Resilient Cultural Heritage

Learning from the Japanese Experience

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Cover photo: Miyajima, Japan, people walking up to the torii gate of the Itsukushima Shrine at low tide. A gate has been in place on Miyajima Island since 1168, the current gate dates back to 1875. Photo: Sara_winter.

All photos by Barbara Mingueź Garcia unless otherwise indicated.

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Japan—World Bank Program for Mainstreaming
Disaster Risk Management in Developing Countries

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A note on terminology This document uses "CH" when referring to cultural heritage in general and "CP" when referring to the specific denomination of Cultural Properties used in Japan. This knowledge note aims to clarify the systems and practices underlying the Japanese experience in building resilience for CH in general, with a special focus on examples of tangible immovable heritage.

In terms of territorial organization, Japan is divided into 47 prefectures, grouped in eight regions. Each prefecture includes several municipalities. For the purpose of this document, the general references to "subnational level" include regions, prefectures, and municipalities, while "local level" includes both prefectures and municipalities; otherwise the reference would specify prefectural or municipal level.

A note on the Law for the Protection of Cultural Properties After the amendment of the Law for the Protection of Cultural Properties in 2019, the administrative department responsible for the protection of cultural heritage has been transferred in some local governments from the Board of Education to others, such as Governor's or Mayor's Departments.

Roof replacement in Kiyomizu-dera temple, Kyoto.

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Abbreviations and Acronyms

AD	Anno Domini
ACA	Agency for Cultural Affairs
AIJ	Architectural Institute of Japan
CBO	Community-Based Organizations
CDMC	Central Disaster Management Council
CH	Cultural Heritage
CH-DRM Net	Cultural Heritage Disaster Risk Mitigation Network
CoE	Center of Excellence
CP	Cultural Property
CURE	Culture in City Reconstruction and Recovery
DIG	Disaster Imagination Game
DRM	Disaster Risk Management
ESF	Environmental and Social Framework (World Bank)
ESS8	Environmental and Social Standard #8 (Cultural Heritage)
EWSS	Environmental Water Supply System
FCHAR	Foundation for Cultural Heritage and Art Research
FDMA	Fire and Disaster Management Agency
FY	Fiscal Year
GEJE	Great East Japan Earthquake
GFDRR	Global Facility for Disaster Reduction and Recovery
HM	Heritage Manager (System)
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council on Monuments and Sites
ICP	Important Cultural Property
IRCI	International Research Centre for Intangible Cultural Heritage in the Asia-Pacific Region
JACAM	Japanese Association for Conservation of Architectural Monuments
JICA	Japan International Cooperation Agency
JSDF	Japan Self-Defense Force
JTA	Japan Tourism Agency
MEXT	Ministry of Education, Culture, Sports, Science and Technology
MIC	Ministry of Internal Affairs and Communications
MLIT	Ministry of Land, Infrastructure, Transport, and Tourism
NGO	Nongovernmental Organization
NICH	National Institutes for Cultural Heritage
NPO	Non-Profit Organization
R-DMUCH	Institute of Disaster Mitigation for Urban Cultural Heritage (Ritsumeikan University)
UNESCO	United Nations Educational, Scientific and Cultural Organization
WH	World Heritage
WMF	World Monuments Fund
WSS	Water Shield System

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Executive Summary

Demonstration of the firefighting system in the Ninna-ji Temple in Kyoto, by the temple staff and the R-DMUCH team.

Japan's cultural heritage (CH) is among the richest in the world, but the country is faced with some of the most difficult challenges in its exposure to hazards. With earthquakes, volcanic eruptions, tsunamis, typhoons, floods, landslides, and fire, Japan is ranked second, behind the Philippines, for exposure to natural hazards, according to the INFORM Global Risk Index 2019.[1] This has forced the country to develop a culture of continuous improvement in the face of hazard events—a quality that is particularly notable in its management of its CH.

This knowledge product—*Resilient Cultural Heritage: Learning from the Japanese Experience*—reflects good practices and lessons learned from Japan to support international practitioners in the fields of disaster risk management (DRM), CH, and public policy, who are seeking to enhance the disaster resilience of CH and communities in their countries. It is organized into three main sections:

- Section 1: Institutional Framework
- Section 2: DRM for CH in Practice—From Risk Identification to Post-Disaster Resilient Recovery
- Section 3: Community Engagement in DRM for CH

SECTION 1

Institutional Framework

Section 1 presents the CH and DRM institutions and key actors, the related legislation and policies, and associated budgets. One of the key elements is Japan's system for identifying and designating its Cultural Properties (CPs) by classifying them into six different categories: Tangible CP, Intangible CP, Folk CP, Monuments, Cultural Landscapes, and Groups of Traditional Buildings. These classifications are the foundation on which the country manages its protection of CH. Japan has been achieving effective results from the application of measures within its frameworks, and additional work to be developed in the future will integrate DRM within all six categories of CP, to further improve the DRM for CH practice.

Japan provides a useful illustration for how an institutional system can be designed to prepare for and respond quickly to complex events, such as disasters. For example, the Coordination Office for Cultural Properties Protection and the Cultural Properties Disaster Countermeasure Committee bring together the heads of key department and section chiefs with staff from the National Institutes for Cultural Heritage (NICH), helping ensure that disaster preparedness and response activities appropriately integrate culture.

The Japanese system establishes different models for budgeting DRM of CH. The key budget and subsidies include: the Agency for Cultural Affairs (ACA) budget for cultural protection and management, which includes DRM measures and actions; the Reconstruction Agency special disaster recovery budget; and ACA subsidies for owners of CP (allocated through local governments) to cover costs related to DRM for CH.

[1] http://www.inform-index.org/

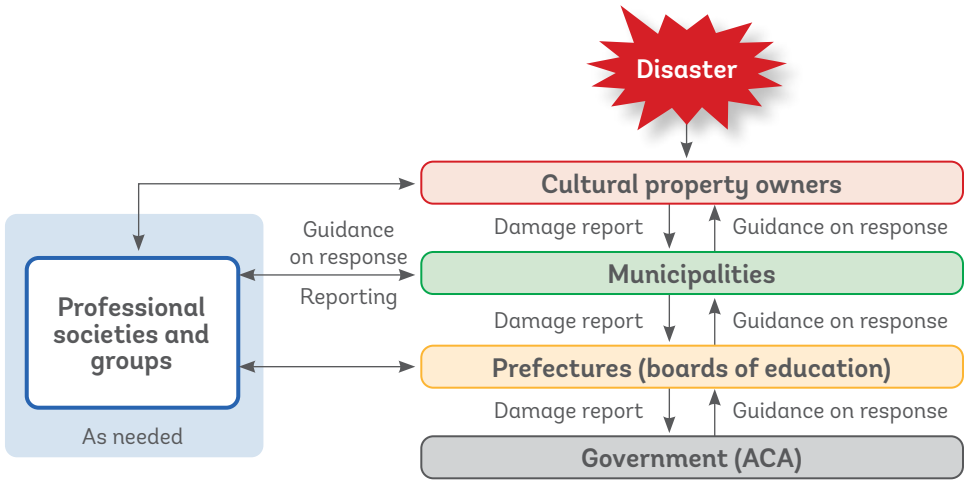


FIGURE 1

Line of reporting and guidance at the time of disaster

Source: Adapted from Mie Prefecture's DRM Manual for CP, 2017.

Risk Identification

Risk to CH is considered through an assessment of natural hazards and the vulnerability of the CH assets. In Japan, different actors conduct risk assessments at various levels. This note includes several examples. Hazard maps are a helpful tool developed by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) and the municipalities, to be combined with specific information about the exposed CPs. ACA provides specific guidelines to assess risk to and vulnerability of CP, such as the *Guidelines for Assessing Seismic Resistance of Important CPs*, to support CP owners and municipalities to develop the assessments. ACA also publishes checklists for fire prevention to be carried out by CP owners. The MLIT provides *Guidelines for Landslides Prevention Techniques* and operates XRAIN, a real-time rainfall observation system. Typhoon- and wind-induced forces assessments are often conducted at the same time as assessments for earthquake resistance, while floods are usually assessed at a wider scale that also includes CH sites.

SECTION 2

DRM for CH in Practice—From Risk Identification to Post-Disaster Resilient Recovery

Section 2 presents practical experience from Japan for planning and implementing measures to manage and reduce disaster risk at CH. The section focuses on practical approaches and specific examples, and on lessons learned from previous experiences and disasters. It includes relevant practices and measures for specific key hazards such as fire, earthquakes, floods, and landslides, and integrates lessons learned from two well-known large-scale earthquakes: the Great Hanshin-Awaji Earthquake in 1995 and the Great East Japan Earthquake (GEJE) and Tsunami in 2011, in addition to one medium-scale disaster, the M 6.6 earthquake in Tottori Prefecture in 2016.

Risk Reduction, Preparedness, and Response

Measures to reduce or mitigate the impact of events or to increase preparedness for them include "hardware," such as physical measures and facilities, and "software," including manuals, education, and trainings. ACA's *Disaster Management Operation Plan* establishes that ACA provides guidelines for developing local DRM plans, manuals, trainings, drills, and communications and knowledge dissemination. ACA provides the *Guidelines for Ensuring Safety of CP during Earthquakes* to increase security and resilience. Through traditional design, some buildings in Japan have proven highly resistant to earthquakes. CP owners and site managers are responsible for securing the safety of visitors, taking immediate action for emergency response to CPs, including the initial damage assessment, and taking measures to prevent potential secondary disasters.

Fire is one of the most serious hazards in Japan. The *Disaster Risk Mitigation Measures against Fire for Important CP* establishes key actions to prevent and fight fire. Fire prevention facilities and equipment play crucial roles in early firefighting; some key Japanese solutions include: gravity pressure–type water supply facilities; water shield systems (WSS); and community-based fire prevention systems for historic urban areas. Japan established January 26 as its Fire Prevention Day for CP.

Local governments and CP owners are responsible for establishing measures to monitor and stabilize slopes, including building retaining walls, monitoring underground water flow, and building drainage facilities. In this regard, *Sabo* is a traditional erosion and sediment control system for upstream areas used in Japan for more than a century. It utilizes different techniques such as terracing and reforestation. Some of these historic measures are themselves considered Tangible CP. This system is helpful during typhoons and rainfalls.

Floods usually affect large geographical areas, and mitigation measures focus on levees and dikes that seek to preserve the landscape, as well as water retention ponds, canals, and drainage systems in urban contexts. In the case of movable heritage, CP owners and managers are responsible for taking different measures to secure, evacuate, and rescue these assets.

Overall, ACA's Wheel for DRM for CP calls for emergency response and rescue within 48 hours after the disaster. Three key actions include emergency rescue, quick response for mass preservation, and further treatment for restoration and conservation.

Resilient Recovery

Japan has built its experience in DRM by documenting lessons and improving its preparedness and emergency response system through recurring events at the local or regional scale. After the earthquake in Hyogo Prefecture in 1995, for example, ACA organized the Committee for the Rescue of Cultural Properties Affected by the Great Hanshin-Awaji Earthquake, and worked with volunteers to implement the rescue action. Hyogo Prefecture assessed the damage to CP in cooperation with municipalities, and the Recovery Fund for the Great Hanshin-Awaji Earthquake was established to provide middle- and long-term support to the recovery efforts. A group of historians, students, and staff members of museums, archives, and libraries founded the *Shiryō-Net* to help preserve historical material. Key lessons learned include the need to improve seismic resistance of CP, extend protection measures to non-designated CP, and improve the involvement and capacity of response of local communities, among others. The Temporary Council on Earthquake Resistance was created to coordinate studies for a precise understanding of earthquake damage to CP buildings and rehabilitation measures that enhance seismic resistance.

The Great East Japan Earthquake (GEJE) and Tsunami in 2011 affected a total of 744 nationally designated and registered CPs. ACA set up the Committee for the Rescue of Cultural Properties and Other Materials Affected by GEJE, including 14 organizations, and supported several recovery projects through the Program for the Promotion of Tourism and the Revitalization of Local Communities, using the regular budget. As part of the Special Disaster Recovery

Budget for GEJE, the Reconstruction Agency allocated a special subsidy coordinated by ACA to support owners and managers in repairing and restoring nationally designated CP. The cooperation between government and actors in civil society was fundamental. The CP Rescue Operation focused on rescuing movable CP from temples, shrines, private properties, museums, and archives; the Cultural Properties Doctor Dispatch Project targeted built heritage affected by the earthquake to carry out damage assessments and provide technical assistance for first aid and early recovery. Key lessons learned include the need to increase the budget for restoration, including repair and recovery of non-designated and nonregistered CPs; the need for more systematic cooperation and technical CP expertise in municipalities; the importance of conserving remnants of disasters as heritage; and the role of CP repairs in healing for community members and as a stimulant for community recovery.

The case of central Tottori Prefecture in 2016 is a good example of operations involving a medium-scale earthquake. The event affected Kurayoshi, a nationally designated Preservation District of Groups of Traditional Buildings, where Heritage Managers (HMs) played an important role in the response and recovery phases of the disaster, drawing up plans and conducting damage assessments. Key lessons learned include the usefulness of HMs to avoid the hasty demolition of affected CPs, the importance of daily management and maintenance, the inclusion of registered and nonregistered CPs, and the roles of prefectures and municipalities, among others.

Some key elements of Japan's approach include the use of community-based disaster mitigation mapping to identify risks, such as the Disaster Imagination Game (DIG) methodology. Examples such as the cases of Kiyomizu-dera and Myoshin-ji illustrate the benefits of involving the local community in the protection and conservation of the site. In Kyoto, the Citizen Rescue System for CH developed by the Fire Department promotes cooperation between local community members and owners and managers of CPs to prevent fires; and the historic neighborhood of Ponto-cho, learning from past events, developed the Ponto-cho Fire Prevention Measures Network and the Ponto-cho Town Protection Unit. Communities are also key in resilient recovery processes. The Miyagi Network for Preserving Historical Materials is a network of volunteers who locate, document, and archive important historical records before the next disaster. After GEJE, the Miyagi *Shiryō-Net* conducted damage surveys and rescue activities in different affected areas just a few weeks after the tsunami. The *Shiryō-Net* model has been replicated in many areas of Japan.

SECTION 3

Community Engagement in DRM for CH

Section 3 explores how Japanese communities and authorities work together to build disaster resilience for CH. Communities are crucial in developing DRM for CH because they are the main users and custodians of CPs, play a key role in their conservation and management, and can respond quickly to disasters, knowing the environment and being able to reach affected places before emergency teams.

Conclusion: Key Takeaways for Practitioners

Sasayama, Important Preservation District.

Japan's experience holds many lessons and good practices for both DRM and CH practitioners. This experience has been hard won—a product of the extensive and complex heritage of the country and the immense hazards it faces. Communities and authorities have developed and adapted their efforts to the local contexts of Japan; international practitioners can best use this note by identifying relevance, applicability, and adaptability of the good practices profiled to these contexts.

To that end, this note proposes 10 key takeaways that are relevant, applicable, and adaptable to DRM for CH globally.

1

Document and categorize CH, as a first step to understand risks to CH and protect it.

Identification, inventory (including geospatial reference), values assessment, and the classification of CH, such as the system for designating Cultural Properties (CP) in Japan, help to organize and prioritize support to develop DRM measures. Likewise, cooperation with academia and universities benefits from the development of studies and researches to complement documentation and data collection.

2

Investing in interagency cooperation before disasters improves performance throughout the DRM process.

Investing in communication and collaboration that connects actors at different levels before a disaster occurs, as happens in the ACA-Prefecture-Municipality dialogue and the explicit budget and incentive mechanisms in Japan, improves the ability of all actors to protect CH proactively and reduce the costs and potential losses from disaster events.

3

Integrating CH into existing risk identification processes and conducting targeted multi-hazard risk assessments for CH assets and sites makes action easier and more likely.

Integrating CH into hazard maps and developing risk identification guidelines and checklists can help communities and policy makers better understand risks and be ready to prepare mitigation and response measures.

4

Risk-informed monitoring and maintenance of historic sites allows better prioritization of conservation efforts, while culturally informed DRM measures help better protect sites' intrinsic values.

Structural assessments, monitoring temperature, humidity, and changes in vibrations, help site managers to identify and implement structural reinforcement measures, as seismic interventions at important CP sites in Japan demonstrate. Ensuring that protection measures integrate the cultural and aesthetic values of the site, such as the slope stability and monitoring system in Kiyomizu-dera, is a key element of DRM for CH.

5

As with DRM in other contexts, adopting a mix of "hard" and "soft" measures for risk reduction, preparedness, and response can provide a useful protection for CH sites against natural hazards.

In Japan, this includes hard measures for monument-level interventions, such as technically advanced firefighting systems, and infrastructure strengthening, such as flood protection. It also includes critical soft measures, such as the development of guidelines, manuals and communication systems that can be implemented at the local level, and community engagement.

6

Traditional knowledge may provide clues to better protect traditional—and even new—structures.

Examples from Japan show how preserving traditional locations, techniques, and materials can help protect CP, such as in the case of the cases of re-roofing of traditional roofs. Likewise, traditional practices and systems such as the *Sabo* system may even become a CP itself, strengthening the DRM of CH concept.

7

Rapid efforts in resilient recovery may make the difference in preventing unnecessary losses.

Trained officials and sometimes even volunteers who are able to conduct rapid damage assessments after a disaster event and implement temporary stabilization measures which can be improved later, may help salvage some CH. Including CH experts in physical recovery efforts can help avoid unnecessary demolitions of important CP, as shown in the case of the Heritage Managers (HM) system, which was developed following the 1995 Great Hanshin-Awaji earthquake.

8

Coordinate with the tourism sector to improve DRM of CH sites.

Most CP, and CH worldwide, are tourist destinations, meaning that crowds not familiar with the site may be vulnerable to disaster events. Integrating visitors into DRM plans for CH sites can help better manage related risks, as authorities in Kyoto do through communication and the translation of key information during emergency evacuations.

9

Involving the local community in CH sites—for risk identification, reduction, preparedness and response, and recovery, as well as general management—helps better protect sites and communities.

The key lesson from Japan is that community engagement improves the performance of all DRM functions and helps build social capital. Capacity building, drills, low-tech solutions, and measures or equipment that can be used and maintained by locals, such as the gravity pressure–type water supply facilities, and engagement tools such as the Disaster Imagination Game (DIG) are key to ensuring that locals are ready to act in case of emergency, and to protect visitors and CH assets.

10

Promote the replication of initiatives and good practices throughout the country.

National authorities can help promote local innovations and good practices, such as the *Shiryō-Net* volunteer organization which was developed after the GEJE to rescue and preserve CP and historical records and has now extended to different regions in Japan. The Cabinet Office and ACA, as well as other national and subnational authorities and academic and technical institutions, also play a key role in documenting lessons learned—both positive and negative—for national and international audiences.

Introduction

Japan's long, rich history has left it an extensive and important cultural heritage (CH). This heritage includes its famed temples and shrines, castles, historic towns, vernacular architecture and many other notable monuments, and museums. It also includes a varied and rich intangible heritage, such as festivals, arts and crafts, and traditions and customs that not only attract tourists from all over the world but are important treasures for local communities. Japanese CH is a source of shared identity that provides a sense of pride and history for local communities and the whole nation.

