

Improving post-earthquake emergency management for built heritage.

C. Caponi

Egis-Group, Christchurch, New Zealand.

A.E. Ohs

Christchurch City Council, Christchurch, New Zealand.

F.L. Stevens

WSP, Wellington, New Zealand.

M.C. Smith

The Heritage Practice, Wellington, New Zealand.

ABSTRACT

The emergency response to a natural disaster is one of the most challenging activities for local and national authorities. They must act quickly and effectively – as delays and mistakes could cost lives and prolong recovery time. The success of the emergency response relies on clear regulation, well-established procedures, and the availability of trained personnel with access to effective technology.

New Zealand's emergency response framework, which is currently under review, is characterised by a lack of assessment guidelines and procedures specific to built heritage. This was one factor that contributed to the loss of almost half of the central city's protected heritage buildings in Ōtautahi-Christchurch following the 2010-2011 Canterbury Earthquake Sequence. Overseas experience demonstrates the benefits of integrating heritage expertise within the disaster risk management response to facilitate better informed decisions. This paper, for example, considers the Italian system as a possible exemplar model.

Due to their heritage values, historic materials, and non-standard construction details, the assessment of built heritage presents additional complexity when compared to the assessment of more contemporary buildings and structures. This paper outlines a proposed pathway to bridge the current gap in the New Zealand regulatory framework and develop emergency response procedures to facilitate the effective emergency management and rapid assessment of built heritage. Improvement in New Zealand's regulation and industry practice would help reduce the loss of built heritage following future seismic events.

1 INTRODUCTION

The emergency response is one of the most challenging activities for local and national authorities responsible for providing post-disaster support (e.g. National Emergency Management Agency, Civil Defence Emergency Management Groups, Fire and Emergency New Zealand, councils, and central Government). They must act quickly and effectively to avoid delays and mistakes that could cost lives and disrupt recovery. Success relies on clear legislation, well-established and tested procedures, well-trained personnel, and effective technical tools.

These elements become crucial during an emergency to maximise efficiency in a process that, by default, may involve multiple iterations. The response operations are complex and may require, for example, different site inspections to be performed for the same site - initially to check for people who are injured or trapped, and to carry out rescue. Then to perform rapid damage assessment, and again to install temporary securing works (if required). In the case of earthquake sequences, inspections may be required after each subsequent seismic event.

While the current New Zealand emergency response framework is world-leading in many respects, it lacks assessment guidelines and specific procedures for built heritage. Due to their heritage values, non-standard construction details, and historic materials, the assessment of built heritage presents a higher level of complexity when compared to the assessment of contemporary buildings and structures.

In 2021, a group of heritage professionals developed a project to address this gap in New Zealand's regulation and operational framework, and to improve the emergency response procedures for the assessment and management of heritage places. The project group consists of heritage engineers, council officers, Heritage New Zealand Pouhere Taonga (HNZPT) heritage advisors, and conservation architects, and currently includes the authors of this paper, along with Fiona Wykes and Win Clark.

The project proposal is based on training, research, and first-hand local and overseas field-experience in post-disaster response. It includes international best practice for disaster risk management of cultural heritage; particularly, advice from the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the International Centre for the Study and Restoration of Cultural Property (ICCROM), the International Council on Monuments and Sites (ICOMOS), ICOMOS Australia/Aotearoa New Zealand Joint Scientific Committee on Risk Preparedness (JSC-ANZCORP), and Heritage New Zealand Pouhere Taonga (HNZPT).

This paper is intended to present the project proposal to the wider engineering industry:

- To socialise the underlying principles.
- To gather feedback to guide refinements to the proposal.
- To seek support from those involved in disaster risk management in Aotearoa New Zealand.

1.1 Background information

In the last decade, New Zealand has refined its emergency response procedures, and in 2015 the Ministry of Business, Innovation and Employment (MBIE) released new post-earthquake rapid assessment forms and field guidelines. The post-earthquake rapid assessment forms were revised again in 2022 and a new template was released in 2023 (MBIE 2023). Forms, guidelines, and procedures were, however, generally tailored to suit the assessment of ordinary structures – such as residential and commercial buildings built in the late 20th and early 21st centuries – with little provision for built heritage. This is problematic, as historic structures are usually characterized by a complex seismic response, and their emergency management may require input from multiple agencies who work within the Building Act 2004, Resource Management Act 1991, and the

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

Heritage New Zealand Pouhere Taonga Act 2014. This apparent gap in the New Zealand's emergency response operation processes and procedures may result in the irredeemable loss of heritage monuments and buildings in future seismic events.

