar buildings were constructed before the seismic design codes were implemented. Because of that, the buildings in Newar town possess seismic vulnerability. Fortunately, no casualties were found in the study area during the 2015 earthquake but when we look at the victim's experiences, one can find their fear, panic of being in upper floors of the building, and also there is a helplessness for family members who remain in upstairs.

Figure 5, Figure 6 the fear and helplessness of the residents of Newar houses. Source: Ibid.

Many of residents also experienced trapping inside the building because of the

distortion of door frames. On the other hand, some of the residents stayed under the nina (main wooden beam) until the earthquake shaking stopped. Traditionally, it is said that the area covered by the nina is the safest place. These experiences show the need of risk assessment of traditional Newar house to clarify seismic evaluation.
In addition, many of the expanded upper floors of the traditional houses are built of RC. The risk awareness of these mixed construction buildings are also needed.

Figure 7 Alleys & Nina. Source: Ibid.
Figure 8 scene of opening the door and helping victims trapped inside the house. Source: Ibid.

4.2 Re-evaluation of local traditional resources of Newar town

The large courtyards like Nagbaha/Ilanani were the main evacuation site for the residents and neighbors of the area. The first day almost 500 people spent night at the courtyard and next day it increases into 1,100 people in the Nagbaha courtyard. Since only 80 households live in the area, it can be said that the courtyards were used by residents from various places. In Ilanani courtyard too, only 38 households live inside the courtyard and there were more than 500 people quick after the earthquake. The tole committee of each courtyards arranged staying place for each household and managed all the things as evacuation center such as food, water, toilets for more than two weeks.

The toilets of Bhansal (owned by Sangha, Buddhist monastery management org. but used as community house) is utilized for toilets and temporary shelter whose house is heavily damaged. Historical water spout Hiti is utilized for cleaning and laundry water. Phalcha which is used for chanting (Bhajan) in normal time, used as administration place to run as evacuation center. Cooking space is the place which is usual cooking place in festivals. It seems that these activities were done without any particular problems, because the community of the area has customs to feed peoples at traditional festivals and events such as marriage ceremony etc.

During the evacuation time, TRC was the main organization which led the disaster response activities. Since there was anxiety about thief at night, voluntary patrol

activities were organized and operated by the TDC. The existing local community and its traditional or usual activities worked effectively during the evacuation life as well. It can be said that tole committee is an important organization to work as a disaster risk reduction organization under local government to respond disaster in Newar town.

It is also a notable point that after staying few days in courtyards, when evacuees started their daily life in their own house, they first shifted their kitchen which is usually on the top floor (mostly in 3rd or 4th floor) to the ground floor which is normally taken as impure space for kitchen use or living space use. They lived using only lower floors of the house for more than half a year because of the fear of aftermath. In this temporary living (recovery) phase, small courtyards were used as an extension of the kitchen or living space. It can be said that the ground floor and small courtyards of Newar town are actually a buffer space for the disaster recovery phase.

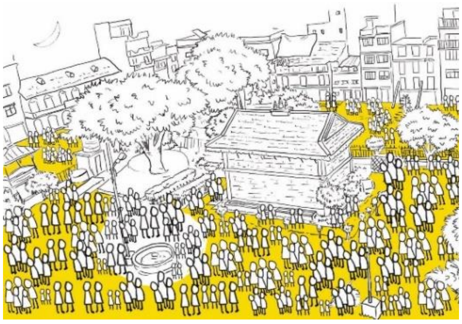


Figure 9 people gathering in the Nagbaha courtyard during the earthquake. Source: Ibid.

Figure 10 people living in courtyard as evacuation site. Source: Ibid.

Figure.11 Hiti (traditional stone water spout) used during the evacuation life. Source: Ibid.

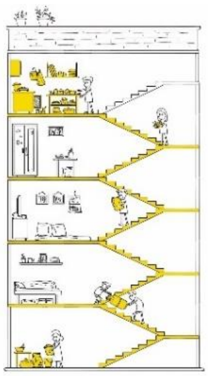


Figure 12 people shifting their kitchen to ground floor from 4th floor. Source: Ibid.

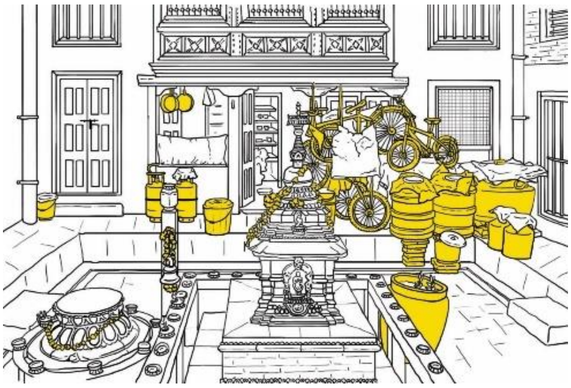


Figure 13 a courtyard with religious artifacts (chaitya/dharmadhatu) used as extension of kitchen or store space of the house. Source: Ibid.

Figure.14 Bedridden elderly in open space. Source: Ibid.

Figure.15 toilet issues during evacuation life. Source: Ibid.

Figure.16 making food for all evacuees in the open space of courtyard. Source: Ibid.

4.3 Challenges of local community response

Many of the victims arranged blue sheets and beddings themselves. But it was not enough to survive raining nights. The victims experienced very cold and wetting beddings. There was also bedridden elderly who needed to have separate care but there was not such supporting environment.

The toilets of Bhansal (the tole community house) are opened for public and some of the resident's ground floor was also opened to use the toilet. But still, some of evacuees experienced the hygiene issues and the lack of water for toilet. It should be necessary to discuss with each community on the issues such as temporary toilet preparation and supply of toilet's water.

Normally, Nepal has shortage of water in dry season, so residents and the TDC used to make storage of water either in the terrace or in ground floor or in underground tank. This stored water also helped a lot to survive evacuation life in open courtyards. In Ilanani, the water of the well became muddy and could not use for few days. Neighbor community of Kuti baha, Nag baha helped providing water of their well.

From above experiences, we can learn several challenges in stockpiling and there need shared responsibility within stakeholders of individual level, community level and local government level as well as academia (disaster risk management experts) level.

5. Disaster memory and shared responsibility

5.1 The book launch event with various stakeholders and book distribution

The book launch event was held in collaboration with the TRC at the park of Nag baha which place was used as evacuation site. The ward chief of the area was invited as chief guest. The members of ward disaster risk management committee were also participated and many of them supported the program voluntarily. Professor at center of disaster studies, Institute of Engineering, Tribhuvan University, Professor at Kwopa Engineering Collage, and a JICA expert were also present as guests. There were almost 200 people, including the residents and neighbors of the site and the local experts of architecture and engineering field. The book is distributed to all the participants of the event. During the event, authors explained the outlines and concept of the book. Chief guest and other guests, leaders of TDC delivered the speech on the book. They gave speech about their own memory of the earthquake, what is their responsibility and how they can work for reducing the Disaster risk. This kind of book launch program organized by local committee and Univ. with presence of local government, local academic institutions, and local experts was the very first attempt. The event successfully shared the memory of the earthquake itself.

After the event, the published books were donated to the TDC to distribute to all households and related organizations of the study area. The book is also distributed to disaster risk reduction committees of the Lalitpur metropolitan city and schools of the city.

Picture. 5 Book Launch Ceremony. Source:by the author.

Picure.6 Participants of the Book Launch Ceremony. Source:by the author.

Picure.7 the book is delivered to the president of Nagbaha Tole Committee. Source:by the author.

Picure. 8 Book distribution to DRR office of Lalitpur metropolitan city. Source:by the author.

Picure.9 Book Distribution to Mitra Primary School. Source:by the author.

Picure.10 Book Distribution to Bal Binod High School. Source:by the author.

5.2 Memory sharing and shared responsibility

The book publishing, the organizing book launch event and book distribution are the sharing memory tools which we believe help to build not only disaster awareness but also promotes correct understanding (with professional 's view) of disaster and promotes appropriate action from the related various activities. And when it comes about action or implementation of the lesson learnt things, there still need more study to figure out the shared responsibility in different level of stakeholders. Our team has approached research on stockpiling planning of the same area and analyzed the shareholders' (individual, community, local government) responsibility towards the stockpiling. We are also doing study on city level and ward level "Disaster Risk Reduction and Management Act" which is recently formulated. We expect our continuous study will give results on shared responsibility for the disaster mitigation and community resilience.

Acknowledgment

We would like to thank Chairman of Nagbaha Tole development committee Mr. Juju Ratna Shakya, chairman of youth club Rabin Shakya and other tole development committee members for supporting for our field survey, and organizing the event. We also would like to thank our local working team Ar. Chandani Shakya (layout of the book), Ms. Sarina Shakya, Ms. Padma Shakya and Ar. Rimishna Manandhar (Illustration of the book) for their contribution on field survey and book editing.

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7.

THE SEISMIC RESILIENCE OF INTERWAR BUILDINGS

Liviu-Costin Gruia
PhD Student, Member of UNESCO Chair #177, Bucharest, Romania, Member of ISCARSAH

Abstract

The paper deals with the resilience of patrimonial buildings designed in seismic prone areas of Romania. There were no seismic codes at that time, so the structures were modelled according to some gravitational regulations. Romania is the single European country with deep tectonic earthquakes of subduction. During their long service the above-mentioned buildings faced at least two such strong earthquakes. However, in spite of some structural damages, some of them survived and remained standing as patrimonial buildings. It is mainly the case of the multi-storey buildings with reinforced concrete structures and masonry infills and also the structural masonry walls and lime mortar. Many buildings of this type were erected during interwar period. Also, the service of these buildings is further allowed only by fulfilling the severe requirements of the codes for seismic protection. That assumes structurally upgrading. Therefore, no structural rehabilitation is recommended if the structure is too degraded. The concept of seismic resilience is dealing with the precise evaluation of the intrinsic resistance reserves of patrimonial buildings. The seismic resilience of the structures in complementary with the seismic risk of patrimonial buildings. Further, the dynamic response of the building to micro-seismic and environmental excitations are recorded by site measurements. In the final step of evaluation, the numerical model in 3D is built up. It is further used to study the sceneries of loading in order to reach the extreme states of stresses and strains. Some study cases were made in order to establish the seismic resilience of interwar structures.

Keywords: Risk, Complementarity, Patrimonial, Masonry, Infills

1. Introduction

The chosen interval of time covers the space between the year 1878, when Romania gained its state independence and the year 1940 when, during the night of November, 10th, the strongest earthquake of the twentieth century, with a magnitude of Mw=7.4, occurred. Romania was a new kingdom at that time. The period was marked by an impressive economic, social and cultural growth. In spite of the dramatic events that occurred in the meantime that period was marked by a real development of buildings and constructions over the all country's territory. (Sofronie R., 2019)

This period of time is marked by the start of using of reinforced concrete as a structural material. Romania is among the pioneering countries in using of reinforced concrete. Reinforced concrete started to be used for civil buildings at the beginning of the 20th century. Some structural components were made from this material. Masonry foundations were replaced by RC ones, mainly for structures with basements. Also, wooden floors and stairs were replaced by RC ones. In the interwar period, the most important types of civil buildings were multi-storey structures with reinforced concrete frames and masonry infills of solid bricks with lime mortars. Most patrimonial buildings from that considered period were made in this way. They were calculated for gravitational actions only. (Sofronie R., 2019)

2. Specific seismicity of Romania

The Southern and Eastern Regions of Romania are periodically haunted by strong earthquakes. They are much different by the EQs occurring in other countries like Greece, Italy and Turkey because are deep, with focuses located at about 200km, last long, often more than 60 seconds and occur rather periodically, at intervals of 40-60 years. For ancient time these EQs are famous by a popular dictum that they are damaging without killing. Indeed, by lasting longer than the shallow quakes, but with a much lower intensity, they are not so dangerous for human lives. However, their damages might reach larger extensions. (Sofronie R, Cazamir R, Gruia L., 2019)

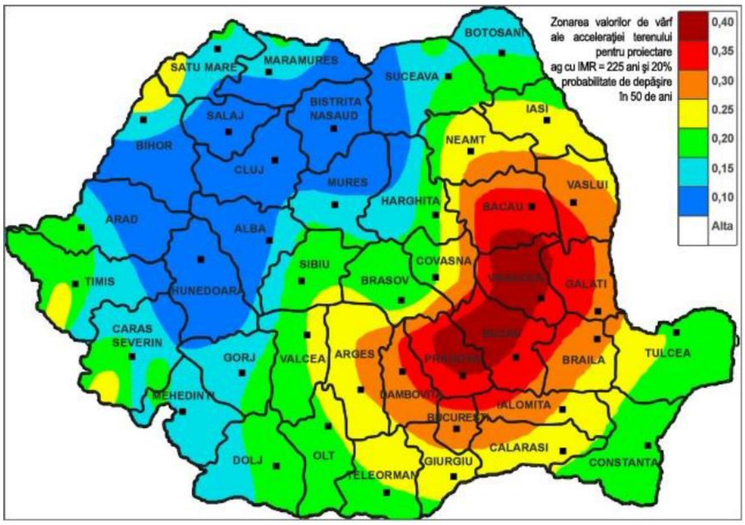

Figure.1 Seismic map of Romania in 2020. Source: Romanian norm P100-1/2013

3. Seismic risk and seismic resilience

In order to decide if a patrimonial building could be rehabilitated or it must be replaced with a new building it is needed to evaluate the seismic risk for each building, according to Romanian norm P100-3/2019. Seismic risk and seismic resilience are both probabilistic notions, respecting the principle of complementarity. Consequently, they are complementary notions. Seismic resilience is the self-defending capacity of buildings against earthquakes.

It is needed to determine if interwar buildings are resilient enough in order to decide if they could be rehabilitated or they must be replaced.

Tabke 1 Resilience values in % according to Romanian norms

RES / RS	RSI	RSII	RSIII	RSIV
R_1	<30%	30-60%	61-90%	91-100%
R_2	<40%	40-70%	71-90%	91-100%
R_3	<35%	35-65%	66-90%	91-100%

Source: P100-3/2008

4. Study cases

4.1 Casin Church in Bucharest

Figure.2 Casin church located in Bucharest. Source: Sofronie R., 2015

The Orthodox church Casin located in Bucharest was erected in less than seven months, between 1937-1938. The golden ratios were respected during design process. The structural system consists of a spatial frame of RC that supports the main steeple, and also the other 4 small steeples. The church was closed with thick walls of solid brick and pure lime mortar. Anyway, the state of the structure was not perfect. There were an important number of cracks caused by the foundation system. Each column is founded using an independent foundation, with no connection to the others, and also with different foundation elevations. (Sofronie R., Feodorov V., 2015)

Expert's Report evaluated the seismic risk evaluated to be 65%. According to the principle of complementarity, the seismic resilience is 35%. This means that structural interventions are urgently needed. (Sofronie R., Feodorov V., 2015)

Five measures were proposed as follows: 1) Putting the floor under safety by temporarily construction in basement a supporting metallic structure for limiting the damages in case of a brittle collapse. 2) Reinforcing the soil around the church body with polymer geogrids and water proofing the surrounded pavement. 3) Remove the existing canalization on a more distant location. 4) Permanently monitoring the church by controlling the 27 marks installed in the basement by technical expert. 5) According to the Code P100-3/2008 the building was classified on the second class of seismic risk. Consequently, by a written advertisement, displayed at the entrance, the believers should be prevented that visiting the church could be dangerous. These measures were carried out in order to repair the damages caused by the foundation. (Sofronie R., Feodorov V., 2015) No measure made sense if the structural system had no resilience reserves. Repairing the damages caused by the foundation system will lead to a minimum seismic resilience of 65%.

4.2 Adriatica Trieste Palace in Bucharest

*Figure.**3** Adriatica Trieste Palace located in Bucharest*
Source: Sofronie R, Cazamir R, Gruia L., 2019

The second study case is based on Palace of the Former Society “Adriatica Trieste” in Bucharest. Designed by the famous architect Petre Antonescu, it was built in 1926. It has a RC spatial structure with two underground levels and eight levels over the ground. The ratio between building’s depth and height assumes the optimal value 1:6. The plan of building has a single polygonal and closed contour, but with non-rectangular angles and without any axis of symmetry. In spite of this less usual geometry, imposed by the available space for construction at that time in downtown, the building behaved well to the both strong earthquakes that occurred in the twenty centuries. (Sofronie R., 2019)

The theoretical analysis and the numerical model were supported by site investigations carried out by the Research Institute URBAN – INCERC in Bucharest. The fundamental oscillation period was found 0.69s, so this value was used in order to calibrate the numerical model. It was considered that the infilled masonry walls have a larger influence than the numerical models considered.

Different methods of numerical modelling were carried out. A conclusion could be drawn about this structure, according to above mentioned results. There is no joint between RC frames and infills and its structural behaviour is closer to confined masonry. That explains the seismic resilience of the building and its good behavior at both important EQ of twenty century.

Expert’s Report evaluated the seismic risk evaluated to be 63%. According to the principle of complementarity, the seismic resilience is 37%. This means that structural interventions are urgently needed. The simplest and the most efficient way to consolidate the building is to connect the two wings of building cross section and to make the switch between the simply connected shape to double connected plan shape. This measure is the compatible to ISCARSAH Recommendations. (Sofronie R,

Cazamir R, Gruia L., 2019)

5. Conclusion

Establishing the seismic resilience of interwar structures could be a difficult task, but it is needed in order to evaluate the patrimonial buildings. First of all, the requirements of the existing codes in present, as well as the ISCARSAH recommendations are extremely restrictive. Secondly, the costs of rehabilitation works could exceed the cost of the new equivalent buildings. Some of the buildings still have and important seismic resilience so they should be consolidated and preserved, some of the interwar buildings must be replaced with new ones. Preserving the patrimonial buildings is an important part of the effort to keep alive our memory.

Acknowledgements

The unconditional support of the UNESCO Chair #177 in Bucharest, Romania, for writing and presenting the paper with this hot subject is gratefully acknowledged.

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8.
SECURING THE FUTURE OF HISTORIC CITIES: THE USE OF INNOVATIVE EMERGENCY LEGISLATION TO IMPROVE PUBLIC SAFETY IN SEISMIC ZONES

Moira Smith
Senior Heritage Advisor, Wellington City Council, Wellington, New Zealand

Abstract

This paper explores the management of historic unreinforced masonry buildings in Wellington, New Zealand. It focuses on the implementation of innovative emergency legislation following the 2016 magnitude 7.8 Kaikōura earthquakes.

The Hurunui/Kaikōura Earthquakes Recovery (Unreinforced Masonry Buildings) Order 2017 required owners of earthquake-prone unreinforced masonry (URM) buildings along selected transport routes to secure vulnerable facades and parapets. The legislation was intended to reduce the risk of falling masonry on busy pavements and streets in Wellington, Lower Hutt, Marlborough and Hurunui. It followed advice by GNS Science of an increased risk of earthquakes in the 12 to 18 months after the initial earthquake. Owners of earthquake-prone buildings were required to complete securing works within the period of heightened risk and were offered grant funding as a contribution towards their costs.

This paper outlines the innovative response of Wellington City Council which worked collaboratively across the organisation and with building owners, engineers and other agencies to implement the new legislation within a tight timeframe. It goes on to consider how heritage buildings and heritage areas can be affected by legislation and other initiatives intended to enhance public safety and to improve the resilience of our city.

Keywords: Seismic, Post-Disaster, Unreinforced Masonry, Legislation

1. Introduction

Aotearoa/New Zealand was one of the world’s last great landmasses to have been discovered, and permanent Polynesian settlements were established by 1300AD. Te Whanganui-a-Tara/Wellington has been settled by Māori for at least 650 years and early Māori history include earthquakes such as Haowhenua (the land swallower or destroyer) estimated to have occurred around 1460AD.

The European settlement of Wellington was established in 1840, and some of the earliest European settlers used traditional Māori construction techniques to construct raupo whare (thatched houses), while others built sawn timber and cob cottages. Although several brickworks were established across the city, very few buildings were constructed in brick in the mid-nineteenth century. All of these were destroyed by the 1848 M7.5 Marlborough earthquakes and the subsequent 1855 M8.2 Wairarapa earthquakes, and most buildings in the following decades were constructed in timber. Wellington’s surviving URM buildings date from the 1870s when bylaws were introduced to manage the risk of fire (Cochran 1990, 111), through to the 1970s by which time the use of URM as a structural material for new buildings had been effectively eliminated in New Zealand.

Wellington’s URM buildings are remarkable survivors. Earthquakes in the early twentieth century, including the 1931 M7.8 Hawkes Bay and the 1942 M7.2 Wairarapa earthquakes led to the removal of URM parapets and ornamentation. Provisions to manage “earthquake-prone” buildings were introduced in the 1960s and proactive programmes to demolish earthquake-prone buildings in the 1980s led to the loss of most Victorian and Edwardian buildings in the central city. Despite this loss some remarkable collections of older commercial buildings remain, particularly in the Cuba Street and Courtenay Place Heritage Areas, and in the nearby suburbs of Hataitai, Newtown and Island Bay.

The 2010/2011 Canterbury earthquakes had a profound effect on many New Zealanders and led to a review of the Building Act 2004 including the provisions for earthquake-prone buildings. The Canterbury earthquakes included the initial M7.2 Darfield earthquake and the subsequent M6.3 Christchurch earthquake on the 22nd February 2011, which resulted in 185 deaths and thousands of injuries (CERC 2012). Thirty-nine people were killed by the failure of URM buildings, including by the collapse of parapets and facades onto adjacent buildings, footpaths and streets.

Figure 1. Examples of buildings where unreinforced brick masonry parapets and facades collapsed onto the pavement during the Christchurch Earthquake in February 2011. Source: Win Clark (MBIE 2017)

2. 2016 Hurunui/Kaikōura earthquakes

Just after mid-night on Monday 14th November 2016 an M7.8 earthquake struck near the North Canterbury town of Waiau and is now known as the “Kaikōura” or “Hurunui/Kaikōura” earthquake. It was a complex earthquake rupture that jumped between faults along 150 – 180km of the northeast coast of the South Island. Initial assessments of building damage in Wellington found evidence of pounding between medium-rise older buildings, along with broken glass and damaged windows, but there were few other signs of significant damage to URM buildings (Brunsdon et al 2017).

Although there was little immediate evidence of failure of URM elements, there was concern about the risk posed by the failure of unsecured masonry parapets and facades in the event of a subsequent earthquake with similar characteristics to the 2010/11 Canterbury earthquakes. This was based in part on a 2014 report by GNS Science Te Pū Ao (GNS) which estimated up to 1800 fatalities could occur in a large Wellington earthquake, with most injuries and deaths caused by falling buildings (Cousins et al 2014). GNS also predicted a period of increased seismicity in the upper South and Lower North Islands (Gerstenberger 2019).

Prompted by the Canterbury earthquakes and the GNS research and forecasts, the New Zealand Society for Earthquake Engineering (NZSEE) and the Structural Engineering Society of New Zealand (SESOC) presented a paper to the Minister of Building and Housing, Dr Nick Smith on the 08th December 2016 (Smith & Campbell 2016). The unpublished paper highlighted the need to motivate URM building owners to act promptly during the period of high risk, and proposed the introduction of financial incentives for works to secure earthquake-prone URM facades within a restricted time-frame.

3. The Hurunui/Kaikōura Earthquakes Recovery Act 2016

A few days after the NZSEE and SESOC presentation, on the 12th of December, Government introduced the Hurunui/Kaikōura Earthquakes Recovery Act 2016. This was followed by an Order in Council (OIC) known as the "Hurunui/Kaikōura Earthquakes Recovery (Unreinforced Masonry Buildings) Order 2017". The Order in Council came into effect on the 27th February 2017 and was designed to reduce the risk of the collapse of URM facades and parapets onto busy streets. The OIC applied to four councils – Hurunui District, Marlborough District, Hutt City and Wellington – and required all URM parapets and facades along streets listed in the OIC to be secured within a year.

To expedite work, the OIC set aside the requirement for Building Consent and Resource Consent (town planning and heritage consents) as long as the works did not include demolition and were overseen by a chartered engineer. It included a fine of up to $200,000 for non-compliance and a sunset clause which revoked the Order in Council on the 31st March 2018. The Order in Council was accompanied by a $4.5million fund to support owners to carry out the works. The fund was intended to pay for up to half the costs, with a limit of $10,000 for a parapet and $15,000 for a façade.

To accompany the legislation, the Ministry of Business, Innovation and Employment (MBIE) published a guidance document "Securing parapets and facades on unreinforced masonry buildings: Advice for building owners, councils and engineers" (MBIE 2017) which provided practical advice on the Order in Council along with advice on methods to manage heritage values of valued historic buildings.