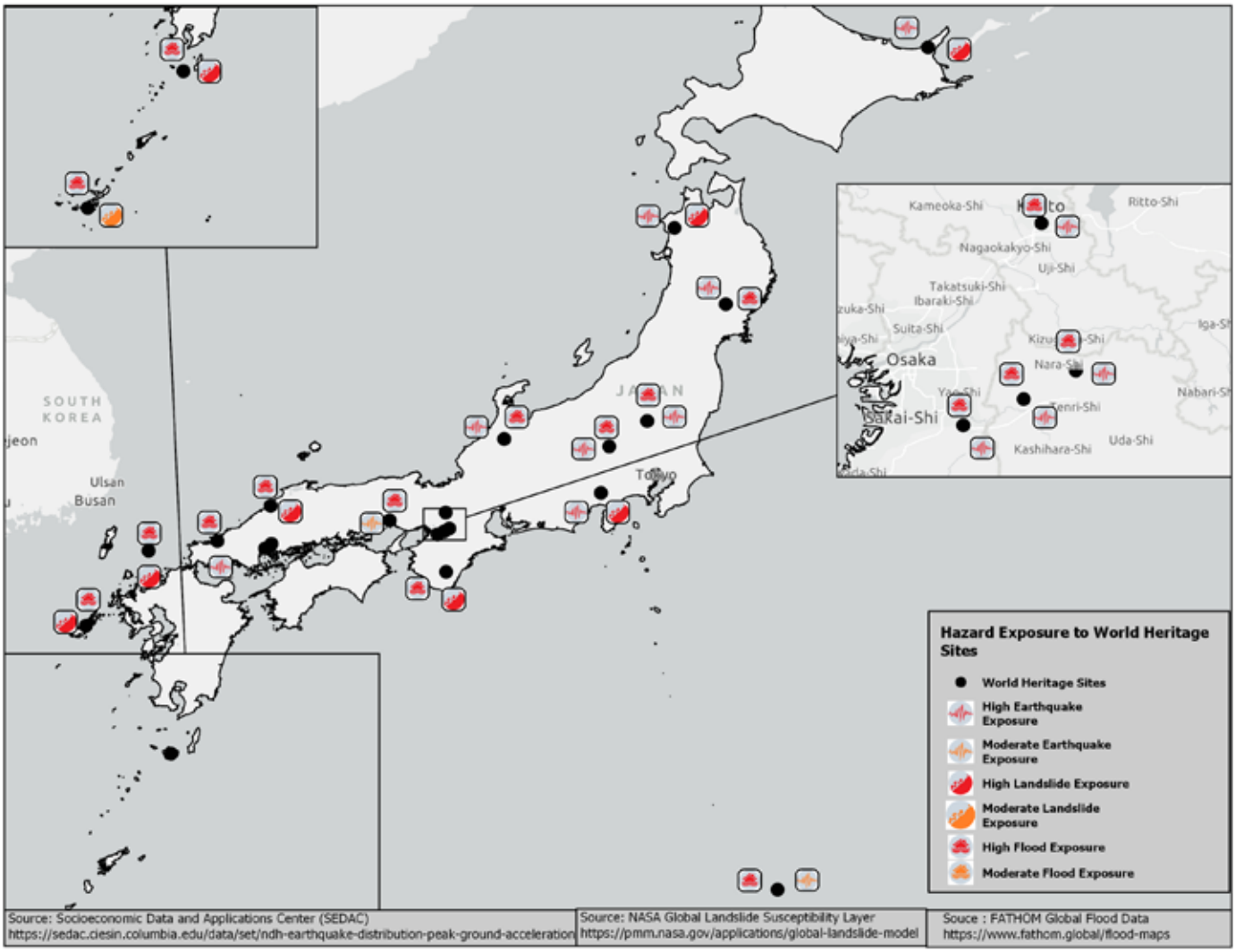
At the same time, Japan is a very hazard-prone country. An archipelago with over 100 active volcanos and 2,000 active fault lines, it is threatened by earthquakes, volcanic eruptions, tsunamis, typhoons, floods, landslides, and fire—the last which is particularly threatening to the extensive wooden-built heritage. The vulnerability inherent in these assets and their high exposure to natural hazards have led Japan to set up a heritage protection system that includes measures to counteract damage caused by the many different types of disasters and emphasizes prevention and preparedness based on lessons learned. All these conditions together have motivated actors across Japanese society to develop a wealth of experience in disaster risk management (DRM) for CH.

To illustrate the overall exposure of CH to natural hazards, Figure 2 presents the UNESCO World Heritage Sites[2] located in Japan and their exposure to earthquakes, floods, and landslides. The exposure to each of the three hazards has been classified as either low, moderate, or high, as derived from the relevant literature for that hazard. The methodology for this analysis is presented in Annex I.

In the past few decades, two major events have shaped the country's approach to protecting heritage assets from disasters. In 1995, the Great Hanshin-Awaji Earthquake, also known as the Kobe Earthquake, caused massive destruction in several cities in the Kansai region. More recently, in 2011, the Great East Japan Earthquake (GEJE) and Tsunami devastated the Tohoku region. Both episodes provided experiences that are reflected in new and more efficient policies, procedures, practices, and systems to improve the conservation of CH in the face of disaster risks.

These two events were not isolated occurrences. Japan is affected by recurrent impacts from hazards of different scales every year, including seismic and hydrometeorological events. This has motivated the country to improve its resilience step by step over decades, learning from the many experiences affecting both people and land. Because of the recurrent events, people have improved their social resilience, learning how to react and respond without panic during emergency situations.

[2] This list is as of the 43rd session of the World Heritage Committee in Baku, Azerbaijan, on 30 June–10 July 2019.



Over the years, and based on these experiences and lessons learned, Japan has set up, refined, and improved its heritage protection system and its institutional frameworks. It has accumulated knowledge and experience in identifying and reducing the particular vulnerabilities of CH, calculating and mitigating the risk to natural hazards, preparing and responding to emergency situations in CH areas, recovering from disasters under build-back-better principles, and fostering resilience for local communities at CH sites. The knowledge, experience, and lessons learned, developed, and systematized in Japan can offer insights for other countries on what can be done to protect CH sites against natural hazards, and on how to establish new systems or improve existing ones.

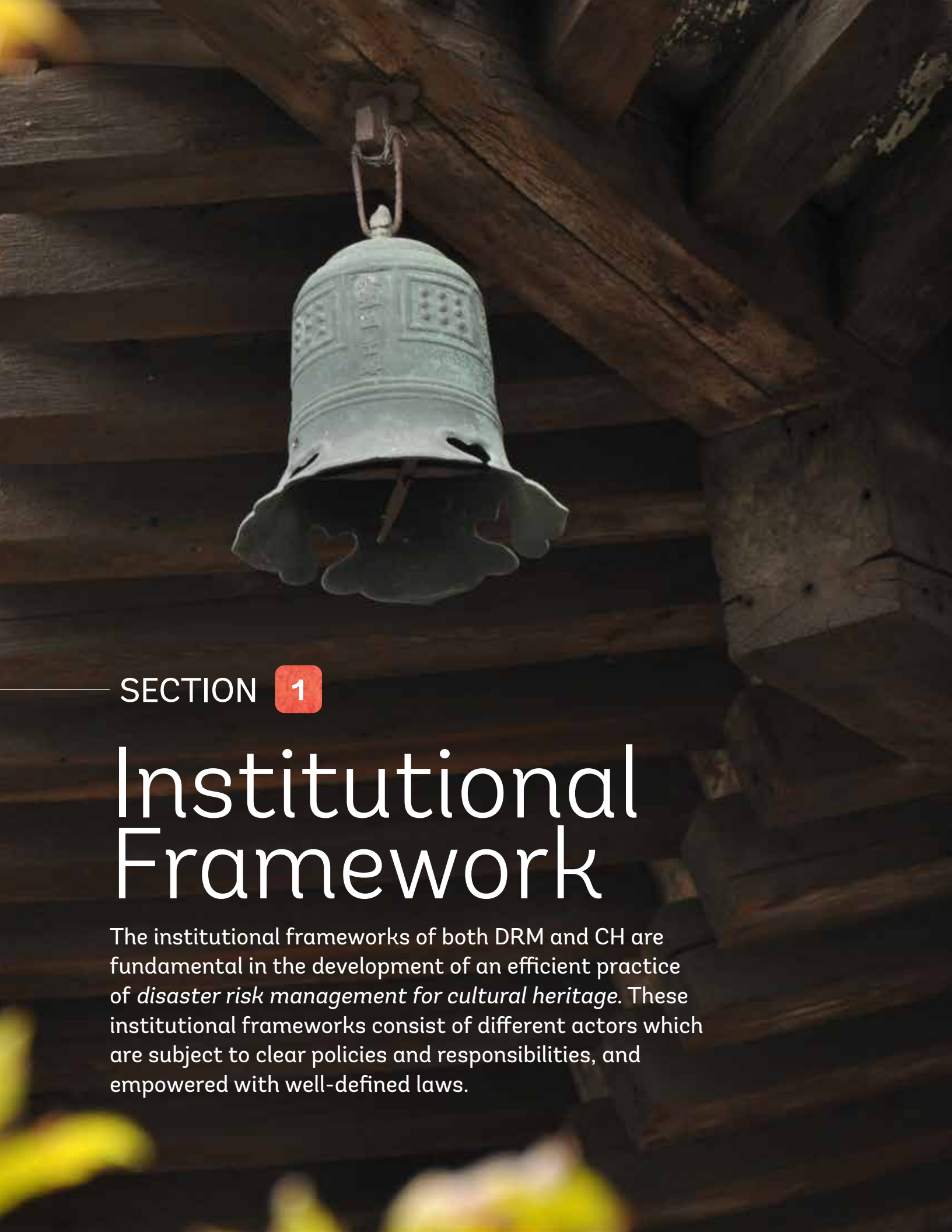
The DRM and CH sectors function at both the national and subnational levels and are equally important at each. The national government coordinates DRM and CH activities; promulgates and enforces regulations; provides funds, support, and guidance to subnational (regional, prefectural, and municipal) governments; and coordinates activities among different prefectures, as needed. Subnational governments liaise between the national government and players at the local level, coordinate actions between different municipalities, and provide technical and financial support for DRM and CH to private owners and other actors in civil society. Most DRM for CH initiatives take place at the local level.

FIGURE 2

Exposure of Japan's World Heritage Sites to earthquakes, floods, and landslides

Sources: Authors, Gaurav Bhardwaj, GFDRR.

Yasaka Pagoda at Houkan-ji temple, Kyoto.



SECTION 1

Institutional Framework

The institutional frameworks of both DRM and CH are fundamental in the development of an efficient practice of *disaster risk management for cultural heritage*. These institutional frameworks consist of different actors which are subject to clear policies and responsibilities, and empowered with well-defined laws.

Roof replacement in Kiyomizu-dera temple, Kyoto.

1. Major actors, laws, and responsibilities in DRM and CH

1.1 Main actors in DRM and CH

National Level

At the national level, Japan's institutions responsible for DRM and CH play key roles in ensuring the resilience of CH. Table 1 provides an overview of these DRM and CH institutions.

DRM institutions

The Cabinet Office

The **Cabinet Office**, in general, secures the coordination and cooperation of the ministries and governmental agencies on a wide range of issues, including DRM. The **Minister of State for Disaster Management** within the Cabinet Office is responsible for integrating and coordinating the DRM policies and measures of ministries and agencies. The **Director-General for Disaster Management**, working under the minister,[3] is responsible for overall coordination, the planning of basic DRM policies, and the response to large-scale disasters.

Central Disaster Management Council

Established under the Cabinet Office by the Disaster Countermeasures Basic Act, the **Central Disaster Management Council (CDMC)**[4] is responsible for development of the Basic Disaster Management Plan and the Earthquake Countermeasures Plans, and provides support to the Prime Minister, who is the council's chairperson, and to the Minister of State for Disaster Management regarding key issues related to disaster reduction. The council members are the ministers of relevant ministries and experts and representatives from the private sector and nongovernmental organizations (NGOs). Within CDMC, CH protection is represented by the **Minister of Education, Culture, Sports, Science and Technology (MEXT)**.

[3] Cabinet Office, "Disaster Management: Protecting Citizens from Disasters," http://www.cao.go.jp/en/pmf/pmf_5.pdf

[4] http://www.cao.go.jp/en/importantcouncil.html

The Fire and Disaster Management Agency

As part of the **Ministry of Internal Affairs and Communications (MIC), the Fire and Disaster Management Agency (FDMA)** is responsible for protecting people's lives and property from fire, and for ensuring coordination among prefectures, fire defense headquarters, volunteer fire corps organized by local citizens, and voluntary disaster prevention organizations, all of which are organized at the local level. It also provides support to fire defense headquarters and volunteer fire corps around the country—through, for example, the development of regulations and equipment inventory, inter alia.

Reconstruction Agency

Established within the Cabinet following the Great East Japan Earthquake (GEJE) and Tsunami in 2011, the **Reconstruction Agency** is the principal body in the Japanese government responsible for the reconstruction and revitalization of GEJE-affected areas.

Japan Self-Defense Force

The **Japan Self-Defense Force (JSDF)** is one of the country's most important organizations in the phase of the initial response to disasters. In the event of a disaster, the JSDF collaborates and cooperates with local governments to conduct various activities such as search and rescue, flood control, medical care, the prevention of epidemics, ensuring a water supply, and the transportation of personnel and supplies. The JSDF dispatches its initial relief action troops from the garrisons located throughout Japan in response to disasters that occur in different parts of the country. The JSDF also takes part in international peace cooperation activities overseas, as it did in the aftermath of the 2010 Haiti earthquake.

CH institutions

The Agency for Cultural Affairs

In Japan, the **Agency for Cultural Affairs (ACA)** is the main body responsible for culture, including CH. Established under the Ministry of Education, Culture, Sports, Science and Technology (MEXT), ACA is composed of eleven divisions, four of which are responsible for tangible and intangible heritage. The **Cultural Resources Utilization Division** deals with the management and utilization of immovable cultural resources, including World Heritage; the **First and Second Cultural Properties Divisions** are responsible for research and the designation of tangible cultural properties (CP), including monuments and traditional buildings, respectively; and the **Culture and Creativity Division** is responsible for intangible and movable cultural resources. Other divisions deal with policy, planning and coordination, the cultural economy, the Japanese language, copyrights, religious affairs, and creativity.

The National Institutes for Cultural Heritage

The **National Institutes for Cultural Heritage (NICH)** network was established in 2007 as an organization semi-independent of the government, with a mission of preserving and properly utilizing CP as important national assets of Japan.

The NICH is comprised of:

- Four National Museums: Tokyo National Museum, Kyoto National Museum, Nara National Museum, and Kyushu National Museum;
- Two National Research Institutes for CP: the National Research Institute for Cultural Properties, Tokyo; and the Nara National Research Institute for Cultural Properties; and
- The International Research Centre for Intangible Cultural Heritage in the Asia-Pacific Region (IRCI).

The main tasks of the NICH are to conduct research and to collect, preserve, and manage CP and display them for the public to see and enjoy, and to organize educational and promotional activities, including lectures and publications. NICH works to ensure that in the event of a large-scale disaster, efficient measures are taken to rescue and restore CH. Since the GEJE, it has been reviewing the coordination and collaboration mechanisms for the protection and rescue of CH.

Cultural Heritage Disaster Risk Mitigation Network

The **Cultural Heritage Disaster Risk Mitigation Network (CH-DRM Net)** was formed from the organizations that engaged in activities for the protection of CP during the GEJE in 2011. In cooperation with ACA, its organizations and institutions work on DRM of CP in emergency situations. Set up under NICH, CH-DRM Net aims to research the roles of NICH in DRM and rescue at CP, and of measures for the conservation, stabilization, and restoration of CP affected by disasters; to collect information and provide guidance and training on DRM and rescue at CP; and to establish a network and international collaborations for DRM and rescue at CP during disasters.

Table 1 National DRM and CH institutions at a glance

Institution name	Main responsibility/description	Key responsibilities in DRM/CH
Cabinet Office	• Overall coordination of DRM policies and measures of ministries and agencies • Overall coordination and response to large-scale disasters	• Overall coordination of DRM policies and measures of ministries and agencies • Overall coordination and response to large-scale disasters
Central Disaster Management Council	• Development of DRM plans and provision of support to the Prime Minister and the Minister of State for Disaster Management on disaster reduction	• Development of DRM plans and provision of support to the Prime Minister and the Minister of State for Disaster Management on disaster reduction, including concern for CP
Fire and Disaster Management Agency (FDMA)	• Coordination among prefectures, fire defense headquarters, and other DRM organizations at local levels to protect people's lives and properties from fire • Provision of support to fire defense headquarters and volunteer fire corps around the country	• Protection of CP from fire, coordinating among relevant organizations and institutes
Reconstruction Agency	• Reconstruction and revitalization of areas affected by GEJE	• Provision of special disaster recovery budget for rehabilitation of CP affected by GEJE
Agency for Cultural Affairs (ACA)	• Protection and promotion of culture, including CH • Designation of Important Cultural Properties and Registered Cultural Properties • Provision of guidance and support to prefectures regarding culture and CH	• Provision of guidance to prefectures on DRM for CP as part of regular protection and management • Provision of subsidies for regular protection and management activities of CP and DRM of properties affected by disasters
National Institutes for Cultural Heritage	• Research on CP • Collection, preservation, and management of CP • Public display of CP • Organization of educational and promotional activities	• Provision of measures for rescue and restoration of CP affected by large-scale disasters
Cultural Heritage Disaster Risk Mitigation Network (CH-DRM Net)	• Research, information gathering, and provision of guidance and training on DRM and rescue for CP • Establishment of a network of organizations working for DRM for CP	• Research, information gathering, and provision of guidance and training on CP of DRM and rescue • Establishment of a network of organizations working for DRM for CP
Ministry of Land, Infrastructure, Transport, and Tourism (MLIT)	• Overall responsibility for planning and implementing harmonized development of the physical, economic, and social infrastructures of Japan • Includes Water and Disaster Management Bureau, Japan Meteorological Agency (JMA), and Japan Tourism Agency, as well as key bureaus overseeing urban development, roads, rail, and housing, among others	• MLIT ensures integration of DRM and resilience in the development and management of Japan's infrastructure, and provides key response capacity to a variety of hazards

Subnational Level

PREFECTURES

Prefectural governments play a major role in DRM and CH. Each prefecture's board of education has a department responsible for CP and their protection and management. Prefectures work with and coordinate among municipal governments, private owners, and the national government (that is, ACA) for any actions related to the conservation and management of CP, such as registration, designation, conservation and repair, maintenance, or recovery of CP, as well as raising awareness of DRM and CH among the general public.

Kyoto, Nara, Shiga, and Wakayama prefectures have the country's greatest concentrations of designated CP. These prefectures have established specialized offices in their boards of education to implement protection measures and repair work. They directly conduct and implement work with their own staffs and resources, rather than subcontracting. In other prefectures, the local governments' staff members in charge of CP design protection-related projects with the guidance of ACA for Important Cultural Properties (ICPs). They contract with specialized professionals and accredited associations, such as the **Japan Association for Conservation of Architectural Monuments (JACAM)**.

For DRM at the subnational level, **disaster prevention committees** are organized at both the prefectural and municipal levels. At the prefectural level, it is mandatory for all the prefectural disaster prevention bureaus to organize these committees, which bring together representatives from all departments, including the board of education, the police, the fire department, and the self-defense force stationed in the region. They meet a few times a year for the development and implementation of a local disaster management plan, and at the time of disasters for necessary coordination for recovery. In the case of CP, the **prefectural board of education** is responsible, and any notifications issued by the disaster prevention bureau are transmitted through the board of education to the CP department.

It is also important to note that land use planning in Japan is primarily determined at the prefectural and municipal levels of government, with various oversight requirements and guidance from MLIT. In general, prefectures are responsible for regional issues beyond the territory of a municipality, as well as major infrastructure or large-scale public facilities.[5]

MUNICIPALITIES

Municipalities in Japan have a substantial role in DRM and CH protection. **Municipal governments** have the responsibility of managing disaster risk at the local level, and coordinating the activities of municipal boards of education, professional firefighting departments, and volunteer community-based organizations at each stage of DRM and response for CH. Municipal governments are generally responsible for district planning, including aspects of special land use, efficient land use, fire protection, and historic townscape preservation.[6] The municipal government identifies the districts for the preservation of traditional buildings and secures official protection. Moreover, municipalities often become the owner and managing institution for many CPs within their jurisdiction—either through direct purchase or donation. Since the basic principle of CH protection in Japan is that "local communities protect local culture," municipal governments play the key role in coordinating with CP owners.