Retrospective post-disaster analysis demonstrates that response procedures can have a detrimental effect on built heritage that exceeds the damage from the disaster itself (Stevens 2015). A recent example is Christchurch, where hundreds of historic buildings were demolished in the emergency response following the 2010-2011 Canterbury Earthquake Sequence. In the absence of specific emergency response procedures, inspectors with little or no experience of historic constructions were put in the unenviable position of having to assess the structural capacity of heritage buildings without suitable technical support or training (Marriot 2011) (McLean et al 2012) (Sage 2013) (Stevens 2014) (Forbes 2017) (ICOMOS 2021). This contributed to a conservative approach that generally favoured demolition over possible alternatives – which could have been based on a more realistic estimation of the residual seismic capacity of the structure and the possibility of installing prompt temporary stabilisation works. In most cases valuable debris (heritage fabric) and building contents were disposed of in general waste, losing their inherent value and the possibility for sustainable re-use.

1.2 Why protect our built heritage?

Heritage is a legacy from the past, that is valued today, and is preserved for the use and enjoyment of future generations (ICOMOS 2010) (MCH 2018) (CCC 2019). Experience from around the world shows that cultural heritage forms part of our shared sense of identity and fosters community resilience. Heritage can play a fundamental role in the recovery process – as a focal point for communities to gather, grieve, and find the strength to rebuild (Craig 1998a) (Spennemann 1999) (Preserve America 2008a) (Al-Nammari & Lindell 2009) (Jha et al 2010) (UNESCO 2010) (CERA 2012) (Jigyasu et al 2013) (MacKee 2013) (NEMA 2019) (CCC 2019). Heritage plays an important role in resilience and urban regeneration, providing a tangible connection to our shared past. The survival of built heritage can encourage people to return to urban areas once regeneration is complete (FEMA 2005) (World Bank 2008) (Stevens 2014). A local example in Christchurch is New Regent Street, a historic site which became a “reef” of social and economic resilience within an area of cleared brown-field sites, and attracted new development at its margins (ICOMOS 2021).

The United Nations Office for Disaster Risk Reduction *Sendai Framework for Disaster Risk Reduction 2015-2030* (UNIDDR 2015) recognises the role of cultural heritage as a component of disaster risk management, and highlights the importance of protecting sites of historical, cultural heritage and religious interest in the aftermath of a disaster.

As the significance of heritage for community resilience and recovery has become internationally recognised in the last decade, new legislative policies have been developed to provide for heritage in emergencies. In New Zealand these include:

- Protection of heritage assets is a primary response objective in the *National Civil Defence Emergency Management Plan Order 2015* (Part 8 Response, Section 113).
- The *National Disaster Resilience Strategy* (NEMA 2019) which outlines a vision and goals for civil defence emergency management. It specifically recognises the importance of culture to resilience.
- The National Adaptation Plan (MfE 2022) identifies the need to minimise threats to cultural heritage from climate change, to increase the resilience of cultural heritage, and improve disaster management.
- The *Emergency Management Bill 2023* has a purpose to “improve and promote the sustainable management of hazards in order to contribute to the social, economic, cultural, and environmental well-being and safety of the public and also to the protection of property” (Part 1, S3. Purpose).

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

1.3 How can we protect our heritage places?

Preventive strengthening works are certainly the best way to protect existing heritage buildings against potential damage induced by earthquake events (ICOMOS 2021). Nevertheless, adopting adequate rapid assessment procedures represents a key factor to safeguard heritage places from unnecessary loss after a major disaster (UNIDDR 2015).

2 BEST PRACTICE – OVERSEAS EXAMPLES

When considering the design of an effective emergency framework for heritage, the project group considered overseas models and examples. International best practice for heritage emergency response is included in key publications by organisations such as UNESCO, ICOMOS and ICCROM. A summary of these publications is considered by Stevens (2014 and 2015) and forms the basis for Table 1. Steven's original tabulated results have been updated, and the table also considers recently released guidelines and standards, including:

- ICCROM's *First Aid to Cultural Heritage in Times of Crisis Handbook*, (Tandon, 2018)
- HNZPT's *Guidance for Preparing Heritage Risk Management Plans*, (Maclean, 2022).
- ICCROM / INSARAG/ OCHA / UNESCO *Guidance Note on Urban Search and Rescue at Heritage Sites*, (Tandon, 2023)
- The Italian Emergency Response Framework as outlined in the current DPC Standards and MiBACT Guidelines (DPC 2013, 2020, and 2023), (MiBACT 2015), (CSRS2016, 2020).

ICCROM's *First Aid to Cultural Heritage in Times of Crisis Handbook* (Tandon 2018) is now one of the most important international resources and details the planning and implementation of a coordinated heritage response. The handbook includes a logical workflow of assessment, temporary securing, and recording and salvaging heritage materials. It advocates for:

- The collation of heritage data.
- Management of sources of supplies for heritage first aid.
- Creation of rapid and detailed assessment forms and templates
- Identification, training, and opportunities for multidisciplinary teams to engage in emergency response scenarios prior to an event.

The ICCROM methodology has been widely implemented by national and local teams in over 70 risk-prone countries and has been taught to over one thousand practitioners from the heritage and emergency management sectors since 2010.