By the end of March 2017 Wellington City Council issued 113 URM notices to building owners and established a programme of works for the coming year. Nearby Hutt City Council identified 72 potentially URM buildings (HCC 2018), and a small number of buildings were also identified in the districts of Hurunui and Marlborough. In Wellington, buildings were selected because they were:

- "Earthquake-prone" under Council's Earthquake-prone Buildings' Policy
- Constructed from unreinforced masonry; and
- Located along one of the routes identified in the Order in Council

4. Heritage Buildings and Heritage Areas

Although the URM legislation was not specifically directed at heritage buildings, it had a disproportionate effect on Wellington's collection of scheduled heritage buildings and heritage areas. Of the 113 buildings identified by Council, approximately 60% (67 buildings) were scheduled in the WCC District Plan, either as individual heritage buildings, or as contributors to heritage areas. Overall, URM notices affected just under

10% of the city's heritage buildings. Most of these (53 buildings) were located in heritage areas including the Cuba Street, Courtenay Place, Civic Centre and BNZ/Head Office heritage areas in the inner city, and the suburban John Street Intersection, Newtown Central, and Island Bay Shopping Centre heritage areas.

These collections of heritage buildings include some of Wellington's most vibrant urban places, and are synonymous with the character and identity of the city and its surrounds. As such, it was important that Council's URM programme took heritage values into consideration when implementing the legislation. This was achieved in the following ways:

- The URM Hurunui/Kaikōura Earthquakes Recovery (Unreinforced Masonry Buildings) Order 2017 allowed the works to be undertaken without Resource Consent (planning and listed building consents), but:
    - Required the design to have regard to the heritage values of the building or heritage area; and
    - Did not allow for the demolition of parapets or facades on heritage buildings without consent.
- The guidance document published by MBIE offered practical advice on "Respecting heritage values in engineering design". The guidance document included input from structural engineers, Council's heritage advisors, and Heritage New Zealand Pouhere Taonga (HNZPT). It included advice on:
    - Heritage buildings, and the identification of heritage values;
    - The ICOMOS New Zealand Charter, and support available from Council's heritage advisors, HNZPT and other heritage experts;
    - The importance of quality workmanship and principles of weather-tightness; and
    - Examples of good practice, with photographs and descriptions of heritage buildings that had been recently been earthquake strengthened.
- Wellington City Council's Resilience Team created a multidisciplinary project team that included Council's heritage advisors, along with Resource Consent (town planning) planners, and Building Consent, parking and traffic management officers.
- The Resilience Team's case-managers included a senor heritage advisor on part-time secondment to assist with some of the most complex heritage buildings.

5. Implementation of the new legislation

Council issued URM notices to 113 building in March 2017, and progress in the first

six-months was slow. By mid-July 2017, 104 buildings remained on the URM list, and only 46% of owners had engaged a structural engineer. A six-month stock-take in September 2017 confirmed that owners were facing significant challenges and many would not complete the programme without additional support. In November, project managers from RCP joined the Wellington City Council URM team. In addition to support with Council's project management, RCP effectively offered a "turn-key" assistance package for owners of the smaller and simpler projects where the costs were likely to be below $50,000. This was helpful for owners who had little or no experience with building contracts, and who had struggled to find structural engineers and contractors to carry out the works.

6. Amendments to the Order in Council

In December 2017, 85 buildings remained on Council's URM list and it was clear that most building owners would struggle to meet the March 2018 deadline, even with assistance from RCP. Just before Christmas 2017 the new Minister for Building and Construction, Jenny Salesa, announced that government would increase the flexibility of URM funding and extend the time before penalties would be applied (HCC 2018). By mid-February 2018, owners of buildings larger than two-storeys could apply for a grant of up to $65,000, while all other owners could claim up to $25,000 to secure either a single parapet or façade, or both a parapet and a facade. The grant applied to each façade on a street listed in the Order in Council, and some owners were eligible for up to $130,000 if their building was larger than two-storeys and located on a corner site. The OIC was also amended to allow an additional six months to complete the works.

Early 2018 was busy time for Wellington City Council's URM team who by this time were in contact with some building owners and their structural engineers on a weekly basis. Every building was different and the case-managers came to understand the building owners, their tenants, and wider issues that they faced. Even straight-forward structural solutions sometimes required weeks and months of Council, building owners, contractor and structural engineer's time. Unforeseen complications included:

- Last-minute sales of at least five URM buildings, and the subsequent need to brief new owners;
- Tenancy agreements that did not allow for access by the owner's builders;
- Difficulty in securing funding;
- Owners who were in poor health, and/or were affected by the pressure and stress of the programme;
- Owners who lived overseas and were difficult to contact;
- Owners undertaking full earthquake strengthening who had to redesign or re-programme works;

- Owners who had long-term plans to demolish their buildings;
- Obtaining Building and Resource Consents for works outside the scope of the URM exemptions; and
- Council processes, consents, licenses and systems that were not covered by the URM exemptions, including parking and traffic management.

Before – Typical commercial building in the Newtown Shopping Centre Heritage Area

After – Parapet has been secured to a new steel frame

Figure.2 Typical solution, before and after

As case managers began to understand the complexities that building owners faced, it became clear that the focus of the programme on engineering solutions and regulations was problematic. Council changed its approach and directed its attention to the needs of building owners, and put people at the heart of programme. In the words of Council's Chief Resilience Officer, Mike Mendonca,

> "…*at the end of the day, resilience is about people and how we live, work and play. If we had stuck dogmatically to Government Policy Guidelines or repeated our previous*

efforts with earthquake-prone buildings I think we would have failed. Instead we recognised [the importance of putting owners at the heart of the programme] halfway through and had the courage to make changes…"

The URM team was reorganised and additional case managers were seconded from other parts of Council including from Council's heritage team. This provided more resources to the URM team and provided an integrated approach to Council systems and processes.

7. Completing the Programme

By the time that the original URM notices expired at the end of March 2018 only one-third of building owners had completed their URM works and 75 buildings remained on the URM list. The list reduced to 65 buildings in May, 58 by early June, and 54 in July. By the 14th of August, with only weeks left before the end of the grace period, 48 buildings remained on the URM list. As the first URM notices began to expire in mid-September there were still 18 active work sites. As the deadline approached it was clear that some sites would only meet the extended URM timeframe by days or even hours. It is therefore remarkable that 112 of the original 113 buildings issued with URM notices complied with the Order in Council within the specified time-period.

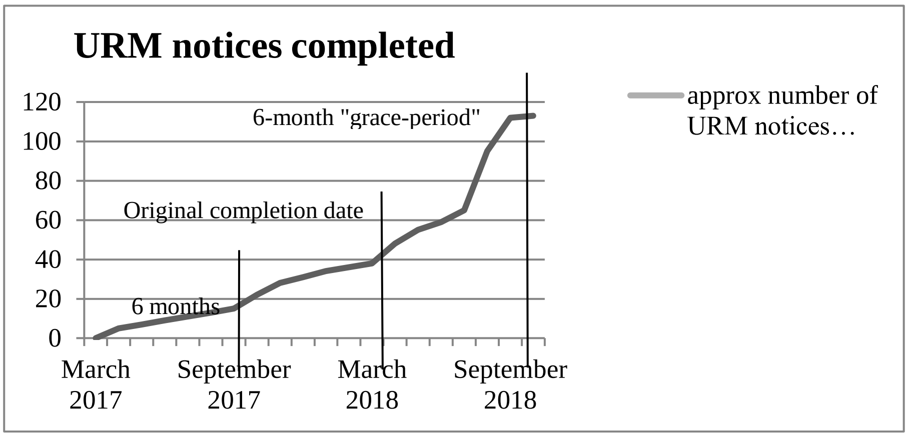

Figure.3 Completed URM notices by month

8. Conclusions

The overall conclusion from the URM programme is that the implementation of emergency legislation in the period immediately following an earthquake is complex, but ultimately achievable if all parties allocate sufficient time and resources. In Wellington, the success of the URM programme was in many ways attributable to the motivation and good-will of the people involved, especially building owners, contractors, structural engineers and Council officers. This co-operative model was actively created by Council's URM team who made a concerted effort to put people

(including building owners) at the heart of the programme. A people-centred approach was an outstanding feature of the URM programme and contributed substantially to its success.

Along with a people-centred approach to its implementation, other lessons learned from the programme are that:

- A motivating factor that led to the creation of (and compliance with) the legislation was the recent experience of the 2010/11 Canterbury earthquakes, where 39 people were killed by the failure of URM buildings.
- The URM programme had a disproportionate effect on heritage buildings, and care must be taken to consider the conservation of heritage values when drafting and implementing emergency legislation.
- All parties need to allocate sufficient time and resources. In this case the scope of work, cost and time required to complete the work was underestimated when the legislation was drafted, and were adjusted subsequently.
- The construction industry and engineering community must be prepared to support building owners to contract their services. One of the key barriers to an initial take-up of the programme was the availability of engineers to carry out the assessment and design work.
- Case management by a government or local authority is critical. Case managers bring together diverse disciplines to act as a team; make sense of complicated processes; and remove the barriers to success for building owners. The effectiveness of case managers had an unparalleled influence on the outcomes of the URM programme.

As well as providing the lessons noted above, the URM programme addressed a significant number of earthquake-prone unreinforced masonry facades throughout the city. This has reduced the risk that parapets and facades will collapse onto the pavement or street in a future moderate earthquake or aftershock. The work has also helped to conserve and repair 67 heritage buildings within a short, eighteen-month, period. Although the programme was not specifically directed at the conservation of heritage buildings, the overall effect was to maintain and protect the city's cultural heritage and restore economic, social and cultural well-being.

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9.

PRESERVING THE ARCHITECTURAL HERITAGE OF DANUBE DELTA

Radu – Constantin Cazamir
UNESCO Chair #177, Bucharest, Romania; Member ICOMOS / ISCARSAH.

Abstract

The Danube Delta lies in the SE of Romania. To the SW it is bordered by the Dobrogean plateau, to the north it extends across the Ukrainian border, and to its East there is the Black Sea. The Danube Delta is crossed by the 45° north latitude parallel and 29° longitude meridian. Its surface, together with the Razim -Sinoe lagoon complex, is 5,050 km^2 wide, 732 km^2 of which belong to Ukraine. The Delta itself has a surface of 2,540 km^2, growing 40 m each year, due to the 67 million tons of alluvial deposits from the river. The Danube Delta is undoubtedly one of the most interesting and original corners in the country. Many consider it to be a unique spot in Europe, both due to its geographical position and its extension. The area belongs to the Tulcea county, delimited by the seaside and the Chilia, Sulina and St. George branches.

In 1991, the Danube Delta became part of UNESCO's list of World Heritage Sites. Around 2,733 km^2 of the Delta are strictly protected areas due to the existence of an architectural, cultural and historic heritage, harmonized with a multi-ethnic structure of the population; the existence of special natural resources, exceptionally beautiful landscapes, diverse fauna and flora, which increase the tourist attractiveness of the area; the existence of many national minorities with their own cultural identity; maintaining and preserving the rural heritage and cultural identity;

Keywords: Danube Delta, Reintegration, Sustainability, Development, Heritage

1. Introduction

The Danube Delta is a region in the South-Eastern part of Romania, in Dobrogea. It is an area of land and water, of ancient mountains (around 300-400 million years ago, compared with the Alps or Carpathians, 'only' 60 million years old), of forests and steppes, with milder temperatures compared to the rest of Romania (influenced by the Black Sea), but with harsh, strong winds. At the mouth of the Black Sea and between the Danube channels, there has always been a commercial and social exchange between the local population and the navigators on the Black Sea coming from the other shores or from the Mediterranean Sea. An area of ancient road crossings – from the North Sea to the Black Sea and from here to the Mediterranean or from the Russian steppe to Constantinople – it is the homeland of no less than 18 different ethnical groups: Romanians, Aromanians, Bulgarians, Turks, Tatars ,Gypsies, Jews, Greeks, Armenians, Russians, Lipovans, Ukrainians, Gagauzians, Germans, Italians, Albanians, Serbs, Hungarians and others. In a way, it can be considered a land of geographic and cultural diversity.

2. Town of Sulina, the most eastern city of the European Union

During the mid-Byzantine period, Sulina was a small cove and in the 14th century a Genoese port inhabited by a handful of sailors, pirates and fishermen. Port town of Sulina (from the Greek word Soulinás, Solina), unique in history, located on Sulina navigation channel, the most daring hydrotechnical achievement in Romania in the second half of the XIXth century at the mouth of the Danube to the Black Sea. It is Romania's town with the lowest average altitude, of only 4 m above sea level and it covers an area of 14.16 km^2. Sulina annually attracts thousands of tourists thanks to its fascinating history, unique historical monuments and surrounding wild landscapes.

Nest of naval piracy in other times, Sulina changed its destiny in the middle of XIXth century, after the Crimean War and the Treaty of Paris (1856). Then, to end naval piracy at the mouth of the Danube, the major European powers (Turkey, France, England) decided to establish an international body called the European Commission of the Danube (EDC), designed to organize navigation through the mouth of the Danube, which operated in the period 1856-1939. The town of Sulina is a river and maritime city with a particular evolution, due to the presence of the European Danube Commission, which operated in Sulina for almost a century, from the mid-nineteenth century until the Second World War. Sulina is the most eastern city of the European Union and part of Danube Delta - UNESCO World Heritage.

The built heritage of Sulina includes 36 monuments (historical, architectural and funeral) recorded on the List of Historical Monuments, 10 of them having outstanding national and universal values, and many of them must be restored.

2.1 Lighthouse built by European Danube Commission in 1869-1870

The lighthouse was built on the right bank of the Sulina branch between 1869 and 1870, having been designed by engineers sir Charles Hontley and M. Engelhardt.

Figure 1. Lighthouse built by European Danube Commission in 1869-1870
Original Image: by the author

2.2 The Palace of the European Danube Commission (EDC) - 1866

The Palace of the European Danube Commission (EDC), in the Neo-Classical style, dominates the Danube cliff. It was built in 1866 and comprises the offices of the Navigation House and the Port Authorities, the facilities required for meetings of the EDC, and flats for staff. The plan shape of the building is an "E" from Europe. European Danube Commission transformed the small village of Sulina into a modern town, inhabited by international office workers, diplomats, merchants, engineers, doctors, ship owners, craftsmen, dockers of all nationalities. The confessional process was provided by nine different churches: an Orthodox Russian-Romanian church, a Greek church, a Catholic church, an Anglican church, an Orthodox Romanian cathedral, an Armenian church, a Russian Lipovan church, a Turkish mosque and a Jewish temple. The architecture of each of these places of worship expresses the cultural identity of their specific ethnic group.

Figure 2. The Palace of the European Danube Commission (EDC)
Original Image: by the author

2.3 The maritime cemetery

The maritime cemetery, founded in 1864, is the place where, especially the foreign citizens found their eternal rest. Most of them were employees of the Danube's European Commission, but also sailors with the most diverse nationalities were buried here. Depending on the main religious faiths of those buried, the cemetery is delimitated in many compartments: the Christian cemetery (the cemetery of the Occidental European churches, the orthodox cemetery, and the old rite orthodox cemetery), the Moslem cemetery, the Jewish cemetery.

2.4 Water Tower - 1910

Water Tower, the "Water Castle" at Sulina has a history that has been released from the stories. At the end of the last century, a ship was moored in Sulina with a guest of attention, the Queen of the Netherlands. When she disembarked, the queen asked for a glass of water. She did not expect to be served directly from the Danube. Surprised that in a port with an intense activity there was no drinking water, she returned home and asked for a water castle construction, with all the distribution network. It was her gift to Sulina. The works began in 1895 and lasted 10 years, ended in 1905. In the second World War, the Germans wanted to blow up the 28-meter-high water castle. They didn't succeed

Figure 3. Water Tower – Sulin
Original Image: by the author

because one of the inhabitants of the city had cut the fuse. But it burned all the wooden structure from the top part. The Water Castle is still feeding Sulina today and has become the symbol of the city.

2.5 Orthodox Cathedral "St. Nicolae and Alexandru "- 1938

Orthodox Cathedral "St. Nicolae and Alexandru "- was built in many phases between 1910 and 1938, its foundation being settled by king Carol I himself with the occasion of his 1910 visit. In the architecture of the building, with Romanian influence, the cable moulding belt and the external mosaic medallions are remarkable.

Figure 4. Orthodox Cathedral "St. Nicolae and Alexandru "
Original Image: by the author

The author started a study to investigate the modal parameters, such as mode shapes, modal frequencies, of a masonry type historical Orthodox Cathedral by performing numerical and experimental analyses. The structural system of the Cathedral consists of a shallow foundation of weak concrete and slender masonry brick walls. The roof has a wooden structure and supports a dome in the traditional ecclesiastical style. Over the years, the seismic protection codes were upgraded and the Cathedral location was enclosed in the seismic zone with a higher PGA of 0.20g. There were made careful investigations in order to establish the seismic risk of the building. The investigations include visual inspections, historical study, material tests, numerical 3D modelling, in-situ measurements, photos and visual inspection, technical expertise.

A complex monitoring program has been set up and implemented to monitor the behavior in time of the architectural heritage building. Due to the location near the waterway the Cathedral has been equipped with a permanent vibration monitoring system to determine the influence of shipping and ship moorings on its general behavior.

Under these conditions, the Cathedral "St. Nicolae and Alexandru" from Sulina, appeared as unprepared for these severe requests. Consequently, in 2019, using advanced 3D computing programs, dynamic calculations were made for all structural components as well as for the structure as a whole. The theoretical analysis and the numerical model were supported by site investigations carried out by the author.

The recordings were made on 11.07.2019 with two recording equipment with accelerometer installed in two locations, as follows: an equipment was installed at the base while, the second piece of equipment was installed at the top of the tower. Were made five sequential recordings with recording times of 180 seconds.

Tabel 1. The maximum values recorded correspond to the y direction (transverse direction of the cathedral)

Parameters / Recordings	PGA (mm/s^2)	PGV (mm/s)	PGD (mm)	FFT dir x	FFT dir y	RSA dir x	RSA dir y
Recording 1	2.432	00.798	000.296	604	459	63	47
Recording 2	2.002	00.729	000.423	594	463	60	47
Recording 3	2.720	01.440	001.677	625	460	60	47
Recording 4	4.673	01.883	001.365	604	460	63	47
Recording 5	4.833	01.425	000.987	601	465	60	42

From the analysis of the results obtained by processing the micro seismic records (both sequential -recordings of 180s, as well as continuous - ringbuffer type) it is found that the spectral amplifications for the two orthogonal directions in the plane are at the values f_x / long = 6.03 Hz - x direction (longitudinal) and f_y / transv = 4.65 Hz - y direction (transversal), respectively, which leads to the following own-period values corresponding to the two directions:

- in the longitudinal direction of the cathedral, the oscillation period is T_x / dir. long. = 0.17 s;
- in the transverse direction of the cathedral, the period of oscillation is T_y / dir. transv. = 0.22s.

3. Conclusion

The basis for conservation and reinforcement must take into account both safety evaluation and understanding of historical / cultural significance of the structure ;Each intervention should, as far as possible, respect the original concept and construction techniques; Where the application of current design codes would lead to excessive interventions that would involve the loss of historic fabric or historic character, it is

necessary to provide adequate safety by alternative means; Repair is always preferable to replacement; Dismantling and reassembly should only be undertaken when required by the nature of the materials and structure or when conservation is more damaging.

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10.

A TALE OF THREE SOUKS AFTER DISASTER

“Reconstruction and Regeneration of Syrian Urban Commercial Areas”,”in Aleppo”, “Damascus and Homs”

Dr. Samir ABDULAC
Ph D. Urban Planning • Architect DPLG • Dipl. Bartlett Sch. UCL
Chairman, ICOMOS Working Group on the Safeguard of Cultural Heritage in Syria and Iraq
Vice-President, CIVVIH (Historic Cities and Villages) • Expert Member, CIAV & ICORP
Member of Steering Committee, ICOMOS France • Executive Member, Blue Shield France

Abstract

The reconstruction of Historic cities after a disaster is a difficult and complex endeavour. Due to their urban structure and fabric, Oriental cities of the Middle East have no easily transferable foreign model to follow. This is why some quite recent reconstruction of distinctive commercial areas, the souks, should raise interest and generate assessments.

After a general presentation of what makes souks so original, three case studies located in the same country, Syria will be presented. Two of them are located in World Heritage cities, Aleppo and Damascus. For two of them damage was due to war, Aleppo and Homs, and caused by a large fire in the third one, Damascus. Information was collected from official reports, from websites and during site visits in 2016, 2018 and 2019.

To facilitate comparisons, what is known about the size and spatial features of each will be presented, as well as their process of implementation, their leading agencies, their stakeholders and their first results. A special attention will be paid to cultural heritage concerns.

Different positive features are emerging: Sometime the speed of implementation, sometime the economical process and sometime the quality of architectural conservation and enhancement. A wider and more comprehensive urban regeneration projects are however still needed, but are still hindered by internal and external issues.

Keywords: Disaster, Historical Cities, Reconstruction, Souks, Syria

1. Introduction

A parallel is often evoked between the scale of recent destruction in Middle Eastern cities in Syria and Iraq and those of European cities during WWII. Hence the temptation to also draw lessons in urban reconstruction. This is not an easy task because of differences in political, sociological and financial contexts. Regarding historic centres, major differences are obvious in terms of traditional urban structure and fabric. Given the importance of commercial areas, this paper will try to provide a first approach to just completed souks reconstruction after disaster, with a cultural heritage particular concern, in three Syrian cities, Aleppo, Damascus and Homs.

2. Souks and disasters

Souks are a typical category of commercial spaces, specific to oriental cities. They used to shelter the city main activities. Their atmosphere particularly fascinated foreign visitors. They were usually located in central areas, close to the Major mosque and often to the to the seat of military power. They do not normally include housing, even if caravanserails may also had a residential role for travellers and foreign merchants. Trades were usually clustered in specialised souk (jewellers, perfumers, silk, ropes, etc.). The name would remain, even if trades may change over time. This specialization and compartment facilitated local management and control.

Two parallel rows of shops along an alley or a street would normally suffice to produce a souk. In fact, the covering of alleys with a wooden roof provide protection from heat, wind and rain. The frequent absence of shop windows draws exposed goods closer to clients and unify the perceived space. Stone vaults would increase the unity and sustainability of concerned places. In Aleppo, barrel vaults, cross vaults or cupolas made with cut stones would provide a monumental scale and architecture. More recently like in Damascus, metal arches or trusses would span larger streets and support barrel shaped roofs with metal sheets.

The owner of a souk could be a foundation (Waqf) when it was built adjacently to a mosque or a Caravanserail. Sometime the souk was built by a ruler and the shops individually owned by merchants.

Souks are ancient and extend over a large geographical area, in Arab countries, but also in Iran and Turkey where they are called bazaars. In Syria, most remaining ones were planned end built between the 16^{th} and the 19^{TH} Centuries, during the Ottoman period. All over history, souks were subject to fires. This is still the case nowadays. Moreover, the souks of Aleppo and Homs recently suffered from fighting. Involved recovery works varied between reconstruction, restoration and rehabilitation, with often, but not always, a care for integrity and authenticity

Syria is presently one of the few counties most concerned by war damage and destruction. This is why ICOMOS has set up a Working Group tasked with the safeguarding of cultural heritage, which developed its own strategy combining, informing, training, advising or developing partnerships.

A sounder foundation for future projects after disaster should include a better understanding and monitoring of on-going present restoration and reconstruction practices. The presentation of a few Syrian urban case studies drawn from Damascus, Homs and Aleppo may provide future directions for a better and more comprehensive rehabilitation. In this process, souks are an important component. Thanks to recent field visits in 2016, 2018 and 2019, some contrasted endeavours were documented.

3. Damascus

Damascus is probably the oldest continuously capital city. The ancient walled town was included on the World Heritage List in 1979. It spans over 86 ha and includes large commercial areas, mainly souks, which are shared by all communities and service the whole urban area around. In old Damascus, damages due to fire and fighting risks would be even higher than in other cities, due to the nature of the traditional building materials (wood, in addition to adobe and some stone). This is why ICOMOS, ICCROM and UNESCO specifically developed a set of recommendations, which was provided in January 2014 to the Municipality of Damascus and the DGAM under the title of “Preparedness and response to a possible heritage emergency in the Old City of Damascus”. Al Hamidiyeh and Medhat Pasha souks in Damascus were built around 1880, under the reign of Sultan Abdul Hamid II. They rose by about 4 m above long hidden previous main Roman avenues. The municipality would still take care of infrastructure services, as well as of common roof renewal. It recently consistently contributed to the harmonization of facades and commercial signs.

During present conflict, the walled city has been geographically very close to rebel held suburbs to the East and received occasional shelling. Several fires spontaneously occurred in some traditional souks: in al Asrouniyeh (April 2016), al Hamidiyeh (December 2016), Bab al Jabieh (July 2017) and al Bzourieh (July 2020). For local architects, the stocking of flammable materials and electrical short-circuits seem to be the main culprits. The unavailability of storage facilities around the city, the use of alternative fuels, the risky electrical connections and the insufficient pressure in the fire hose network represent continuous threats.

Sometimes, just a few shops were involved, but al Asrouniyeh fire was the most important as 205 shops burnt. The souk appeared in the late Ottoman period between the citadel to the West, the Omeyad Mosque to the East and the Souk al Hamidiyeh to the South. It was not covered, even if it included a few functional “bridges”. Toys and

some cheap domestic utensils used to be sold there. With the municipality assent, the reconstruction of burnt commercial premises was carried swiftly by shopkeepers for economical reasons, with respect to scale, but too quickly and without care for appropriate building materials. Hollow bricks and metal were used instead of traditional flat bricks. Today, an ordinary passer-bye would not guess this lively area was reconstructed a few years ago.