Civil society

While government institutions play major roles in DRM at CH sites, DRM is not only a government-led process. Other important actors operate in civil society, collaborating with government-related institutions.

[5] MLIT. "Urban Land Use Planning System in Japan," https://www.mlit.go.jp/common/001050453.pdf
[6] Ibid.

Professional societies and groups

Societies and groups of professionals with skills in conservation and management, such as architects, engineers, carpenters, and craftspeople, play an important role in providing their skills and expertise, especially where government-related institutions cannot deploy their staff. These organizations include the previously mentioned JACAM and the **Heritage Managers (HM)** system.

JACAM, which was established in 1976 as an ACA initiative, is an association of conservation architects that designs, implements, and manages repair projects for heritage buildings. It also provides training on traditional techniques and modern conservation technology, ensuring a supply of professionals who can be authorized by the government to work on repairs to ICPs and national treasures.

The HM system was created based on a lesson learned from the Great Hanshin-Awaji Earthquake. Professionals mainly in the field of architecture and building are trained and registered as HM to work on the preservation and ongoing utilization of historic buildings in various regions. Their special training, organized by each prefecture's association of Architects and Building Engineers, provides knowledge on and skills in traditional architecture and related techniques. Working in their own regions, they already know the CP for which they are responsible, even if the properties are not registered, and they can be deployed rapidly for initial emergency response when a disaster strikes. The HMs can also provide advice to local communities. When dealing with disaster emergency responses, they often operate on a voluntary basis.

Cultural properties (CPs) owners, management organizations, and local communities

CP owners and organizations in charge of day-to-day management of the CH sites have the closest contact with CP and, according to the *Law for the Protection of Cultural Properties* (explained below), are primarily responsible for the management, protection, and public display of these properties. They also play an essential role in identifying risks to CP, providing preparedness against potential hazards, responding immediately should disaster strike their CPs, and acting for recovery, all in cooperation with other partners. CP owners and managing organizations also take the lead in organizing the evacuation of visitors from CH sites in case of emergencies.

Local communities play a crucial role in DRM of CH as many members integrate the Community-Based Organizations (CBO) such as local fire corps (*shobo-dan*) and so-called *Jisyubo*,[7] which are legally designated CBOs for DRM and have played a key role in search and rescue during disasters.

Tourists, visitors, and the general public

CPs play different roles in societies. They are quite often well-known buildings and monuments that symbolize local communities; they may be religious sites, such as temples, shrines, and churches, that play an important role in people's daily lives; or they can be tourist sites that attract many visitors. In short, CPs may mean different things to different groups of people. This is why the protection and management of CP does not rely only on government institutions or heritage professionals; visitors and the general public also play an important role in the protection and preservation of CP. This needs to be taken into account in the strategies and resilience measures developed for CH sites.

[7] Ishiwatari, M., 2012, "Government Roles in Community-Based Disaster Risk Reduction," in Shaw, R. (Ed.), *Community, Environment and Disaster Risk Management*, Volume 10, 19–33, Emerald Books, https://doi.org/10.1108/S2040-7262(2012)0000010008

Summarizing responsibilities of the relevant stakeholders

All actors mentioned above play important roles and have different competencies for the protection and management of CP:

- **National government:** Legislating on CP conservation and management; designating ICPs and registration of those in particular need of preservation and appropriate utilization; regulating alteration of the status quo; providing instructions, recommendations, and assistance to owners regarding management, restoration, and public display; providing assistance to local governments regarding transfer to public ownership; establishing special tax measures, facilities open to the public, and research institutes.
- **Subnational governments:** Establishing and implementing regulations; identifying, designating, and preserving CP (excluding those covered by the national government); providing instructions, recommendations, and assistance to owners regarding management, administration, restoration, public display, and restrictions on alteration of the status quo; establishing and operating facilities for conservation and public display; organizing local activities to promote protection; administering, restoring, and regulating public display of CP designated by the national government.
- **Professional societies and groups:** Undertaking repair and restoration work under ACA guidance; providing capacity-building training on conservation techniques to other professionals; providing advice to CP owners and local communities.
- **CP owners and management organizations:** Notifying officials of any transfer of ownership, loss, destruction, damage, change in location, among other changes, of CP designated by the national or local government; undertaking day-to-day management and restoration of CP; regulating public display.
- **Local communities, visitors, and the general public:** Cooperating with national and local governments' activities; notifying authorities of finding remains; participating in excavations at well-known sites; surveying buried cultural properties upon excavation; engaging in appropriate use of CP.

Special frameworks of partnership among prefectural governments

In March 2014, to strengthen regional collaboration, several prefectures launched a new framework of partnership among local governments for mutual aid in case of disaster. This cooperation agreement organizes the terms for carrying out emergency and recovery measures. It comes into action when one of the prefectures in the agreement is affected by a disaster and is unable to provide sufficient first-aid measures through its own means.

Currently, two mutual assistance agreements are in place; one is for the wider Kansai area and the other for the Tokyo Metropolitan Area.[8] The **Union of Kansai Governments** comprises ten core prefectures and cities—Hyogo Prefecture, Kyoto Prefecture, Osaka Prefecture, Shiga Prefecture, Tokushima Prefecture, and Wakayama Prefecture, as well as Kobe City, Kyoto City, Osaka City, and Sakai City—and four collaborating prefectures—Fukui Prefecture, Mie Prefecture, Nara Prefecture, and Tottori Prefecture. The agreement for Tokyo and the Kanto Metropolitan Area covers nine prefectures and cities: Saitama Prefecture, Chiba Prefecture, Tokyo (metropolitan government), Kanagawa Prefecture, Yokohama City, Kawasaki City, Chiba City, Saitama City, and Sagamihara City.

[8] Tokyo Metropolitan Government Disaster Prevention website, http://www.bousai.metro.tokyo.jp/foreign/english/index.html.

1.2 Main laws and regulations governing CH and DRM

Two main laws in Japan stipulate CH protection and DRM: the *Law for the Protection of Cultural Properties*,[9] which regulates the protection and utilization of CP, and the *Disaster Countermeasures Basic Act*,[10] which clarifies the roles of different public organizations and regulates the basis for necessary DRM measures, such as disaster planning, prevention, emergency measures, and recovery.

Besides these two main laws, CP buildings follow the *Fire Service Act* [11] in issues relating to fire protection. Additionally, even though they are exempted from certain articles of the National Building Code, CP buildings have measures in place that meet the needs of their own specificities and heritage values.

Law for the Protection of Cultural Properties

Enacted in 1950, the *Law for the Protection of Cultural Properties* synthesizes existing laws and regulations concerning the protection of CP into a comprehensive system. The law is critical, as it defines the categories of CP to be protected by the national government, and regulates how they should be designated, managed, protected, publicly displayed, and researched. Through its provisions, MEXT, through the ACA, sets out the "designation policy" for ICPs and the regulations on how they should be protected. These strict regulations make some exceptions when emergency measures are needed at the time of disasters. The law also stipulates the mechanisms for protection involving the national government, local governments, and CP owners. Amendments to the *Law for the Protection of Cultural Properties* enacted in April 2019 set out that prefectural governments are to draw up comprehensive general principles for the preservation and utilization of CP, including DRM, and municipality governments are to formulate local planning of the preservation and utilization of CP. Tha amendments set out that the department in charge of CP may be transferred to administrative departments other than Boards of Education.

Disaster Countermeasures Basic Act

This act was established in 1961 but has constantly been reviewed and amended, notably as a result of lessons learned from the GEJE. It aims to promote comprehensive disaster planning and management to protect the lives and properties of the people and the land. It addresses all the phases of disaster, providing for the formulation of disaster prevention plans and basic policies relating to preventive and emergency measures, as well as financial action and recovery and reconstruction measures. It defines the roles of national and local governments, and ensures cooperation in the implementation of various disaster mitigation measures.

[9] http://elaws.e-gov.go.jp/search/elawsSearch/elaws_search/lsg0500/detail?lawId=325AC1000000214. For English translation please refer to: http://www.unesco.org/culture/natlaws/media/pdf/japan/japan_lawprotectionculturalproperty_engtof.pdf

[10] Disaster Countermeasures Basic Act (Act No. 223, November 15, 1961), http://www.adrc.asia/documents/law/DisasterCountermeasuresBasicAct.pdf

[11] Fire Service Act (in original Japanese with English translation), http://www.japaneselawtranslation.go.jp/law/detail/?ft=2&yo=%E6%B6%88%E9%98%B2%E6%B3%95&ky=&page=1&re=02

Ponto-cho, Kyoto.

2. The System in Practice

2.1 The system of cultural properties (CPs)

The *Policy of Cultural Affairs in Japan*[12] indicates that "cultural properties are essential to accurately understanding the history and culture of Japan, and they also form the foundations for its future cultural growth and development."[13] In this sense, Japanese practice relies heavily on its rigorous system for understanding and identifying CPs to properly protect, preserve, manage, and utilize them.

The Designation/Selection/Registration System employed by the national government (MEXT-ACA) under the *Law for the Protection of Cultural Properties* establishes different categories of CPs to better protect them. This helps in identifying and adopting the best protection measures for each CP depending on its category, and provides subsidies for preserving it, repairing it, or making its structure disaster resilient.

Categories of cultural properties

The Japanese government classifies CP into six different types:

- **Tangible CP** includes two types of cultural properties: structures, and fine arts and crafts. "Structures" mainly refers to historic monuments, buildings, and other structures. Most of the historic structures in Japan are made of wood and use plant-based materials for roofs. Fine arts and crafts include cultural works of historic, artistic, and/or academic value, such as paintings, crafts, sculptures, calligraphic works, classical books, paleography, archaeological artifacts, and historic materials.
- **Intangible CP** refers to all of the nonmaterial cultural properties that hold historic or artistic value for Japan, including stage arts, music, and craft techniques, among others.
- **Folk CP** includes tangible and intangible assets related to traditional daily life and its legacy for the people of Japan, such as customs and manners.

[12] Agency for Cultural Affairs, 2018, Policy of Cultural Affairs of Japan, http://www.bunka.go.jp/english/report/annual/pdf/r1394357_01.pdf

[13] Ibid., p. 38.

- **Monuments** includes assets such as ancient tombs, palaces, fortresses, or castles, as well as gardens, bridges, seashores, mountains, and other geological features, and animals, plants, and minerals.
- **Cultural landscapes** are understood to be scenic spots created through the influence of the lives, livelihoods, and climate of a given region, which are indispensable in understanding the lives and livelihoods of the Japanese people.
- **Preservation districts for groups of traditional buildings** are especially important in Japan for the protection of historic cities, towns, and villages.

The government designates CPs of national importance and provides necessary measures for their preservation, including protection from disasters. Additionally, through the registration system, which was created after the Kobe Earthquake, the government provides more moderate protective measures to a wider range of CPs that constitute the historic and cultural environment. Figure 3 presents the system of protection by CP type.

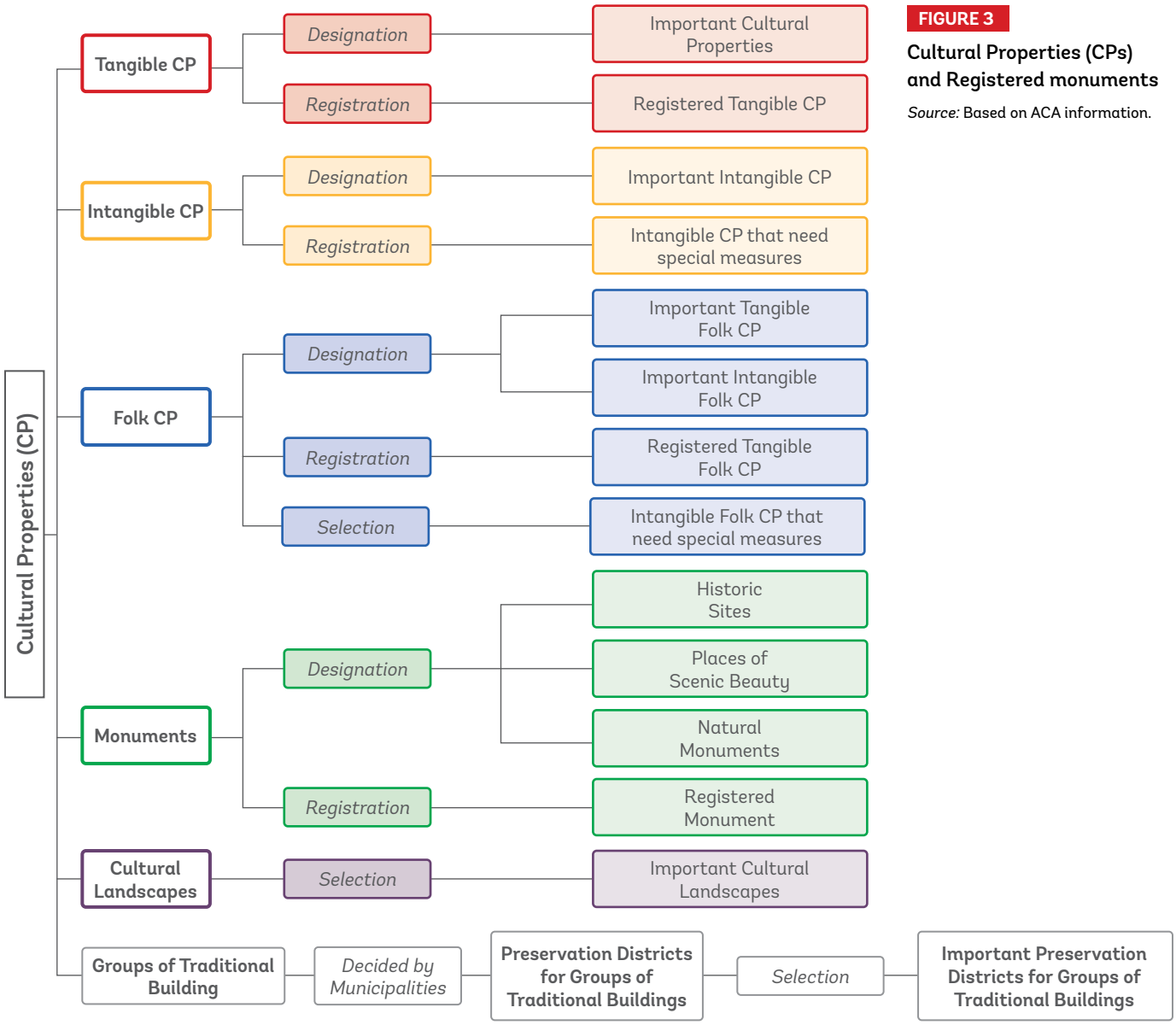


FIGURE 3

Cultural Properties (CPs) and Registered monuments

Source: Based on ACA information.

Under the *Law for the Protection of Cultural Properties*, the national government may designate or register tangible CP as Important CP (ICP) or Registered CP. The main difference between the two is the level of restriction and the activities national subsidies can cover. For ICP, for example, restrictions are stricter on changing its original forms, and the ACA provides specific instructions, orders, and guidance on its management, repair, recovery, and public display. The ACA may also provide subsidies to cover actual work, such as repairs that are necessary for the conservation and utilization of the CP. On the other hand, it is possible to change or modify Registered CPs without notification, as long as the changes do not affect more than 25 percent of the exterior; reinforcement and repair work before disasters and recovery work after an emergency also do not require prior notification. The ACA subsidies can only cover the planning and design of conservation and restoration work, not the actual work itself.

Process of CP protection and management

As previously indicated, the Japanese system for CP protection and management consists of several steps—designation, protection and management, and utilization—all of which are considered part of a comprehensive framework. This framework applies to all six types of properties. In the case of tangible ICP (structures), the framework is designed slightly differently, consisting of designation, planning of repairs, alteration of current state, maintenance, and utilization. DRM is integrated into each of these steps. Risk mitigation measures, for example, are installed during the maintenance phase in preparation for future hazards, and alterations to the current state may be considered during repairs if damage is found because of hazards.

To better protect and manage a CP that falls under several categories, a Coordination Meeting (*Chouseikan Kaigi*) is convened regularly within the ACA to bring together officers in charge of the different categories involved and discuss issues relevant to protection and management, and coordinate their actions.

Overall, the application of measures in the framework of the six CP categories has been effective. Additional work to be developed in the future to integrate a comprehensive DRM approach within all the six categories of CP will further improve the overall practice of DRM for CH.

2.2 DRM for CH as an integral part of CP protection and management

Key policies and processes

The basic principle for DRM and CH policies in Japan is that the two are inseparable. The principles for the preservation and utilization of ICPs, issued by the ACA, clearly state that preservation and utilization shall have a comprehensive plan that includes all measures for conservation and management, environmental protection,[14] DRM, and utilization.[15] This means DRM is integrated into each step of CP protection and management (from designation, protection, and management to utilization), and the same approach applies to processes taken at the different levels of national, prefectural, and municipal government. Therefore, taking DRM into consideration is mandatory for all those responsible for CH protection and management. The strength of this approach is that risk prevention is integral to the protection and management of all types of ICP, and that appropriate DRM measures for each type of CP are designed and implemented by government staff, cultural property professionals, and managers.

[14] The term "environmental protection" here refers to measures taken involving the environment that surrounds the CP building, with the aim of maintaining it in a sound state of conservation. Examples of such measures include setting up of protective walls, protecting water drainage systems, and taking measures to cut down trees that may otherwise fall and damage the CP, etc.

[15] Agency for Cultural Affairs, 1999, "Guidelines for Planning of Preservation and Utilization of Important Cultural Properties (Buildings)." http://www.bunka.go.jp/seisaku/bunkazai/hokoku/kenzobutsu_hozonkeikaku.html

Also key to the Japanese system is that DRM measures are designed to be integral to the protection and management of CP, and are not limited to the provision of physical equipment. Measures emphasize the importance of the people who actually operate the physical equipment and thus involve in the protection and management of CP the organization of regular drills involving various actors, including representatives from national and subnational governments, site managers, and local communities.

Disaster management plans

The Japanese disaster management planning system consists of four plans at four different levels— national, ministerial, local, and community.[16]

- **The Basic Disaster Management Plan,** prepared by the Central Disaster Management Council based on the Disaster Countermeasures Basic Act, is a comprehensive, long-term plan at the highest level, stipulating DRM measures common to all types of disasters, including earthquakes, tsunamis, storms and floods, volcanoes, and snow. It is designed to address all disaster phases (disaster prevention and preparedness, emergency response, recovery, and reconstruction) and clarifies concrete measures to be taken by each stakeholder. This national plan constitutes the basis for the three other plans below.
- **The Disaster Management Operation Plan** is developed by each designated government organization (ministry or agency), based on the Basic Disaster Management Plan. In the case of DRM for CH, the ACA developed the **ACA Disaster Management Operation Plan.**
- **The Local Disaster Management Plan** is elaborated by each prefectural and municipal disaster management council, taking local circumstances into consideration.
- **The Community Disaster Management Plan** is jointly prepared on a voluntary basis by residents and local companies and business people who operate in the area.

Following the experiences and lessons learned from the Great Hanshin-Awaji Earthquake in 1995, the Basic Disaster Management Plan was entirely revised, and a new chapter was added after the GEJE, reflecting the amendment of the Disaster Countermeasures Basic Act.