A second recent publication by ICCROM – in collaboration with International Search and Rescue Advisory Group (INSARAG) of the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and UNESCO – is *The Guidance Note on Urban Search and Rescue at Heritage Sites*, (Tandon 2023). This document is a response to an international collective commitment to addressing the unique challenges of urban search and rescue operations at heritage sites, and was developed by heritage and emergency management specialists. It provides practical procedures and critical information for Urban Search and Rescue (USAR) teams, emergency management, and heritage authorities involved in operations at heritage sites affected by disasters, within the context of the International USAR Response Cycle.

Although the focus of Figure 1 is on published international guidance, the literature review for the project outlined in Section 3 of this paper is also based on the experience and training of the project team, and on international case-studies. Each emergency provides new lessons, and these are widely and actively shared in the international heritage community through in-person and online symposiums and published proceedings, with the aim to improve methodologies and continue to close knowledge and practice gaps.

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

Recent case study collections covered by our literature review include Kealy, de Marco, Hadzimuhamedovic, Marchand, Gregory and Ploteau (2020), ACCU (2021 and 2022), ICOMOS (2021).

The literature analysis summarised in Figure 1 supports the need for a collaborative approach between the heritage and emergency management sectors during the emergency response phase and was used to establish the project methodology – described in Section 3 of this paper.

Table 1: Planning for Response - Recommendations from international best-practice guidance on the emergency response for heritage places. This is adapted from Stevens (2014 & 2015).

Project Task	Recommendations.	UNESCO (Pichard 1985)	ICCROM (Feilden 1987)	National Trust for Historic Preservation (Nelson 1991)	California Preservation Foundation (Eichenfield 1996)	ICOMOS/ICCROM/UNESCO (Stovel 1998)	(Preserve America 2008)	NZHPT (McClean 2009)	World Bank (Jha et al 2010)	ICOMOS/ICORP (Jiguasu 2011)	California State Parks (CSPOHP 2014)	ICCROM (Tandon 2018)	HNZPT (Maclean et al 2022)	ICCROM (Tandon 2023)	Italian emergency framework
All	Involve conservation practitioners in emergency response planning.	•		•	•		•	•	•			•		•	•
2,3,4,6,7,8	Develop appropriate building condition assessment processes.						•			•		•		•	•
2,3	Prepare and test “damage and risk assessment forms” tailored to local cultural heritage and provide for these to be collated and stored		•									•			•
2,3,4	Develop a range of standard details for temporary repairs.						•							•	•
2,4	Develop an appropriate property and material salvaging process.						•			•			•	•	•
4,5	Identify conservation practitioners. Keep a list of contacts.			•	•	•	•	•		•	•	•	•	•	•
4,5	Train conservation practitioners and emergency responders.		•	•		•	•	•		•	•	•	•	•	•
5	Develop a peer-review system for rapid heritage building assessment														•
6	Develop procedures for managing safeguarding cultural heritage activities for USAR.													•	•
6	Develop an appropriate demolition permitting process.						•			•					•
7	Prepare an inventory of historic properties	•	•	•	•	•	•	•	•	•	•	•		•	•
7	Prepare and maintain geo-locations of all significant heritage places.											•		•	•
7	Prepare document files on each historic property for reference during emergency response (Significance/ values, floor plans).	•	•	•								•		•	•

2.1 Case study – Italian emergency response framework

The Italian emergency response (DPC 2013) (DPC 2020) (DPC 2023) (MiBACT 2015) (CSRS2016, 2020) is an advanced and effective framework that supports the local population and safeguards cultural heritage in a highly earthquake prone country. It achieves each criterion noted in Figure 1, and is an exemplar of an emergency response framework. An overview of the Italian emergency response for heritage is summarised as follows:

2.1.1 Italian emergency response framework

The Italian response framework consists of inter-institutional coordination centres that manage the main emergency response stakeholders: Civil Defence Department (DPC), Ministry of Heritage, Culture and Tourism (MiBACT), National Fire and Rescue Services (V.V.F.), Territorial Authorities (TA), Armed and Police Forces, and volunteer services.

Coordination centres can be activated at different geographical levels depending on the scale of the disaster and the number of Territorial Authorities involved. When a Regional or National State of Emergency is declared, the DPC can activate the Local Emergency Management Authority (LEMA) and set up national coordination centres (DI.COMA.C.) on site.

This geographical modularity allows the Italian framework to be flexible and agile with response operations calibrated to the scale and extent of each emergency. The modular system ensures unity and consistency of the emergency response across the entire Italian territory. Heritage is embedded at each level, and there is support for good heritage outcomes for places that would otherwise be poorly resourced.

2.1.2 Emergency response main phases and stages for heritage

The coordination centres (COC, CCS and DI.COM.AC) implement the procedures and protocols developed for the three main phases of emergency response: rescue and immediate assistance to the population (PHASE I), rapid building damage assessments and building usability evaluation (PHASE II), installation of temporary securing works and reconstruction stage (PHASE III). The following is a summary of each phase with a focus on the response for heritage places.