An elegant late ottoman bank (now the "Commercial Bank") with tile covered pitched roofs was also a fire victim. A UNESCO consistent report including architectural drawings recommended its careful restoration, including an internal courtyard that was, years ago, divided among tenants. The project may have been too costly or the bank presently too poor, so the ruins are still closed but untouched to the present.

Figure. 1 – Damascus: Souk al Asrouniyeh, after reconstruction. May 2018 – Photo s. abdulac

4. Homs

The city is located in central western Syria and emerges into historical records in the 1st century BC, during the Hellenistic Seleucid dynasty. Homs became recently a major industrial centre and was the third largest town in Syria. The city experienced a heavy destruction between 2012 and April 2014 during a rebellion. Most ancient monuments were damaged: Mosques, churches, housing and the souks.

The Souk area is supposed to come from the 13th century and measure about 45,000 m2 and includes 15 different souks. Their global size is however much smaller than in Aleppo or Damascus who played a much greater international commercial role. They included small alleyways covered with plaster coated stone vaults. Larger avenues were covered with more recent metal barrel or pitched roofs. They were damaged, but comparatively less than other parts of the old city.

The United Nations Program for Development (UNDP) wished, with a small seed

budget, to generate a sustainable employment and revitalization process in Homs. After a large consultation including public meetings (inhabitants, business community, authorities), the UNDP decided to carry on a project to restore the souks, with a rather smart social and economic logic: this program generates employment for construction workers who repair the souks, their roofs and their shops. Shopkeepers are encouraged to come back as no building investment is needed. Finally, the rebirth of the souk should encourage inhabitants and consumers to return.

This 2-year project started in June 2016 and included 4 phases: cleaning, archiving, restoration and reconstruction. It includes 892 shops. Structural damage was repaired. Plaster coated vaults were cleaned and redone neatly. Prefab semi-cylindrical metal roofs were placed over wide alleys. Solar lighting is to be provided. Uniform individual metal rolling shutters replaced older ones to close shops. The Directorate General of Antiquities and Museums (DGAM) took care of monitoring and archiving undertaken works. This endeavour was designed as a pilot urban reconstruction project quickly implemented with a cost of a few hundred thousand dollars only. It may not scientifically satisfy professional conservation architects, but Homs is not a World Heritage site anyway.

When we visited the place in May 2018, about half of shops seemed open. The jewellers' souk was still empty and works did not have started in the Qaisariyah, but this was during a weekend after all. It is not known if all shopkeepers who left the city were back or how their rights would be preserved.

The local chapter of Architects organised several meetings on conservation. Training for a group of architects was offered by a UNESCO program based in Beirut, thanks to Prince Claus Fund. The UNDP also provides training to craftsmen, like in carpentry.

Figure. 2 – Homs: Souks main alleyway, after rehabilitation, May 2018 – Photo s. abdulac

Figure. 3 – Homs: Jewellers' Souk after restoration, May 2018 – Photo s. abdulac

5. Aleppo

The Ancient City of Aleppo was included on the World Heritage List in 1986. It measures 364 hectares. Its Souks are located at its very heart between the Citadel to the East and the Antakya Gate to the West. At the end of the 15th century, most of the souk's roofs were built with wood. After two major fires, Ottoman authorities decided to cover the souks with stone vaults and domes. With their long and narrow alleys Aleppo Souks are probably the largest covered historic market in the world, with nearly a length of a dozen kilometres of alleys, and a surface area of around 16 ha. Detailed surveys produced large-scale plans as early as the 1930's. They were completed by recent 3D and drone measurements and images. The alleys orthogonal network is probably due to a former Hellenistic urban plan.

The recent crisis extremely affected Ancient Aleppo from 2012 to December 2016. This sector long remained on the battle front line and shelling was exchanged from one house to the other. As a result, the historic town has suffered a major destruction of its physical assets, and a severe disruption o its social and economic life. The city souks were looted, burned, bombed and sometime blown up. Some sections disappeared other remains as pitiful ruins invaded by grass and savage plants. . This terrible situation prompted the World Heritage Committee in 2013 to inscribe the Old City (as well as all the other Syrian sites) as a World Heritage site in Danger.

The Aga Khan Fund for Culture had a long history of interventions in Aleppo before the conflict, in the citadel, in public spaces and craftsmen training. When peace returned to Aleppo, it wished to invest in strategic issues like a report on a prospective vision for Aleppo (2018) or a pilot reconstruction project like the Souk al Saqatiya (2017-2019). For this latter one, a Memorandum of understanding was passed between it, the DGAM, the Syrian Trust for Culture and the Municipality.

This souk al Saqatiya had several advantages: It was located near two main accesses to the souk area and close to the Omeyad Mosque. It suffered rather minor damage and belonged to one owner only, the Religious endowments. Most tenants were gradually identified. The Saqatiya used originally to be a sort of meat market but its functions gradually evolved. It included 53 shops along a 4.7-4.9 m wide and nearly 100 m long alley, on a Surface area of about 1,500 m2. Its architecture was monumental with vaults and domes. It had the potential to become a model, even a flagship for restoring the historical souks in ancient Aleppo.

The project involved a complete restoration of the damaged covering and structures, the construction of new and modern technical installation (water, electricity, communication, etc.) and the design of appropriate functional and decorative elements (wooden portals for the shops, artistic lighting of spaces, etc.) in harmony with the historic character of the souk.

The Aleppo municipality used to be dynamic in the conservation of cultural heritage in the 1990s and 2000s and began undertaking area rehabilitation projects. Because of a lack of funds and ownership complications, historic residential areas are left aside for the moment. It now boasts the reconstruction of 650 m of souks. It mainly worked on al Khabia souk and has views on al Sawabtia as wall as commercial areas linked to al Harir, Jaky and Venetian's Caravanserails. In al Khabia the pitched metal roof was completely reconstructed and the occupancy rate of stores is 30%.

Figure. 4 – Aleppo: Souk al Saqatiya during restoration, January 2019 – Photo s. abdulac

Figure. 5 – Aleppo: Souk al Saqatiya after restoration, September 2019 – Photo dgam

6. Provisional conclusion

Presented case studies illustrate the architectural variety of souks as well as their urban centrality in their historic cities. Even in World Heritage sites, some of them may represent artistic masterpieces and others not. This is why some deserve a restoration as careful as for other historical monuments. It is however the alliance of tangible and intangible heritage that gives them such a fascinating flavour and atmosphere. Their magic fades away as soon as they are empty, whatever the reason is.

The conservation and management of souks has developed locally, even before, in peacetime. There is usually care and pride in rehabilitating souks after disaster among local and specialized authorities. Young professionals and architects are eager to learn, to be trained and to participate in the reconstruction effort. The DGAM and municipalities however suffer from a shortage of funds and cadres. External initiatives are however important to initiate conservation pilot project as in Aleppo or using souks as a leverage of socio-economic development as in Homs. The large-scale destruction inside the country doesn't facilitate the allocation of domestic resources. Political opposition with foreign powers prevents usual bi-lateral aid and cooperation. Even if cultural heritage is not specifically targeted, international or unilateral sanctions end up by paralyzing any funding from abroad, even for ordinary persons.

Recovery from fires is comparatively easier, as clients, providers, merchants and employees are still all present. They could be consulted and associated. After a military conflict, some could be dead or may have migrated elsewhere in the country or even abroad. Economic sanctions would prevent their return. Giving a priority to souks was probably a wise approach, even if more detailed studies are still needed. It already seems that expected leverage effect for revitalizing historic cities may however not reach its full potential yet, because of internal and external factors. In spite of a

promising beginning, the reconstruction of historic cities in Syria, particularly Aleppo, may take a long time, perhaps a too long one, if it is ever achieved.

Acknowledgments

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- In Malbork (Poland), in September 2019, at a colloquium on "Reconstruction and Recovery of Towns after War Damage" organized by ICOMOS Scientific Committee on Historic Cities and Villages (CIVVIH).
- In Paris Institut National du Patrimoine, in January 2020, at a colloquium on "Rebondir après le drame: patrimonies et résilience", organised by Blue Shield France.

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11.

A DEEP LEARNING SYSTEM FOR THE ASSESSMENT AND RESTORATION OF HERITAGE STRUCTURES, *"CASE STUDY OF THE 2017 PUEBLA, MEXICO EARTHQUAKE"*

Satwant Rihal[1], Hisham Assal[2], Hiram Badillo[3], Maria Margarita Segarra Lagunes[4]
[1] Prof. Emeritus, College of Architecture & Env. Design, Cal Poly,
San Luis Obispo, California U.S.A.
[2] Lecturer, Computer Science and Software Engineering Department, Cal Poly,
San Luis Obispo, California, U.S.A.
[3] Asst. Prof., Civil Engineering Department, Universidad Autonoma de Zcatecas, Mexico
[4] Prof., Department of Architecture, Universita degli Studi Roma Tre., Rome, Italy

Abstract

The world ancient rich architectural heritage is at risk, especially in developing countries due to aging, rapid urbanization, and disasters e.g. earthquakes, floods, fires and terrorism. Mexico was struck by the catastrophic M_w 7.1 - 2017 Puebla earthquake and its aftershocks, which caused damages in the states of Puebla, Morelos, Oaxaca etc., and the greater Mexico City area. Almost 2000 historic buildings were damaged during this earthquake, mostly churches.

Data collected from this earthquake through field reconnaissance, and advanced technologies, present a wealth of information for different types of damage to a variety of religious heritage structures. We propose building a deep learning system, which uses the given data to learn patterns of damage and identify areas of improvement to the structures during the restoration efforts. The system will group similar structures in clusters and apply the learning mechanism to extract common features and patterns of damage, which may indicate common weaknesses in such structures. The results can later be compared to similar events in other regions to validate the findings or to point out the regional differences that may affect heritage structures.

Keywords: Religious Cultural Heritage, Earthquake Damage Data, Seismic Risk and Mitigation, Deep Learning, Role of technology, Restoration

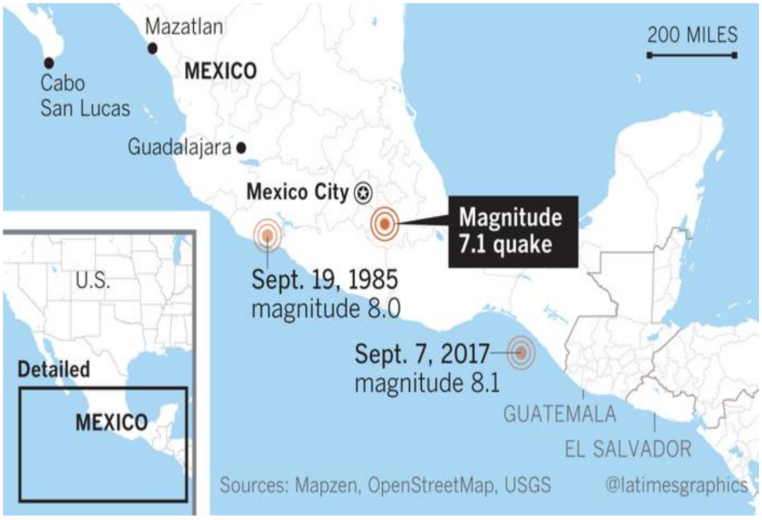
1. Introduction

The beautiful and rich religious cultural heritage of central Mexico are under threat from effects of natural disasters, and need to be preserved for future generations. This rich and beautiful architectural heritage of Puebla, Oaxaca, Morelos and neighboring areas in central Mexico, consisting of churches, cathedrals and basilicas, sanctuaries, convents and chapels suffered the wrath of natural disasters e.g. earthquakes, rains / floods over centuries. Following each of these natural disaster events, these churches have been repaired and restored within the constraints of available resources. The surveys and reconnaissance of the historic churches carried out following these natural disasters, result in a large amount of data and the knowledge base that has been accumulated, can be useful in planning for restoration and conservation of religious cultural heritage for any future disaster events.

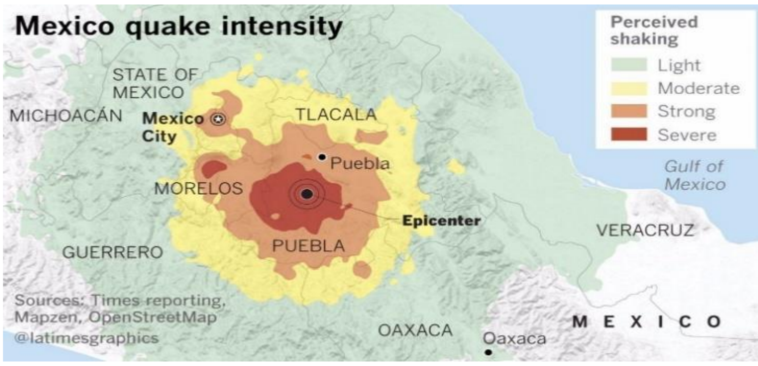
2. Puebla-Morelos Earthquakes of September 2017

Central Mexico was struck by a powerful M_w 7.1 intraplate earthquake, on September 19, 2017, just 12 days after the M_w 8.2 Chiapas earthquake in southern part of Mexico. This earthquake had a focal depth of 57 km and affected not only Mexico City, but caused unprecedented devastation in the neighbouring states of Puebla, Morelos, Guerreros etc. claiming 370 fatalities. This powerful earthquake occurred almost on the 32nd anniversary of the catastrophic 1985 Michoacán, Mexico earthquake. The September 7, 2017 M_w 8.2 earthquake caused widespread damage in the Isthmus of Thuantepec region of the state of Oaxaca, and resulted in 100 fatalities. The area is still in the process of rebuilding and recovering from this disaster.

The epicentral locations of the catastrophic 1985 Michoacán earthquake, Sept. 19, 2017 Puebla earthquake, and the Sept. 7, 2017 Chiapas earthquake are shown in Figure 1 (left). The earthquake shaking intensity experienced during the Sept. 19, 2017 earthquake is shown in Figure 1 (right)



Epicentral Locations of Mexico Historic Earthquakes



Puebla-Morelos, Mexico earthquake Shaking Intensity - Source: LA Times

Figure 1. Mexico Major earthquakes – Epicentral locations (up) – Shaking intensity - Sept. 19, 2017 Puebla earthquake (dwon)

3. Performance of Religious Heritage – Churches during the earthquake

A report from the Mexican Bishops' conference reported that out of a total of 1850 churches that were seriously damaged during this earthquake, 1603 churches were categorized as historic churches. Reconnaissance surveys of the performance of different typologies of buildings, infrastructure and affected sectors have been carried out by different professional groups e.g. INAH, GEER (2020), EERI (2021), UNAM (2017) among others. The surveys of the performance of heritage structures e.g. churches and related religious buildings have been carried out by INAH, Church Organizations, NGO's and Badillo (2019). A study of the performance of historic church buildings in Mexico during the 2017 and previous earthquakes shows that the observed damage of such heritage structures is influenced by the following characteristics:

- Geometry, Form and Configuration
- Heavy exterior masonry facades
- Tall masonry exterior walls

- Bell towers
- Vaults and Dome Roofs
- Foundation Conditions

Some examples of the damage suffered by historic churches during the 2017 earthquake are presented in figure 2 below.

Figure 2. Bell tower collapse – exterior façade damage -Chalcaltzingo, Morelos (left) Heavy damage of the main dome, Immaculada Concepcion, Zacualpan de Amilpas (right) Source: Lagunes (2020)

3.1 Inventory of the damage suffered by the historical churches During the 2017 earthquakes

Based on observed damage data collected from site visits to historic churches, and that available from other sources, Badillo (2019) has presented an inventory of historical religious buildings damaged by the September 2017 earthquakes. In this inventory the damaged religious historical buildings were classified into the following categories: (i) Cathedrals and Basilicas (ii) Sanctuaries (iii) Convents and former Convents and (iv) Parishes

For each category the names and location of the religious historic buildings are presented under each of the following damage classifications:

- Severe Damage
- Moderate Damage
- Minor Damage

An excellent earthquake damage survey and documentation of a number of religious

heritage structures – churches, and restoration of one Augustian Convent – now on the UNESCO world heritage list, has been presented by Lagunes (2020). A preliminary inventory and statistics of collapsed buildings in Mexico City during the 2017 Puebla – Morelos earthquakes has been presented by Galvis, et. al (2017).

3.2 Overview of Observed Damage and patterns

An analysis of the accumulated data on observed damage of historic churches during the 2017 Puebla-Morelos earthquakes as reported by Lagunes (2020), was made. A preliminary summary of the patterns of damage derived from observed damage data for religious heritage structures – churches is presented in Table 1.

Table 1. Patterns of earthquake damage in some of the affected heritage churches

Religious Heritage Site	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6
	Ext. Façade Wall collapse (out of plane)	Roof - exterior wall connection. failure	Belltower damage / collapse	Exterior heavy masonry façade damage	Vaulted roof/ceiling heavy damage/ cracking /tension - shear	Dome Roof heavy damage /cracking/ tension - shear
1.Capilla de Guadalupe, Amecameca	X	X			X	X
2.Chalcaltzingo, Morelos			X	X		
3.Iglesia del Carmen, Alixo, Puebla	X	X		X	X	**X**
4.Immaculada Concepcion, Zacualpan de Amilpas	X		X	X		X
5.San Martin Caballero, Huaquechula	X	X	X	X	X	
6.San Tomas Tetelillia, Jonacantepe, Morelos	X		X			
7.San Juan Bautista, Tlayacapan, Morelos	X	X	X	X	X	

A study of the earthquake damage inventory presented by Badillo (2019) shows that out of all the affected regions of Mexico the largest number of damaged religious historical monuments were located in Puebla (27%) and Oaxaca (25%) comprising a

combined total of 52%.

Based on an analysis of the damage patterns presented in Table I, it can be estimated that some of the significant reasons for the heavy damage and collapse of the old historical churches are as follows:

- Tall heavy masonry exterior walls-damaged due to large out-of-plane displacements
- Inadequate connections between the heavy roofs and the exterior masonry walls
- Masonry bell towers suffered heavy damage and collapse due to amplification of seismic response accelerations and displacements
- Decorative components of heavy exterior masonry façade walls in the upper parts of the facades suffered damage and collapse due to amplification of seismic response accelerations and displacements
- If we assume that 50% of the historic churches had vaulted roofs/ceilings, we may speculate that a significant percentage of them are likely to suffer damage depending on their age, materials, openings, their supporting structure and foundations, due to large seismic displacements they will experience due to amplification of earthquake ground motion effects
- If we assume that 40% of the historic churches had dome roofs, we may speculate that about a third of them may suffer serious damage and collapse depending on their age, materials, openings, and their supporting structure, due to large seismic displacements that they may experience due to amplification of earthquake ground motion effects

4. Earthquake Data Sources and Data Types

- USGS (U.S. Geological Survey)
- EERI (Earthquake Engineering Research Institute)
- INAH (National Institute of Anthropology and History of Mexico)
- UNAM (National University of Mexico)
- Church Organizations
- Professional Organizations (ICOMOS, architects, engineers, planners etc.)
- University Research Units
- NGO's
- Others

5. Deep Learning System: the role of technology

The large volume of data, that is collected from the September 2017 Mexico earthquakes, offers the opportunity to build a deep learning system to extract patterns

of damage both from images and from numerical data. Different types of damage can result from many conditions, including ground settlement, ground motions, amplification of ground motions, etc. Each type of damage points to a weakness in the structure to resist the forces and displacements imposed by an earthquake. Identifying patterns of damage can help restoration efforts and provide recommendation for strengthening or retrofitting existing structures to withstand future events.

Efforts have been made to use the earthquake data to build systems that assist in the assessment of risk and identification of damage in many types of buildings. (Maioa et al., 2020 and Mosoarca et al., 2020). Machine learning allows us to extract knowledge from large volumes of data and deep learning allows us to dig deeper into the data and find more complex relationships. In this paper we propose building a deep learning system from the large data sets of more recent earthquake events.

Figure 3 shows the typical process of building deep learning systems from large sets of data. First, data analysis will be performed on the data set to identify the significant elements of the earthquake event and the significant damage to each type of structure. The result of this analysis will be a set of extracted features, which reflect the meaning of the data set. A model will be built to represent the extracted features in a uniform way. The model will be used to train the deep network of the learning system to identify the same significant elements in new data sets. Other data sets from different earthquake events can be used as test the learning network.

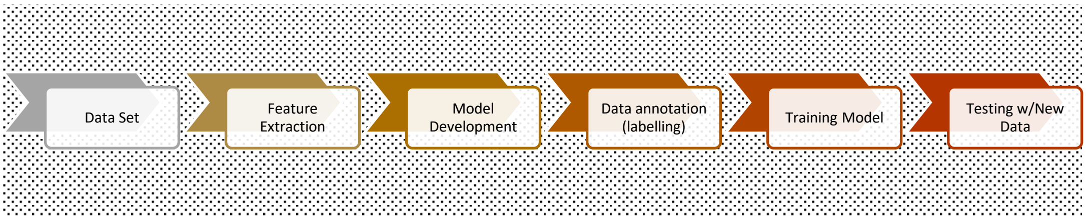


Figure 3. Deep Learning process work flow

The trained network can be adjusted and re-trained with more data sets from other sites to ensure that the results are applicable more generally to a wide variety of earthquake events.

6. Conclusion

Earthquake events cause significant damage to historic buildings, especially those which were built before any earthquake building code was in place. The number of historic structures that were damaged by recent earthquakes is very large and the types of observed damage varies widely. There is a large volume of data generated from the recent earthquake events, which offers the opportunity to perform analysis and extract insight about the effect of earthquakes on historic buildings. This type of analysis can be performed by a deep learning system that is built from models of the collected data.

The lessons learned can be used to restore damaged historic structures and provide guidance to preservation projects.

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12.
MOULD REMEDIATION IN HERITAGE CONSERVATION USING UVC

Victoria Pearce
Director and senior conservator at Endangered Heritage Pty Ltd Canberra Australia.

Abstract

Mould is a serious deterioration agent in small artifacts i.e. books and leather, and in organic materials found in large technology items and built heritage sites. Mould causes loss of surfaces, details, and structural strength, resulting in irreversible damage to the integrity of heritage items.

Mould can cause serious illness and even death. The effective treatment of mould to provide safe working environments that eliminate human exposure is a critical area of research, with extensive additional benefits to the material heritage in collections.

This paper explores the use of UVC for mould remediation in heritage conservation. Using established data from journal research in the medical and water sanitation industry, experimentation was designed to test the efficacy of using UVC to kill mould in book and paper materials. Exposure over differing time periods was tested on processed paper pellets with fruiting mould and fungi. Total eradication of mould and fungi exceeded expectations and has encouraging results for further research.

The follow up cleaning and removal of mould and mildew by products is more effective following UVC treatment than alternative treatments improving the aesthetic appearance of a heritage artifacts stained by mould.

This preliminary work has implications for preventing bio-deterioration in built heritage post flood or excavation, bio-deterioration in desalination treatments of underwater archaeological finds and for the treatment of small artifacts in the conservation laboratory. The development of a protocol for built heritage interiors is discussed and hazards of using this radiation source are covered in this paper

Keywords: UVC, Mould, Remediation, Bio-Deterioration, Disaster-Recovery

1. Introduction

In the past 10 years Endangered Heritage has been using UVC for mould remediation in movable heritage and recording the findings of exposure on paper, wood, leather, textiles, painted surfaces and other organic material. The benefits have proven outstanding to both the artifacts and to human health from risk to exposure to moulds. The team continue to do further research with the aim of establishing an international protocol for mould remediation for a variety of high risk heritage applications, in particular a call for professional collaboration in built heritage.

2. Mould risk and dangers

Mould is a type of eukaryotic (fungi), which grows in multi-celled filaments called hyphae. These are organisms, which derive their nutrients from the biochemical digestion of the substrate. They can cause an extensive amount of damage to the host material. Once infected, the breakdown of the host leads to secondary population of other micro-organisms which all contribute to further bio-deterioration. The bi-product of the mould biochemical digestion (enzymes and acids) are referred to as mildew and is often the visual evidence of the presence of colonized mould. Killing of the mould hyphae is the deactivation of the organism and it is not the same as the removal of the staining-mildew. Removal of this visual staining/mildew can require further bleaching or chemical treatment and occasionally layers of paint, render, or other surface finishes are added obscuring the original surface and trapping the bio-deterioration beneath the paint, where it can continue causing unseen damage or lay dormant until another damp cycle.

The presence of fungi and specifically mould in historic objects is a significant cause of damage to both the structural integrity of the artifact and the aesthetic value of an artifact. There have been many historic treatments for the killing of mould and followed with yet further chemical treatment for the reduction of the mildew, however most of these are further chemically damaging to the artifact. Some of the secreted enzymes and acids can be dangerous to human health. Moulds, once advanced, will form fruiting bodies (spore cases) on the hyphae filaments, which, if conditions persist will ripen, spreading tens of thousands of spores for reinfection of the substrate and other adjacent materials. Airborne spores are easily inhaled and pose a further health risk. If conditions do not persist, spore cases act as a protective shell protecting spores from chemical treatment and deactivation. For this reason, many traditional treatments for moulds are non-permanent as treatment is effective for only the active mould and does not impact on the protective spore cases. It must be noted that the biochemical residue of some moulds is hazardous to human health, even if the mould is deactivated.