ACA Disaster Management Operation Plan

The Disaster Management Operation Plan specifically regulates disaster management issues related to ACA competencies, based on the *Disaster Countermeasures Basic Act* and the Basic Disaster Management Plan. It aims to protect the lives of people visiting cultural facilities and other places, such as temples and shrines, that contain designated CP, and to protect these CP and facilities from the impacts of disasters. It sets out what key disaster prevention measures are advised, what emergency measures to take should a disaster happen, how the recovery should be planned, and what institutional mechanisms and training should be in place. The plan also provides support to prefectural governments for the management of disaster risks to CH and for the establishment of supporting mechanisms for disaster areas, which also provides support to CP not affected by a specific disaster.

DRM measures for CP

According to the *Law for the Protection of Cultural Properties*, any intervention involving ICP that may influence their state of conservation or alter their current state requires prior approval by the **Commissioner for Cultural Affairs**. These interventions include reconstruction, structural reinforcement that might affect the original structure of buildings, or alterations to buildings that may be needed for their utilization or modern use.

Since most of the CP in Japan are wooden structures, and earthquakes and fires are frequent, DRM efforts center on countermeasures for these risks, as well as on fire

[16] Cabinet Office, Disaster Management in Japan, http://www.bousai.go.jp/1info/pdf/saigaipamphlet_je.pdf

prevention systems. Fire prevention equipment and facilities, such as automatic fire alarm systems, fire extinguishing equipment, and lightning rods, are typical of disaster prevention measures promoted by the ACA. Some of the measures (such as fire plugs, drenchers, and alarms) do not require ACA's prior approval as long as they do not affect the properties and may benefit from specific subsidy support. The law also allows for some interventions that must be reported to the ACA but do not require its prior approval. These include maintenance and repairs using materials and techniques that will maintain or restore the original state of the CP, and first-aid measures at the time of disasters. The key here is whether or not interventions affect the status quo of CP.

In the case of historic sites, it is considered that DRM measures affect the status quo; hence, prior approval by the ACA is always needed. In places of scenic beauty, prior approval has to be sought when new buildings and/or facilities are installed.

Preservation districts are composed mainly of wooden buildings, which make them vulnerable to fire, and risk prevention is a priority. DRM measures for preservation districts include the installation of facilities, such as fire extinguishing tools; termite inspections and control for the whole district; and the reassembling of unstable stone walls. The measures are planned and implemented as public works by boards of education in cooperation with the ACA and other relevant stakeholders. As a result, no explicit prior approvals are required. Table 2 summarizes the approval process for DRM measures.

For the Registered CP, DRM measures—and emergency measures in particular—are among interventions that do not require the submission of a report to the ACA. Emergency measures include reinforcement or repair work carried out in advance for risk preparedness and initial response measures after disasters.

Table 2 DRM measures and ACA approval process

DRM measure	Types of interventions	Examples
DRM measures that require the ACA's prior approval	Reconstruction, structural reinforcement, alterations to buildings for utilization/modern use, excavations under the CPs or in their surrounding areas, installation of DRM facilities in historic sites, installation of buildings in places of scenic beauty	Installation of fire prevention equipment and facilities, such as automatic fire alarm systems, fire extinguishing equipment, and lightning rods
DRM measures that only need to be reported to the ACA	Maintenance and repairs, first-aid measures at time of disasters	Installation of lightning rods and fire alarms, temporary installation of security booths, tree cutting to the extent it does not affect CP value

2.3 Coordination among actors before, during, and after disasters

As various actors at different levels are involved in the DRM for CH sites, the coordination among them is essential in order to ensure prompt, appropriate, and best-possible preparedness and responses before, during, and after disasters. Table 3 shows the roles of different actors of DRM for CH sites.

Table 3 Roles of different actors before, during, and after disasters

Actor	Before disaster (identification and preparedness)	During disaster (response)	After disaster (recovery)
National government (ACA)	• Provision of expert advice and technical guidance to prefectures • Provision of subsidies for DRM activities and projects	• Compilation of reports on disaster damage to nationally designated CP • Provision of technical guidance regarding emergency protection measures for CP	• Provision of technical assistance and human resources for salvage, repair, and recovery in the event of large-scale disasters
Prefectures	• Provision of expert advice and subsidies to municipalities and CP owners • Awareness raising on DRM for CP • Provision of subsidies for DRM activities and projects	• Compilation of and submission to the ACA for disaster damage reports of nationally designated CP • Compilation of disaster damage reports of CP designated by prefectures • Provision of technical guidance to municipalities and CP owners on emergency protection measures	• Provision of technical support, human resources, and subsidies to municipalities for salvage, repair, and recovery activities for CP
Municipalities	• Provision of expert advice to CP owners • Awareness raising on DRM for CP • Provision of subsidies for DRM activities and projects	• Damage assessment of nationally designated CP and CP designated by prefectures, and reporting of results to the prefecture • Damage assessment and reports on CP designated by municipalities • Implementation of emergency protection measures for CP • Provision of technical guidance to CP owners on emergency protection measures	• Provision of technical support and human resources to CP owners for salvage, repair, and recovery activities for CP • Awareness raising on CP protection in disaster-affected areas
CP owners	• Implementation of day-to-day DRM measures	• Damage assessment of own CP • Reporting of damage to CP to municipalities (if the CP is owned by a prefecture, report to the prefecture) • Implementation of emergency protection measures for CP	• Planning and implementation of salvage, repair, and recovery activities

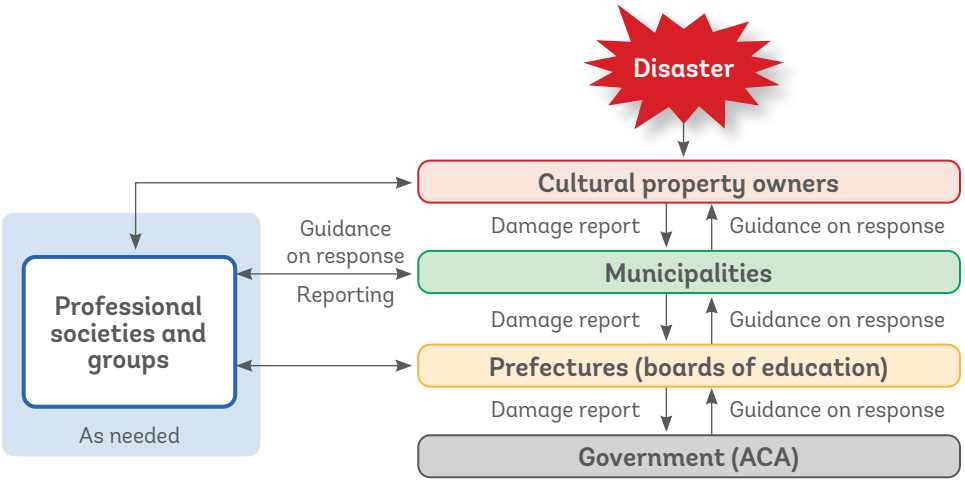
Source: Based on the summary table provided in the Cultural Properties DRM Manual of Mie Prefecture, 2017, http://www.bunka.pref.mie.lg.jp/common/content/000731635.pdf

When a disaster happens, all actors must know to whom they should report and from whom they can seek appropriate guidance on response actions. The DRM Manual prepared by Mie Prefecture shows a clear line of reporting and guidance, which is the same for all other prefectures in Japan, as shown in Figure 4.

FIGURE 4

Line of reporting and guidance at the time of disaster

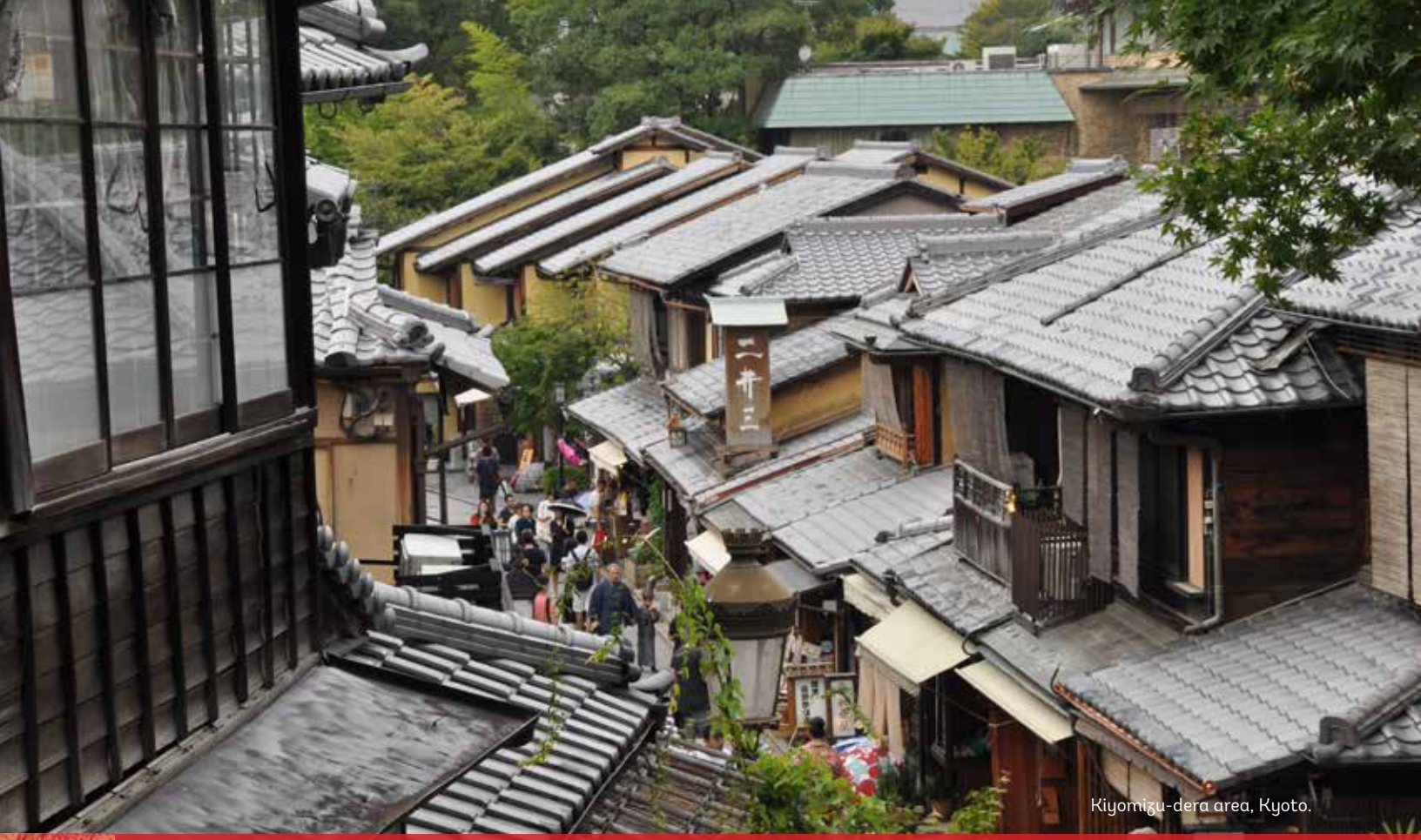
Source: Adapted from Mie Prefecture's DRM Manual for CP, 2017.



When a disaster affects several categories of CP, the **Coordination Office for Cultural Properties Protection** (*Bunkazai Hogo Chousei Shitsu*), established within the ACA Cultural Resources Utilization Division, takes the lead and brings together officers in charge of the different categories of CP affected to discuss the measures to be taken. The Coordination Office compiles a summary of damage to plan a request for subsidy and plans a recovery project, such as through a CP Rescue Project or CP Doctors Dispatch Project, detailed below.

In the event of a large-scale disaster, the **Cultural Properties Disaster Countermeasure Committee** (*Bunkazaitou Saigai Taisaku Iinkai*) takes the lead in defining the basic directions of rescue and restoration policies for affected CPs, gathering the heads of each department, all section chiefs, and key staff from NICH.

For the protection of ICP at the time of disaster, the ACA also cooperates with various partners, such as the network of education boards within local governments and JACAM, in conducting post-disaster assessments and surveys and the planning of repair and restoration works. Types of cooperation with other organizations depend on the categories of CP involved. The **Rescue Project**, led by NICH, for example, leads response- and recovery-related actions for movable CP, and the **Doctors Dispatch Project** brings together several organizations, such as JACAM, the **Architectural Institute of Japan (AIJ)**, the **Japan Federation of Architects and Building Engineers Associations**, and heritage managers. It plays a major role in providing emergency responses for built CP. Both the Rescue Project and the Doctors Dispatch Project were originally established in response to and during the recovery from the GEJE, and the Doctors Dispatch Project covers designated and non-designated CP alike.



Kiyomizu-dera area, Kyoto.

3. Budgets and subsidies for CP protection and management

There are three types of budgets for DRM for CH in the Japanese system: (1) the ACA ordinary budget for CH; (2) a special disaster recovery budget, managed by the Reconstruction Agency; and (3) a revised or supplementary budget.[17]

3.1 ACA budget for cultural protection and management, including DRM

The ordinary budget for culture as a whole that is managed by the ACA consists of five components;[18] the largest of these, at 41 percent of the total, is the budget for the conservation, utilization, and transmission of precious cultural properties. As shown in Figure 5, this portion is further divided into three categories:

1. Promotion of tourism strategy implementation utilizing cultural properties at 14,706 million yen (USD 135.1 million)
2. Transmission and utilization of cultural properties by appropriate maintenance at 35,241 million yen (USD 323.6 million)
3. Utilization and public display of cultural properties, capacity building of skill holders, and enrichment of opportunities to appreciate culture at 7,470 million yen (USD 68.6 million)

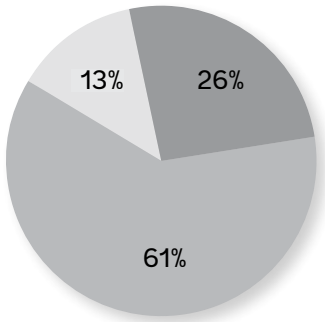
The budget for transmission and utilization of cultural properties by appropriate maintenance, which constitutes 61 percent of the budget for the conservation, utilization, and transmission of cultural properties, is mostly allocated to conservation and repair activities related to DRM.

[17] http://www.bunka.go.jp/seisaku/bunka_gyosei/yosan/pdf/h30_gaiyo.pdf

[18] These five components are (1) culture and art innovation, development, and capacity building; (2) conservation, utilization, and transmission of precious cultural properties; (3) creation of social and economic value using cultural resources; (4) promotion of culture and art for the improvement of the Japanese brand; and (5) infrastructure maintenance as a basis for cultural promotion.

FIGURE 5

Estimated budget request for conservation, utilization, and transmission of precious CPs



- Promotion of tourism strategy implementation utilizing cultural properties
- Transmission and utilization of cultural properties by appropriate maintenance
- Utilization and public display of cultural properties, capacity-building of skill-holders, enrichment of opportunities to appreciate culture

Source: Based on ACA data for FY2018.

This component of the budget has seven subcategories, of which five have DRM-related activities as an important portion:[19]

1. Conservation of and repair to tangible heritage (structures): This subcategory is for repairs of ICP (structures) for their transmission to future generations, and for activities toward fire and crime prevention measures, as well as earthquake-proof countermeasures to protect CPs from disasters.
2. Conservation of and repairs to tangible heritage (arts and crafts): This budget is for the maintenance of arts and crafts whose deterioration is advanced, and the installation and maintenance of disaster and crime prevention facilities.
3. Reinforcement of groups of traditional buildings: This budget is for a comprehensive process for protecting preservation districts of traditional buildings, which includes research for conservation and DRM measures, conservation and repair activities for making buildings resilient against earthquakes, and the installation of disaster prevention facilities.
4. Management of registered cultural properties: This supports the maintenance and management of nationally registered CPs, such as through inspections of fire alarms and fire extinguishing facilities that are required by law.
5. Conservation, maintenance, and utilization of historic sites: This budget provides support to owners and management bodies that implement conservation and utilization activities, including repair work to buildings and the installation of disaster prevention facilities within important cultural landscapes.

Table 4 shows the key budget subcategories that may be applied toward enhancing the disaster resilience of CP within category 2, "transmission and utilization of cultural properties by appropriate maintenance." This estimate is based on line items that specifically note expected DRM-related measures and programs. The remainder of the budget under "conservation and repairs of tangible heritage" for both structures and arts and crafts is allocated to subsidies, which support many DRM-related activities conducted by prefectures as part of conservation and management activities. This estimate provides the approximate scale of financial support for DRM-related activities. ACA notes that DRM is integrated into regular conservation and, therefore, is not easily treated as a separate item. General repairs and restoration work carried out on a wooden structure, for example, contribute to DRM of CP, as they reduce the vulnerability of the structure itself. They also provide the opportunity for reinforcing CP structures and improve the state of the surrounding environment to make them less vulnerable. This budget estimate should, therefore, be considered a lower limit for the financial support Japan provides to achieve the disaster resilience of its CH.

The budget for utilization and capacity building of skill holders at 5 million yen (USD 45,195) is also used for DRM, such as providing training on DRM measures and CP protection procedures to owners of ICP within budget category 3, "utilization and public display of cultural properties, capacity building of skill holders, and enrichment of opportunities to appreciate culture" at 7.470 million yen (USD 68.6 million).

3.2 Special disaster recovery budget managed by the Reconstruction Agency

In response to the GEJE in March 2011, the special disaster recovery budget was established and is managed by the Reconstruction Agency. Under this budget, the ACA has 781 million yen (USD 7.28 million) for the fiscal year of 2018, specifically used for the recovery of CP affected by the earthquake.

[19] The other two budget components are conservation and management of nationally owned cultural properties and the conservation and maintenance of specific sites.

Table 4 ACA budget related to DRM in transmission and utilization of CPs

Line item	Line item budget (yen millions)	Equivalent in USD million	Estimated portion used for DRM (yen millions)	Equivalent in USD million	DRM as estimated percentage of line item
Conservation of and repairs to tangible heritage (structures)	¥12,911	$118.6	¥2,009	$18.5	15.6%
Conservation of and repairs to tangible heritage (arts and crafts)	¥1,580	$14.5	¥218	$2.0	13.8%
Strengthening of foundations of groups of traditional buildings	¥1,940	$17.8	¥1,666	$15.3	85.9%
Management of designated cultural properties	¥140	$1.3	¥125	$1.2	89.3%
Conservation and management of nationally owned cultural properties	¥790	$7.3			0.0%
Conservation, maintenance, and utilization of historic sites	¥16,974	$155.9	¥300	$2.8	1.8%
Conservation and maintenance of Heijo and Asuka-Fujiwara palace remains	¥905	$8.3			0.0%

Source: Based on ACA information on Estimated Budget Requests for FY2018.

3.3 Revised/supplementary budget

The revised or supplementary budget includes adjustments made to the budget after it is approved, to address inevitable changes in the situation. It is often applied when a disaster takes place. The ordinary budget explained above is used for DRM activities that are planned in advance, whereas the revised/supplementary budget allows for rapid and flexible use of money should a disaster strike. This enables the ACA to respond rapidly to damage inflicted on CP.

3.4 Subsidies for subnational governments for DRM at CH

Subnational governments are entitled to ask the ACA for subsidies to cover costs related to DRM for CH. There are different types of subsidies according to different types of CP, but they are all paid from the ordinary budget of the ACA.

Although there are no special subsidies for DRM at CH sites, different subsidy rates are applied depending on the nature of work carried out for CP. The subsidy can cover up to 50 percent of the costs for regular repairs, maintenance, and DRM measures (disaster preparedness in particular) for ICP if the work is done by subnational governments, and up to 85 percent if it is done by not-for-profit organizations or individuals. This subsidy is normally used for the installation and maintenance of prevention measures and equipment, which are quite often implemented or installed, respectively, during repair and restoration work. This reflects the fact that DRM is not considered on its own but as an integral part of CP protection and management. If the work is for disaster recovery, another 20 percent is automatically added to the subsidy rate, but may not exceed the maximum of 85 percent of the total cost. Rates are adapted according to the financial resources of subnational governments and owners in increments of 0.5 percent. The portion of costs not covered by subsidies is borne by local governments and owners. In the case of severe disasters, the subsidy can cover up to 90 percent of the total cost of CP recovery.