- PHASE I is led by the V.V.F. who undertake reconnaissance, triage, and assign a colour code, confirm safe and usable roads, provide access to critical zones, and begin the rescue operations.
- PHASE II is led by the DPC who, in coordination with the MiBACT, plan and arrange for rapid building assessments and usability evaluations. A summary of this phase includes that:
 - The MiBACT is responsible for the assessment of heritage and monumental structures, religious and cultural buildings (e.g. churches, theatres, cinemas, etc.), buildings housing heritage and cultural collections (e.g. archives, museums, libraries, palaces, etc.) as well as for their own (government owned) portfolio of buildings and assets.
 - The assessment of heritage places is generally assigned to teams with a diverse skillset (usually consisting of one MiBACT, one V.V.F. and one or more National Technical Register (NTN) members).
 - Once assessments are complete, they are validated, and the results are sent to the TA. The TA informs building owners of the outcomes; confirms the building usability status (usable, partially usable, or not usable); and notifies any requirements for urgent temporary securing work.
 - The V.V.F. installs temporary securing works for some high-priority places.
- PHASE III is led by the MiBACT (for heritage places).

- The MiBACT nominates teams of internal and external technical experts to inspect heritage sites and advise on stabilisation and repair. Methodologies and costs are reviewed, and MiBACT decides whether to install temporary securing works or to move directly to the design and installation of permanent strengthening solutions.
- The MiBACT manages collections, cataloguing, storage, and re-housing of valuable building debris (historic fabric) and movable historic items or collections.

2.1.3 The success of Italian emergency response framework: key-factors

The success of the Italian Emergency Response relies on the following factors:

- Deployment of technical heritage experts to undertake rapid building inspections and the establishment of a robust peer-review system to review and validate their assessment.
- Adoption of Rapid Building Assessment forms and comprehensive technical manuals specifically developed for each main heritage building typology.
- Development of an emergency database and information systems to provide, acquire, process, and share the data collected among the different government agencies and services.

2.1.4 Highly skilled and well-trained personnel

In Phase II, the DPC manages and oversees the Rapid Building Assessments (RBA). Assessor teams are created deploying specialised personnel from DPC, MiBACT and the National Technical Register (NTN). The NTN comprises technical experts and skilled professionals trained in post-disaster rapid assessments and whose competencies have been tested and certified. Depending on their level of training and expertise, the NTN members are divided into four tiers:

- TIER 1 – basic training on emergency response.
- TIER 2 – specialised technical training on the assessment of ordinary buildings and structures.
- TIER 3 – specialised technical training on the assessment of heritage monumental buildings and large-scale industrial/commercial buildings and structures.
- TIER 4 – advanced training on management and coordination of emergency response.

While TIER 1 is an open level, TIER 2, 3 and 4 are generally reserved for chartered professionals and national/international technical experts (e.g. university researchers or professors, etc.). The assessment of heritage buildings is only assigned to qualified and trained experts (NTN - TIER 3). This recognises the complexities associated with the assessment of built heritage and the importance of reliable results. Once completed, each assessment is peer-reviewed and validated by technical committees led by senior members of the DPC, MiBACT and NTN. The peer-review process ensures high standards for public safety, dependable outcomes, and consistency in the evaluation of the level of damage assessed by the different assessor teams.

2.1.5 Rapid Building Assessment forms and comprehensive technical manuals

To facilitate the assessment process and support good outcomes for heritage buildings, a suite of standardised Rapid Building Assessment forms (Schede AeDES) has been developed by the Italian Government and MiBACT. These forms address:

- Initial estimates of the scale of damage.
- Damage assessment and associated building usability status.
- Design, peer review, and installation of temporary/permanent repair, and strengthening solutions.

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

- Protection of movable heritage items/collections during emergencies.

Tested in several real disasters, these standardised forms have proven to be invaluable in the management of buildings in emergencies. The use of these forms:

- Ensures consistency in the assessment process.
- Reduces the risk of omissions.
- Collects data to inform the decision-making process in the following emergency stages.
- Act as the official record for Government, TAs, and owners.

The effectiveness of the Italian Rapid Building Assessment (RBA) forms has been recognised worldwide and the forms have been adopted by many European countries as a reference model.

2.1.6 Emergency database and information systems

During the last few decades, the Italian TAs have commenced the migration of their building property archive, district plans, and emergency plans into a digital format – along with relevant data from DPC, MiBACT and VV.F. In preparation for disasters, these databases are used to define strategic actions to improve the preparedness of the various TAs against natural and anthropogenic (human-induced) hazard. During emergencies, these databases provide VV.F., DPC, MiBACT and NTN with information to plan and organise their operations. Shared information systems enhance collaboration and communication among government agencies during the emergency response. This allows government agencies to oversee emergency operations, monitor results, extrapolate potential trends, and identify upcoming issues in a timely manner.