White vinegar, biocides, peroxides and disinfectants have all been reviewed and used

with varying success historically. Most of these have had long-term deleterious impacts to the artifact in the years following treatment. Most rely on leaving a damaging pH on the surface in order to create a hostile environment inhibiting the flourishing of spores. This damaging pH, usually in the highly acid or very alkali range, can also dissolve organic finishes and decoration. Some treatments reduce the mildew staining but do not remove or kill the spores from the mould, meaning that at high humidity regrowth is almost certain.

The World Health Organizations "Indoor air quality; Dampness and mould" report focuses on air quality for workers and occupants of damp and infected building sites and details the deleterious effects moulds have on short- and long-term health outcomes. These include respiratory disease, immunological diseases and in extreme cases even death. A person in good health can be exposed to mould spores and their immune system will remove spores with little ill effect, however prolonged exposure or primary weaknesses in the immune system can reduce the resilience to exposure. In the case of built heritage assets, mould is a regular and known issue. While many traditional indigenous building techniques were once resilient, changes in custodianship, changes in climate, rainfall and topography immediately around some buildings has made them increasingly vulnerable to disaster flood events. Increased urban growth causing accumulated run-off of water, and even changes in ground absorption of moisture from reduced forestation in proximity to sites are known contributing factors in the increased moisture egress into built heritage sites. Globally, urban planning for hundred-year floods is changing in recognition that excessive water events are no longer once in a centaury event. Heritage buildings are vulnerable to flooding and issues of access, staffing, funding and political expediency complicate efforts to mitigate the damage. Buildings with applied surface design such as wall friezes, or wall-paper, can be problematic, as it is often difficult to remediate the mould in a timely enough manner to prevent irreparable damage. The clean up and conservation can take a prolonged period of time, exposing workers to unacceptable repeat exposure to mould and spore hazards. [1]

It is important to understand the presence of mould can potentiate other exposure hazards in a building by making that hazard mobile and increasing absorption in to the body. Or example lead paints, toxic pigments such as mercury sulphide, cadmiums and other heavy metals, once bound to a substrate can become airborne as the moulds break down the binder (e.g. egg, animal glues, starch) and the moulds absorb the metal

[1] The author respectfully wishes to acknowledge the death of her sister in law, Tania Gibbs at aged 34 from mould infection to the lungs following a winter bout of influenza. Exposure occurred at work as a dog groomer, with repeated exposure to mould from damp pet hair.

particles once bound in the art work of the walls or friezes. The absorption of these compounds by the body is also increased in the presence of mould. Proximity to heavy metals when well bound is a fairly low risk, but when impacted by mould the risk rise considerably. In some country's workers lack personal protection equipment and adequate knowledge to enable safe conservation of these heritage sites.

Growth of mould is dependent on a food source i.e. organic nutrient from the substrate, this is commonly wall paper, painted surfaces, wood, paper, textiles, leather and even straw, hair and other inclusions in traditional building materials. Mould treatments of movable heritage commonly uses sunlight or a 70% ethanol: 30% v/v water mix sprayed on the mould. This treatment uses the spore case's own reflex to open in the presence of water, at the same time, the presence of alcohol desiccates the actual spores. While effective, this treatment is not always appropriate. [1] There can be damaging effects resulting from using alcohol, causing dyes to bleed, pigment paint binders to break down and the desiccating impact of alcohol can impact paper and textiles, particularly leather and silk surfaces, leading to further staining and shrinkage on drying. Treatment using exposure to sunlight requires over 15 minutes of strong sunlight, possible for movable heritage for some sites and in some countries, but sufficient sunlight is not always available in all locations or during all seasons. Further, sunlight is not as effective in breaking spore cases filled with spores. In both the above mould treatment options the mildew remains a persistent issue requiring additional treatments in order to return aesthetic value. [2]

Traditionally, air circulation is also used as the principle way of slowing mould growth. Unfortunately, air circulation is also the principle mechanism responsible for circulating and spreading mould spores. Many different treatments including vinegar, alcohol, disinfectant and bleach have been recommended for treating mould in built heritage. All methods leave a chemical residue which often does significant secondary damage.

3. We have been using UV in heritage conservation labs UVC is a new tool

Ultraviolet light has always been blamed for fading in museums[3] and light energy is always a source of cursing to custodians. However ultraviolet light has been used for

[1] The author wishes to acknowledge that the use of ethanol is not allowed on religious grounds in some countries and that the large amounts necessary to remediate some built spaces would be hazardous, intoxicating and prohibitively expensive.

[2] Aesthetic value is important to secure respect, funding, visitation and appreciation of cultural artistry.

[3]

conservation purposes and is a very useful tool in the care of museum artifacts collections and heritage buildings and sites. Ultraviolet light is used to examine art work to induce visible fluorescence of some pigment's moulds and binders. Conservators use UV light to detect otherwise invisible marks and clues to forgeries and hidden underwork in layers of paint or multiple over layers of varnish. The use of UVA is the most common historically for this purpose and is referred to as black light or woods light. UVA has been used as a sunlight substitute on bad weather days to expose mould and the exposure time taught to be 15minutes per side. UVC is far more effective and requires much less time to sterilize works so that the over all light exposure time is reduced and the risk of damage is also reduced. Light energy breaks molecular bonds to be sure, but mould is much more damaging and spreads in a very uncontrollable way in the right conditions.

Ultraviolet light is non visible light and covers a range of frequencies.

- UVA1: (340-400nm), UVA2: (320-340nm). (Black light)
- UVB (290-320nm)
- UVC (180-280nm) (germicidal)

UVA penetrates deep into the dermis causing wrinkles and photo aging it will transmit through glass. UVB impacts the surface of the skin and causes cancer but does not transmit through glass. UVC is cancer causing mutating cell DNA. UVC does not penetrate our atmosphere normally and therefore using UVC for sterilization is possible, as no earth-bound micro organisms have resistance to it. UVC is a highly hazardous form of radiation and as a result its application will have limitations in some jurisdictions. UVC causes cancer due to high cell damage and mutation resulting from exposure. Using UVC requires a strict protocol in the work place. For this reason, formal accreditation for users is required.

The use of UVC for sterilization and sanitation of water, foods and air borne pollutants has been widely investigated and researched in other sectors. The results of this research have led to Endangered Heritage carrying out lab based experimentation over the last 10 years, by way of using a UVC light source and exposing mould affected artifacts for short exposure times.

4. UVC use in a heritage conservation laboratory

Initially a UVC globe was used in a black polypropylene tub with a lid. Items, which had mould were placed inside with the electrical cord of the light extending to the next room and being switched on remotely so no exposure to the light source was possible by conservation staff.

Mould treatment has been carried out in this way on an extensive variety of organic materials from leather, paper, textiles, plastics, painted surfaces etc. Exposure time was initially guided by exposure times found in water and air sanitation literature, with exposures of between 15 and 25 seconds being used, depending on the visual appearance of the object and how deeply the hyphae appeared to have penetrated. Following exposure, items were brush vacuumed to remove mould hyphae and associated soil. Post treatment the odor of mould has been found to be no longer evident. The reinfection of mould has thus far not been reported on any artifacts. The author is sure that clients possessing mould treated items would bring them back for follow up treatment were mould to re-occur. Unfortunately, assumptions such as this are not scientific, and thus it has been timely to do some checking on what has become a common place remediation practice in order to verify the treatments efficacy.

In 2018 a series of experiments were carried out to develop a more precise protocol and establish improved recommendations regarding exposure time.

5. Experimental design

Paper pellets dampened and infected with mould scraped from mouldy book spines were weighed into 50gm quantities and placed in sterile polypropylene bags. A slit was placed in the bag with a cover of micro-pore surgical tape, so as to allow air exchange but without cross contamination occurring. Once mould had colonized on all of the samples, the contents of the bags were placed in a glass dish and were then exposed to UVC, with individual samples being exposed over a range of durations: five, ten, fifteen and thirty seconds. The contents were returned to a new sterilized bag with micro pore tape. The mound infested control was not exposed to UVC. Following exposure, the bags were placed in conditions conducive to mould growth. The experiment was repeated 5 times and the results were the same in all cases.

6. Results

It was anticipated that the mould regrowth would be varied according to exposure time or, that there may be particular species of mould which remained active, identifiable by the colour or location of the colony. The results showed that none of the bags re-grew mould, except the non-UVC exposed control. Notably the characteristic odor of fungi and mould was no longer evident in any of the exposed bags. The control remained pungent. These results delievered little data upon which to extrapolate. No experimental design expects 0 data from all samples. The experimental results do explain why we have not had any reinfection of mould on artifacts treated in the lab during conservation treatment.

7. Observations

Over the course of using UVC in the last 10 years another observation in practice is notable. The removal of the mildew and hyphae from the substrate has not required mechanical or chemical treatment e.g. abrasion or bleaching, following exposure. Simple brush vacuuming has been sufficient to remove the residue and in many cases the resulting surface has little or no visual[1] mildew staining. Black mould on textiles remains the most problematic staining to remove. Further consultation with a mycologist is necessary to understand the precise reaction that mould has when exposed to UVC. It appears to recoil and loosen its attachment to the substrate in most cases. It remains startling to the author that the results show near absolute removal and little staining, requiring minimal secondary conservation treatment. Following UVC exposure there is minimal damage and no odor of mould. The exposure time is also short enough as to show no visible colour fading to the artifact.[2]

In recent months Endangered Heritage pty ltd has set up a small germicidal treatment room with an installed UV light source. The source is switched from outside of the room and the circuit has a red warning lamp mounted next to the door which is wired in parallel with the switched circuit. If the exterior warning lamp is lit we know the interior UVC light is active, significantly increasing the safety of staff. Germicidal units are commercially available from suppliers but it has been found that they are too small to be of use on heritage artifacts. Our treatment room can accommodate carpets, garments and larger scale items.

8. Built Heritage and Sites

The success of the mould treatment has been inspiring and has encouraged us to carry out testing in the area of built heritage. Mould is often the more significant bio-deterioration factor post flood, slowing repair and damaging authentic decoration and frescos. Damage to buildings from mould is also common following fire, due to fire suppression systems, and other natural disasters.

It is hypothesized that treatment by means of the use of UVC in a bulb within the rooms of built heritage sites would be beneficial in protecting the heritage from deterioration while reducing the mould inhalation risk to site personnel. Globes can be activated from a long electrical cord outside of the building, preventing any exposure to staff. It is the aim of the author to pilot a project in multiple countries using the same protocol to develop an international standard and protocol for the effective treatment of

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[1] To the naked eye or low-level magnification

[2] The slight amount of fading is always likely with follow up chemical or mechanical treatment. So the fact there is no noted fading as a byproduct of treatment is a significant improvement in treatment outcomes.

built heritage sites and the safety of conservation practitioners.

9. Issues when treating a building

Mould spores are everywhere and reinfection will come on the breeze, however the food and moisture supply required for mould growth is inhibited by UVC exposure. Re-exposure of rooms or areas by means of short bursts at the beginning of each working day would significantly protect staff from risks associated with the inhalation of live spores. Small exposure times will not appreciably damage the art present within the building, certainly not as much as would result from unfettered mould growth.

Treatment need only persist for as long as the building conditions are damp enough for reinfection to occur and the application of slow dehumidifiers and fans may reduce the need for re-treatment. There already exists a large number of products on the market which use UVC within air filtration systems drawing air from the contaminated site into the filter past UVC lights which sterilize the air, which is then expelled back into the open space. Once surface treatment and exposure are complete, the space can be maintained with dehumidifiers and an air filtration system utilizing UVC.

Light exposure can be repeated and (given the data from the food industry) damage to paint binders and other organic material should be minimal. Further research within the heritage context is desirable. The use of UVC in the food industry also show no effective difference in damage levels to organic materials regardless of the UVC sources used, be they mercury lights or LED based.

Using a light source in a room with an unobstructed direct line of sight to the wall and exposure times of 25 seconds is anticipated to be long enough for most surfaces, even materials such as cloth, wall paper etc. If there are soft furnishings or carpet then it is important that the UVC light source be moved to ensure direct line of sight exposure to the entire interior. Treatment distances have not been documented in the research literature currently available however a distance of between 1-2 meters has been found to be effective in our UVC room on small movable items. It is recommended that moving the light around a room and keeping the distance to walls etc at 1-2 meters from the light source rather than treating at greater distances either for longer times or with higher powered sources is preferable, however this is an area which requires further experimentation.

Australia has recently been in drought for the last 10years and mould has not been a significant issue in our built heritage. The drought ended with spectacular raining the southern states at the beginning of 2020 with hail storms and flooding in some areas. However due to Covid 19 restrictions, planned experimentation was not able to be carried out and access to some sites limited to prevent spread of covid into isolated areas.

It was hoped that by GA2020 in October it would be possible to disseminate this research and call for partners within ICOMOS community to carry out further testing in their own countries. Currently the author is working with Signify Pty Ltd[1] to develop a protocol and accreditation for users in the heritage sector to increase safety of this technology.

10. Summary

Scientific research is the search for solutions to problems, often in small incremental steps. The use of UVC in laboratory conditions for over 10years developing a safe workplace procedure and the consistent observation of mould remediation with minimal impact on artifacts is a significant beginning.

The use of UVC air filtration systems in art store rooms and display areas with high humidity, is highly recommended and a very cost-effective way of managing mould without the damage of cyclic temperature and moisture conditions, common with air-conditioning system.

The use of UVC light for mould remediation in built heritage is too simple and too effective to ignore and partnered with fans, dehumidifiers, and air filtration can very quickly create a safe working environment for conservators and heritage experts post disaster. UVC accreditation is necessary for staff but once done the inclusion of UVC LED globes (with accompanying personal protection screening masks etc) in disaster kits should become standard practice.

The team at Endangered Heritage Pty Ltd are actively furthering this research and hope that the quality of life of heritage staff are positively impacted by the results.

11. Further research currently being undertaken by the Endangered Heritage staff

- "Use of UVC in book conservation and mould remediation of bound papers" Bacon, I
- "Use of UVC on Leather and wood as seen in edged weapons and scabbards" Harper-Pierruse, A
- "Electrical circuits and the germicidal room design for heritage objects, exploring wavelength frequency and exposure times" Pearce, A
- "Using UVC for mould remediation inside large technology objects in museums where access is impossible" Pearce, A
- "UVC for sterilization and prevention of bio-deterioration of archeological marine artifacts during desalination processing" Colville, B

[1] Signify pty ltd formally known as Phillips

- "Use of UVC in treating large volumes of museum and library artifacts post flood disaster" Pearce, V and Colville, B

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13.

PRESERVING BUILDING CHARACTER FOR CHARACTER BUILDING AT THE GOVERNMENT HOUSE IN ANTIGUA AND CLIFTON PARK IN BALTIMORE: *"TWO CASE STUDIES IN COMMUNITY ENGAGED REPURPOSING OF PRIVATE ESTATES TO PEOPLE'S PALACES"*

Professor Samia Rab Kirchner, Ph.D.[1], Professor Barbara Paca, Ph.D.[2]
[1] School of Architecture and Planning, Morgan State University; Chair, Morgan Internationalizing of Education Committee
[2] O.B.E., Department of Anthropology, University of Maryland, College Park; Cultural Envoy to Antigua and Barbuda

Abstract

Rising inequality across the world poses a critical challenge to the implementation of UN Sustainable Development Goals (SDG) 2030. The legacy of slavery that shaped intergenerational wealth disparity across the African diaspora anchors local mistrust of globally regulated policy systems. Though many historic estates are repurposed to museums for tourists and private event venues, each chooses to represent the history of the space in its own way; and very few preserve and present the legacy of slavery. Thinking historically in the present, these properties are functioning as stages for reparation enhancing deeper understanding and respect for the African Diaspora.

Our paper examines two former estates, Antigua's Government House in St. John's, and the Clifton Mansion in Baltimore, where custodians have engaged communities in preserving the building character and present shared histories of the sites to build character of marginalized citizens. Both properties serve as exemplary award-winning models for cultural institutions across the world. They embody cutting edge practices in low-cost conservation for empowerment, where the building character preservation becomes a catalyst for character building of marginalized communities. The positive impact of these approaches on tourism is obvious, particularly for sophisticated travelers, who now gravitate toward destinations with inclusive approaches to embracing complex, shared and contested histories. Particularly now, when the pandemic and Black Lives Matters Movement have given us pause to rethink the motivations behind encounters with other cultures.

Keywords: Caribbean, Baltimore, Slavery, Plantations, Shared Heritage

1. Case Study 1 - The Government House of Antigua and Barbuda: The People's Palace

Every house has a story, and behind the imposing facade and its creaky floors, Government House shares a forward-looking narrative centered on the storied site of Antigua and Barbuda's "People's Palace." Once a symbol of British colonial oppression, today's Government House is a living testament to overcoming the adversity of slavery to achieve a sense of national autonomy that nurtures a flourishing cultural identity.[1]

Today's leaders in Antigua and Barbuda descend from the people who built the structure at the dawn of the nineteenth century, establishing the property as a profound site of Caribbean history with universal resonance. Situated in the capital city of St. John's, Government House was originally the principal seat of British colonial authority in the Leeward Islands; and is noted as the largest wooden Georgian structure in Antigua, and the primary seat of government power.

In telling the complex story of its historic, architectural, and aesthetic significance, our narrative engages and honours all persons who have played a part, encompassing indigenous Arawaks, Caribs, and enslaved Africans through the periods of colonialism, slavery, emancipation, and independence. Through extensive research aided by the miraculous survival of artifacts, archival papers, photographs, and oral histories, our analysis offers a rare, empowering study of the population, and their journey toward international excellence.

As with the resilient people who labored there, the Government House buildings and the surrounding pastoral landscape have survived against all odds. Commissioned by Ralph Payne (1739–1807), the first and last Baron Lavington, prior to beginning his second tenure as Governor of the Leeward Islands in 1799, the main structure has withstood fire, earthquakes, hurricanes, and now climate change.

Of perhaps greatest significance is the West Wing, a long masonry structure recently identified as the largest and most intact slave quarters within the Caribbean region. The long lists of enslaved persons from Antigua's vast Carlisle estate, the ancestral family seat of Lord Lavington, provides clues to those who built and lived in the lodgings behind Government House. Their names are preserved at Yale University's Beinecke Library in eighteenth-century ledger books, and listed among common livestock as the chattels of his family.[2]

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[1] *The Conservation Management Plan for the Government House Restoration Initiative,* © November 8, 2018, ISBN 978-0-578-41651-9, p. 1. Barbara Paca wishes to thank everyone who contributed to the document that guided the achievements made at the Government House over the past six years.

[2] For more information regarding Yale University's Beinecke Rare Book and Ms. Library lists of enslaved persons owned by Lord Lavington, please refer to the, "Guide to the Ralph Payne, Baron

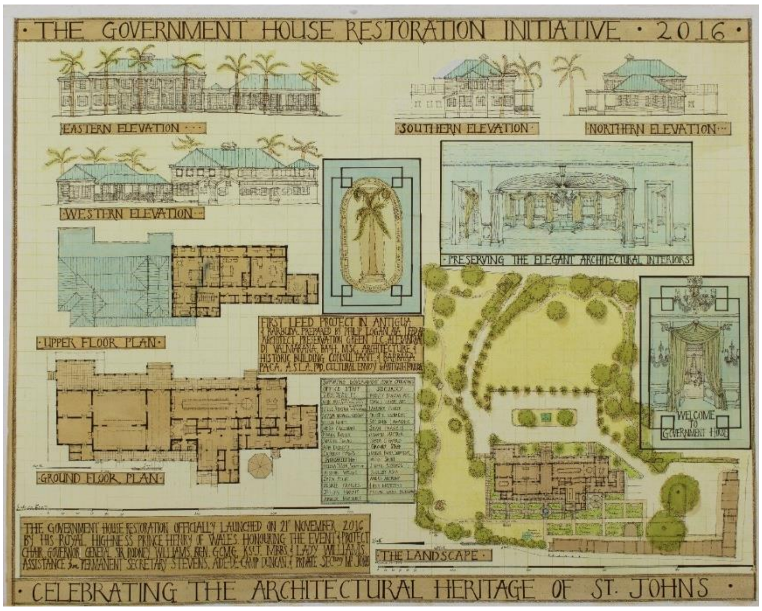

Figure 1: The Government House Restoration Initiative, prepared by Preservation Green LLC, NYC. - © Photograph by Philip Logan, Architect

1.1 Strange Beginnings

Every good story has a villain, and at Government House it is Lord Lavington, a man who was profoundly racist. Lord Lavington was extreme in his bigotry, as is recorded in a surreal contemporary account:

> *His lordship, it is said, was a very hospitable man, and very fond of splendour; his Christmas balls and routs were upon the highest scale of magnificence; but he was a great stickler for etiquette, and a firm upholder of difference of rank and colour. It is asserted, that he would not upon any occasion, receive a letter or parcel from the fingers of a black or coloured man, and in order to guard against such horrible defilement, he had a golden instrument wrought something like a pair of sugar tongs, with which he was accustomed to hold the presented article. In his household he was also very particular. He had, of course, an immense number of attendants, but he would not allow any of the black servants to wear shoes or stockings, and consequently his ebon footmen used to stand behind his carriage as it rolled along, with their naked legs shining like pillars of jet, from the butter with which, in accordance to his excellency's orders, they daily rubbed them.* [1]

Lavington Papers," OSB MSS 138, which is an excellent finding aid prepared by Diane J. Ducharme in March, 2009.

[1] Attributed to Mrs. Flannigan, *Antigua and the Antiguans: A full account of the Colony and its Inhabitants from the Time of the Caribs to the Present Day*. 2 Volumes. London, Saunders and Otley,

It was against this morally unsustainable backdrop created by Lord Lavington and his supporters that abolition ensued, and a new nation was born in spite of their efforts. In his second appointment as governor, Lord Lavington was brought back to Antigua to pacify the fears of white planters who were worried about the abolition of slavery. Planters were getting rich from sugar and the slave trade in Antigua against a backdrop of environmental and social calamity. Earthquakes, fire, drought, and failed slave rebellions plagued Antigua throughout the 18th century, forcing the population to focus on day-to-day survival. Since the first major rebellion in 1729 and again in 1735, people were restless and fearful of slave insurrections. By 1760 the first Methodist church promoting education for people of color was established by Nathaniel Gilbert, who was a Methodist and Speaker of the House of Assembly in Antigua.[1] Lured by the promise of a grand new Government House commissioned by a top English architect such as Sir John Soane (1753–1837) or James Wyatt (1746–1813), he ruled with a bizarre opulence that led to two lavish construction projects.[2]

Whilst awaiting the official building, Lavington opted to reside at the Deanery, a spacious property near the land that eventually became the site of Government House. Lavington demanded a two-storey addition be built on the property for extravagant entertainments and relaxation as well as separate quarters for his private secretary. Theoretically, Lavington was conducting the office of Governor from the land dedicated to the mission of the Anglican church; however, it devolved into a spot of excessive partying, with the Governor often too hungover or ill to report to work.

Recognizing the significant shortcomings of Lord Lavington, Treasurer Thomas Norbury Kerby quietly began to purchase plots of land in 1805 located between the town and the barracks and marching grounds. This strategic move led to the siting of today's Government House, and resulted from an understanding of the axis of power that ran through the City of St. John's: from the north to south there was the parsonage, courthouse, and cathedral–and from the east to west lay the barracks, marching grounds and plots of land along the old Barracks Land. [3]

The English Bill to abolish slavery passed in February 1807, and with that an increasing concern of how Antigua would remain economically viable. Against that

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1844. Reprint, MacMillan Education Ltd., London, 1991, Vol. I, pp. 136-137.

[1] Thomas Southey, *The Chronological History of the West Indies* [1827], p. 340.

[2] National Archives of Antigua and Barbuda, ROE book 334B, Loc. NO HO1274, ff 103-105, May 21, 1801.

[3] Vere Langford Oliver, *The History of the Island of Antigua, one of the Leeward Caribbees in the West Indies, from the first settlement in 1635 to the present time,* London, Mitchell and Hughes, 1894, Vol II, p. 246. Also, refer to NAAB, ROE books 335-337, Loc. NO HO1275 f. 37, 18 June 1805.

backdrop, Lord Lavington continued to hold fetes until he died at Government House on 3 August 1807. 68 years of age, Lord Lavington should have been thinking of his wife's future; however, through his recklessness and opulent lifestyle, he left his estate in financial ruin. Upon his death, his temporary structures were dismantled and attached to a stately home on Norbury's properties to create today's Government House. It is interesting to note that even though the slave trade had been abolished earlier that year, there were many enslaved persons in Antigua over the next twenty-seven years, including at Government House. Treasurer Kerby appointed "two trusty slaves" to live on the property throughout the construction process, where they were expected to take care of the property, preventing "any injury to the Buildings or Garden."[1]

Ironically, Lavington was replaced by the noted abolitionist Sir Hugh Elliott, who served as Governor of the Leeward Isles until 1814. After the abolition of slavery in 1834 and throughout the nineteenth century, Government House remained central to social and political activities in Antigua and Barbuda, with governors rotating on average every five to seven years. In a climate of relative political stability, the governors and their staff were challenged in their role of protecting the site from fire and extreme weather.