Each prefectural government submits a request to the ACA for subsidies for ICP, registered CP, and preservation districts located within the prefecture. The ACA makes decisions and allocates those subsidies five times per year.

The disaster recovery subsidy is only for ICP, and the national government cannot subsidize fees for actual recovery work for Registered CP and non-designated CH. In such cases, the ACA assists subnational governments by reaching out to private foundations to call for support and donations.

SECTION 2

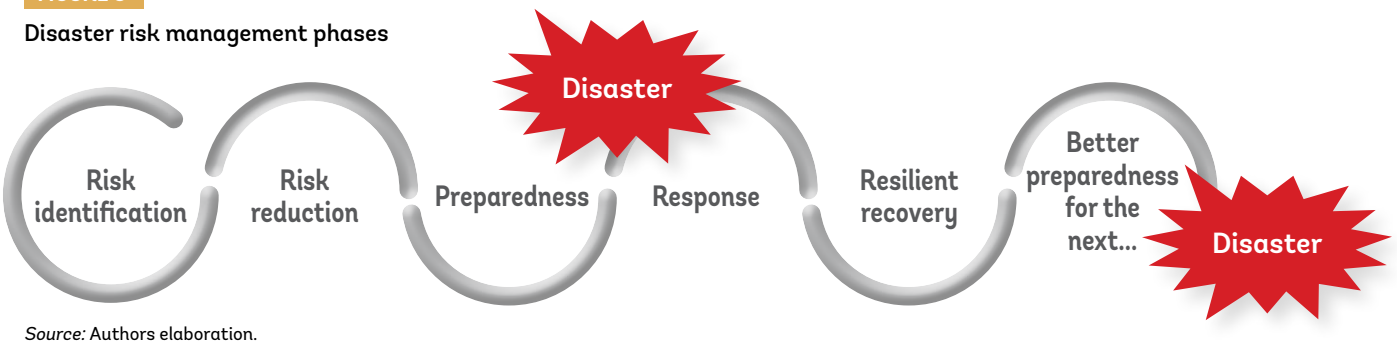
DRM for CH in Practice—From Risk Identification to Post-Disaster Resilient Recovery

Developing DRM plans for CH sites involves unique considerations, and any DRM measure implemented takes into account the heritage values that are specific to each site. Ancient structures, for example, differ from new ones in the values represented, as well as materials and construction techniques that are used. This poses a series of challenges that DRM practitioners need to consider, such as how to preserve and integrate cultural values, both tangible and intangible, in their work. Several Japanese examples illustrate good practices for DRM at CH sites through the phases of DRM—risk identification, risk reduction, preparedness and response, and resilient recovery (Figure 6).

Kiyomizu-dera temple, Kyoto during autumn at dusk. Photo: SeanPavone.

FIGURE 6

Disaster risk management phases



Source: Authors elaboration.

These phases do not always appear as a linear process. Ideally, risks to CH sites should be identified even before hazards strike, but, in some cases, they only become lessons learned after a severe disaster when new measures to reduce risk and prepare for future hazards are developed during the response or recovery phase. Many such cases have occurred in Japan where various disasters have struck CH sites throughout the course of the country's history. The case of Hyogo in the Hanshin-Awaji Earthquake (1995) is one such example. Japan has learned from such experiences and accumulated knowledge that might provide some useful insights for other countries faced with similar risks to CH.

When discussing DRM in Japan, risks of earthquakes and fire are always taken into consideration. This is because Japan has over 2,000 active fault lines[20] and 111 active volcanoes,[21] which cause frequent earthquakes, and many buildings are made of wood, which makes them vulnerable to fire.

[20] Geospatial Information Authority of Japan, http://www.gsi.go.jp/bousaichiri/explanation.html

[21] Figure as of June 2017 by Japan Meteorological Agency, http://www.data.jma.go.jp/svd/vois/data/tokyo/STOCK/kaisetsu/katsukazan_toha/katsukazan_toha.html

Sensō-ji ancient Buddhist temple, Asakusa, Tokyo.

1. Risk identification

The government, through ACA and other CH stakeholders such as managers of heritage sites, identify risks to sites and communicate them to other stakeholders and the public. By better understanding the most important risks, actors can integrate DRM into CH site management, reduce the risks to sites and people, prepare the sites and stakeholders for potential hazards, provide rapid response, and plan for recovery.

Risks to CH sites can be understood through an assessment of natural hazards and the vulnerability of the CH assets to those hazards. Information about the areas around a CP—including geographical and meteorological information, factors that may damage the CP, and the history of disasters that have affected the area—are used to identify the risks. Additionally, human-induced hazards and social aspects need to be considered when identifying risks to CH and tourism. For example, authorities should consider people's use of CH assets, activities that take place in CH sites, tourist visit statistics, and key risk factors, such as potential overcrowding, sufficiency of firefighting systems, and posting and training on clear evacuation routes.[22]

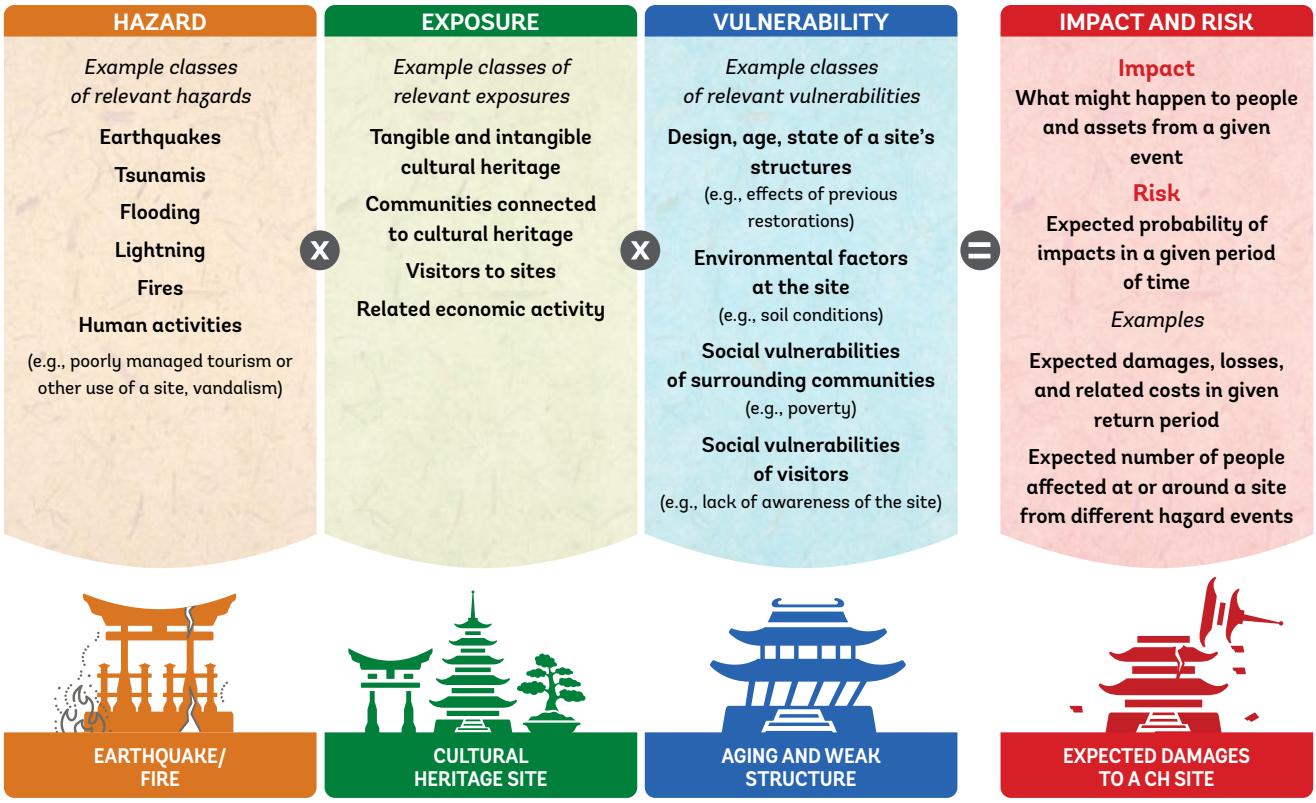
Risk identification is carried out by different actors at various levels. Ministries and prefectures collect, assess, and provide basic information on hazards (for example, the expected extent and depth of flooding under given return periods), based on which municipalities prepare hazard maps of their regions. Experts and institutions like universities work with municipalities to carry out detailed technical analyses to identify and assess risks. Local communities also identify risks through consultative processes and citizens' workshops. These might involve preparing local maps and verifying them using neighborhood walk events, for example.

Risk identification should be conducted on a regular and continuous basis, ensuring that new sources of hazard exposure and vulnerability are taken into consideration—for example, changing soil or slope conditions, changes in activities at the site, or weakening support structures (Figure 7).

[22] As an example, Kyoto City prepared maps for the evacuation of tourists in case of disasters in popular CH sites such as the Togetsukyo Bridge in Arashiyama.

FIGURE 7

Risk identification for cultural heritage



Source: Authors elaboration.

1.1 Hazard maps

A hazard map helps people visualize the current scientific probabilities of the scale and degree of potential hazards in a specific area. Based on usage, they can also incorporate information about evacuation routes and shelters, and about important facilities. Different hazard maps can be created for different purposes; those with information on CH sites are particularly useful to identify potential drivers of risks near areas where risks are present.[23]

In Japan, each municipality prepares its own hazard maps based on the information and hazard maps[24] provided by MLIT, and the prefectures, which compile these maps make them accessible to the public, including online. Several municipalities have specific CP hazard maps, incorporating information on local CP. In the case of earthquakes, the **Headquarters for Earthquake Research Promotion** provides national seismic hazard maps[25] that cover the whole country and are updated regularly. Figure 8 presents an example of a hazard map of CP prepared by Kanagawa Prefecture, showing the locations of CP (structure) and

[23] GFDRR: Preparedness *Map for Community Resilience: Earthquakes—Experience of Japan*, https://www.gfdrr.org/sites/default/files/publication/121516_drmhubtokyo_Preparedness_Map_for_Community_Resilience_Earthquakes.pdf

[24] https://disaportal.gsi.go.jp/

[25] Portal page of Earthquake Hazard Maps (in English), https://www.jishin.go.jp/main/index-e.html
National Seismic Hazard Maps for Japan (2005) with explanations (in English), https://www.jishin.go.jp/main/chousa/06mar_yosoku-e/NationalSeismicHazardMaps.pdf
Maps and explanations for 2018 (Japanese only), https://www.jishin.go.jp/evaluation/seismic_hazard_map/shm_report/shm_report_2018/

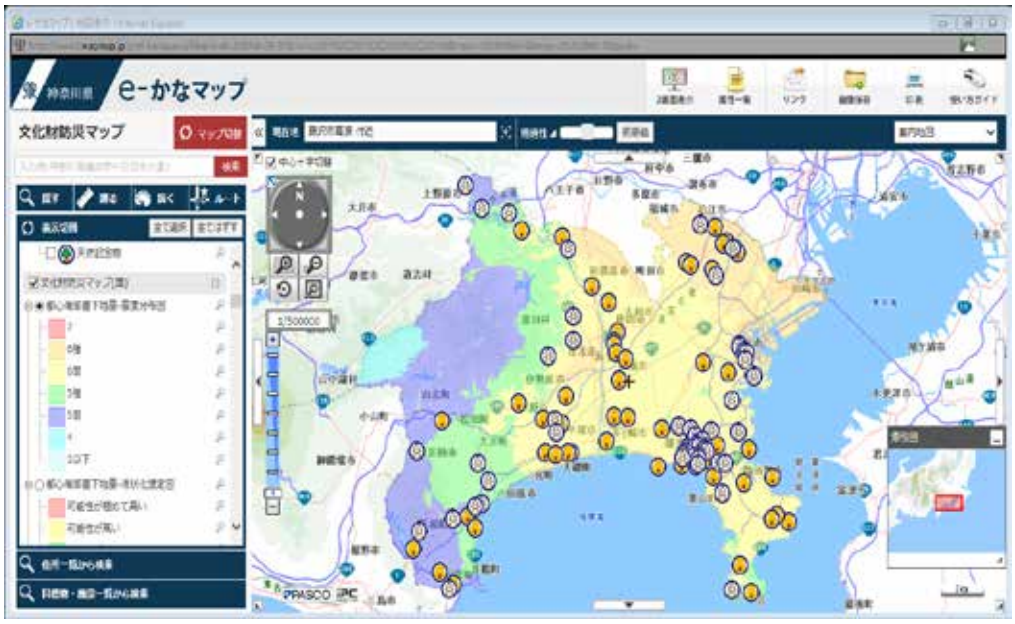


FIGURE 8

Hazard map of CP prepared by Kanagawa Prefecture

Source: "e-kana Map—Bunkazai Bosai Map," Kanagawa Prefecture, http://www2.wagmap.jp/pref-kanagawa/PositionSelect?mid=23

historic sites, and the distribution and seismic intensity caused by a potential earthquake hitting Kanagawa Prefecture and the Tokyo metropolitan area.

Local hazard maps are especially helpful in identifying evacuation routes. Some examples from Japan show that CH sites may serve as evacuation centers because many sites, such as temples and shrines, are surrounded by large green areas. As shown in Figure 9, the earthquake hazard map prepared by Kyoto City indicates two large evacuation centers marked in green. The green area in the middle is Nijo-jo Castle, which is part of a World Heritage property. The other large green area is the Kyoto Imperial Palace and its surrounding national garden.

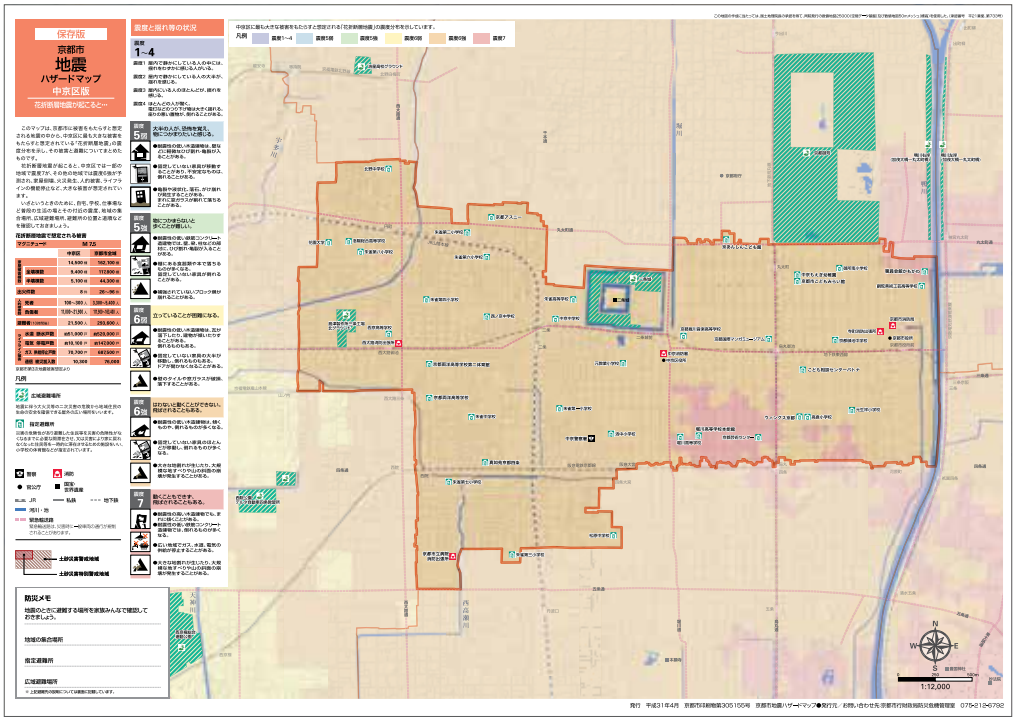


FIGURE 9

Earthquake hazard map of Nakagyo-ku, Kyoto City

Source: Kyoto City Earthquake Hazard Map, Kyoto City Administration, and Finance Bureau Disaster Prevention Crisis Management Office, April 2019, http://www.bousai-kyoto-city.jp/bousai/pdf/dismap/jishin/04jishin.pdf

1.2 Seismic exposure and vulnerability assessment

Earthquakes are among the most common hazards in Japan. To ensure the safety of CH buildings during earthquakes, CP owners and managers focus on site-level vulnerabilities to better understand actual and expected damage. The ACA *Guidelines for Ensuring Safety of Cultural Properties (Buildings) during Earthquakes* recommends that CP owners and managers estimate both the damage an earthquake of the largest scale may inflict on CP and the secondary damage that may be caused by earthquakes, such as from landslides and fire.[26] The ACA guidelines indicate that to make such an estimate, it is the responsibility of each CP owner and manager to carry out a structural assessment with the help of experts; research the damage caused by disasters in the past, using records (both written and oral) and photos; and compare the current situation around the CP with the past situation.

The ACA also provides *Guidelines for Assessing Seismic Resistance of Important Cultural Properties (Buildings)*. The methodology for seismic risk assessments followed in these guidelines has three steps (Figure 10):[27]

1. **Preliminary seismic assessments:** To be developed by CP owners, with the guidance of municipalities as needed, to understand the condition of the CPs regarding their location in seismic areas, structural characteristics, and states of conservation. These assessments could result in one of three conclusions: (i) the CP has adequate seismic resistance; (ii) measures (such as minor temporary reinforcement) must be taken to restore the CP's original structural soundness or to improve management or utilization; and (iii) major repairs (including reinforcement) or utilization reviews may be necessary, and basic seismic assessments must be conducted as soon as possible.

2. **Basic seismic assessments:** Conducted if the results of the preliminary seismic assessments deem it necessary to understand whether the "current seismic resistance" of CP structures meets the standards for "necessary seismic resistance" to preserve the CP's value and safety. CP owners, with the guidance of prefectural boards of education, ask architectural structure specialists and conservation architects to carry out this assessment, which will mainly be based on data obtained from observations of external appearance and other materials, such as geological maps. These assessments should determine if (i) a CP can maintain its function during a large-scale earthquake; (ii) the CP will not collapse during a large-scale earthquake; or (iii) the CP may collapse, but can be restored as a CP.

3. **Expert seismic assessments:** Conducted only if the results of the basic assessments indicate it to be necessary, using detailed data and methods adapted to structural characteristics of the CP buildings. CP owners, with the guidance of prefectural boards of education, should ask architectural structure experts to conduct such assessments.

When conducting expert seismic assessments, the cultural value of the building, including the original forms, designs, materials, and techniques, must be understood, and historical materials and research about land use history and past disasters should be included in surveys. If an assessment based on a nondestructive survey is difficult and needs to involve some destructive methods (for example, removal of a part of the exterior, or the extraction of sample materials), a meeting with the prefectural boards of education must be held beforehand to discuss the methodology of the survey. Box 1 gives an example of an expert seismic assessment.