3 PROJECT SCOPE

Based on national and overseas experience, and a review of international best practice, a team of New Zealand heritage professionals have developed a project to improve the current post-disaster emergency response for built heritage. The project is focused, initially, on improving the emergency response procedures for earthquake events. Once the main general tasks are completed, the proposed procedures can be adapted for use following other disasters, such as geophysical (e.g. landslides, tsunamis and volcanic activities), hydrological and climatological (e.g. avalanches and floods), and meteorological (e.g. cyclones and storms/wave surges) events. The main aim of this project is to:

- Advance collaboration between authorities and organizations involved in the emergency response. To agree mutual processes and goals, and to enhance the protection of heritage buildings.
- Assist MBIE to update current operation processes and procedures framework to include specific clauses for the assessment, stabilisation, and protection of heritage buildings during time of emergencies.
- Develop post-earthquake rapid assessment forms and field books for heritage buildings and cultural sites.
- Arrange training courses on how to assess, document and stabilise damaged heritage buildings.
- Create a register of practitioners specifically trained to undertake rapid post-earthquake site inspections on heritage buildings.
- Create an electronic database reporting the most relevant information currently available on New Zealand heritage buildings.
- Develop a digital application to perform rapid post-earthquake assessment inspections using mobile devices.

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

3.1 Project tasks

A first overview of the project tasks is proposed in the following paragraphs:

TASK 1: Emergency and Post-Earthquake Rapid Assessment

Adapt international best practice to create a heritage emergency response system for New Zealand for:

- The management and protection of heritage buildings in times of emergencies.
- Post-earthquake rapid assessment and stabilisation techniques.
- Salvage, rehousing, and storage of valuable debris and movable items.
- Documentation of heritage buildings and sites in case of partial or complete demolition.

TASK 2: Typical seismic response and failure mechanisms for heritage buildings

Classify the most common typologies of heritage buildings in New Zealand, considering typical construction techniques and architectural features. For each class, identify typical seismic response(s) and potential failure mechanisms. Summarise research outcomes in synoptic tables to provide comprehensive and accessible data on local traditional construction techniques for use by assessment teams.

TASK 3: Post-Earthquake Rapid Assessment forms and field-book.

Based on the outcomes from Task 1 and Task 2, develop new post-earthquake rapid assessment forms and field-books for the most common categories of heritage sites, including:

- Built heritage.
- Museums, libraries, archives, and other buildings that house significant collections.
- Other historic structures, monuments, archaeological and historic sites.

TASK 4: Guidelines and training courses.

Develop guidelines for the assessment of heritage places and risk management during state(s) of emergency. Arrange training courses for engineers, architects, conservators, and other heritage professionals. The training courses should include but not limited to the following topics:

- Health and safety and emergency evacuation.
- Damage assessment.
- Estimation of residual capacity of built heritage to withstand potential aftershocks.
- Structural stabilization, temporary securing works, weatherproofing.
- Documentation and rapid assessment forms.
- Salvage, rehousing and storage of historic fabric and movable items.
- Communications and team building.
- Real-time simulation of emergency scenarios.

TASK 5: Post-Disaster Heritage Response Team

Set up a register of practitioners for deployment in the event of a disaster. The practitioners enrolled in the register should have completed the training course outlined in TASK 4 and demonstrate proficiency in carrying out Rapid Post-Earthquake Assessment Inspections of built heritage. Establish a Post-Disaster Heritage Response Team to assist local and national authorities, by:

- Organising assessor teams to inspect heritage buildings and structures.
- Peer-reviewing and validating assessments carried out by inspectors.

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

- Suggesting actions to manage the risk and protect heritage places during emergencies.

TASK 6: Legislation and Policy Framework

Assist MBIE in updating the current operation processes and procedures framework to include new procedures for the management of built heritage during emergencies. The new framework should regulate, but not be limited to, the following activities:

- Assessment of heritage places.
- Stabilisation and temporary securing works.
- Partial or complete demolitions.
- Collection and management of historic fabric and movable items.

TASK 7: Heritage Electronic database

Create an electronic database of heritage places and sites listed in the New Zealand Heritage List Rārangī Kōrero, scheduled in district and regional plans, and/or otherwise formally documented. The electronic database should collect information currently available for each site, including but not limited to:

- Location.
- Significance and heritage values.
- Building typology and year of construction.
- Plans, elevations, and sections.
- Relevant physical features.
- Materials, construction details.
- Significant moveable items or collections housed at the site.

The database should also include a catalogue of the construction techniques and construction details established in TASK 2. This would support the rapid assessment of sites where no specific information is available.

TASK 8: Rapid Post- Earthquake Assessment for built heritage: digital application

Develop a digital tool for Rapid Post-Earthquake Assessments using mobile devices. The application would allow users to:

- Complete assessment forms and record seismic status of the buildings assessed.
- Populate an electronic database that is accessible in real-time by all the authorities and parties involved in the emergency management.
- Establish damage trends and track the speed of the assessment process.
- Monitor the location of inspectors allowing early warnings to the rescue teams in case of aftershocks.
- Allow a faster review/validation of the assessments undertaken.