1.2 Equality and Inclusion at Government House

The mid twentieth century saw the arrival to Government House of Lord Oliver Risdale Baldwin, the Second Earl of Bewdley (1899–1958). Ahead of his time as an openly gay man, Baldwin served as Governor of the Leeward Isles from 1948 to 1950, marking one of the most celebrated periods of enlightenment at Government House. In spite of his privileged birth into an aristocratic family, he was an outsider and had an awareness of injustice which led to deep compassion for others. It was Baldwin who first brought diversity to Government House, hosting parties that shocked the colonial planters when more than half of his guests were people of color. Immediately upon his arrival, Lord Baldwin resolved labor strikes, brokering peace between the white planters and the workers, who were mostly people of color. As a person who suffered political incarceration, he had empathy for the prisoners and included them in meaningful work programs at Government House. In Lord Baldwin's address to the Legislative Council acknowledging his contributions after eight months on the job, Baldwin spoke of his arrival, encountering a lack of water, lack of employment, lack of sympathy between the various classes of the community, countered by a majority who sought positive change. The Governor shocked his peers when, during his speech, he

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[1] National Archives of Antigua and Barbuda, ROE book 337, Loc. NO HO1275, ff 12-15, April 6, 1809.

made a confession of his life of incarceration: “Being the only Governor you have had who has been in prison, I naturally take an interest in that unfortunately necessary institution and I hope that shortly we shall reform our prisons...Having worn chains myself, I have had them abolished for good and all in our Colony.”[1]

Baldwin’s political views were in sharp contrast to his father Stanley Baldwin, Conservative party leader and three-time Prime Minister to the Queen. And given his sexual orientation, Baldwin’s personal life was far from that of a conventional colonial governor. Once opening a speech with “Having worn chains myself,” Oliver Baldwin identified himself as the only governor who knew what it was like to be imprisoned. He was, in fact, incarcerated twice. First, when he was apprehended by Bolshevik revolutionaries while fighting for the Russian Empire, and again, in Turkey, where it was suspected that he was spying for the Russians.

Lord Baldwin’s Private Secretary, Ross Hutchinson, who was also openly gay, made it his mission to document Baldwin’s empathetic role in empowering the underrepresented. With Lord Baldwin’s blessing, he recorded critical inaugurations held at Government House, including the Antigua Art Group, the first steel pan performances (remarkable in a country where drumming was banned from times of slavery), as well as true Antiguan Carnival in which the John Bull character was accompanied by a Whip Man (essentially a white character being oppressed by a person of color). Through images and writing, Private Secretary Hutchinson created an inclusive account that was submitted as a screenplay to an agent in Haymarket, London, but ultimately was not produced. His photograph albums portray Government Houses’ inclusive daily life activities and normal, respectful interaction among a diverse population, with Baldwin quietly smiling in the background.[2] The enduring tenure of Baldwin and Hutchinson left a legacy beyond aesthetics and an acute understanding of the importance of historic preservation: their commitment to improving the quality of life for Antiguans and Barbudans endures to this day.

1.3 The People’s Palace

Celebrated today as “the People’s Palace,” Government House presents shared legacies of the country's history. Government House’s story today reflects the calm, confident leadership of Antiguans and Barbudans through the lens of the Government

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[1] “General Legislative Council Speech by H.E., The Governor of the Leeward Isles, Lord Baldwin.” December 8, 1948, Cambridge University Library, Rare Books and Ms., Add. 9735/2/7/vi.

[2] Ross Hutchinson, “Leeward Letters: Being an epistolary account of some eighteen months in the Leeward Islands as Private Secretary to His Excellency, The Governor, The Rt. Hon., The Earl Baldwin of Bewdley.” Cambridge University Library, Rare Books and Ms., Add.9735/14/2/12.

House Restoration Initiative, which was officially launched by Prince Harry in November 2016.

As the seat of the current Governor General of Antigua and Barbuda, Sir Rodney Williams, Government House is where he fulfills his role as the representative of Her Majesty Queen Elizabeth II, the Head of State of Antigua and Barbuda. Working closely with a supportive government, the property's transformation is unparalleled in the Caribbean as a model of collaboration in support of social cohesion.

Today the property is significant as one of only two properties in the Caribbean to receive placement on the World Monument Fund's Watch List (2018). This accolade was achieved for its uniqueness as the most extensive surviving Georgian wooden structure, slavery quarters, and historic fabric; however, the unique approach to community building at all levels is largely behind the honor. Nearly every aspect of the project reflects a will for social change and associated positive outcomes. Government House is the first LEED-registered property in the region, and the Initiative exemplifies the successful union of conservation, inclusion, and sustainability—setting standards in cutting-edge conservation and for best practices to withstand severe weather events.

The Government House Restoration Initiative offers training programs for youth, people with disabilities, older people who are unable to find jobs, professionals with an interest in sharing their expertise, teachers, and the incarcerated. NY neurosurgeon Dr. Caitlin Hoffman and landscape architect Dr. Barbara Paca designed a therapeutic garden for the differently abled and persons who suffer from chronic stress disorders. And this has been the site of a successful program with members of Her Majesty's Prison Rehabilitation Programme in the building trades and historic preservation to allow technical skills of the incarcerated to be developed for a stipend accessible upon release, serving as a bridge to ease their re-integration into society.

The diverse team behind the success of the Government House project have worked carefully to preserve not only the fabric of the building, but the spirit of Antiguans and Barbudans. Thanks to thoughtful coordination, the community has remained engaged through all phases of design, construction, and implementation. This collaboration is, in itself, a healing process, as the community comes together to provide a brighter future for all citizens of Antigua and Barbuda for generations to come. [1]

[1] Barbara Paca, *The Conservation Management Plan for the Government House Restoration Initiative,* © November 8, 2018, ISBN 978-0-578-41651-9, p. 75.

Figure 2: Sir Sylven and Kathleen, Lady Walter in the dining room of the Government House.

The philosophy behind the project echoes the eloquent words of First Lady Obama in 2016, when she gazed out the window of her home, which at that time was the White House:

> *I wake up every morning in a house that was built by slaves. And I watch my daughters, two beautiful intelligent black young women playing with their dogs on the White House Lawn.*[1]

2. Case Study 2 - Clifton Mansion in Baltimore: *"An anchor to a private estate and a city park"*

> *Clifton Park, near Baltimore, the residence of Johns Hopkins, Esq., is unquestionably one of the most elaborate places in this country. We remember no other, where in addition to a fine and costly house, there is so large a range of glass, with such diversified and extensive grounds; the varieties of trees, shrubs, walks, lawns, large pieces of ornamental water, containing numerous islands planted with masses of rhododendrons and evergreen shrubs, and connected by appropriate and tasteful bridges, are all, certainly, much in advance of any other place we know.*
>
> *Andrew Jackson Downing and Henry Winthrop Sargent, 1859*[2]

1 Michelle Obama, Speech, Democratic national Convention in Philadelphia, July 25, 2016.

2 As cited in Lauren Emily Schiszik, Masters Thesis in Historic Preservation, The University of Maryland College Park, 2010, p. 34.

Figure 3: Clifton Mansion, home of prosperous merchants located in one of the city's most widely used public Park, was listed in 2007 on the Maryland's National Register of Historic Places. - © Photo Peter Kurtze, 1995

Located inside Clifton Park on 2701 St. Lo Drive, the Clifton Mansion was built in 1790-1803 as a country home by Henry Thompson, a prominent Baltimore merchant. He operated the roughly 260 acres around the country home as a farm worked by paid employees, indentured servants and slaves.[1] (See Detail 1872 Map "New and Enlarged Map of Baltimore City, Including Hampden, Waverly, All the Parks, and a Miniature Map of the State" published by John F. Weishampel Jr. Courtesy of Enoch Pratt Free Library, Maryland's State Library Resource Center, Baltimore, Maryland).

2.1 Johns Hopkins Estate

Johns Hopkins purchased the mansion in 1840 and hired Niernsee & Neilson in 1851 to remodel the Mansion in the Italianate style, adding formal rooms and an imposing stairway and tower from which one may still find a magnificent view of the city and its harbor. He also turned the farm into an English garden. (See 1874 Map of "The Johns Hopkins University Grounds Clifton" surveyed and published by Simon J. Martenet. Courtesy of the Ferdinand Hamburger Archives, Sheridan Libraries, The Johns Hopkins University.) Hopkins purchased the 55 acres of Clifton and 101 adjacent acres at auction in 1841 for $15,000.[2] Since he was a fierce abolitionist and strongly supported the

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[1] "Best Park: Clifton Park". In Baltimore City Paper, September 17, 2008. Retrieved June 18, 2020: https://wp.issuu.com/citypaper/docs/v32_38_pt1/26.

[2] National Register of Historic Places, Clifton Park, Baltimore, (Independent City), Maryland, National Register # 07000941, Section 8, 3, citing Baltimore County Land Records, Liber TK 306, Folio 393.

Union during the Civil War, he turned the farm landscape to an English garden, and the homestead into a Mansion in an Italian Renaissance style.

The property assessment conducted in 1818 shows that Thompson owned ten slaves. While there is thorough documentation of the Clifton Mansion and the associated historic structures of the Clifton Park, archaeological survey is inconclusive and slave housing and burial sites are not accounted for in the documentary records of the Estate. Another undervalued asset on the original Estate is St. Vincent de Paul Cemetery, located within Clifton Park. The 5-acre parcel is not owned by the city and so is not part of the City's Master Plan for Clifton Park, and is not interpreted or maintained by the city. This Catholic cemetery was disturbed when the golf course was expanded by the city, bodies were not reinterred, and headstones were removed. The cemetery was also subjected to vandalism in the 1960s and has the potential for being the first archaeological site in the park worthy of being listed with the Maryland Historical Trust.

2.2 Baltimore City's Clifton Park

In 1895 the City purchased the estate at the end of the 19th century and turned it into a public park. A non-profit organization, Civic Works, now rents the CM as the headquarters for its community service and youth training programs. Listed on the National Register of Historic Places in 2007, it has a dynamic, multi-layered and racially unjust history shaped by relationship between the Baltimore City and Baltimore County. The Clifton Mansion is a locally designated Landmark and is listed on the Maryland Inventory of Historic Places.

During the 20th century, Clifton Park was the site of innovative practices in active recreation in the United States, with some highlights being the golf course and 3.5-acre concrete swimming pool constructed in 1916. The park also has important associations with the turnpikes of the nineteenth century, railroads, and the municipal water system and reservoir. For over 200 years, the stone house in Georgian style of the Clifton Mansion (CM) in Baltimore City has anchored the Clifton Park and adjoining communities' home to predominantly African American residents.

The Park is used for the Real Food Farm (RFF) to train people in farming, food safety andlandscaping. CM and the RFF present an economically sustainable model for building preservation and Community Supported Agriculture (CSA) providing dependable funding for urban farmers during the growing season. Adjacent to Clifton Park is the Coldstream-Homestead-Montebello neighborhood, which is statistically the most lethal of Baltimore's neighborhoods.

Johns Hopkins intended for Clifton to be the site of his University, and for almost twenty years following his death, it was owned and managed by the University trustees. In 1873, the same year as Hopkins'death, an article in Appleton's Journal of Literature,

Science, and Art describes the planned University grounds:

> *The magnificent estate of Clifton, just on the eastern suburbs of the city, and containing four hundred acres, is to be the site of a university, endowed with probably three million dollars. Clifton is the finest private property in the neighborhood of Baltimore…It is already parked out, and is prepared, with but little change, to become the free pleasure-ground it is ultimately to be, by winding paths and wooded slopes, tree-dotted meadows, exotic evergreens almost unsurpassed anywhere in the United States in size and symmetry, and vast ranges of conservatories filled with rarest flowers. In the midst of such surroundings will stand the buildings of the university, within the design of which is included a Law, Medical, Classical, and Agricultural School.*[1]

In 1895, the trustees of the Johns Hopkins University sold the remainder of Clifton Park to the City of Baltimore, having chosen another site for the University, on the grounds of another historic estate – Homewood. The 1896 Bromley Atlas depicts the Baltimore and Ohio Railroad Belt Line cutting across the southern portion of the park, and this was likely constructed while the University owned the property. For the first decade of city ownership, the park seems to have simply been used in the same manner that it was when it was owned by the University – that is, as a farm and semi-formal park.

In 1904, the city hired the Olmsted Brothers firm to develop a plan for a system of city parks. The Report Upon the Development of Public Grounds for Greater Baltimore outlined a plan for Baltimore ‘s parks that was akin to Boston ‘s Emerald Necklace, a network of six types of parks. While the city ‘s anchor parks, Druid Hill, Clifton, and Patterson, would be linked by smaller parks and parkways, the report did not have any great recommendations for within the grounds of Clifton Park. In 1916 and 1917, the City constructed a 18-hole golf course and the country ‘s largest concrete swimming pool, both publicly accessible. In 1962, Lake Clifton was filled in for the construction of Lake Clifton High School. Today, two schools use the building. The Public Parks Commission maintained extensive records of their additions and alteration to their parks, and these were published in annual reports.

The selection of another site for the Johns Hopkins University has had a negative impact on the adjacent neighborhoods, as the alternative anchor institution, Morgan State University is further away to the North and not in walking distance. While the

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[1] Appleton's Journal of Literature, Science, and Art., Vol. 9, No. 197-223, 1873 (New York: D. Appleton and Company) 596. As cited in Schiszik, Op.Cit., p. 64.

median price of homes in the Homewood neighborhood (site of the JHU) is $500,00, the CHM neighborhood has high vacancies and median price of homes at $30,000. The City's ownership of the former Estate has led to the decline in property values around Clifton Park and its leasing the Clifton Mansion to a non-profit organization, Civic Works, is meant to mitigate the stabilization of these "blighted" neighborhoods. Since becoming a tenant at Clifton, Civic Works has procured over $250,000 in funds to restore the building from the Maryland General Assembly, the National Trust for Historic Preservation, and the Maryland Historical Trust. Civic Works hired Chris Wilson to oversee the mansion 's restorations,[1] while focusing on the Park as a site for agriculture-led social justice programs.

3. Conclusion

The Government House and Clifton Mansion stand proudly as defiant models of confident independence within the diaspora. Though these historic places belonged to the ruling and aristocratic elites, the present custodians acknowledge past inequities charting a path forward to reconcile racial parities in a polarizing world. The reason these two historic places are successful is because each has taken a private estate and made it publicly accessible. Engaging the city residents and relation-holders in the process of restoration and rehabilitation, the present custodians integrate cultural resource preservation with capacity-building activities that enhance economic and resilience of local communities.

Both properties have contributed to increasing access to culture for everyone, through the enhancement of cultural infrastructure at neighborhood level, the development of education opportunities and the promotion of specific programs for disadvantaged groups. Both serve as models for cultural institutions across the world of lower cost conservation for empowerment, where the building character preservation becomes a catalyst for character building of marginalized communities.

The right to cultural heritage, diversity and creativity are core components of the Sustainable Development Goals (SDG) 2030. Both historic places we examined have used exclusive architecture to conduct inclusive activities that involve artists and professionals, making accessible participation in cultural life for citizens of all ages, gender, class and race. The positive impact of these approaches on tourism is obvious, particularly for sophisticated travelers, who now gravitate toward destinations with inclusive approaches to embracing complex, shared and contested histories.

[1] Schiszik, Op.Cit., p. 85.

Acknowledgements

Barbara Paca would like to thank His Excellency, Sir Rodney Williams, for inviting me to Government House with Sir Selvyn and Kathleen, Lady Walter in 2014. Over the past six years it has been a privilege to work with Their Excellencies, both of whom are visionaries, and their excellent staff in collaborating on their wish to open up the property to the people of Antigua and Barbuda as well as visitors. Partnering with Antiguan and Barbudan professionals, citizens, and public servants has been an experience I shall always treasure. Their Excellencies have created an atmosphere of warmth and inclusion, and the Government House family embraces all who enter through the gates. Equally, it has been a privilege to work alongside members of the international team, who have proven worthy collaborators as well.

Samia Rab Kirchner would like to thank Morgan State University students for their continued participation in guiding participatory design process in Baltimore City neighborhoods, Mr. John Cikot of Civic Works for allowing us to use the Clifton Mansion for community-engagement, and Mr. Mark Washington of CHM Neighborhood Association for partnering to connect students and residents at the Clifton Mansion.

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14.
POST-DISASTER EMERGENCY TREATMENT PRINCIPLE AND PROCEDURE OF CULTURAL HERITAGE FOR WIDE-RANGE MAJOR EARTHQUAKE- THE 921 EARTHQUAKE EXPERIENCE IN TAIWAN

Alex Yen[1], Chinfang Cheng[2], Chao-Shiang Li[3]

[1]China University of Technology, Associate Professor at Department of Architecture, Director of Cultural Properties Researcher Center.

[2 3]China University of Technology, Associate Researcher, Cultural Properties Researcher Center.

Abstract

When a major earthquake occurs, the national disaster relief system is often unable to integrate with the cultural heritage disaster prevention system immediately and effectively, resulting in serious losses of cultural heritage; this article will establish disaster assessment and rescue procedure to achieve effective emergency treatment of cultural heritage after major earthquakes. This research is based on the experience of the 921 Earthquake in 1999. Through the review of legislation and regulations, literature review, case analysis, and expert interviews, the research focuses on the emergency treatment procedure for each stage after the major earthquake.

1. The integrated system of cultural and non-cultural departments for disaster prevention of cultural heritage after major disasters.
2. Principle and administrative procedure for emergency assessment of cultural heritage.
3. Principle of emergency assessment training.

The study found that the emergency treatment of cultural heritage after major earthquakes should be incorporated into the national disaster prevention and relief system, including the completeness of legislation and regulations, the establishment of administrative procedure, the standardization of personnel and execution tools, etc.

Keywords: Wide-Range Major Earthquake, Cultural Heritage, Emergency Treatment

1. Introduction

The earthquake on 21 September 1999, caused comprehensive damage to the large area of Taiwan. The first-time rescue and the restoration of life-saving and life-saving systems (transportation, water, electricity, etc.) were given priority. Relatively disadvantaged cultural heritage did not rank among the priority rescue. Similar examples are not uncommon in countries around the world, such as the 2015 earthquake in Kathmandu, Nepal.

With the considerable importance of emergency rescue to cultural heritage, experts and scholars of the Taiwanese cultural heritage field spontaneously gathered on 23 September 1999. The professionals discussed preliminary countermeasures, launched collaborations, and liaised the county and city competent authorities urgently. They went to the scenes to collect and evaluate the disaster situation and provided necessary assistance and advice to the victims (either owners or users). These initial assessments and rescue suggestions provided great support to the cultural heritage that was affected by the disaster at that time and laid a good foundation for the follow-up restoration work. The 921 Earthquake caused heavy losses and had a great impact on the preservation of cultural heritage, including the inclusion of historical buildings in the 2000's amendment of Cultural Heritage Preservation Act, and the use of modern technology and construction methods to increase cultural heritage' earthquake-resistant and disaster-prevention functions. It was an important response after the 921 Earthquake and it has continued to affect it ever since.

When the Cultural Heritage Preservation Act was amended in 2005, the daily management and maintenance of cultural heritage and disaster prevention have been continuously strengthened through legislation and partition mechanism[1]. The *Cultural Heritage Safeguard Program* since 2016 has further promoted the integration of agencies and the implementation of the divisional work at the county and city level[2].

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[1] In 2010, the Bureau of Cultural Heritage, Ministry of Culture had planned six-partition professional service centers aiming to promote the daily management and maintenance of cultural heritage in each county and city through the regular visitation. Since 2015, there are five partition centers conducting the monthly visitations to national monuments in which achieve the more effective management.

[2] On 10 November 2016, the Ministry of Culture promoted the 'Disaster Prevention and Safeguard Plan for Tangible Cultural Heritage' according to three aspects of '*building a disaster prevention and preparation mechanism*', '*promoting the integration of disaster prevention technolog*y' and '*deepening the cultural heritage safeguard network*'. The above combines with the resources from the Ministry of Interior's fire and police departments to assist local governments in conducting the exercises of disaster prevention on historical sites, setting up patrol

The above works mainly focused on disaster prevention for the buildings or settlements which are the listed heritage. By dealing with the hazard like the 921 Earthquake, it is critical to include the issue of wide-range major disaster into the current legislation and administrative system of emergency treatment. The Principle and Execution Procedure of Emergency Treatment for Cultural Heritage After Major Earthquakes are in demand. The main content of the emergency treatment principle and execution procedure means to achieve the following state:

> *After a major earthquake disaster, the investigation and evaluation shall be completed within seven days; the emergency treatment shall be completed within 30 days; the implementation mechanism of the comprehensive recovery plan shall be proposed within 60 days; and the restoration plan shall be proposed within six months, including the completeness of legislations and regulations, the establishment of administrative procedure, the regulation of personnel and execution tools, etc.*

It attempts to provide a more complete network of protection for conserving the domestic cultural heritage in Taiwan.

2. Legislation Framework

At present, when cultural heritage faces major disasters, the actions can be implemented according to the relevant regulations in the 'Disaster Prevention and Protection Act System' and the 'Cultural Heritage Preservation Act System'.

2.1 Disaster Prevention and Protection Act System

The Central Disaster Prevention Association formulated the 'Disaster Prevention Plan' in 1994, but the disaster prevention system for cultural heritage was not included. After the 921 Earthquake in 1999, lots of important cultural heritage and historic buildings in the disaster area were damaged. Civil experts and scholars referred to the 1996 'Classification of Dangerous Buildings after Earthquake Disaster and Evaluation Criteria for the Uses'[1] published by the Construction Agency of the Ministry of the Interior. After the occurrence, the assessor will visually assess the degree of damage and danger of the building. There are three types of sign for dangerous assessment: 'Dangerous Buildings Suspended (red sign)' and 'Notice that the buildings are

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boxes, and establishing monitoring mechanisms to strengthen the night safeguard. It is expected to decrease the number of cases in damaging cultural heritage but also sustain the value of cultural heritage.

[1] Construction and Planning Agency, Ministry of Interior (2009). The Rapid-assessment Regulations for Earthquake-damaging Buildings, Ministry of Interior Construction, 10 February 2009.

temporarily suspended (yellow sign)', 'Safe buildings can be used (green sign)', but the follow-up assessment was not included in the disaster prevention system.

The 'Disaster Prevention and Protection Act' was promulgated and implemented on July 19, 2000. Article 3:

'*... 8. Other disasters: According to the Act or the Central Disaster Prevention and Rescue Committee shall report to the designated central disaster prevention and rescue business authority...*'

The cultural heritage is still not specifically included.

In 2008, the Legislative Yuan passed the amendments to some provisions of the Disaster Prevention and Protection Act in the third reading. The amendments added Article 27, Item 4, and the Ministry of the Interior's Construction Agency issued the 'The Rapid-assessment Regulations for Disaster-damaging Buildings' on 10, February 2009. The scope of emergency assessment of dangerous buildings has been expanded from earthquakes to natural disasters and has become a form of legal provisions. On 12 March of the same year, the 'The Rapid-notification Sheet of The Disaster-damaging Buildings', 'The Rapid- assessment Detail Sheet of The Disaster-damaging Buildings', 'The Rapid- assessment Sheet of The Disaster-damaging Buildings', and 'The Rapid- assessment Danger Sign of The Disaster-damaging Buildings (Yellow Danger Sign)' and 'The Rapid- assessment Danger Sign of The Disaster-damaging Buildings (Red Danger Sign)' to enable emergency assessors to conduct assessments according to the form. Another Article 36:

'*To implement post-disaster recovery and reconstruction, governments at all levels shall implement the following matters according to their powers and responsibilities... 9. Approval or assist in the formulation of plans for rush repairs and restoration of historic sites and historic buildings. 10. Investigation of disaster situation of historic sites and historic buildings, Emergency rescue, reinforcement and other contingency measures.*'

However, the follow-up implementation approach is still unclear.

2.2 Cultural Heritage Preservation Act System

After the 921 Earthquake, experts and scholars launched an investigation into the damage to cultural heritage in the disaster-stricken area. The results of the investigation in 2000 were compiled in the 'Preliminary Investigation Report on Earthquake Damages to Historic Sites and Historic Buildings in the 1999 Taiwan Jiji Earthquake (Provisional Office of National Center for Cultural Heritage, 2000).' To cope with the

problems caused by the earthquake, there were two important changes in the amendment of the Cultural Heritage Preservation Act in the same year. First, modern construction methods were allowed when necessary for the restoration of historic sites. Second, cultural heritage is added to historical buildings. Article 30-1 stipulates that 'if necessary, modern technology and construction methods may be used to increase the functions of earthquake prevention, disaster prevention, and moth prevention when the restoration plan is proposed.' And Article 30 bis stipulates that 'Major disasters shall be handled. For the emergency restoration of historic sites, the municipality and county (city) governments where the historic sites are located shall submit rescue plans within 30 days after the disaster, and put forward a reconstruction plan within six months after the disaster, and send them to the central competent authority for review.'