[26] Guidelines for Ensuring Safety of Cultural Properties (Buildings) During Earthquakes, 1996, http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/pdf/kokko_hojyo_taisin10.pdf. For English, http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/pdf/kokko_hojyo_taisin10_e.pdf

[27] Guidelines for Assessing Seismic Resistance of Important Cultural Properties (Buildings), 1991, revised in 2012, http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/pdf/kokko_hojyo_taisin11_e.pdf

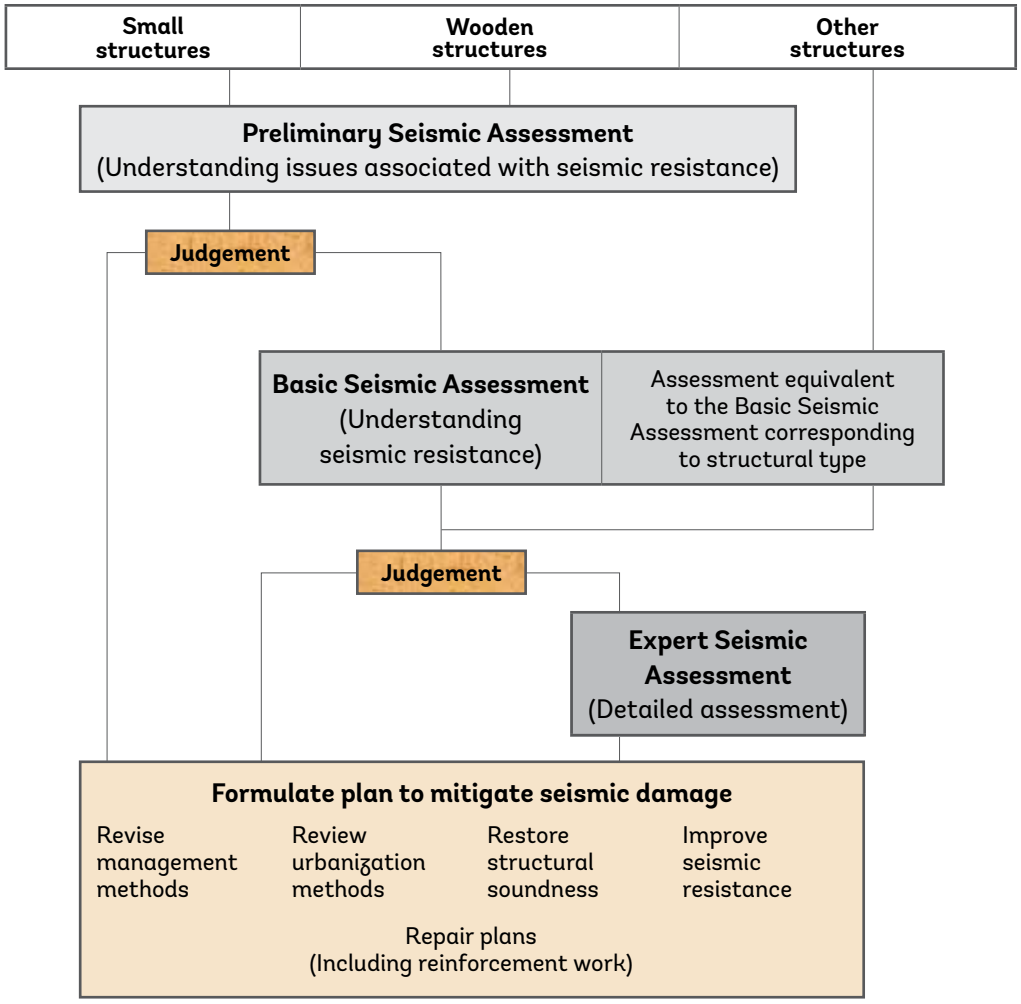


FIGURE 10

Steps for seismic vulnerability assessment of CP

Source: ACA Guidelines for Assessing Seismic Resistance of Important CP Buildings, 1991.

Based on the results of these assessments, risk mitigation measures will be determined. These may include the revision of management methods, a review of utilization methods, the restoration of structural soundness, and the improvement of seismic resistance, which could be done through repairs and reinforcement work.

At the national level, seismic assessments can provide key information on CH assets at risk to improve CP owner awareness, drive investments to better manage the risk, and spur action. From 2009 to 2015, the ACA executed a seismic risk assessment of 2,942 of the 4,695 CPs in Japan. The ACA found that 57 percent were in need of in-depth professional assessment, and 6 percent were at risk of collapse.[28] Based on the results, the ACA then crafted new policies and programs to help CP owners. Today, more than 1,000 CP owners (30 percent) have reported taking action to protect their sites.

[28] Agency for Cultural Affairs, internal study.

BOX 1

Seismic assessment: The case of Kiyomizu-dera

The Kiyomizu-dera Temple in Kyoto dates to the ninth century AD. Its Main Hall consists of wooden architecture 18 meters high, constructed in a 1,170 m^2 area on a slope at the foot of a steep slope. Affected by fire at least nine times between 1063 and 1629, it was burned down in 1629 and rebuilt in 1633 AD. Besides the Main Hall, other major buildings of the precinct are also of traditional wooden construction. The Kiyomizu-dera is part of the World Heritage Site of the Historic Monuments of Ancient Kyoto (Kyoto, Uji, and Otsu Cities), and its Main Hall is also designated as a National Treasure.

In 2013, a team of experts from different Japanese universities conducted a seismic assessment of Kiyomizu-dera to analyze the vulnerabilities and risks of earthquake damage.[29] They used the following methodology:

1. On-site surveys and examinations of historical materials and structures were conducted to determine the scale and details of possible vulnerabilities.
2. Based on the results of these surveys, virtual models were developed using numerical analyses to calculate and display how the structures would be affected during an earthquake.

The second step included the creation of a specific model for each column, beam, and connecting part to be combined into an analytical model containing a total of 3,000 members. For these surveys, various methods of inspection were used, including simple nondestructive deterioration testing using X-ray and electromagnetic radiation, to find possible internal damage to wooden structures. Verification methods included static analysis (conventional and approximate), dynamic analysis (directly tracing dynamic vibration phenomena), and shaking table tests (the most direct methods).

An important aspect of the Kiyomizu-dera Main Hall case is that an analysis was first conducted of the wooden structure on its own, followed by the analysis of a "coupling model" to consider the structure, together with the conditions of the soil and the ground on which it actually stands.

The results of these analyses showed that the Main Hall is at risk of partial damage but would not collapse in the event of a large-scale earthquake.

Currently, Kyoto Prefecture carried out projects to revise and conduct seismic assessment for the building of the Main Hall as part of a series of restoration and conservation works on the National Treasures and ICP buildings of the temple. As a result, the slopes and grounds of the Main Hall have been reinforced, and structural reinforcements of the building itself and a small-scale reinforcement of the stage have been carried out.

The next challenge is to further integrate research results into actual DRM measures. While concrete measures are yet to be taken, an alarm system has been installed to facilitate the evacuation of visitors when the quakes reach the same level as previous earthquakes that caused damage.

To address the question of the evacuation of visitors from tourism sites, Kyoto's municipal government has prepared a series of documents[30] to provide local citizens with information on how to assist in the evacuation of visitors and tourists in case of large-scale disasters. A base document provides an overview of the procedures and is supplemented with documents for specific areas—the Kiyomizu-Gion area and the Saga-Arashiyama area—containing flowcharts, maps, and lists.

[29] Sakai et al., 2014, "Seismic assessment of Japanese traditional wooden structure by dynamic interaction numerical analysis of surrounding ground," Journal of Natural Disaster Science, vol. 35, no. 1, pp. 1–20, https://www.jsnds.org/jnds/35_1_1.pdf

[30] Evacuation map for Kiyomizu area. Kyoto City Administration and Finance Bureau Disaster Prevention Crisis Management Office, 2013, https://www.city.kyoto.lg.jp/gyozai/page/0000076886.html

1.3 Fire exposure and vulnerability assessment

Fire has many causes, including lightning, flying sparks, spontaneous combustion, and human activities. As many traditional buildings are made of wood in Japan, understanding the risk of fire and preventing it from starting and spreading are key to DRM related to fire.

The ACA publishes checklists for fire prevention to be carried out by CP owners.[31] Different checklists are designed for the different types of CPs, including tangible CPs (structures), tangible CPs (arts and crafts), monuments, and folk CPs. Owners are encouraged to check the characteristics of their buildings (such as materials and surrounding environments), the characteristics of usage (who uses the buildings, whether there are any activities or rituals using fire), the management systems, fire prevention facilities and equipment, and cultural artifacts inside the buildings. Detailed translations of these checklists are found in Annex II – Fire and Crime Prevention Checklist for Tangible CPs.

FDMA also used a fire scenario in its report on ICP buildings to identify basic requirements for fire prevention measures.[32] This scenario allows for clarifying and understanding the process, from the outbreak of fire to its extinction, the elements of CP that need to be protected, the weakness of current fire prevention measures requiring their improvement or replacement, and necessary human resources and systems. This exercise took two scenarios into consideration—fire originating from the ICP building itself, and fire spreading to the ICP building—and assessed quantitative scenarios, calculating the time needed for firefighting, rescue, and evacuation activities. The results contributed to identifying measures and facilities that need improvement.

1.4 Landslide exposure and vulnerability assessment

Different types of landslides—from slumps to debris flows—are associated with different geographical features and hazards. In Japan, landslides are frequently caused by heavy rains and are also a common secondary hazard following earthquakes. *The Guidelines for Landslides Prevention Techniques*, prepared by the MLIT, calls for landslide assessments to be conducted with the aim of developing a landslide prevention plan. These are typically completed in three steps: (i) preliminary assessment based on records and literature on geography, geological features, climate, and past landslides; (ii) overall assessment to understand the scope and degree of landslides and movements, with the purpose of planning a more detailed assessment; and (iii) detailed assessment to understand the occurrence and motion of landslides, using different methods that include topographical and geological surveys and soil testing.[33]

Monitoring of slope stability may be useful to predict the time, place, and scale of landslides that might happen by evaluating slope stabilization that changes continuously due to rainfall (Box 2).

1.5 Typhoon and flood exposure and vulnerability assessment

Typhoons are another important hazard affecting Japan. Typhoons Vicki in 1998, Talas in 2011, and Jebi in 2018 caused considerable damage. Typhoon Vicki's damages to CP structures, including national treasure buildings, mainly consisted in direct damage due to strong winds and indirect damage from nearby trees falling onto buildings.

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[31] ACA checklists for fire prevention can be found on http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/check_list.html

[32] Fire and Disaster Management Agency, 2010, "Study group report on fire protection measures corresponding to important cultural property buildings etc. (Interim report)," http://www.fdma.go.jp/html/data/tuchi2204/pdf/220412_houkoku.pdf

[33] Ministry of Land, Infrastructure, Transport and Tourism, 2008, "The Guidelines for Landslides Prevention Techniques," http://www.mlit.go.jp/river/shishin_guideline/sabo/jisuberi-boushi_shishin.pdf

In the case of CP in Japan, assessment for wind-induced lateral forces is often conducted at the same time as assessment for earthquake resistance. Additionally, the ACA also suggests conducting an analysis of tree health at the site in order to identify and locate any trees that may be a threat to structures—for example, weakened trees that may fall in the event of typhoons and strong winds, threatening damage to nearby CPs. This analysis is conducted as necessary during field surveys, although it is not compulsory according to the guidelines.

In the process of formulating a *Conservation and Utilization Plan* (as stated in the amended law for CP), risks are assessed and verified as part of the Disaster Prevention Plan.[35]

Although all structures in Japan have to comply with the Building Code regarding winds and typhoons, CP are exempt from that restriction. Municipal governments conduct assessments and guidance on a case-by-case basis to determine the measures to take to prepare CP structures for typhoons and strong winds, according to the specifics of each building.

In Japan, communication technologies are used to collect meteorological data.[36] MLIT operates XRAIN, a real-time rainfall observation system using X-Band Multi-Parameter Radars,[37] which transmits information with high accuracy, at high resolution, and in close to real time. Other tools and methods used in Japan include high-precision terrain elevation data from airborne laser measurement; runoff analysis using a distribution-type flood prediction model, which increases the accuracy of prediction by conducting an analysis by mesh; and real-time understanding of flood situations.

Risks of floods and water-induced damages need to be assessed on a wide scale. Local governments prepare flood and related maps to be used at the site level for CP. Assessing the risk of these large-scale phenomena goes beyond the scale of action and assessment that CP owners can conduct for their own properties and sites alone.

[34] Sako Kazunari, Ryoichi Fukagawa, Kenichi Iwasaki, Tomoaki Satomi, Ikuo Yasukawa, 2006, "Field monitoring on slope around important cultural asset in order to prevent slope disasters due to rainfall," Japanese Geotechnical Journal, vol. 1, no. 3, pp. 57–69, https://www.jstage.jst.go.jp/article/jgs/1/3/1_3_57/_pdf/-char/ja

[35] For more information see sections "Environmental Conservation Plan" and "Disaster Prevention Plan" in the *Guidelines for Conservation and Utilization Plan of Important Cultural Properties (Buildings)*: Chapter 5, pp. 13–17. It contains sections on 1. Fire and crime, 2. Earthquakes, 3. Winds, 4. Others (Japanese only), http://www.bunka.go.jp/seisaku/bunkazai/hokoku/pdf/hozonkeikaku_yoryo.pdf

[36] Communication companies such as SKY Perfect or NTT DOCOMO provide services such as broadband Internet and satellite mobile communication, which are also used for communicating weather information in hazard-stricken areas.

[37] http://www.mlit.go.jp/river/pamphlet_jirei/pdf/xrain_en.pdf?0930

BOX 2

Kiyomizu-dera slope stability identification and monitoring

The Geo-Hazard Research Group at Ritsumeikan University supported the installation of slope stability monitoring systems in the Kiyomizu-dera area to monitor pore water pressure—the pressure of groundwater held within a soil or rock—and its relationship with rainfall.[34] Generally, water permeation from the land surface is a gradual process that might cause landslides not immediately after the rain, but after some time. In very few cases does slope failure occur immediately after the start of a heavy rain.

Six tensiometers were placed at different depths in the ground. The monitoring result, which was compared with records of past landslides, showed that the possibility of slope failure is extremely high when the total amount of continuous rainfall exceeds 100 mm, and hourly rainfall 30 mm/hour. The empirical results also indicated that understanding changes in the water content of a slope surface may be effective in predicting slope failure, which will aid in decisions on when to issue evacuation alerts and the development of a more accurate DRM system.

Firefighting system in the back garden of the Goten Palace at Ninna-ji temple, Kyoto.

2. Risk Reduction, Preparedness, and Response

Once risks have been identified, property owners can take specific measures to reduce them, and to ensure preparedness and response options. These include the application of disaster prevention measures; the preparation of DRM plans and manuals; the education of CP owners and managers on DRM expertise and skills; awareness raising for CP owners and managers (as well as visitors); strengthening of partnerships with relevant actors; and the implementation of regular DRM drills, all of which play important roles.

These measures can be taken at various levels, and many guidelines in Japan emphasize the importance of improving both "hardware" (including physical measures and facilities) and "software" (manuals, education, and training). Some of the measures are hazard-specific, but many others are common to all types of hazards. The *ACA Disaster Management Operation Plan* indicates that the ACA creates guidelines for developing DRM plans and manuals, which clarify how to secure the safety of visitors at the time of disasters, the division of staff roles, and the availability of communication channels. The ACA also provides and promotes training on communication during disasters, regular DRM drills, and the dissemination and reinforcement of DRM knowledge by organizing lectures and distributing DRM guidance materials. CP owners and managers, on the other hand, play an important role in reducing risks at sites by improving the safety of their sites and facilities (through, for example, regular maintenance, reinforcement measures, and repair work); securing evacuation routes and maintaining related facilities and signage; securing the safety of display cases, lights, and shelves; and ensuring safety measures for dangerous objects or substances such as chemicals during disasters.

Preparedness and response measures allow property owners and managers to address the issue of what to do when a natural hazard event strikes. Emergency plans work best when practiced through simulation drills to ensure on-site readiness and preparedness to face real events. Drills are also essential to verify the applicability of the emergency response plan and revise and update it if necessary. The strengthening of partnership among stakeholders is also essential to ensure efficient information sharing and the effective implementation of measures and plans, both of which are necessary for the protection of human lives and CP at the time of disasters.

2.1 Earthquakes

The basic principle of earthquake mitigation measures at CH sites in Japan is to ensure the safety of people's lives, even during strong earthquakes. The *Guidelines for Ensuring Safety of Cultural Property Buildings during Earthquakes* calls for achieving this by implementing reinforcement work, if possible, to the extent that it will not lessen the value of the CP, or by restricting the entrance of visitors to CP sites if such reinforcement measures may damage the CP's value.[38]

Due to Japan's long history with earthquakes, some buildings are traditionally designed to be earthquake resistant. However, risks of building collapse may be further reduced in two ways. One is to improve the building's ductility to resist seismic movement by adding stable truss structures, hoop ties, and steel jackets. Another is to reduce or absorb seismic forces by installing seismic isolation systems consisting of lead rubber bearings and/or high damping rubber bearing or vibration control systems, including various kinds of dampers (viscous, hysteretic, and friction types) to control vibrations in buildings during an earthquake.

The *Guidelines* also points out that risk may be substantially reduced by improving the maintenance and management of a CP and its surrounding environment. Building maintenance is especially crucial to secure the resistance of the building and maintain its structural performance over time. Heritage buildings need to be systematically maintained by their custodians on a daily basis and periodically reviewed by DRM professionals. Daily maintenance includes checking changes in the condition of buildings during cleaning, including observing cracks in the floors and walls, the degree of inclination of main structures, deterioration of materials, stains on ceilings, and changes in foundations. Simple measures to stabilize internal facilities, such as lights, furniture, and canopies, should also be taken to prevent earthquake damage. Since changes in surrounding geographical features caused by earthquakes can have major impacts on the preservation of CP buildings, attention should be paid to elements of the surrounding environment, such as stone walls, cliffs, ponds and lakes, and big trees, and potential dangers should be removed while maintaining respect for historic scenery and landscapes. Periodic examination by professionals should include a detailed structural investigation, a deterioration diagnosis, and the observation of temperature and humidity. Monitoring of changes in vibration characteristics with the installation of a seismometer can also be useful.[39] CP owners are encouraged to conduct necessary reinforcement and repairs with the guidance of experts, without causing damage to structures and designs, and taking into consideration the original materials, building techniques, and designs.

In the case of the Kiyomizu-dera Temple, the custodians regularly diagnose the deterioration of materials caused by insects, and have installed a seismometer to monitor and study vibration characteristics. To ensure inspection is nondestructive, methods such as radiographic testing and electromagnetic investigation are used for diagnosing deterioration.

In the case of ICP buildings, assessments of earthquake resistance are often conducted, and measures to increase resilience are implemented during repair and restoration works.

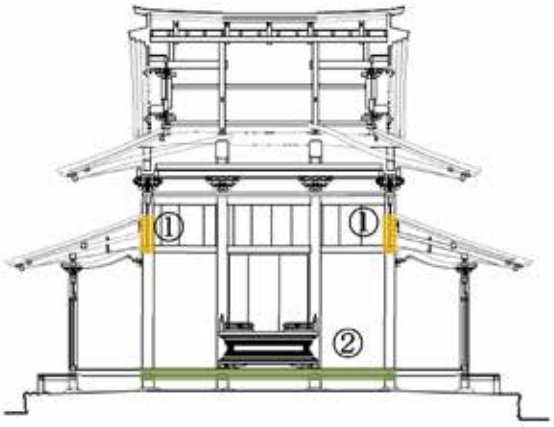
The ACA has compiled cases of various interventions from diverse contexts and conditions throughout Japan. Figure 11 summarizes a selection of key examples of seismically resilient interventions at important CP sites in Japan, from the ACA's compilation of case studies. For a fuller review of case studies, see Annex III – Selected examples from the "Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings).

[38] http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/pdf/kokko_hojyo_taisin10.pdf
[39] Ritsumeikan Center of Excellence (CoE), 2013.