4 CONCLUSIONS

Although the emergency response framework in New Zealand is world-leading in many respects, it lacks assessment guidelines and specific procedures for built heritage. This gap in regulation and industry practice may result in the loss of built heritage and historic collections, which could in turn, impact community recovery following future disaster events.

International literature identifies that heritage can play a fundamental role in the recovery process. Research on this topic has led international organisations such as UNESCO, ICOMOS and ICCROM to publish guidance on disaster risk management for heritage places, including for emergency response. Some countries have developed advanced and effective frameworks to safeguard cultural heritage in areas with high seismicity. This is the case of Italy, whose emergency framework has been discussed as a case-study in this paper.

This paper presents the work of a group of New Zealand heritage professionals, who propose a pathway for emergency response procedures that are specific to our shared cultural heritage. The project proposal is arranged into eight key tasks - from developing new tools for rapid assessment, to assisting MBIE in updating the current legislation and policy framework. The creation of procedures for the emergency response management of heritage places allows New Zealand to align with international best-practice – not only for the seismic design of new buildings and structures – but also for the post-disaster response management for its existing historic and heritage buildings.

We look forward to discussions on how to implement this proposed post-emergency response, which has been based on international best practice and tailored to fit New Zealand’s heritage places.

5 ACKNOWLEDGMENTS

The authors would like to thank Win Clark and Fiona Wykes for their knowledgeable advice and enthusiastic support.

The views expressed in this paper are those of the authors and do not necessarily reflect those of the organisations to which they belong.

6 REFERENCES

ACCU (2021). “*Disaster Risk Management for Cultural Heritage in the Asia-Pacific Region - Current State and Issues (I): Emergency Response Case Studies.*” International Workshop 2021, Asia-Pacific Cultural Centre for UNESCO (ACCU), 107pp. <https://www.nara.accu.or.jp/img/report/iw2021.pdf>

ACCU (2022). “*Disaster Risk Management for Cultural Heritage in the Asia-Pacific Region - Current State and Issues (II): Emergency Response Case Studies.*” International Workshop 2022, Asia-Pacific Cultural Centre for UNESCO (ACCU), 126pp. <https://www.nara.accu.or.jp/img/2023/accu-kokusa2022.pdf>

Al-Nammari, F M & Lindell, M K (2009) ‘*Earthquake Recovery of Historic Buildings: Exploring Cost and Time Needs*’, *Disasters* 33:3

CCC (2019). *Our Heritage, Our Taonga Heritage Strategy 2019–2029*, Christchurch City Council. <https://www.ccc.govt.nz/assets/Documents/Culture-Community/Heritage/Our-Heritage-Our-Taonga-Heritage-Strategy-2019-2029.pdf> (Accessed January 2024)

CERA (2012). *Recovery Strategy for Greater Christchurch Mahere Haumanutanga o Waitaha*, Canterbury Earthquake Recovery Authority. <https://greaterchristchurch.org.nz/assets/Documents/greaterchristchurch/recovery-strategy-for-greater-christchurch-Copy2.pdf>

CSPOHP (2014). *Disaster Preparedness Planning*, California State Parks Office of Historic Preservation https://ohp.parks.ca.gov/?page_id=25506 (Accessed 09 May 2014)

CSRS2016 (2022). “*La sicurezza sismica degli edifici di interesse culturale*”. Report, Commissario Straordinario Ricostruzione Sisma 2016 - Presidenza del Consiglio dei Ministri, Roma, 40pp.

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

<https://sisma2016.gov.it/wp-content/uploads/2023/01/La-sicurezza-sismica-degli-edifici-di-interesse-culturale.pdf>

Dipartimento della Protezione Civil, *Emergenze*, <https://emergenze.protezionecivile.it/it/> (Accessed 09 January 2021)

Craig, S (1998b) 'Case Study: Earthquakes' in Spennemann, D H R & Look, D W (ed.'s) *Disaster Management Programmes for Historic Sites*. USA: Association for Preservation Technology (APT) & US National Park Service; Australia: Charles Sturt University

DPC (2013). "Approvazione del manual per compilare la scheda di rilievo del danno ai beni culturali". Standard, Dipartimento della Protezione Civil - Presidenza del Consiglio dei Ministri, Roma.