In 2005, the Cultural Heritage Preservation Act was first comprehensively revised, emphasizing the implementation of the concept of preventive preservation, equal emphasis on preservation and reuse, and parallel integration with relevant legislation and policies. In 2017, the Ministry of Culture revised the 'historical monuments, monuments and settlement buildings' Measures for Handling Major Disasters of Groups', the content of which is referred to Article 27, Paragraph 4 of the Cultural Heritage Preservation Act: 'The measures for handling major disasters of historical sites, historic buildings, memorial buildings, and settlement buildings shall be formulated by the central competent authority.' Articles 4, 5, and 6 stipulate that after a major disaster occurs, the competent authority shall investigate the disaster situation, assist in drawing up emergency repair or restoration plans, etc., and shall consider when proposing major disaster restoration plans based on Article 27 of the Cultural Heritage Preservation Act with the maintenance of the value of the building and the overall appearance of the surrounding environment.

The major disaster response measures for monuments, historical buildings, memorial buildings, and settlement buildings propose emergency treatment procedure, including disaster reporting, initial disaster control, and casualty rescue (Figure 1).

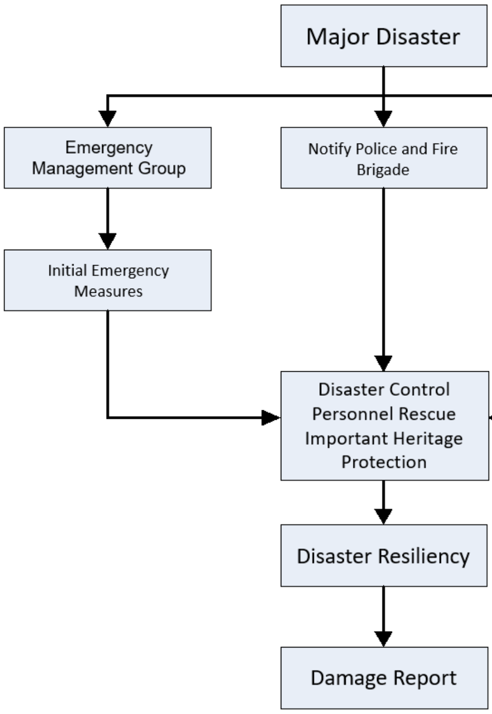

Figure 1 Emergency treatment procedure for cultural heritage. Sourse: by the authors.

However, the above emergency treatment process for the major disaster is designed for a single building only. It is unable to be applied as an emergency treatment procedure for large-scale disasters.

In the same year (2005), the Ministry of Culture revised Article 12 of the 'Measures for the Management and Maintenance of Historic Sites', which stipulated that disaster prevention plans should be formulated, including 1. Disaster risk assessment. 2. Disaster prevention. 3. Disaster rescue. 4. Disaster prevention drills. The plan is executed by the owner, user, or manager of the historic site as the convener, and a disaster prevention group composed of the village (li) chief, residents, and social justice and enthusiastic people in the place where the historic site is located. Guidance of other disaster prevention authorities. Similarly, this item is only formulated for single-building disasters and does not address the protection of regional disasters. The content of this regulation continued to be used in the 2016 amendments without adjustment.

3. Establishment of System and Execution Framework

In response to the above content requirements and problems, the system and implementation structure for emergency treatment of cultural heritage are proposed as

follows:

3.1 *Amendment of Cultural Heritage Preservation Act and the relevant regulations*

According to Article 27 of the Cultural Heritage Preservation Act, the government should take the initiative to dispose of the impact of cultural heritage on a large field rather than a single building without explaining the content of the disaster. Therefore, it is recommended to add the first text stating that '***major disaster occurs the competent authority should take the initiative to carry out the record assessment and emergency disposal of cultural heritage in the disaster-affected area***' and incorporate the overall environment of cultural heritage and buildings into the focus of maintenance and management. ', the first item of Article 3 is added: '***In the event of a major earthquake disaster, the competent authority shall conduct various emergency assessment operations according to the "Principle and Execution Procedure for Emergency Treatment of Cultural heritage after Major Earthquakes".***' The competent authority of cultural heritage shall include Central disaster prevention and rescue system (Figure 2).

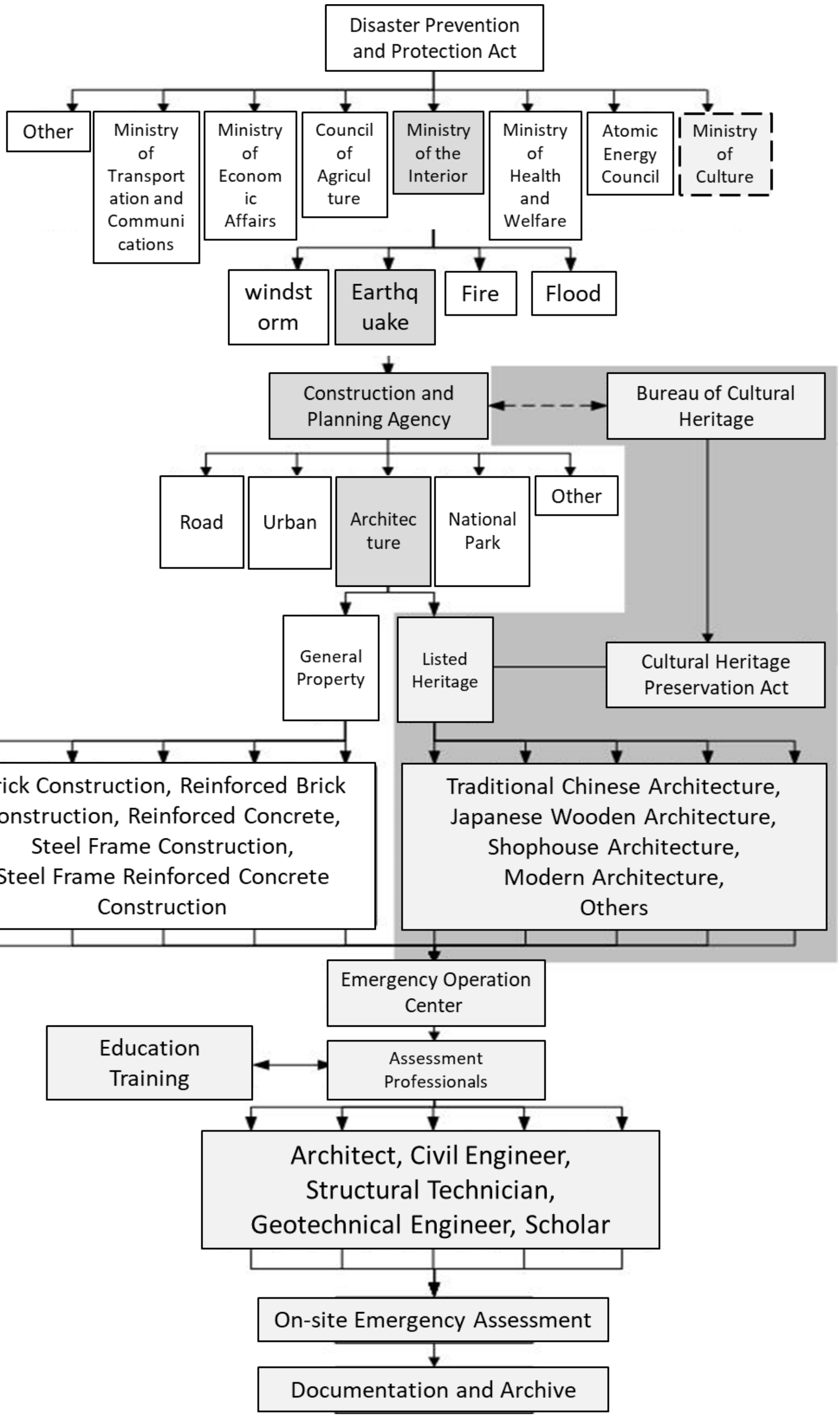

Figure 2 The diagram of cultural heritage (in gray) post-disaster emergency treatment system for the disaster-damaging buildings after major disasters. Sourse: by the authors.

3.2 Establishing an Execution Framework of Emergency Treatment for Wide-range Major Disaster

The emergency treatment plan is drawn up, taking the large-scale field as the consideration, led by government agencies, and directing the municipal and county (city) governments to carry out the emergency treatment procedure of the disaster-stricken area. The emergency treatment plan should also be reviewed and revised from time to time to make the plan It can better meet the needs of actual conditions. Additionally, the emergency appraisers listed in the 'The Rapid-assessment Regulations for Disaster-damaging Buildings' have the same qualifications as those of cultural heritage emergency prospecting professionals. Therefore, they should coordinate the staffing subordinates with the Construction and Development Agency to establish a roster of appraisers and database.

3.3 Proposing the Emergency Treatment Procedure

In the face of a major earthquake, the execution procedure for the emergency site survey of cultural heritage is as follows:

1. Within 3 days (owner, user, and manager of cultural heritage)
   (1) Report the damage to the competent authority after the disaster.
   (2) Investigate or extinguish fire sources within a safe range.
   (3) Set up a warning and protective measures.

2. Within 7 days (local competent authority):
   (1) Assemble a team for emergency assessment operations.
   (2) Suggestions for emergency disposal (mainly simple disposal, such as removal, cleaning, and emergency reinforcement).
   (3) On-site security to avoid damage (please contact the manufacturer, security company or military police personnel for assistance).
   (4) Records of emergency assessment operations and recommendations and report to the Central Emergency Operation Center.

3. Within 30 days (local competent authority):
   (1) Collect report information from various places.
   (2) Organize expert divisions to go to the site for on-site review and suggest ways to recover damaged parts.
   (3) Seek or absorb sufficient funds from relevant agencies, and coordinate the contract issuance channels in response to special conditions.
   (4) Issue communications and exchange messages.

(5) Collect and report case repair plans.
(6) Coordination and integration of emergency repair cases.

4. Within 60 days (the local competent authority shall report to the central competent authority):
(1) Collect reports from various regions and propose an overall recovery plan.
(2) Planning the follow-up work and putting forward overall recommendations.

5. Within 6 months (local competent authority):

Within six months after the disaster, the professional team for outsourcing the ‘repair plan’ commissioned by the individual or multiple cases will be implemented after approval by the competent authority.

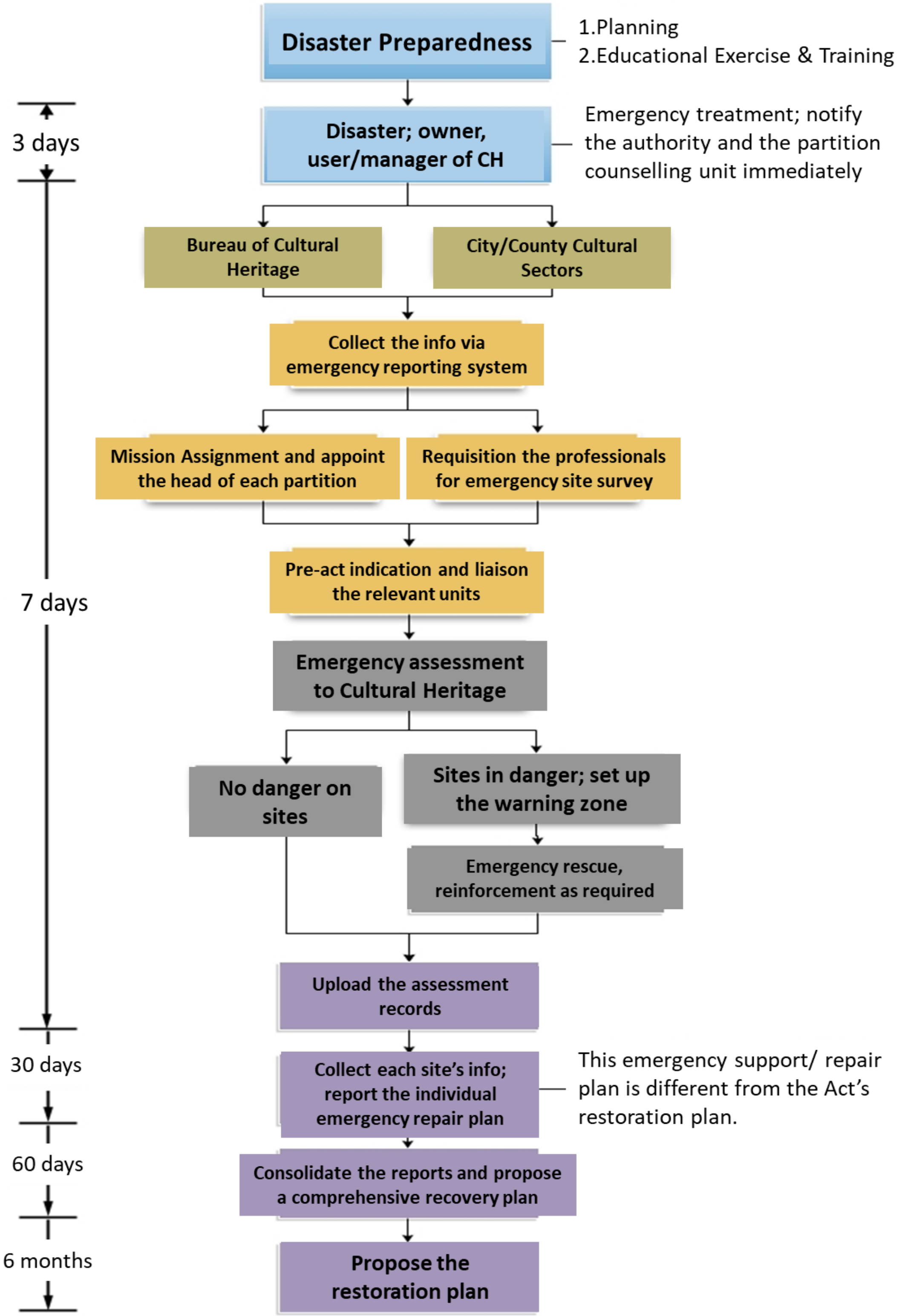

Figure 3 The diagram of emergency site survey of tangible cultural heritage after earthquakes. Sourse: by the authors.

* The procedure shown in this figure is executed by the local competent authority, and they can also be listed as work items through the intensive training of the district service center.

* A cultural heritage that is difficult to reach due to traffic and terrain are not subject to the above time limit.

3.4 *Establishing an Emergency Assessment for the Administrative Principle of Execution*[1]

By increasing the efficiency of professionals' emergency mobilization to conduct post-disasters emergency assessments for cultural heritage, cultural heritage authorities at all levels should conduct disaster preparedness works as the daily routine, such as establishing disaster relief hotlines, establishing emergency assessors' roster and contact information, and establishing an inspection list of cultural heritage with priority (such as the property with high-risk disaster factors of earthquakes, insufficient personnel for management, and the high significance), preparing the materials and equipment required for emergency assessment operations, and establishing the disaster relief equipment and resources network. The above are all indispensable tasks.

The emergency assessment procedure for cultural heritage after major disasters are as follows: (Adjust according to actual conditions)

1. Establish the central and local emergency operation centers of cultural heritage conservation for major disasters.
2. Notify the owners, managers, or users of cultural heritage to assist in investigating damage to cultural heritage.
3. Announce and convene to recruit emergency assessors and report to the designated place at the designated time.
   (1) Arrange meeting place, transportation, accommodation, and pre-departure briefing
   (2) Inventory or distribute emergency assessors according to changes to group divisions and required equipment
4. The assessment team performs on-site emergency assessment work and puts forward emergency treatment suggestions on site
5. According to the emergency assessment results, post announcements using the classification result signs at appropriate locations of the building
6. Collect evaluation data and work review for each case and report to the competent authority
7. The owner, user or manager of cultural heritage shall be notified in writing that they shall handle emergency treatment, repair, or reinforcement within a certain period according to the Act, and shall be assisted by the competent authority.

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[1] Refer to: Construction and Planning Agency, Ministry of the Interior (2010). Textbook for Workshop for Emergency Assessment Operators of Disaster-damaging Buildings after Disasters.

According to the emergency assessment operation of the execution procedure, the procedure of the emergency treatment execution procedure within seven days is proposed, as shown in Figure 4:

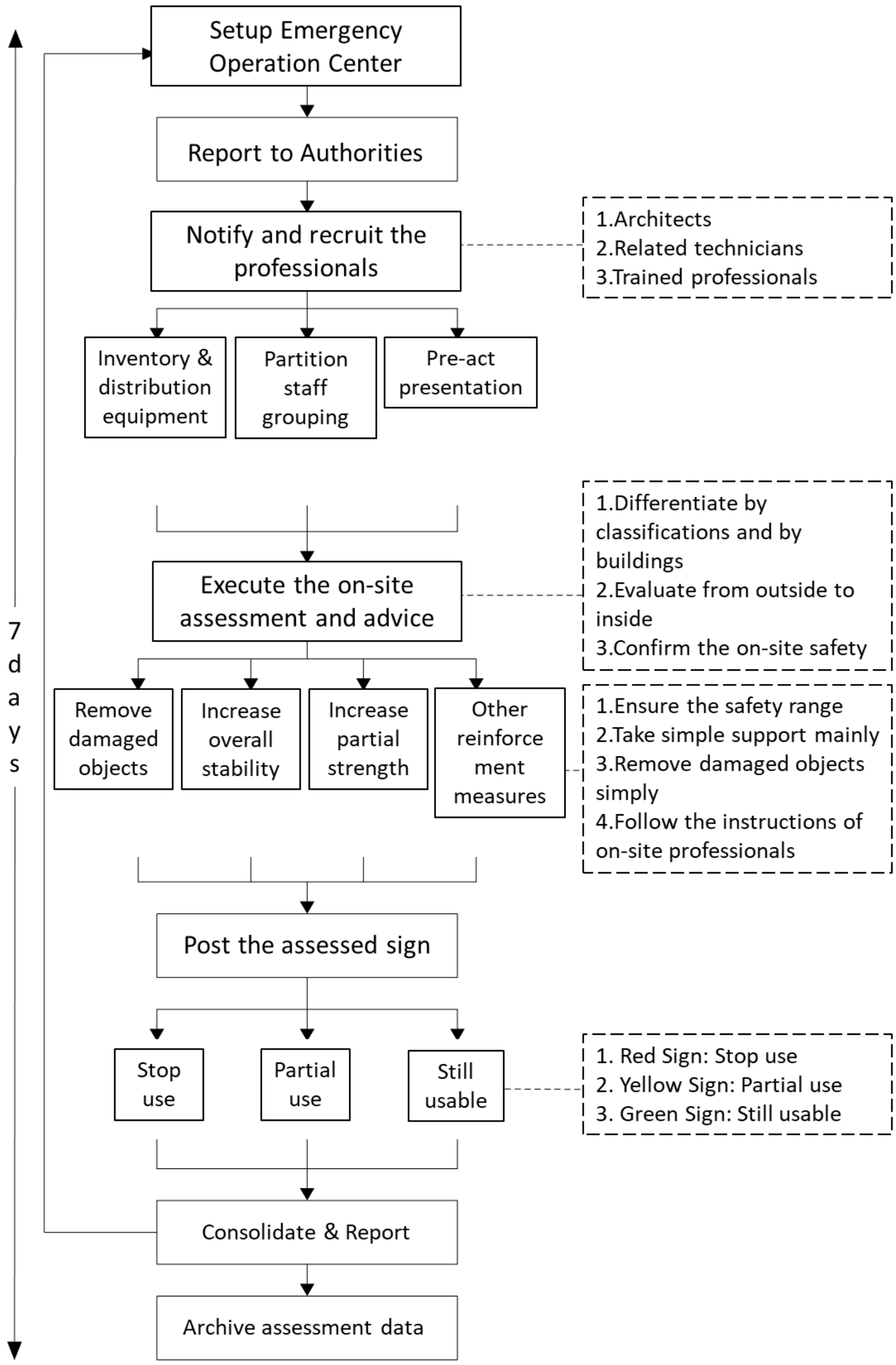

Figure 4 The execution procedure of emergency treatment for cultural heritage after major earthquakes. Sourse: by the authors.

4. Planning the Principle of Emergency Assessment Training

4.1 Personnel qualifications

1. General staff

(1) Administrative personnel: Ministry of Culture, municipalities, and counties (cities) in charge of cultural heritage

(2) Owner, user, or manager

The above two types of personnel should participate in the organization of the county agency or entrust the relevant agency, and the group will conduct training and lectures for 2-4 hours (mainly for the principle, procedure and emergency treatment conducted at the first moment when a major disaster occurs), and obtain the certificate for the completion of training or seminar as a ‘general personnel’.

2. Professionals

(1) Architects, civil engineering technicians, structural engineering technicians, geotechnical engineers, etc. who are registered to operate according to the law.

(2) A lecturer or equivalent qualification or above in a college or university, with a background in architecture and engineering; and a person with experience in restoration or reuse of historical sites, historical buildings, memorial buildings, and settlement buildings.

The above-mentioned two types of personnel should participate in a 4-6 hours' emergency assessment training seminar which is either sponsored by the central competent authority or the relevant agencies and groups commissioned by the authority (mainly focused on the principle, procedure, emergency assessment operation, and practical training). The on-site assessment can only be carried out by the 'professional' who had obtained the certificate for the completion of training or seminar.

4.2 Targets

1 Designated and registered monuments, historical buildings, and memorial buildings.

2 The registered community buildings (overall and sub-building assessment).

4.3 Partition grouping and training

Compile the partitions of responsibility based on counties and cities; conduct emergency assessment tasks, operation methods and practical exercises.

4.4 The Approach of Implementation

1 Textbook compilation

2 Draw up a demonstration plan

3 Include into the partition’s educational training courses

4.5 *Expected Outcomes*

1 Establish, review, and update the roster and database of emergency assessors as the basis for preparing for mobilization, grouping mechanisms, and operating procedure.

2 Implement the spirit of preservation of cultural heritage and effectively combine all available resources to give full play to the functions of disaster prevention and relief.

4.6 *Establish basic files and responsibility area*

For the above two types of targets, the competent authority shall establish the following basic files before the disaster:

1 Basic information table of cultural heritage.

2 Cultural heritage map.

3 Regional Partition of responsibility, and a list of relevant contact persons, including owners, users, managers, and assessors.

5. Conclusion

The principle developed in this study is prepared for the post-disaster immediate investigation, research, assessment, and emergency treatment after major earthquakes. It is recommended to formulate the 'Principle and Execution Procedure of Emergency Treatment for Cultural Heritage After Major Earthquakes' based on Article 27 of the Cultural Heritage Preservation Act. This study aims to contribute to propose an administrative guidance document as the reference for the competent authorities at all levels. The conclusions are as below:

1. Integration of relevant departments for disaster prevention of cultural heritage after major disasters

This research is the subject of cultural heritage management, maintenance, and emergency treatment, and should be integrated with the system at the implementation level. It is recommended to establish a communication mechanism with the Ministry of Internal Affairs and Construction, and jointly establish a roster and database of assessors, so that cooperation can be carried out quickly when a major disaster occurs.

2. Integration of emergency assessment data of cultural heritage

The results of this study suggest that through the *Cultural Heritage Safeguard Program*, the systems of various large and small partitions should be assisted in the review, assessment, and adjustment, and the 'management maintenance plan' should be included and revised. It mainly focuses on the adjustment of three parts: the emergency treatment plan, management organization and exercise training.

3. Integration of emergency assessment training

In the management and maintenance of various education and training content, situational exercises based on the information provided in this research can be added, and demonstration plans can also be considered to strengthen promotion when necessary.

The study argues that through continuous training, we can integrate forces from every field to provide executable tools for the initial assessment and rescue of cultural heritage after major earthquakes.

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I I.

Selected Abstracts

A. Cultural Heritage Disaster Risk Management and Resilience for Climate Change

1.

Climate Change of Pollution and its destructive effect on Mechanical and Physical Prosperities of Historical Albumin Photographs Prints

Rasha Ahmed Elsaid Shaheen
Director of Conservation Department, Eyptian Textile Museum at Ministry of Antiquates.

Abstract

This paper presents a study of the result of changing the mechanical and physical properties of Black and White Silver Albumin Photographs Prints due to exposure to air pollution gases. The test material used is black-and-white silver albumin photographic paper. Different properties and characteristics of the prints have then been measured and compared before and after the exposing. Mechanical and physical performance was also investigated. Tensile strength, elongation percentage, and resistance breakout force and tear have been determined. Identify change in functional groups by using FT-IR ATR. Learn about the change in surface morphology and chemical composition of components by using SEM-ADX. The obtained results indicate a certain change in the mechanical physical properties of the supporting paper, which may probably increase with time.

Keywords：Albumin, Climate Change, Air Pollution Gases, Mechanical and Physical Properties, Photographs.

2.
TOURISM AND HERITAGE IN MALLORCA: THE FINE LINE BETWEEN SUCCESS AND DISASTER

Bartomeu Deya
Economist, company owner, Can Det. Mallorca (Spain)

Abstract

The key concepts regarding cultural landscapes are connected to the practical management of the rural cultural landscape of the Serra de Tramuntana. It was declared World Heritage mainly due to the agricultural stone building and the water channeling systems. The level of protection of the area is very strict but over the last 40 years it has suffered a decrease in agricultural profitability. Many inhabitants have left their rural activities to work in growing sectors such as tourism. The main challenge is that despite the fact that these landscapes have contributed immensely to the island's attraction as a tourism destination (compensating for the crowded tourist resorts), the land owners "stakeholders" have received only a very small part of the income. There are areas that have been completely abandoned.