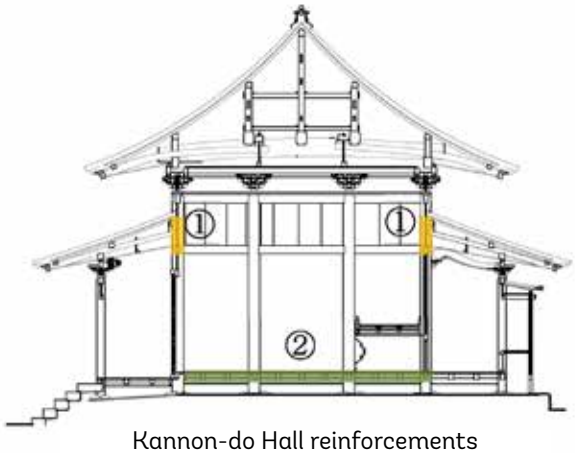
FIGURE 11

Summary of case studies on seismic assessment and seismic reinforcement for ICP

Name and location	Characteristics and assessment	DRM measures
Eihouji Temple, Kaizan-do and Kannon-do Halls (Gifu Prefecture)	Buddhist temple, two wooden hall buildings (1333–92). Both halls are at high risk of collapse in case of a strong earthquake.	Earthquake resistance measures (e.g., structural reinforcements inside walls and under floors) introduced during reroofing and partial repair works.



Kannon-do Hall reinforcements (longitudinal section)



Kannon-do Hall reinforcements (transversal section)

Reinforcement inside the wall (①)

Reinforcement under the floor (②)

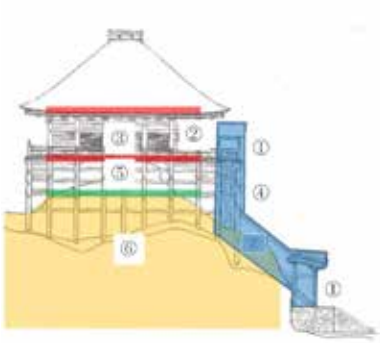
Eihouji Temple, Kannon-do Hall

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

FIGURE 11

Summary of case studies on seismic assessment and seismic reinforcement for ICP (cont.)

Name and location	Characteristics and assessment	DRM measures
Nyohoji Temple, Hall (Ehime Prefecture)	Buddhist temple, wooden hall building (1670). At high risk of partial collapse due to deformation in the case of strong earthquake.	New reinforcing elements were concealed with new panels to respect the hall's design and wall details; foundations were reinforced as counterweight; beams in roof structure received metal reinforcements.
Hassho-ji Temple Amida Hall (Kumamoto Prefecture)	Buddhist temple, wooden hall building from the late 15th century. At high risk of deformation and collapse in the case of strong earthquake. During restoration works, the roof design and materials were restored to their original configurations, resulting in a significant increase of high wind pressure.	A combination of permanent and temporary reinforcements and management systems were applied to achieve maximum effect with minimum visual impact. For instance, reinforcement of the four outer pillars was connected by wires to counterweights buried in the ground, as temporary reinforcement to wind pressure.
Kasamori-ji Temple, Kannon Hall (Chiba Prefecture)	Buddhist temple wooden hall building (1597). The structural analysis suggested that in the case of a strong earthquake, the pillar bases might be dislocated from the foundation stones, and the staircase is at risk of collapse.	A comprehensive set of reinforcements was undertaken: the climbing stairs were reinforced with steel columns that resemble the existing handrails; wooden reinforcements inside roof and under floors; metallic braces and fittings; soil improvement and bolts to secure foundations.



Location of reinforcements

Steel columns reinforcing the stairs (①)

Steel frame reinforcement of the handrails (②)

Under-floor brace reinforcements of the stairs (④)

Metal fasteners to avoid the dislocation of columns (⑤)

Sprayed mortar coloured to match (⑥)

Kasamori-ji Temple Kannon Hall

Source: *Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.*

FIGURE 11

Summary of case studies on seismic assessment and seismic reinforcement for ICP (cont.)

Name and location	Characteristics and assessment	DRM measures
Nagoya Castle, southwest turret (Aichi Prefecture)	Military building: wooden structure covered with earth walls, dating from 1612. At risk of collapse in the case of a strong earthquake.	Reinforcements were concealed in earthen walls to respect building's design (e.g., space between earthen walls and wooden beams in wall structure was filled with additional layer of earth to increase walls' resistance, and a concrete foundation was introduced to alleviate ground subsidy of the foundations.)
Osaka Central Public Hall (Osaka)	Public hall building, brick masonry structure with metal frame (1918). Assessment showed only a third of required earthquake resistance capacity.	Installation of earthquake retrofitting/base isolation limited reinforcements of the building's upper structure to the very minimum.

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

When an earthquake strikes, securing the safety of people is of the utmost priority. CP owners and site managers are thus responsible for securing the safety of visitors. Once the seismic movement has stopped and visitors have been evacuated to a safe area and their safety confirmed, CP owners and site managers may take immediate action for emergency response for CPs, including an assessment of the damages and the overall situation.[40] The subsequent emergency measures include the following:

1. Notifying firefighters immediately in case of fire breakout, securing one's own safety, and beginning to extinguish fires;
2. Putting up emergency props to secure the safety of buildings and limit access to the premises or parts of the premises as necessary;
3. Moving artifacts and artworks to safe places; and
4. Requesting the cooperation of DRM-related groups and volunteer and local groups, because in large-scale disasters, help from firefighters or local groups may not be available.

CP owners and managers also have to take measures to prevent secondary disasters—these measures may include closing or limiting access to premises until safety has been confirmed, and checking for any leaks before restoring electricity and gas. Once these steps have been taken, the damage should be recorded, using cameras or video. These records are useful during recovery phases, and for better understanding risks and devising appropriate mitigation and preparedness measures. After documentation, arts and crafts CP should be moved to a safe location to prevent loss, damage, and theft. If CP buildings are damaged, first-aid measures to reinforce them and prevent collapse can be completed with expert guidance; CP managers normally restrict access at this stage. At the same time, CP owners and managers should contact local authorities to report damage and seek guidance before beginning cleanup.

Municipalities, prefectures, and the ACA are responsible for collecting damage and loss information and deploying staff to where damage has occurred so that the situation may be rapidly assessed and first-aid measures and guidance to other actors provided. In particular, ACA establishes a **Committee for Rescuing of CP** if needed. The Committee provides first-aid assistance at the request of CP owners and managers.

[40] See Box 3 on *DRM Manual for CP Owners* developed by Kyoto Prefecture, which provides useful references for concrete actions.

BOX 3 DRM Manual for CP Owners by Kyoto Prefecture[41]

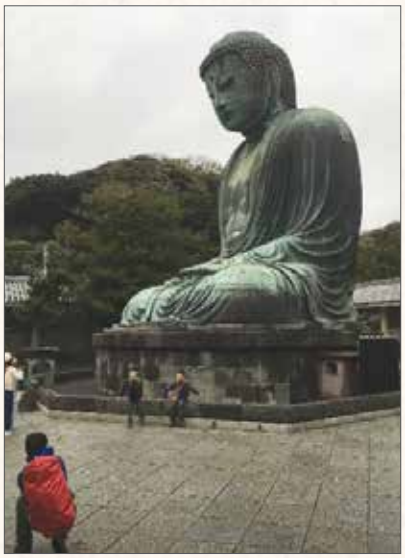
The DRM Manual for CP Owners developed by Kyoto Prefecture provides guidance on the actions CP owners should take before, during, and after disasters. Based on the Kyoto Regional Disaster Prevention Plan and the Kyoto City Regional Disaster Prevention Plan, the manual is aimed at protecting CP from disasters, ensuring the safety of people, and helping CP owners provide emergency measures to minimize damage and conduct the conservation and restoration of disaster-affected CP at an early stage.

The manual consists of four volumes, covering four topics: (i) measures for earthquakes; (ii) measures for wind- and rain-related disasters; (iii) fire prevention and crime prevention; and (iv) documentation and references. It provides guidance on how to prepare for and respond to different kinds of disasters, which helps CP owners take appropriate conservation and restoration measures as quickly as possible, along with a checklist of what needs to be done.

Although this manual is mainly designed for CP owners and managers, it also helps guide stakeholders of non-designated CP in taking appropriate measures for the prevention of disasters and the mitigation of their impacts.

[41] Kyoto Prefecture/Kyoto City, 2011, *DRM Measures Manual for Cultural Property Owners* (simplified version) [Earthquake countermeasures], https://www.pref.kyoto.jp/kikikanri/documents/bunkazaim-jishin.pdf

BOX 4 The case of the Daibutsu of Kamakura

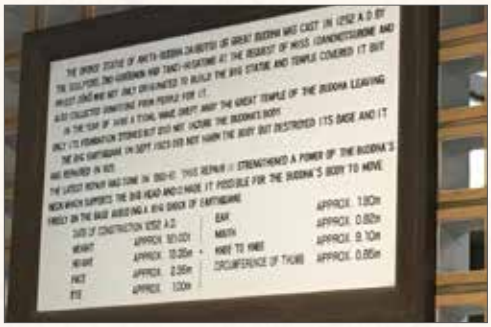


Kōtoku-in, which includes in its precinct a great seated Buddha, known as a Daibutsu, is a Buddhist temple in Kamakura in Kanagawa Prefecture. The Daibutsu is made of bronze and designated a National Treasure. It is one of 22 historic sites included in "Temples, Shrines, and Other Structures of Ancient Kamakura" on UNESCO's Tentative List for World Heritage Sites.

The site has been subject to hazards that include earthquakes, tsunamis, and flooding, and it endures as a symbol of the good practice of resilient cultural heritage. The statue itself was cast in approximately 1252 AD and since that time has faced 1,498 tsunamis, as well as serious earthquakes, including the 1923 Great Kantō 7.9-magnitude earthquake, which severely damaged the base on which the Daibutsu sits.

In 1960–61, authorities reinforced the support in the statue's neck area, a structural change that allows it to move freely from the base of the body in the event of an earthquake.

The CP owners and authorities have made a study of the repairs and restoration for disaster resilience, and included it in the visitor experience.



Photos: James Newman

2.2 Fire

Fire is a category of hazard that requires the highest level of protection because the damage it causes on CH is irreversible, particularly in Japan where most CH assets are composed of wood and other flammable materials—once a CP catches fire it is impossible to restore the historic material. Fire usually spreads quickly, and extinguishing it is extremely difficult. Therefore, it is crucial to take measures to ensure that it is both detected and extinguished early.

The Review Committee of *Comprehensive Disaster Risk Management of Important Cultural Properties* (structures), consisting of DRM and CP experts and convened by the Director General for Disaster Management, lists three elements for fire prevention for CP:

1. Prevention of ignition and combustion from inside CP and of susceptibility to fire spreading from outside CP;
2. Early detection of fire; and
3. Firefighting.[42]

Fire risk mitigation and firefighting systems/techniques

Risk of fire can be reduced by regular checks and maintenance of flammable objects and their storage; implementation of fire drills; installation of site security and monitoring equipment (especially to prevent arson); and installation of lightning rods and reinforcement of anti-seismic measures. In cases in which fire is part of daily activities and rituals in CP buildings, CP owners and users should take basic safety precautions, such as keeping buckets of water on hand. While municipalities have prohibited the use of fire in the areas surrounding many CP sites, electrical fires as a result of earthquakes remains a challenge.[43]

Detecting fires early and preventing their spread is crucial for fire prevention, as even a single spark can cause a conflagration in a wooden building. For early fire detection and monitoring, fire alarm systems, well-established communication channels, and regular drills are indispensable. The case of the Kuroishi Historic District presented in Box 5 provides an interesting example of a fire monitoring system well-integrated into the information network.

Fire prevention facilities and equipment play important roles in the early deployment of firefighting resources. As more than 90 percent of ICP (structures) are made of wood and nearly 40 percent of roofs are made of plant materials, DRM for CP in Japan has placed a major focus on how to secure water sources for fighting both spontaneous fires and those induced by earthquakes. Fire prevention facilities and equipment commonly used in Japan include the following:

- **Gravity pressure water supply facilities:** These facilities do not require complex mechanisms or electricity to operate, just a water source elevated above the expected target. They are particularly useful in the event of earthquake-induced fires, when it is necessary to secure fail-safe water supply facilities that can maximize the functioning of various kinds of water spraying equipment. A standalone power-pressure water supply system with a backup power supply is usually used in cases of water outage or power failure at waterworks facilities. Figure 12 shows, as an example, the Environmental Water Supply System (EWSS)

[42] Cabinet Office, 2008, First Working Group for Comprehensive Disaster Risk Mitigation Measures for Important Cultural Properties (Buildings), "Disaster Risk Mitigation Measures against Fire for Important Cultural Properties," 14 July 2008, http://www.bousai.go.jp/jishin/sonota/bunkaisan/pdf/080714_siryo3.pdf

[43] Agency for Cultural Affairs, 2009, Working Group for Comprehensive Disaster Risk Mitigation Measures for Important Cultural Properties, "Comprehensive Disaster Risk Mitigation Measures for Important Cultural Properties and their Surroundings," April 2009, http://www.bunka.go.jp/seisaku/bunkashingikai/kondankaito/kenzobutsu_bosai/pdf/sougoubousai_h2104.pdf

BOX 5 Fire monitoring system in Kuroishi, Aomori Prefecture

The Kuroishi District in Aomori Prefecture in northern Japan throve as a commercial center linking the cities of Hirosaki and Aomori in the 17th century. Many wooden merchant houses were also built during the mid-Edo period in the 1700s and early 1800s; one of these is designated as an ICP. The district of Kuroishi is also nationally designated as a Preservation District of Groups of Traditional Buildings, and authorities continue to preserve traditional buildings and the historic neighborhoods in which they are situated.

Local Area Emergency Information Network System.

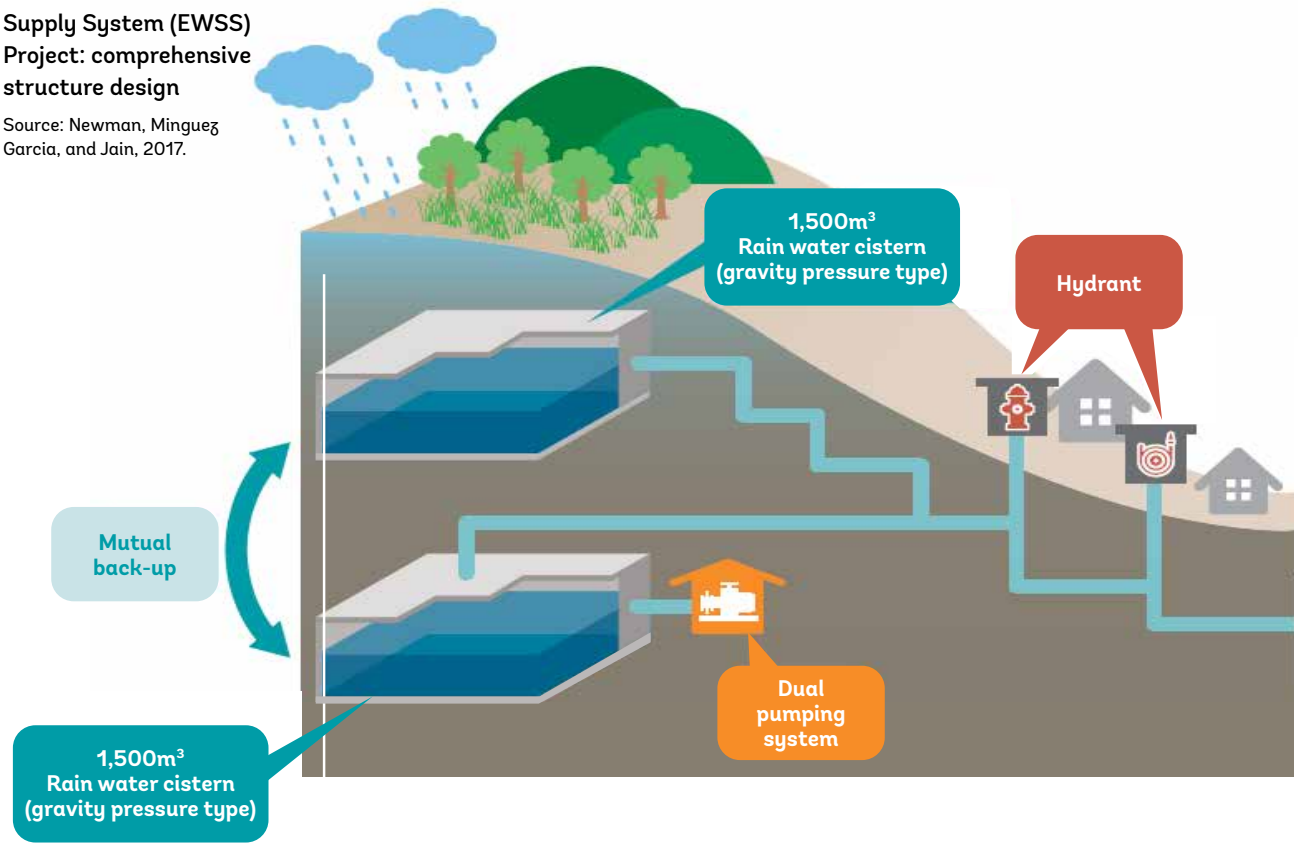
The authorities established early detection as a priority measure and Kuroishi is equipped with a standard contemporary set of fire alarm systems, including smoke detectors that support a first response to fire. A special feature of Kuroishi is that another system was installed on top of this one to monitor the spread of fire using fire alarms as sensors, and that a robust and secure wireless information network was set up. These systems automatically collect information on any outbreak of fire and send warnings and information to local firefighters and residents on the direction in which fires are expected to spread. Using open-source geographic information system (GIS) software, the system lets mobile phone users access a real-time map showing fire locations. Since the fire monitoring system is connected to sirens and loudspeakers, the information can also reach those who do not have mobile phones.

The Local Area Emergency Information Network System has been developed by NOHMI BOSAI LTD. and R-DMUCH (https://www.nohmi.co.jp/product/emergency_info/).

FIGURE 12

Environmental Water Supply System (EWSS) Project: comprehensive structure design

Source: Newman, Mingueg Garcia, and Jain, 2017.



established in Kyoto in 2006.[44] This system uses an existing natural water source—a small cistern situated at an elevation of 80 meters—and natural gravity for water pressure. It incorporates citizen hydrants, which can be used by residents.

- **Water shield system (WSS):** This system helps protect traditional wooden buildings by spraying water on building exteriors to prevent the spread of fire in areas with many narrow streets. The wet surfaces of wooden buildings serve as a temporary fire wall.[45] For example, buildings in Myoshin-ji Temple, Kyoto, are equipped with this WSS system.
- **Water cannons, drenchers, sprinklers, and fire extinguishing systems:** These facilities focus on reducing fire risk originating from surroundings, such as neighboring buildings and mountains.
- **Community-based fire prevention system for historic urban areas:** One example of a community-based approach is the case of Sannei-zaka. Since 2006, efforts have been made to secure water resources on the west side of the Kodai-ji Temple, in the area of Sannei-zaka. Beneath the Kodai-ji Park, an earthquake-resistant cistern with a capacity of 1,500 m^3 has been installed to collect rainwater. It includes a pump system for pressure-transporting water during a shortage. As maintaining water supply systems from diverse alternative sources is an important concern, another seismic-resistant water cistern of 1,500 m^3 is planned, using natural differences in elevation in the Kiyomizu-dera area. Community members are encouraged to use the water of these "citizen hydrants" on a daily basis (to water their plants, etc.). By doing so, they become familiar with the equipment and thus special trainings and drills become unnecessary. (Figure 12)
- **Overall firefighting system for World Heritage (WH) Sites in Kyoto:** WH sites such as the Nijo-jo Castle and Ninna-ji Temple have various types of water hydrants designed not to interfere with the characteristics of the surrounding scenery or landscape. They also include fire alarm systems, lightning protection systems, firefighting systems and the arrangement of fire prevention equipment, as well as annual maintenance and monitoring plans for all these countermeasures. (Figures 13 and 14)

Similarly, all component temple and shrine sites of the WH property of Kyoto are equipped with fire-fighting measures of their own, which are planned specifically according to the site's location and surrounding environment. For example, in both the Kozan-ji Temple and Ninna-ji Temple, a gravity-pressure system taking advantage of the difference in heights of the mountain slopes behind the temple provides water to fire extinguishing equipment. The fire extinguishing system of Daigo-ji Temple is based on gas, in order to preserve the color of the painted surfaces inside the five-storied pagoda. At both the Kiyomizu-dera Temple and Kinkaku-ji Temple, automatic fire alarm equipment and electrical circuits are wired with glass fiber, in order to avoid electrical failure due to lightning.