DPC (2020). "Valutazione dell'impatto, censimento dei danni e rilievo dell'agibilità post-sisma sulle strutture pubbliche e private e sugli edifici di interesse culturale, in caso eventi emergenziali di cui all'art.7, comma 1, del d.lgs. n.1 del 2 gennaio 2018 – Codice della Protezione Civile. Indicazioni operative per la formazione di tecnici della pubblica amministrazione, delle organizzazioni di volontariato e professionisti iscritti agli albi di ordini e college (Fascicolo SIGES 4.38/171)." Standard, Dipartimento della Protezione Civil - Presidenza del Consiglio dei Ministri, Roma, 29pp. <https://www.protezionecivile.gov.it/it/normativa/indicazioni-operative-per-il-raccordo-e-il-coordinamento-delle-attivit-di-sopralluogo-tecnico-speditivo>

DPC (2023). "Struttura Technical Nazionale – Modelli e scenari organizzativi nella gestione delle Emergenze". Report and attachments, Dipartimento della Protezione Civil, Rome, 151pp. <https://www.protezionecivile.gov.it/it/normativa/dpcm-del-13-marzo-2013/>

Eichenfield, J (1996). "20 Tools that Protect Historic Resources After an Earthquake: Lessons Learned from the Northridge Earthquake." California Preservation Foundation, Oakland, California. <https://marinet.bibliocommons.com/v2/record/S113C1455751>

Feilden, B M (1987). "Between Two Earthquakes: Cultural Property in Seismic Zones." ICCROM and the Getty Conservation Institute, Rome and Marina del Rey, California, 102pp. https://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/between_two.pdf

Federal Emergency Management Agency (FEMA) (2005) *Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning: State and Local Mitigation Planning How-To Guide*. USA: Federal Emergency Management Agency.

Forbes, C (2017). *Issues Paper: Post Earthquake Christchurch New Zealand Issues Associated with the Protection and Recovery of Built Cultural Heritage*. Australia ICOMOS, ICOMOS-ICORP, Blue Shield Australia, AIA 31 January 2017, Revision 5 (March 2019).

ICOMOS (2010). *ICOMOS New Zealand Charter for the Conservation of Places of Cultural Heritage Value*. https://icomos.org.nz/wp-content/uploads/2020/12/NZ_Charter.pdf (Accessed January 2024).

ICOMOS (2021). *ICOMOS Global Case Study Project on Recovery and Reconstruction*. <https://www.icomos.org/en/focus/reconstruction/41704-icomos-global-case-study-project-on-reconstruction> (Accessed 24 January 2024)

Jha, A K; Barenstein, J D; Phelps, P M; Pittet, D; Sena, S (2010). "Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters." World Bank, Washington DC, 408pp. <https://issuu.com/world.bank.publications/docs/9780821380451>

Jigyasu, R (2011). "The Importance of Incorporating Protection of Cultural Heritage into Disaster Risk Management." Statement given at the Third Session of the Global Platform for Disaster Risk Reduction, United Nations Office for Disaster Risk Reduction (UNDRR) Switzerland. <https://www.preventionweb.net/globalplatform/2011/>

Kealy, L, de Marco, L, Hadzimuhamedovic, A, Marchand, T, Gregory, A.R and Ploteau, A (2020). "Analysis of Case Studies in Recovery and Reconstruction Case Studies." Volume 1, volume 2 and report, International Centre for the Study of the Preservation and Restoration of Cultural Property Regional Office, Sharjah

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

(ICCROM) and International Council of Monuments and Sites (ICOMOS), vol.1 278pp, vol.2 220pp, report 34pp. <https://www.iccrom.org/index.php/publication/analysis-case-studies-recovery-and-reconstruction-volumes-1-and-2-and-reports>

MacKee, J (2013) 'Reconceptualising Cultural Heritage: The Adaptive Cycle as a Means of Rebranding the Risk and Vulnerabilities of Cultural Heritage in the Face of Natural Disasters', paper given at the 3rd International Conference on Building Resilience, Sri Lanka, September 2013.

Maclean, C (2022). "Guidance for Preparing Heritage Risk Management Plans." ISBN 978-1-877563-49-2, Heritage New Zealand Pouhere Taonga (HNZPT), Wellington 31pp. <https://hnzpt-rpod-assets.azureedge.net/cmdnw500/guidance-preparing-heritage-risk-mgt-plans.pdf>

Marriot, A (2011). "The Performance of Heritage Buildings in the 2010/2011 Christchurch Earthquake Swarm", paper given at the 16th Engineering Heritage Australia Conference, Australia, November 2011

MBIE (2023). *Rapid Building Assessment System*, <https://www.building.govt.nz/managing-buildings/managing-buildings-in-an-emergency/rapid-building-assessment-system/> (Accessed 24 January 2024).

McClean, R (2009). "Toward Improved National and Local Action on Earthquake-Prone Heritage Buildings." Historic Heritage Research Paper No.1. New Zealand Historic Places Trust, Wellington.

McClean, R; Duff, M; Burgess, R; Margetts, D; Maclean, C; Whybrew, C; Vincent, M (2012). "Heritage Buildings, Earthquake Strengthening and Damage: The Canterbury Earthquakes September 2010 – January 2012: Report for the Canterbury Earthquakes Royal Commission." New Zealand: New Zealand Historic Places Trust

MCH (2018). *Strengthening protections for heritage buildings: Report identifying issues within New Zealand's heritage protection system, November 2018*, <https://www.mch.govt.nz/sites/default/files/2023-11/proactive-release-strengthening-protections-for-heritage-buildings-report.pdf> (Accessed January 2024).