The only way to improve local economy is related to the local products. The aim is to foster products for both locals and tourists. Aresilient approach is the main challenge. Any profitable model needs to adopt new technologies and harvesting systems, but authenticity is vital for the positioning of the products in the market.

Some clear examples will be demonstrated to show how to improve the economic viability of small farms at this cultural landscape in the future.

Recent published studies on Tourism Congestion Management and Carrying Capacity are mentioned in order to justify the proposed (sustainable) Tourism Strategy for this Cultural Landscape.

A personal example of agriculture-tourism approach will be explained. The paper's author is an active stakeholder of this cultural landscape. He owns a 400 years old family business which harvests ancient olive groves with olive oil production using traditional systems. The aim is to demonstrate how a survival plan can be achieved despite the difficulties that imply the differences between rural and urban society.

Keywords: Shared Responsibility, Stakeholder Participation, Agricultural Resilience, Responsible Tourism, Landscape Abandonment

3.
DOCUMENTATION: A MILESTONE TO KNOW, PROTECT, AND SHARE CULTURAL HERITAGE ASSETS.

Efstratios Stylianidis[1], Fulvio Rinaudo[2]

[1] Associate Professor Aristotle University of Thessaloniki (Greece)

[2] Full Professor Politecnico di Torino – DAD (Italy)

Abstract

Documenting Cultural Heritage assets is an essential step to share knowledge, to preserve values, to protect local and international culture.

Responsibility of this action is mainly on governmental organisations, which have to fix common rules to collect records and information, to fund scientific bodies to develop strategies and practical solutions, to promote data collection and monitoring actions at different levels by involving professionals, scientists, tourists, and local people, to share the achieved data among scientific and professional communities.

The rapid development of technologies allows a possible data collection and a “day by day” monitoring action about the effect of climate changes, human actions and natural degradation processes. Image and video acquisition instruments are today the most diffuse instruments among all levels of possible actors (e.g., scientists, professionals, students, tourists, and local people). The knowledge and diffusion of correct strategies to collect and share images and video will allow a subsequent extraction of crucial information (e.g. shape, dimensions, degradation effects, etc.) to maintain a correct documentation strategy on Cultural heritage assets.

Scientific research is today funded by national and international projects but a strong action in the documentation direction is required to skip fragmentation and loss of power. University bachelor and master courses have to be designed to offer a real multidisciplinary approach where scientific and humanistic approaches are merged to form a new generation of professionals able to manage, at the same time, technology and knowledge.

Local communities, tourist agencies and local action bodies have to encourage collecting and share primary data by pointing out the common responsibility in the preservation of worldwide Cultural heritage assets.

Keywords: Documentation, Monitoring, Multidisciplinarity

4.
“THE OLD LAND AND THE SEA. THE CARIBBEAN GENIUS LOCI AND CLIMATE CHANGE”.
(LAC PANEL: CULTURAL HERITAGE AND DISASTERS)

Angela Rojas
Professor, ICOMOS Cuba / Univesidad Tecnológica de La Habana

Abstract

Beaches and waterfronts constitute a fundamental part of the spirit of the Great Caribbean. Their importance is not only geographical, functional or touristic, but they are linked to the culture of the region, to the ways of life, to the intangible heritage but also, as landscapes, to the pristine physical attributes, even, in many cases, to the built heritage as well as to historical facts that, since centuries ago have been relevant. The concept of the beach in the Caribbean has been more linked to leisure and festivities than to sports, while the waterfront has been both a meeting place and a place of conflict. But always a recurrent image.

The region has always suffered aggressive hurricanes and floods, some of which are part of a dramatic collective memory, but climate change has increased aggression until it reaches devastating situations.

This presentation aims to show some examples of adaptability and mitigation that allow us to ask questions related to the possible effects on integrity and authenticity derived from technical solutions characterized by a perhaps excessively naive or simplistic approach.

There are cases of beaches in which built heritage has been demolished to protect the strip of sand, but resulted in loss of integrity, affected by development of tourism; proposals for dikes and other containment elements that, rather than acting against floods, would become examples of author architecture. Likewise, positive examples of heritage conservation of waterfronts will be presented, which at the same time constitute a valid response to climate change.

In summary, the basic idea of the presentation is to show that fighting climate change does not mean forgetting heritage, but to learn from it.

Keywords: Disasters, Waterfronts, Beach, Adaptability, Caribbean

5.
ASSESSING VULNERABILITIES OF ARCHAEOLOGICAL SITE MUSEUMS

Sibel Yıldırım Esen[1], A. Guliz Bilgin Altınöz[2]
[1] Assist.Prof.Dr., Middle East Technical University
[2] Assoc Prof., Middle East Technical University

Abstract

Archaeological sites have been increasingly deteriorated or lost due to natural events (e.g., earthquakes, floods) and human-induced factors (e.g., deliberate destruction, mass tourism) in many places. The extent of the damage of an archaeological site as a result of its exposure to one of these hazards is directly related with its level of vulnerability (i.e., susceptibility) to that hazard. Prevention and mitigation of damage depend on informed judgments about all factors contributing to the adverse impacts of hazards. Therefore, assessing vulnerabilities is a critical aspect of risk prevention and mitigation activities. Besides, vulnerability assessments should be carried out not only on a site scale but also on larger scales in order to manage risks, which affect large areas (e.g. earthquake, flood) and multiple sites, through upstream decision-making.

Focusing on archaeological site museums (ASM), this paper aims to present a vulnerability assessment methodology as a decision-support tool for heritage management at a provincial level. An indicator-based methodology is developed by taking into account that the vulnerability of an archaeological site may result from its physical characteristics, managerial and contextual factors. The proposed methodology combines spatial, quantitative, and qualitative analyses to assess vulnerabilities. The methodology was tested by conducting a research in 12 ASM in Izmir, Turkey. The study area possesses traces of various Anatolian civilizations, including two World Heritage Sites: Pergamon and Ephesus. In this paper, hazards threatening archaeological sites are introduced. Various factors that increase vulnerabilities of ASM have been identified and a methodology for evaluating these factors is proposed. The results and how this approach can contribute to the risk management of ASM have been discussed. Given the complexity of factors affecting vulnerabilities, this approach can support decision-making processes at an upstream level for management of ASM. This research promises its generic applicability across a range of historic environments.

Keywords: Archaeological Site Museum, Vulnerability; Risk; Archeological Heritage Management, Turkey

6.

ROLE OF INTANGIBLE CULTURAL HERITAGE, BOTH NEGATIVE AND POSITIVE, IN DISASTER MANAGEMENT PRACTICES, CASE- CHITPORE, KOLKATA.

Sukrit Sen
Student, Centre for Heritage Management, Ahmedabad University, India

Abstract

Tangible and Intangible linkages are a highly discussed heritage discourse in present times, but I still think that the concept needs to be relooked at, and these linkages must be implemented in heritage management practices today.

Disaster Management is another very important sector in the field and as mentioned above that too has been looked at with a very "built" point of view and even today there is a lack of legal frameworks for the protection of historic precincts not only to impending disasters but also for phases both during emergencies and post disaster, that take intangible aspects into consideration. My paper however focuses on looking at a more integrated approach to these management practices by looking at the role of intangible cultural heritage both as a risk and a component to mitigate risks in pre and post disaster situations with the case of Chitpore, a heritage precinct in Calcutta, India.

Various intangible aspects and practices are directly responsible in generating livelihoods and hence an important aspect to help mitigate risks and help in recovery in post disaster situations. My research particularly tries to study how historic practices prevalent in Chitpur has survived, adapted and contributed to disaster risks and might also play a role in post disaster resiliency. Further it studies how these aspects respond to the historic built fabric of the area and how that too has adapted over the years to survive, in spite of major socio-economic pressures like urbanisation and modernisation. Finally, this research being a heritage management masters thesis, looks at how the tangible and intangible aspects can be integrated to propose strategies to manage, mitigate and adapt to disaster risks with the help of the capacities present on site. This will further help suggest methodologies by which the same concept can be looked at for global disaster management practices.

Keywords: Intangible Cultural Heritage, Linkages, Local Capacity, Resilienc

7.
IRELAND'S CLIMATE CHANGE ADAPTATION PLAN FOR BUILT AND ARCHAEOLOGICAL HERITAGE

Jacqui Donnelly
Senior Architect, Built Heritage Policy, Department of Culture, Heritage and the Gaeltacht, Government of Ireland

Abstract

In October 2019, the Government of Ireland published nine climate change sectoral adaptation plans prepared by seven different government departments as part of the National Adaptation Framework (NAF). The sectors included cover natural and cultural capital, critical infrastructure, water resource, flood risk management and public health, and set out the climate adaptation measures necessary to ensure that the state is ready to protect people from the negative effects of climate change in Ireland and the steps needed to limit any damage caused. The Department of Culture, Heritage and the Gaeltacht, in recognition of the significance of adaptation planning to its work, published the *Climate Change Sectoral Adaptation Plan for Built and Archaeological Heritage* as part of the NAF.

The architectural and archaeological heritage is a finite and irreplaceable resource. While many of our historic buildings, archaeological sites and monuments have survived for centuries, there can be no denying the risks that a changing climate poses to this heritage. The priority risks identified for Ireland's built heritage include inland and coastal flooding, storm damage, coastal erosion, soil movement, pest and microbiological infestation, and wildfire. The impacts may be both immediate and cumulative. The built heritage is also vulnerable to maladaptation, that is, the inadvertent loss or damage to structures and sites during adaptation works.

The intention of the *Climate Change Sectoral Adaptation Plan for Built and Archaeological Heritage* is to address built heritage in the widest sense and covers not only structures and sites subject to statutory protection, but all man-made assets that have historical, aesthetic and cultural value. The strategy and actions of the Plan aim to build adaptive capacity within the sector and to reduce the vulnerability of built and archaeological heritage to climate change. The Plan identifies leading actors and stakeholders for each action together with an indicative timescale and will be reviewed and updated at regular intervals.

The *Climate Change Sectoral Adaptation Plan for Built and Archaeological Heritage* can be viewed and downloaded from the website of the Department of Culture,

Heritage and the Gaeltacht: https://www.chg.gov.ie/heritage/climate-change/the-built-and-archaeological-heritage-climate-change-sectoral-adaptation-plan/

Keywords: Built Heritage, National Policy, Climate Change, Adaptation

8.
CHALLENGES AND OPPORTUNITIES INTEGRATING STAKEHOLDERS IN A RISK MANAGEMENT PLAN: *"HUMBERSTONE AND SANTA LAURA SALTPETER WORKS, CHILE."*

Marcela Hurtado
Dr. Architect. Professor, Technical University Federico Santa María, Valparaíso Chile

Abstract

In 2016 it started the design of the first Risk Management Plan for a World Heritage Site in Chile: Humberstone and Santa Laura Saltpeter Works, a former industrial complex located in the Atacama Desert, north region of Chile. The process was conducted by the supervision of the Ministry of Culture, Arts and Heritage, and developed by Technical University Federico Santa María. The methodological guidelines used were those suggested by the specialized agencies (UNESCO, ICOMOS, ICCROM), with the necessary adaptations, according to the conditions of the case and the associated groups. The site had enough information and data that facilitated part of the process, and especially all the support and collaboration of the site manager. The most challenging aspect during all stages of the process (diagnosis, proposal and implementation) was the work with the different stakeholders linked to the site. The challenge was to define a model that allowed them to work articulated among themselves, according to their abilities, interests, and responsibilities. On the one hand, each group had knowledge of the site, from their vision and particular experience. On the other hand, these groups had no experience of working together and more specific, working in risk management for heritage sites. However, after several workshops and meetings, with much collaboration and interest from them, it was possible to define a model that articulated the groups, defining specific roles. Finally, at the implementation stage - currently underway - the effectiveness of the proposed model has been verified. Critical aspects have been identified and adjustments have been made to facilitate proper implementation. This experience will serve for the work that is being developed in other Chilean World Heritage Sites.

Keywords: Risk Management Plan; Shared Responsibility; World Heritage.

9.

CLIMATE CHANGE AND THE URGENCY OF MANAGING RISKS OF QHAPAQ ÑAN, A WORLD HERITAGE SITE

Claudia González-Muzzio
Consultant / CEO, Ambito Consultores Ltd.

Abstract

The complexity of the management of Qhapaq Ñan, Andean Main Road (QÑ), is related -among multiple factors- to the diversity of geographical siting and the constructive solutions of the roads and sites that comprise it as well as its condition of ruin, with a high environmental fragility and exposure to geological and hydrometeorological hazards, exacerbated by climate change. Several extreme events occurred in Chile have revealed the urgency of risk management in this heritage site, a situation exposed by UNESCO requesting the States Parties to show progress at the end of 2020. Although the documents developed by Chile for the nomination of QÑ to the World Heritage List included an evaluation and zoning of hazards affecting the road segments and archaeological sites, the analysis covered mainly the site and its nearest surrounding, according to which a series of measures were proposed to reduce its vulnerability both in the Conservation Plan and the risk management program of the Management Plan, none of which have been implemented so far. In the light of extreme hydrometeorological events that occurred in 2015 and 2017 that affected the Atacama Region, and in 2019 in Arica - Parinacota and Antofagasta regions, the risk is reassessed in a sample of roads and sites of QÑ-Chile integrating different territorial scales of analysis. In addition, a risk assessment sheet is prepared based on the review of others developed for Chilean World Heritage (WH) sites and the one proposed by QÑ-Peru for the whole site. It is hoped that this will contribute to prioritize the risk management of QÑ in Chile based on concrete and current data as well as contributing to a broader methodological discussion on how to address the risk of this heritage site taking into account its particularities and the impact of climate change.

Keywords: Qhapaq Ñan, Risk Management, Climate Change, Territorial Analysis

10.

ESTABLISHING AN EFFECTIVE DRM SYSTEM FOR CULTURAL HERITAGE – *"Case Study on Georgia"*

Manana Tevzadze
Secretary, ICOMOS Georgia, Blue Shield International

Abstract

My paper talks about the creation of a system for disaster risk management of cultural heritage and in particular, it discusses the case study from Georgia.

The paper first describes the existing system and some of the identified challenges in it. To do so, it reviews the results of a study and a situation analysis undertaken by the Georgian National Committee of the Blue Shield (GNCBS). Further on, the paper describes the strategy developed by the same organization in cooperation with the Ministry of Culture and Monuments' Protection of Georgia to reform the system.

Besides, it also lists the concrete actions taken by the NGO towards facilitation of the process. It refers to the example from Italy where the heritage disaster risk management component was incorporated in the work of the civil protection agencies in order to analyze the replication of the process in the Georgian context. The paper talks about the efforts by GNCBS of including a variety of stakeholders in the discussion and in more detail, it explains the concrete plan for creating a civil-military task force for the protection of cultural heritage in times of crisis in Georgia. This task force is planned to be the very first multidisciplinary and cross-sectoral group to work on the above issues (to be created within the Aliph foundation funded project taking place in Gori, Georgia in the next 2 years). The paper defines the short-term and long-term goals of the group which will, on one hand work on the very first disaster risk management plan for a cultural institution in Georgia, and on the other hand, develop the sustainable system for DRM for cultural heritage in Georgia.

Keywords: DRM For Heritage, Multi-Stakeholder Approach, Sustainable DRM System

11.

RISK ASSESSMENT FOR ENERGY EFFICIENT RENOVATIONS OF HISTORICAL BUILDINGS UNDER CONSIDERATION OF THE CHANGING CLIMATE

Franziska Haas

Researcher, Eurac Research, Bolzano/Bozen

Abstract

Historical buildings are made responsible for a large part of the CO2 emissions. Therefore, their renovation is of high importance with regard to the achievement of climate targets. However, especially when it comes to the energy efficiency of historic buildings, appropriate solutions must be found that not only ensure a sustainable use with adequate comfort conditions, but also protect the historic structure from any damage. In the meantime, it has become widely accepted to perform complex hygrothermal calculations for energetic interventions at historic buildings and monuments in order to verify possible solutions. In her PhD thesis at the Eurac Research/Politecnico di Milano, Lingjun Hao goes one step further and includes future climate forecasts in her considerations of the historical building stock of South Tyrol. She proposes a methodology based on the analysis of local weather conditions and the identification of homogenous climatic zones to simulate the future hygrothermal performance of traditional constructions with interior insulation. Based on the research at Eurac, the presentation will provide an overview of the climate parameters that influence in particular the risk assessment for measures at historic buildings and will provide concrete simulation results to verify this. The results of this research can support better decision making in order to reduce energy use while adapting historic buildings for future climate.

The presentation will be prepared together with my colleagues Daniel Herrera, Lingjun Hao and Alexandra Troi.

Keywords: Energy Efficiency, Renovation, Historic buildings, Hygrothermal Risk, Climate Change

12.

MAKING IT SIMPLE: RETOOLING CLIMATE RISK ASSESSMENT IN CULTURAL BUILT HERITAGE FOR CLIMATE ACTION IN BADAGRY (NIGERIA)

Olufemi Adetunji[1], Jamie MacKee[1], Ifte Ahmed[1]
[1]PhD candidate, School of Architecture and Built Environment, University of Newcastle, Australia

Abstract

The evidence of climate risk to cultural built heritage is overwhelming and there is considerable consensus across heritage professionals and researchers on the importance of understanding the complex nature of the challenges of climate change to cultural built heritage. Therefore, assessing the risk of climate change in built heritage is a vital and complicated but not enough to understand and take actions addressing the risks. Such complexities are due to reliant on scientific methods in analyzing the changes in climate, which are difficult to understand by local communities. This results in non-involvement of people from local communities of cultural built heritage in analyzing, anticipating the risks, taking decisions and implementing climate actions. This paper, therefore, investigates the climate risks facing the built heritage in Badagry and develops actions to address the risks through semi-structured interviews and focus discussions with cultural heritage experts and Badagry community. The paper adopted the 'ABC' method of heritage risk management to investigate the risks of changes in rainfall, temperature, humidity and wind, which are the main climate elements affecting Badagry. The 'ABC' method, developed by the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) and Canadian Conservation Institute (CCI), has five basic steps to establish the context of the built heritage, identify, analyze, evaluate and treat risks. The findings emphasised that adapting cultural built heritage to the impacts of climate change will not only protect the values and significances of the heritage for future generation but also improve the awareness of the community to their environment and help to create community-based actions that will involve all stakeholders. The paper, therefore, argues that the complex nature of climate change risks to cultural built heritage requires the involvement of all stakeholders with direct and indirect connections with the built heritage.

Keywords: ABC Method, Climate Change, Community Participation, Decision Making, Heritage Values

13.

Site Management Challenges and Potential Disaster Risk at Restoration Sites

Antara Sharma
Principal Conservation Architect, Kabira Architecture, Conservation And Management

Abstract

The city of Mysore located in Karnataka, India was a historic capital city for six centuries. It boasts of heritage structures from the thirteen hundreds based on local Canara architecture upto nineteen hundreds with a combination of colonial and vernacular styles. This shared built heritage flanks the various roads leading upto the historic Mysore Palace and is used for various purposes like government offices, museums, market places, souvenir shops, etc. The government agencies and private owners have mixed opinion to the heritage buildings- some want them to be demolished while some opine for its restoration, some consider them as danger to life while some consider them as part of Mysore's heritage. One such building is the Devaraja Market Building spanning 250mX50m consisting of 200 permanent and 500 temporary shops built over a long span of time in a mixture of various historic architectural styles and materials. The shops are rented to local vendors by the municipal corporation whose livelihood is dependent on the heritage building and its vibrant character that attracts visitors to the market..While the Municipal Corporation had initiated the restoration work in the building in 2015, a partial collapse of the northern gateway (while under restoration) on 27th August 2016 brought a series of concerns to the fore. The restoration work was immediately stopped and plans for complete demolition and rebuilding an identical copy (using modern materials) was proposed. While the case is being discussed in court, the project and events highlight the challenges that are discussed in this paper- general disregard for heritage by the people who use it and include incompatible renders into the historic fabric, shortcomings of the restoration process during implementation, management challenges and post disaster site & risk management.

Keywords: Devaraja Market, Shared Built Heritage, Collapse, Disaster Management, Risk

14.
MAPPING THE CENTRAL ASIAN SILK ROADS TOWARDS A RISK MANAGEMENT STRATEGY

Ona Vileikis
Research Fellow, University College London / ICOMOS Executive Committee Member CIPA/ ICOMOS GA2020 Co-Chair

Abstract

The diverse Central Asian landscapes along the Silk Roads is under threat from multiple natural and anthropogenic activities. These include changing agricultural practices especially in the context of the climate crisis, infrastructure schemes, urban expansion, and traditional crafts. The future of heritage resources depends on strategic planning, as part of sustainable development policies. This requires a proper workflow, and accessible information management systems for the correspondent authorities. Thus, creating a digital inventory of sites and a systematic data gathering of information has become a priority for the Central Asian region. This contribution introduces the challenges and opportunities of the Central Asian Archaeological Landscapes (CAAL), a digital platform, in combination with site condition assessment towards systematic monitoring and risk assessment.

The project has a large and diverse number of stakeholders involved. These currently include 13 institutions in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan and the Xinjiang Uyghur Autonomous Region of China, with main participation of the International Centre for Central Asian Studies in Uzbekistan, and the Northwest University and the ICOMOS International Conservation Centre Xi’an in China. The teams across the region are digitising existing archives and records, and consolidating the information held by regional institutions and research centres.

The project is using the open-access Arches, platform developed by the Getty Conservation Institute and the World Monuments Fund, and QGIS, free and open-source geographic information system, to build the database and map sites using satellite images. This ongoing work presents the CAAL database and workflows for site condition assessment. These results are enhanced by new research, using a combination of photogrammetry and satellite imagery, along with targeted field visits, in order to discover new sites, improve documentation, promote awareness and scholarship, and facilitate policy making.

Keywords: Silk Roads, Risk Management, Cultural Heritage, Digital Technologies, Geospatial Content Management Systems

15.

Nanoparticles performance on durability of historical adobe
(A case study- Kashani house, Iran)

Mona Khaksar Dehnavi[1], Hamed Niroumand[2], Maryam Afsharpour[3]

[1] MA in restoration of historical buildings

[2] Post-Doctoral in Sustainable Development, Assistant Professor the Department of Civil Engineering of BZT University

[3] Associate Professor of Inorganic Chemistry, Faculty member of Inorganic Chemistry Department

Abstract

Adobe is one of the oldest materials used in the construction of a wide range of monuments; however, high erosion of the adobe caused by various reasons including humidity, wind, and temperature is usually more obvious as minor cracks on the adobe. This type of cracks leads to strength reduction and fragility of the adobe over time. Therefore, adobe protection is considered an indispensable issue, especially by finding appropriate scientific methods to upsurge its strength and durability.

The use of nanoparticles as a spray to protect clay materials in cultural heritage has been proposed as a rapid method to increase the durability of these materials against erosion.

In this study, the application of nanoparticles to the Strengthening of the historical Kashani house (Semnan, Iran) was evaluated. Studying and cognizance of Kashani house and its environment in the first phase and studies in the field of nanotechnology and nanoparticles in adobe reinforcement with laboratory methods and description of the experimental data in the other phase has been addressed. Studies in the field of nanotechnology are in harmony with the monument's protection principles and in line with the preservation of the structure authenticity.

Investigation of the effect of nanoparticles spray on the adobe has shown improvement of physical and mechanical properties and also increasing the adobe strength up to 40% against erosion which could be of interest also for the Strengthening in new constructions.

Keywords: Historical Buildings, Nanoparticle, Strengthening, Adobe, Erosio

16.

BUILDING A SACRED PLACES HERITAGE NETWORK FOR DISASTER RESILIENCE IN THE TEXAS GULF COAST REGION

Sedef Doganer

Associate Professor, The University of Texas at San Antonio (UTSA), Department Chair of Architecture and Interim Associate Dean of College of Architecture, Construction and Planning

Abstract

Natural disasters are increasing in frequency and intensity within the U.S., and the state of Texas has been impacted severely. An interdisciplinary research team at The University of Texas at San Antonio (UTSA) has been working on a project to address the impact of hurricanes on cultural heritage resources of the Texas Gulf Coast region. Through this project—the Sacred Places Heritage Network for Disaster Resilience—UTSA and partners are targeting sacred spaces listed on the National Register of Historic Places and located within the "most impacted areas" of Hurricane Harvey damage. Ultimately, the project will provide support for and create connections between multiple faith-based organizations and the communities they serve, empowering them to become more resilient to large-scale disruption. This paper will discuss potential project's outcomes and a new "Resiliency Roadmap" for a nontechnical audience to guide disaster management planning and increase capacity, allowing communities to recover, rebuild, and prepare.

Keywords: Cultural Sustainability, Resilience, Disaster Management Planning, Sacred Places, Heritage

I I.

Selected Abstracts

B. Post-disaster Management, Re-construction, and Authenticity

1.