MfE (2022). "Urutau, ka taurikura: Kia tū pakari a Aotearoa i ngā huringa āhuarangi Adapt and thrive: Building a climate-resilient New Zealand Aotearoa New Zealand's First National Adaptation Plan". ISBN 978-1-99-102549-4, Ministry for the Environment, Wellington, 196pp. <https://environment.govt.nz/publications/aotearoa-new-zealands-first-national-adaptation-plan/>

MiBACT (2015). "Aggiornamento della direttiva 12 dicembre 2013, relativa alle Procedure per la gestione delle attività di messa in sicurezza e salvaguardia del patrimonio culturale in caso di emergenze derivanti da calamità naturali". Standard and attachments, Ministero dei Beni e delle attività culturali, Roma, 25pp. <https://www.gazzettaufficiale.it/eli/id/2015/07/23/15A05594/sg>

Nelson, C L (1991). "Protecting the Past from Natural Disasters." National Trust for Historic Preservation, Washington DC. <https://archive.org/details/protectingpastfr00nels>

NEMA (2019). "National Disaster Resilience Strategy Rautaki ā-Motu Manawaroa Aituā". ISBN 978-0-478-43523-8, Ministry of Civil Defence & Emergency Management, Wellington, 52pp. <https://www.civildefence.govt.nz/cdem-sector/plans-and-strategies/national-disaster-resilience-strategy>

Pichard, P (1985). "Emergency Measures and Damage Assessment After an Earthquake." Centre de Documentation UNESCO-ICOMOS. https://openlibrary.org/books/OL18944759M/Emergency_measures_and_damage_assessment_after_an_earthquake

Preserve America (2008a). "Preparing to Preserve: An Action Plan to Integrate Historic Preservation into Tribal, State, and Local Emergency Management Plans." Heritage Preservation, USA, 22pp. <https://resources.culturalheritage.org/heritagepreservationemergencyreports/wp-content/uploads/sites/16/2017/06/PreparingtoPreserveActionPlan.pdf>

Preserve America (2008b). "Preparing to Preserve: Emergency Planning: Model Checklist for Historic Preservation." Heritage Preservation, USA, 1p. <https://www.doi.gov/sites/doi.gov/files/uploads/FinalChecklist-12-2008.pdf>

Paper 120 – Improving Post-Earthquake Emergency Management of Heritage Buildings.

Sage, E (2013) ‘Heritage New Zealand Pouhere Taonga Bill: Second Reading’, The Green Party of Aotearoa New Zealand: www.greens.org.nz/speeches/eugenie-sage-speaks-second-reading-heritage-new-zealand-pouhere-taonga-bill (Accessed 28 March 2014).

Stevens F.L (2014). “*Developing an Earthquake Response Framework for Historic Buildings in Aotearoa New Zealand*”. Masters Thesis, Department of Archaeology, University of York, York, UK, 240pp.

Stevens F.L (2015). “Earthquake Response for Built Heritage in New Zealand” *ICOMOS NZ Conference and AGM: ICOMOS 50- past, present, future*, 17-18 October 2015, Auckland, 29 pp.

Spennemann, D H R (1999) ‘*Cultural Heritage Conservation During Emergency Management: Luxury or Necessity?*’ *International Journal of Public Administration* 22:5

Stovel, H (1998). “*Risk Preparedness: A Management Manual for World Cultural Heritage.*” International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), Rome, 153pp. https://www.iccrom.org/sites/default/files/ICCROM_17_RiskPreparedness_en.pdf

Tandon, A (2018). “*First Aid to Cultural Heritage in Times of Crisis Handbook.*” ISBN 978-92-9077-281-1, International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), Italy; and Prince Claus Fund for Culture and Development, the Netherlands, 180pp. https://www.iccrom.org/sites/default/files/2018-10/fac_handbook_print_oct-2018_final.pdf

Tandon, A (2023). “*Urban Search and Rescue at Heritage Sites Guidance Note.*” International Search and Rescue Advisory Group (INSARAG) of the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), United Nations Educational, Scientific and Cultural Organization (UNESCO), International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), 41pp. https://www.iccrom.org/sites/default/files/publications/2023-06/en_1_guidance_note_usar-cultural-heritage-safeguar_far_2023_iccrom.pdf

United Nations Educational, Scientific and Cultural Organisation (UNESCO); International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM); International Council on Monuments and Sites (ICOMOS); International Union for the Conservation of Nature (IUCN) (2010) *Managing Disaster Risks for World Heritage*. France: UNESCO World Heritage Centre

UNIDDR (2015). “*Sendai Framework for Disaster Risk Reduction 2015-2030*”. United Nations Office for Disaster Risk Reduction, United Nations, Geneva, 37pp. <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

World Bank (2004) *Technical Annex for a Proposed Loan of US\$220 Million to the Islamic Republic of Iran for a Bam Earthquake Emergency Reconstruction Project*. USA: World Bank