ISSUES ARISING FROM THE FIRE DISASTER AND RESTORATION PROCESS OF CULTURAL HERITAGE REPRESENTING THE COUNTRY - FOCUSING ON *SUNGNYEMUN* FIRE CASE

Sangsun JO
Senior Researcher, National Research Institute of Cultural Heritage (NRICH)

Abstract

Universal principles should apply to the restoration of cultural heritages damaged by disasters. However, in the case of cultural heritage representing the country, various external factors other than cultural heritage are to be considered. The value of cultural heritage should be judged in various aspects, such as history and art, and their values should also be respected and protected in the process of reconstruction from disaster. The *Sungnyemun* fire (2008) caused the most controversy and issue in the nation's history of cultural heritage repair due to its symbolism as Korea's national treasure No.1. It was restored in 2013 but some of the issues raised at the time were still unresolved. This paper summarizes the beginning and development process of major issues that occurred from the time of the *Sungnyemun* fire to the present

Keywords: Fire Disaster, Restoration, Principle, Issue, Heritage

2.
AUTHENTICITY AND DISASTER OF RE-CONSTRUCTION IN THE ARAB WORD

Jamal Shafiq Ilayan
Professor Architect, King Saud University

Abstract

The real disaster in the Arab word is in concept of authenticity, the re-construction in general is the best method used by most institutes whose work in the heritage field.

They are many voices in the academic and in the practical institute experiences believed that we don't need to conserve our heritage, because our civilization (Arab - Islamic) is not died, so we can change and produce new heritage, we can make re – construction it. No authenticity concept exists in this.

The actual research needs to revel the concept of authenticity from the original Arab Islamic culture, also it well presents a historical practice experiences in the area of conservation and restoration to approve that the authenticity is a real concept in our culture.

Adding to the disaster of the Authenticity concept, they are a lot of real disaster situations: revolutions, wars and vandalism are present. No national or international organization put any plan to prevent the conservation of the Arab heritage without needing of its re-construction.

Keywords: Authenticity, Re-Construction, Arab Word, Disaster.

3.
WHOSE AUTHENTICITY IS IT, ANYWAY?

Stephen J. Kelley
Secretary General, ISCARSAH

Abstract

We are all aware of the *Venice Charter* (1964), the *Nara Document on Authenticity (1994)* and the revised *Burra Charter (2013)*. I would posit that there is a reason why we continually amend these standards: in a dynamic societal landscape we must continually reflect upon authenticity and why we might consider reconstruction to be appropriate. As Gustavo Araoz, former president of ICOMOS, recently said in an email exchange, these charters "are not the Ten Commandments." Let us reflect upon reconstruction and its perceived flip side, the nebulous term of authenticity.

Reconstruction can take place under the right circumstances. For example, just in the last century historical reconstructions have been a driver in the reclamation of national identity of states following war or following social and political upheaval. These reconstructions are sometimes difficult to fathom when viewed through a Eurocentric prism. Authenticity can have intangible qualities and cannot always be objectively measured. Buildings and sites provide identity and to impose orthodox rules on their reconstruction is to rob cultures of their heritage when they have been ravaged by war or failed ideological movements. It is not possible to define authenticity as an "one size fits all" understanding. Whose authenticity is it, anyway?

Numerous examples will be presented for open discussion.

Keywords: Authenticity, Reconstruction, Culture

4.
AUSTRALIA IS ON FIRE – DEVELOPING TOOLS FOR MITIGATION, RESPONSE AND ADAPTATION FOR HERITAGE ON THE FRONTLINE

Catherine Forbes

Principal, Conservation Architect and Heritage Specialist, GML Heritage

Abstract

The 2019-2020 Australian fire season was horrific – the worst on record globally. With increasing periods of drought, rising temperatures and extended fire seasons, Australia is on the front line when considering the impacts of climate change. The recent bushfires (wildfires) extended across large areas of the eastern and southern states, burning hundreds of thousands of square kilometres of forests and farmland, severely impacting our natural and cultural heritage. Thousands of structures were destroyed, and lives were lost in trying to defend the – World Heritage to local heritage – Aboriginal heritage, rural heritage, industrial heritage, infrastructure, historic towns, cultural landscapes and archaeology.

Australia ICOMOS and Blue Shield Australia developed tools and guidance documents to enable the community to assess and respond to its fire impacted heritage. They also worked closely with Government Agencies to develop actions plans for assisting property owners through the process of damage assessment, clean up and recovery planning. But as the next fire season is just around the corner, the Joint Australia ICOMOS and ICOMOS New Zealand Risk Preparedness Working group, is also reviewing management, mitigation and adaptation strategies for heritage in fire prone areas and is preparing guidance. Although Australia has fire management and mitigation strategies, early warning, evacuation and response systems developed over many years, the scale and intensity of these fires was beyond conception. Across Australia new conversations have begun around climate change, land management practices, fire risk reduction practices, including ‘cultural burning’ and the use of fire-resistant landscaping, as well as stricter codes for construction in bushfire prone areas. All these measures will affect heritage and adaptation is required.

I will provide a brief overview of the fires, their impacts, and the tools developed in response. I will then open the floor to discussion to facilitate the 6 ISC response to the fires for feedback into the proposed scientific symposium panel session on Wildfires and Heritage (proposal attached).

Keywords: Wildfires / Bushfires, Emergency Toolkit, Emergency Action Plans, Adaptation and Resilience

5.
CULTURAL TOURISM – FRIEND OR FOE TO THE AUTHENTICITY OF POST-DISASTER RECONSTRUCTION

Sue Millar
President Emeritus ICOMOS ISC Cultural Tourism,
SMA Cultural Tourism Consultancy

Abstract

The primary focus in talks on post-disaster reconstruction is on communities and costs. The outside perspective is rarely central to debates. An uneasy scenario frequently emerges. Disrupted, dispersed communities may or may not have the energy, will-power or political heft to influence early decisions. Who pays and macro-political pressures frequently determine the nature and prioritization of individual projects. Cultural and social values are challenged. Economic development is paramount. At iconic heritage sites the importance of cultural tourism is recognized implicitly or explicitly. But it is hardly given space in cultural heritage conservation reconstruction agendas.

Authenticity – I contend – is the bedrock of cultural tourism's success.

The concept and nature of the development of an authentic Disneyland is explored as it emerges in the framework of post disaster reconstruction. In parallel, the seemingly insatiable demand for cultural heritage experiences on the tourist trail is often met post-disaster by the 'invention of tradition' – an imagined past. Facadism, full scale or half scale replicas and sanitized landscapes embrace a future with past resonance if not the full legitimacy of the past. Mobile communities, multi-media images, and the exponential growth in cultural tourism to the point where it is often described as being in part responsible for 'overtourism' all have an impact on the authenticity of heritage conservation and the uses, presentation and interpretation of cultural heritage.

As conservation professionals we owe it to ourselves to ask what role does and what role should cultural tourism play from the outset in sustainable planning for post-disaster reconstruction and our understanding of authenticity given its potential for short and long term impacts especially at iconic places – many World Heritage sites. Case studies include: Menin Gate Ypres, Belgium; Bridge over the River Kwai, Thailand; Valley of the Kings, Egypt; Palmyra, Syria; Tower of London, England and Venice, Italy.

Keywords: Cultural Tourism, Authenticity, Disneyland, Sustainable Planning

6.
LEARNING FROM THE EARTHQUAKE OF NOVEMBER 26, 2019 IN ALBANIA: POST-DISASTER ANALYSIS OF DAMAGE IN HISTORICAL BUILDINGS

Grigor Angjeliu
Research Associate, Politecnico di Milano

Abstract

On November 26, 2019, a 6.4 magnitude earthquake struck Albania, destroying many buildings across the north-western area. Among others, important historical buildings were severely damaged or partially collapsed. The objective of this study is to provide a description of the observed damage caused to Albanian heritage structures in engineering terms. Causes and strengthening possibilities are discussed considering the structural safety and authenticity.

Data are collected from different sources and a reconnaissance mission carried after the earthquake in designated historical buildings. The collected data include buildings with stone or brick masonry and with many reconstruction phases. The analysed structures have a highly varying construction technique since they were built within a large timeframe (between 6th and 19th century). The most frequent type of failure is the out-of-plane mechanism, probably related to the heavy nature of the construction technique. Among the collected data, towers are observed to be a frequently damaged construction typology. Given their simple geometry, analytical models are proposed to understand the structural safety and to compare them with the actual observed response. The analysis concludes upon the importance of damage present before the earthquake or construction phases as a determinant factor in the observed collapse mechanisms.

Finally, a discussion is developed with regards to the possibility of reconstruction, strengthening and authenticity, which can be an important basis for the development of mitigation strategies for historical buildings in the Albanian territory.

Keywords: Earthquake Damage Assessment, Post Disaster Reconstruction, Authenticity

7. MANAGING HERITAGE AMIDST CONFLICT AND CHAOS – FIVE YEARS OF SMITHSONIAN PROJECTS IN IRAQ

Brian Michael Lione
International Cultural Heritage Protection Program Manager, Museum Conservation Institute, Smithsonian Institution USA

Abstract

The Smithsonian Institution (SI) has delivered multi-faceted, collaborative programs in emergency preparedness, disaster response, stabilization and recovery in Iraq since 2015. This paper will describe these efforts and asses their efficacy, focusing equally on best practices and lessons learned from the five-year effort.

SI offered an initial short course in 2015 in Erbil, Iraq, delivered in partnership with the University of Pennsylvania and using the First Aid for Culture methodology developed by ICCROM, Prins Claus Fund, the SI and others. This course focused on Iraqi specialists from areas threatened or damaged by ISIS. This was followed by SI-led meetings in 2016, 2017 and 2019 with heritage authorities, and religious and ethnic minority community leaders from across Iraq to define priorities to protect and recover heritage in ISIS-affected areas. In 2016, SI updated its training coursework at the Iraqi Institute for the Conservation of Antiquities and Heritage in Erbil to include emergency preparedness and response; these courses have been delivered to dozens of Iraqis each year since.Working in partnership with the Iraq State Board of Antiquities and Heritage (SBAH), SI started the ‘Nimrud Rescue Project’ in 2017 to respond to the devastation left in ISIS’ wake at Nimrud, listed on Iraq’s World Heritage Tentative List. Funded by the US Department of State and others, the project completed recovery seasons in 2018 and 2019, with a third in the works as of early 2020.

This partnership with the SBAH expanded in 2018 with an effort to stabilize, document and recover the ISIS-damaged Mosul Cultural Museum. Similar to the Nimrud project, the ‘Mosul Museum Project Zero’ focused on developing an Iraqi team of specialists to work on site. This project continues into 2020 and is a collaboration between the SBAH, SI and the Louvre Museum, and is funded by ALIPH and others.

Keywords: Iraq, Smithsonian, Stabilization, Recovery, Management

8. NURTURING TRADITIONAL TRADES FOR DISASTER RECOVERY

Mary Knaggs[1], Lynette Gurr[2]
[1] Director, RK Heritage
[2] Associate Director, Urbis

Abstract

There is increasing concern in Australia and overseas about the loss of traditional trade skills and the lack of appreciation for why traditional materials and methods are important for authenticity and sustainability in heritage conservation. When there is extensive loss of heritage fabric after a natural or man-induced disaster, then there is increased pressure to accelerate conservation processes. This often leads to the use of inappropriate non-traditional materials and methods – partly because more traditional solutions are in short supply.

By nurturing traditional trades during peaceful times, we can ensure that there are more traditional tradespeople available for post disaster conservation and more general awareness about the authenticity and sustainability of traditional approaches. This paper will explore how traditional trades for heritage conservation are supported in Australia and overseas and how we can share initiatives in both peaceful times and during a disaster response.

Keywords: Traditional Trades, Quality, Authenticity, Sustainability

9.

WILDFIRES/BUSHFIRES: HOW WE CAN BETTER PROTECT OUR SHARED HERITAGE

Chris Marrion PE, FSFPE, MScFPE, NFPA
Fire/Disaster Risk Management Director, CEO, Founder; Marrion Fire & Risk Consulting PE, LLC; ICORP – President

Abstract

Wildfires/bushfires continue to have devastating impacts to our natural heritage, as well as our cultural sites/structures within wildfire/bushfire-prone areas globally. While wildfires have existed since there has been combustible vegetation (Paleozoic Period, 420 mn years ago), climate change, natural and man-made hazards further exacerbate these fires and will only likely increase the frequency/severity going forward, unless the root causes are further understood and practical, effective prevention/mitigation measures are implemented.

Through detailed studies of wildfires/bushfires, a significant amount can be learned to better protect our Shared Heritage. This includes further understanding why/how fires started and progressed, what failed vs what worked, etc. Numerous common themes emerge, including:

- Numerous ignition sources present (e.g. lightning, smoking, campfires, powerlines, intentional, misinformed controlled burning, coal seams, etc.)
- Significant combustible materials exist and continue accumulating (underbrush, dead trees, etc)
- Limited rain resulting in dried vegetation, rapid fire growth/spread
- No/limited early detection (i.e. limited firewatches, fire towers, satellite monitoring, etc)
- Delays notifying fire brigades.
- Limited fire brigade access, resources/water, equipment, etc.
- Limited control areas, firebreaks to limit/slow fire spread
- Structures within prone areas, no defensible spaces, combustible construction, etc.
- No/limited fire prevention/emergency response plans
- Limited fire safety awareness, capacity building.

Through understanding these, and incorporating them into a hazard/risk-based approach, engaging local communities and understanding natural and cultural values, in addition to the significant indigenous knowledge local communities have related to wildfires/bushfires, and developing tailored, risk-informed strategies addressing

Keywords: Wildfires, Bushfires, Indigenous Knowledge, Risk-Informed

10.
FIRE: ISSUES, LESSONS LEARNED & OPPORTUNITIES TO BETTER PROTECT OUR SHARED HERITAGE

Chris Marrion PE, FSFPE, MScFPE, NFPA
Fire/Disaster Risk Management Director, CEO, Founder; Marrion Fire & Risk Consulting PE, LLC; ICORP – President

Abstract

Fires continue to have significant adverse impacts on our shared heritage to not only buildings (Notre Dame, etc.) and collections (i.e. National Museum (Brazil), Natural History Museum (Delhi), et/al), but also historic ships (Cutty Sark), bridges (Kapellbrücke Bridge) and National Monuments (Namdaemun Gate, South Korea). Fires also follow other events including earthquakes and volcanoes.

Through detailed studies of fires a significant amount can be learned to better protect our Shared Heritage. This includes understanding why fires started and progressed, what failed, and what worked. Numerous common themes emerge via research, including:

- Numerous ignition sources present
- Significant combustible materials
- Renovation works underway
- Fire protection systems not present/operational.
- Delays notifying fire brigades.
- Limited access for fire brigades - site, structure, origin
- Limited firesafety awareness, capacity building.
- No/limited fire prevention plans, emergency response plans

By understanding these, significant steps can be made to mitigate fire risks through a hazard/risk-based approach and developing a tailored, risk-informed strategy having multiple benefits:

- incorporate effective firesafety provisions addressing actual issues/hazards,
- minimizing aesthetic impact to historic structure,
- using traditional materials/skills
- developing maintenance/monitoring strategies

Keywords: Fire, Vulnerability, Risk Informed Decision

11.
RESTORATION OF THE CHURCH OF THE NATIVITY OF OUR LADY IN MOSCOW OBLAST

Ivan Strelbitsky
Engineer-restorer of highest category, Head of Private Conservation Consultancy.

Abstract

The social and economic changes in the Russia after 1917 revolution had led to neglect or destruction of many historical monuments. Some of them were used as jail houses, prison camps or storehouses. Those lucky ones that were not destroyed suffered from neglect and vandalism. The lack of regular maintenance increased the influence of initial structural mistakes when exposed to natural conditions of changing temperature in the presence of atmospheric water. Such combination of negative factors results in collapse of upper parts of the monuments.

The church Nativity of Our Lady is located at Medvedeva Pustyn (Bear's Hermitage) village in Moscow oblast. The name of the place indicates that it was situated in a deserted wilderness, where the bears must be quite common. Or it might mean that the hermit, who lived there, had a difficult character. The pustyn was founded in 1360 by Reverend Mefody Peshoshsky who had built the first small wooden church and lived there to obtain maximum isolation.

The brick church of Nativity of the Virgin was erected in 1555, and was sponsored by tsar Ivan the Terrible, who visited the place in 1553 after severe sickness on the way to a distant Northern Kirillo-Belozersky monastery. This is a typical example of one headed four pillar church that was common for Northern architecture in 15-16 c. A belfry was soon erected nearby. The original image of the church had changed in 19 century, Complex original roofing (pozakomarnoye pokrytie) with 3 rows of 3 arches on each façade decorated the base of the drum and the head, was replaced by simpler one, that was much easier to maintain. The bases of the arches were found under the roof. Small outer windows were widened. Soon one more wooden church appeared – it was smaller and easier to provide heating in long winters.

Its dimensions in plan are almost rectangular – each façade is about16 and a half meter (54,3x 54,7 ft). Thickness of the walls from 152 to185 cm (5-6,1 ft). Height 19,55 m – 64,2 ft. In 1937 pustyn was closed, robbed and stood neglected for more than 70 years, until in 1975, when first research of its structures and measures were done for the first time. No money could be found even for minimal conservation works. In 1993 the drum with the head suddenly collapsed and only during 1996 to 2003 restoration works took place. Funding of the project was provided by Moscow Oblast Culture Center. The main reasons of the collapse were:

1. Total neglect of the church for more than 70 years
2. The load from the drum and the head was distributed unevenly. In the contact with four bearing arches, it touched them only in 1/3 of the arches width, so the arches worked less effectively then they should. It means that the upper parts of the arches were overstrained under the weight of the drum and cupola.
3. The "Sails" – the upper space between the bearing arches were clad in horizontal brick layers, making them work like a console, which is much less effective than the arched brickwork. Original tie frames in two levels were made from timber beams. Parts of them were placed inside the brick walls and were connected with aerial ties by notches. They linked walls and pillars in two dimensions. It was a common practice to make the whole structure more stable until the masonry laid on lime mortar will receive necessary strength, which took several years, depending on the thickness of the walls
4. After wooden beams became rotten inside the walls, they stopped working as links or joints and all horizontal thrust was taken by massive thick walls. Still some vertical cracks appeared in the walls in the middle of the facades, weakened by windows and doors sections
5. In 19 c. some reinforcing work was done in the church. The lower level aerial ties (links) originally made in timber were out of work by that time and were repeated in steel bars, fixed directly into the walls. The higher-level ties remained out of service, although the effectiveness of them could be more, then the lower level.
6. And the crucial reason for the fall of the drum was the poor condition of the roof, especially at the contact with the vertical wall of the drum. It caused regular leaks and as the result the destruction of brickwork of the overstrained part of the load bearing arches. When the vertical load overcame the reserve of the arch's brickwork strength – the collapse had happened.

So in our case we can see the combination of several main factors, that finally led to the collapse of the completion of the church – initial structural defects that led to the overload of the parts of bearing arches and many years of lack of proper care for the monument, which ended in the weakening of the overstrained parts and final collapse of the upper part of the church.

1. The restoration work consisted of the following. The first part of works was to remove huge amount of debris from the fallen structures. Whole and half bricks were thoroughly selected and stored for future use. The following works are conducted in this process. estoration of the walls weakened by the through cracks in the walls. It consisted of repairing the major cracks with injecting all cracks with reinforcing by fiberglass rods to compensate the lack of bonds between separated parts of the wall. Each rod crossed the crack at a certain angle and was fixed by hydraulic lime mix.
2. Installing reinforced concrete in-wall bonds in voids from former timber bonds. They were linked with air ties (bonds), which formerly were also wooden, but fell down after in-wall timber got rot.
3. Restoring the 19 c. metal air bond on 1st tier, which were damaged during the fall of the upper structures
4. Restoring crushed vaults and arches
5. Installing reinforced concrete circular base for the drum.
6. Restoring the drum and the head (cupola)

7. Restoring 19 c. pitched roof.
8. Repairing brickwork with changing the missing ones with the new bricks of the same size.

Minor erosion of the brick surface was repaired with special colored vapor-permeable composition. After painting the facades, the church was given to local parish. The above shows the process of restoration works took place during 1996 to 2003 by restoring a 16-c. monument, introducing except collapsed elements the new ones that aimed to mitigate the influence of initial structural defects of the monument.

Figure 1. View of the church after the collapse of the completion – drum and dome.

Figure 2. View to the ruined bearing arches from the interior.

Figure. 3. Restored drum, bearing arches and reinforced concrete air bonds from in the same place and dimensions as original wooden ones.

Figure 4. The church after the restoration.

Keywords: One Headed Four Pillar Church, Weakening of The Overstrained Parts, Collapse of Bearing Arches, Restoration of Historic Bearing Structure

12.
REMOVAL OF CRUDE OIL FROM CULTURAL RESOURCES

Vrinda Jariwala
Research Associate
National Center for Preservation Training and Technology, National Park Service

Abstract

Oil spills are inevitable as crude oil circulates throughout the world by ships, trucks, rail, and pipeline. Oil spills impact natural and cultural resources and the environment. The impact on cultural resources includes risks for historic buildings, structures, landscapes, and archaeological sites. Despite the physical and chemical damage associated with crude oil contamination, we know little information on how to remove oil from the built environment.

In 2018, the National Center for Preservation Technology and Training (NCPTT) began research funded by the U.S. Department of Interior Inland Oil Spill Preparedness Project to identify and evaluate commercially available Surface Washing Agents (SWAs) and the effective application techniques for removing crude oil from historic architectural substrates. The study exposed surrogate materials to oil and examined the application of SWAs as potential conservation treatments in a controlled laboratory setting. Analyses used SWAs selected from the Environmental Protection Agency's National Contingency Plan Product Schedule. The study used two oils of varying viscosities to understand physical interactions with substrates. Research continued to the third Phase in 2019 and the fourth phase is funded.

Phases I and II have led to understanding the various kinds of SWAs that may be used for the effective removal of oil from historic substrates. Successful SWAs are being further explored in Phase III. The research classifies SWAs, simulates the process of oil contamination in a laboratory setting, and assesses the long-term effects of oil contamination for occupied historic buildings. Success is measured by color, gloss character, and surface roughness data, and water vapor transmission of historic materials before and after exposure to oil, as well as after successive treatments.

Future research will result in practical oil removal methods for large surfaces, a decision tree to guide responders in selecting and applying SWAs to historic materials, and guidance for using SWAs in large areas.

Keywords: Risk Preparedness, Disaster Response, Oil Spill, Cultural Resources, Architectural Materials

13. CONSERVATION AND MANAGEMENT OF RIVER *GHATS* IN INDIA

Antara Sharma
Principal Conservation Architect
KABIRA Architecture, Conservation and Management

Abstract

The state of Madhya Pradesh located in the heart of India with Rivers Naramda and Kshipra running across, boasts of many historic towns that were once established and are still present along the revered rivers. The river banks along the most visited historic towns of Maheshwar, Omkareshwar and Ujjain along these rivers built in the form of stepped accessway to river (*ghats)* are still used by visitors for various activities along the river- religious, cultural, daily ablutions, recreational, etc. Considerable efforts have been taken by the local municipal authorities, religious bodies as well as cultural agencies for beautification of these banks and providing visitor amenities. However, the critical issue of gradual deterioration of the underside of stepped banks owing to water flow as well as the added pollutants in river water due to industrialization and human actions is yet to be addressed. While the underside of the stepped banks gets deteriorated and hollowed, the steps and walkway used by thousands of devotees and tourists are fast becoming a life hazard. There have been instances where an amateur swimmer has been caught inside the deteriorated spaces and eventually died.

This paper explores the development of a comprehensive plan for material conservation as well as framework for site management so it may be utilized for other historical sites along rivers.

Keywords: Stepped River Bank, Water Action, Heritage Public Space, Management, Material Conservation

14.
AUSTRALIA 2019/2020: DISASTER RISK MANAGEMENT AND RESILIENCE IN A SUMMER OF DISASTER AND CLIMATE CHANGE

Robyn Riddett
Director, Anthemion Consultancies

Abstract

In an age of climate change how do we prepare for disasters which increasingly are on what is claimed to be an "unprecedented" scale. Are they similar to past events in scale and damage caused or is the scale becoming greater and our preparedness is less effective? Are preceding conditions similar or different? Have we simply forgotten the past or never experienced a particular type of disaster in living memory? Have we learnt anything from previous disasters for the next disaster?

The greatest natural disasters in Australia are bushfires, floods and cyclones. Every year at least one of these disasters happens somewhere, sometimes in close proximity of time and location. While the response by governments will necessarily be directed to saving lives of humans and animals and to retarding the spread of effects of a disaster, making areas safe and clean-up, the initial priorities of citizens will be directed to their own needs and circumstances. The next step in recovery is to re-establish communities, businesses, tourism, farms, and to provide new habitats for wildlife. Where do heritage and endangered species fit in? What are the priorities – is this appropriate?

This paper will examine how we can prepare better or in some cases must we just accept the inevitable? How might heritage places and endangered species be the subject of special priority efforts to save them? How far can places be recorded as a knowledge repository strategy to offset loss? And the elephant in the room: are some mitigation strategies such as backburning also destructive? Can Indigenous fire practices assist future preparation methodologies? We know the answers to some of these questions now while others will inevitably be discussed in the forthcoming months as a result of the 2019/2020 bushfires and the anticipated cyclones and floods in the coming months.

Keywords: Mitigation Strategies, Bushfires Australia, Risk Preparedness

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