Fire risk preparedness and response

Japan's culture of preparedness provides a useful basis for action. Since 1955, January 26 has been designated as Fire Prevention Day for Cultural Properties. On this day, various fire prevention activities, including checkups and maintenance of fire prevention facilities for CP and fire prevention drills, are conducted by municipalities in cooperation with fire departments and local communities throughout Japan.

For CP to be prepared against fire, it is imperative that the fire prevention facilities that are installed work when needed, and that people know how to use them in an emergency. This can be ensured by regular maintenance of facilities and training and drills of various stakeholders around CP, including CP owners and managers. In addition, since many of these water resources are used on a daily basis by the community, this also assists in their

[44] K. Toki and T. Okubo, "Protection of Wooden Cultural Heritage from Earthquake Disaster," in Proceedings of Meetings on Cultural Heritage Risk Management (Kyoto: World Conference on Disaster Reduction), 94–102.

[45] Ritsumeikan CoE, 2013, pp. 64–65.

FIGURE 13

Nijo-jo Castle Fire Response System

maintenance. The systems and standard operating procedures for responding to fire have to be established and tested and all actors trained beforehand so they can take appropriate action without confusion or panic. Creating a communication line and making everybody aware of it to deliver necessary information smoothly during a disaster are also essential.

When fire is noticed or an alarm goes off, it must be immediately reported to the fire department, while residents and visitors are evacuated. Then, if the fire is a small one, trained individuals such as CP owners and managers and residents should try to extinguish it, or prevent it from spreading by using fire extinguishers or water cannons. It is important to note, however, that as the substance used in some fire extinguishers can cause damage to CP, discretionary use is recommended; it is important to select the most appropriate extinguisher to cause minimum damage to heritage materials. CP should have fire extinguishers and/or facilities available for use. Collaboration with the fire department and local communities is established beforehand to improve efficiency in firefighting. Likewise, CP should include lightning protection measures with the installation of conductors on buildings or on trees, as shown in Figure 14.

FIGURE 14

Examples of disaster prevention measures at temples in Kyoto

Source: Newman, Mingueg Garcia, and Jain, 2017.

Establishing a good emergency communication network makes a big difference in responding efficiently to disasters, securing people's safety, and rescuing CP. The **Kyoto Cultural Properties Disaster Prevention Measure Liaison Meeting** (*Kyoto Bunkazai Bosai Taisaku Renraku Kai*) is an association that was established in 1962 in response to a lesson learned from a sequence of fires that caused the losses of ICP buildings and arts and crafts, with the objective of promoting comprehensive DRM for CP.[46] This meeting gathers 12 organizations together to exchange information and views on disaster prevention with respect to CP and establishes good communication and coordination to address issues of fire and CP effectively. They are: the Cultural Heritage Protection Division of Kyoto Prefecture; the Bunkyo Division of Kyoto Prefecture; the Disaster Management Division of Kyoto Prefecture; the Lifestyle Safety Planning Division of Kyoto Prefectural Police Headquarters; the First Division of the Kyoto Prefectural Police Headquarters Security Department; the Kyoto City Fire Department; the Landscape Policy Division of Kyoto City; the Kyoto Cultural Foundation; the Kyoto City Culture and Tourism Resource Protection Foundation; the Kyoto Ancient Culture Preservation Association; the Kyoto Osaka Forest Management Office; and the Kyoto National Museum. They meet three times a year to discuss a wide range of issues related to the protection of CP from fire, such as measures and techniques for fire prevention and firefighting, DRM training and activities, and subsidies.

Two types of communication networks have been established within the Liaison Meeting: one is a network for fire mitigation, and the other a network for the prevention of theft and vandalism. When a disaster happens, networks are used for immediate reporting, information sharing, and consultations. Depending on the level of designation of the affected CP (for instance, whether it is designated by the national government or the subnational government, or is not designated at all), the order of priority and the timing of reporting (urgently, later, or no reporting required) is decided. Bringing relevant stakeholders involved in DRM for CP together regularly contributes to maintaining communication channels between them and keeping them ready for emergency situations, which strengthens preparedness against fire.

2.3 Eruptions, landslides, and slope erosions

Landslides are mass movements of land that can cause loss of life and assets, and they often threaten CH. To manage landslide risks, governments and property owners focus on securing the stability of slopes. This includes methods of controlling their movement by managing topography, soil properties, and underground water flow. Removing potential sliding soil masses from slopes, especially around their tops, may help stabilize them, and building drainage facilities is also useful to avoid excessive water infiltration from precipitation. Tree planting may also ease the erosion of slopes.

Additional structural measures, such as the building of retaining walls or the use of anchors, may help prevent landslides. The retaining wall method is mainly used at the base of a slope to increase its stability. The anchor method, using fixtures such as earth anchors and rock bolts, is applied to integrate the surface of the slope with the foundation bed. These measures have been undertaken in the Kiyomizu-dera area.[47] Systems to be applied in CH areas have to be designed in a way to avoid spoiling the cultural landscape.

[46] For information about the Kyoto Cultural Properties Disaster Prevention Measure Liaison Meeting, see Fire and Disaster Management Agency, "Chapter 3: Case studies on mechanisms for stocking and sharing of technical expertise and information on fire prevention for cultural properties," http://www.fdma.go.jp/html/data/tuchi2304/pdf/230422-1-3.pdf

[47] Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University, 2016, "Slope Evaluation and Examples of Measures for Cultural Heritage Disaster Risk Reduction—Slope stabilization and Preservation of Historical Landscape," http://r-dmuch.jp/jp/results/shamen.html

Kiyomizu-dera area, Kyoto.

CASE STUDY

Fujisan's measures for DRM, erosion control, and volcanic eruptions

In the WH Site of Fujisan, sacred place and source of artistic inspiration that encompasses several prefectures and municipalities, the Fujisan World Cultural Heritage Council[48] coordinates initiatives to protect the whole site. In the area of DRM initiatives, Yamanashi and Shizuoka prefectures and related municipalities promote measures based on their Regional Disaster Prevention Plans, with due consideration given to the site's heritage values. The measures are aimed at protecting the lives and property of visitors and residents, and drills are conducted regularly to verify and enhance the effectiveness of the individual measures and the overall system. The methods for communicating and disseminating the DRM information related to evacuation routes for both locals and visitors are currently being reviewed to include preparedness for sudden volcanic eruptions. Initial results were reflected in the Fujisan Wide–Area Evacuation Plan, enacted in 2015.[49] Regarding protective and recovery measures for buildings, as well as safety measures for visitors, the Fujisan World Cultural Heritage Council follows the ACA Disaster Prevention Program.

In the area of erosion control, the MLIT has set up the **Fuji Sabo Office**[50] and taken the lead in installing riverbed barriers to prevent landslides at the starting point of a major river on the western slope of Fujisan, which has been subject to continual landslides.[51] Landslide prevention measures also include erosion control dams and sediment basins. These have been put in place at strategic points in downstream areas, preventing damage to the section of river located in the foothills, as well as those of its tributaries that are prone to debris slides. (Box 6)

[48] http://www.fujisan-3776.jp/en/index.html
[49] http://www.fujisan-3776.jp/en/preservation/crisis-management/eruption.html
[50] http://www.cbr.mlit.go.jp/fujisabo/en/index.html
[51] http://www.fujisan-3776.jp/en/preservation/crisis-management/sand-control.html

BOX 6 Sabo: Erosion control system in upstream areas

Sabo is an erosion and sediment control system for upstream areas. It has been in use in Japan for more than a century. The approach employs a number of techniques, including terracing—the creation and maintenance of a series of successively receding flat surfaces or platforms—and reforestation. Seventy percent of Japan's territory comprises mountainous areas, which are highly susceptible to sediment-related disasters caused by typhoons and torrential rains. For example, Nikko, a popular tourist destination that hosts hot springs as well as ICPs including the shrines and temples of the Nikko WH Site, has suffered historically from floods and landslides because of its proximity to the Kinu, Daiya, and Inari rivers. Nikko is surrounded by mountains, and the soil around the Kinu River contains lava, which makes the area even more susceptible to sediment-related disasters. Repetitive damage from sediment runoff led to the start of sabo construction in the Kinu River drainage area in 1899, continuing until the mid-20th century. In the early 20th century, in the absence of heavy equipment, a series of *sabos* were built by hand. These still prove useful during typhoons and torrential rains. In September 2011, they protected the WH Site and the city of Nikko from Typhoon No. 12. While *sabo* construction in the past was focused on preventing disasters, in recent years care has also been taken not to destroy the ecosystem. Historic *sabo* constructions are themselves now registered as tangible CP.

Source: Ministry of Land, Infrastructure and Transport, Kanto Regional Development Bureau, Nikko Sabo Office, Nikko Sabo Office Leaflet, http://www.ktr.mlit.go.jp/ktr_content/content/000065179.pdf

For further reading, see T. Mizuyama, 2008, Sediment hazards and SABO works in Japan, www.jsece.or.jp/jece/archive/1/Mizuyama.pdf

Sannai in Nikko City, 1966.

Inari River Upstream Sabo No. 10 before Typhoon No. 12 (left) and after the typhoon (right).

The location of the *sabo* system in relation to the rivers and the World Heritage Site of Nikko.

Kamatsuzawa Downstream Sabo Weir.

Source: Ministry of Land, Infrastructure and Transport, Kanto Regional Development Bureau, Nikko Sabo Office.

There are numerous other examples of *sabo* constructed all over Japan, of which several are in direct connection with major heritage and WH Sites, such as the *sabo* of Miyajima Island and the *sabo* of Fujisan.[52]

[52] For more on the *sabo* of Fujisan, see the website of the Fuji Sabo Office, http://www.cbr.mlit.go.jp/fujisabo/en/index.html

CASE STUDY

Kiyomizu-dera Temple: Recent slope failures and the countermeasures

Kiyomizu-dera Temple, which is located on a steep slope at the base of Otowa Mountain, has suffered from many landslides since its construction. In 2013, Typhoon No. 18 caused slope failures 5–16 meters in width and 7–20 meters in length. DRM measures around CH sites need to take into consideration harmony with the environment, including topography, vegetation, and landscape. For this reason, slope stabilization measures at the Kiyomizu-dera Temple employ a geo-fiber method, using continuous fiber-reinforced soil, once the ground has been anchored. The mixture of sandy soil and fiber creates shearing force, while allowing for landscaping (Figure 15).

FIGURE 15

Geo-fiber works of Kiyomizu-dera Temple

Source: Ryoichi Fukagawa, Ritsumeikan University.

CASE STUDY

Kumano-Nachi Taisha Shrine typhoon damage

Kumano-Nachi Taisha Shrine, which is part of the WH Site of Sacred Sites and Pilgrimage Routes in the Kii Mountain Range, was damaged in September 2011 by Typhoon Talas, an event which caused heavy rains and slope failures. The debris did not follow the designed flow path, and flooded instead into the main hall of the shrine, destroying at least five big trees around the area. During the recovery process, a new barrier for debris was installed on the actual flow path. (Figure 16)

FIGURE 16

The damage and recovery following Typhoon Talas at Kumano-Nachi Taisha Shrine

Source: Ryoichi Fukagawa, Ritsumeikan University, 2010.

CASE STUDY

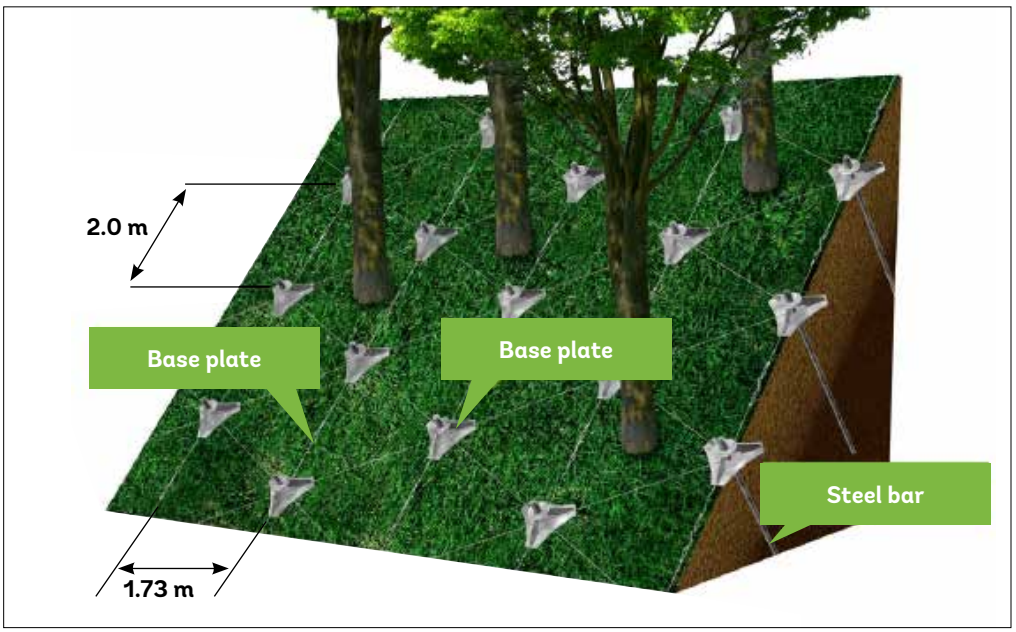
Kumano-Kodo route typhoon damage

Kumano-Kodo is an ancient pilgrimage route which is also part of the WH Site of Sacred Sites and Pilgrimage Routes in the Kii Mountain Range. In 2011 Typhoon Talas caused great damage to mountainsides of the Kii Peninsula. The repair of slope failure damages in parts of the disaster-struck areas was undertaken with the adoption of the non-frame method, which allows slopes to be stabilized without removing the trees that grow on them. (Figure 17)

FIGURE 17

Scheme of the non-frame method developed by Nippon Steel Metal Products Co., Ltd.

Source: Nippon Steel Metal Products Co., Ltd.



The non-frame method is often adopted in the case of CP sites and surroundings, using special slope failure prevention measures that respect the landscape and cultural value of sites both in terms of design and implementation work. This method does not require slope alteration, making the DRM measures inconspicuous and allowing the original landscape features of the area to be maintained. (Figure 18)

FIGURE 18

Conventional method or non-frame method

Source: Nippon Steel Metal Products Co., Ltd. http://www.non-frame.com/about/structure.html

2.4 Floods

Many CPs are affected by floods in Japan. However, since floods normally affect large geographical areas, it is generally not feasible to have site-specific risk reduction measures, including for CP, that can reduce the risk entirely. Nevertheless, several types of flood mitigation measures such as afforestation, levees, and dikes are designed to preserve the landscapes. Urban flood risk reduction measures at the planning level, such as water retention ponds, canals, and well-planned drainage, among others, are applicable and effective at specific CH sites.

In general, DRM at CH sites focuses on developing and ensuring preparedness and response measures. CP managers and authorities in Japan generally focus on early warning systems and the simulation of potential damage to protect CP and facilities from potential loss and damage, and to enhance their preparedness for evacuation.

The WH Site of Itsukushima Shrine on Miyajima Island, in Hiroshima Prefecture, has suffered major damage from typhoons and coastal flooding. After repeated damage, the priests of this shrine took a new approach to managing disaster risk.[53] Because of its unique location on the shore, damage to the shrine and its structures cannot be completely avoided. When a typhoon or high tides are forecast, the shrine's priests and staff take measures to reduce wind shear and "let the water and the winds flow through" as much as possible. To reduce the severity of any damage, they remove selected portions of roof cover plates and floorboards. As ICP buildings and CH sites cannot introduce conspicuous structures to prevent damage, the shrine's priests understand and accept that it may occur. With preparation and forethought, however, the damage can be managed and limited to the extent that it can be remedied by repairs and restoration work.

Miyajima Island is also known for a *sabo* project undertaken between 1948 and 1950 as part of the efforts for recovery from the great damage to the islands' protected Historic Sites and Places of Scenic Beauty caused by the 1945 typhoon's torrential rains. This was a pioneering project in that the *sabo* system was designed with great respect for the visual, scenic, and heritage values of the site.[54]

2.5 General considerations for emergency response, rescue, and recovery of movable heritage

In DRM for CH sites, movable heritage, such as paintings, sculptures, furniture, decorative ornaments, ceramics and glass, fabrics, books and paper, photographs, and archival documents, require special attention, as these may also have diverse types of vulnerabilities. CP owners and managers need to take different measures according to the needs of the CP in question to secure and rescue priceless objects in their response to disasters.

The Wheel for Disaster Risk Management for Cultural Properties compiled by the ACA emphasizes emergency response and rescue within 48 hours after the event. This means moving movable heritage to a safe location. For the highest priority properties and collections, stakeholders are encouraged to contact experts as soon as possible and to freeze properties made from such materials as fabrics and paper that cannot be dried within 48 hours. *The Wheel* also provides detailed instructions on the rescue measures for the different types of movable heritage.[55] Japan has several important collections of movable heritage, such as archives of historical documents. These paper documents may

[53] MLIT Interview (2005), http://www.mlit.go.jp/river/pamphlet_jirei/bousai/saigai/2005/24.pdf

[54] About the Miyajima *sabo* (Japanese only), http://www.mlit.go.jp/sogoseisaku/region/tedukuri/pdf/Part20_H17/H17_taishou_32.pdf

[55] Agency for Cultural Affairs, *The Wheel for Disaster Risk Management for Cultural Properties*, 1997 Transcription of the contents of the Wheel is available (in Japanese) at http://www.bunka.go.jp/earthquake/taio_hoho/pdf/jyoho_03.pdf. It points out that some materials such as metals, glasses, photographs, and furniture are not suitable for freezing.

BOX 7 First-aid and recovery measures for rescuing archival documents

Tohoku University has been working on the rescue of archival documents affected by tsunami waves during the GEJE. Archival documents damaged by the tsunami and floods are threatened by mold, by paper sheets sticking to one another, by deterioration from water and humidity, and by damage from living organisms. Tohoku University applied the following procedure to rescue and restore such documents:

1. First-aid procedure for archival documents affected by disasters. This involves checking the state of the document and disassembling its pieces. It is essential to take records throughout the whole process.
2. Working over the individual pages of the disassembled archival document.
3. Checking the state of damage, cleaning each piece, and flattening wrinkles, following specific techniques.
4. Adding paper fibers to the damaged areas, following the "leaf-casting" method.
5. Reshaping and rebinding the disassembled pages into one document.

A recent guide on first-aid to CH has been developed by the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM).[57] The *First Aid to Cultural Heritage in Times of Crisis* comprises a handbook and a toolkit, developed for the various actors involved in an emergency, and provides practical actions and tools for securing endangered CH, both tangible and intangible.

suffer damage during disasters, especially tsunamis, floods, and fires, and they are at risk of being lost in a very short time, or deteriorating very rapidly with humidity.

Tohoku University worked on the rescue, preservation, and restoration of historical documents and archives damaged by the GEJE tsunami, and the torrential rains that struck the Tohoku and Kanto regions in 2015 (Box 7). Their work is based on three steps, which may prove useful for other types of movable heritage:

1. **Emergency rescue:** Immediate actions are to be taken to remove as many documents as possible from the affected area in the shortest time possible, especially in cases where great numbers of documents are in danger.
2. **Quick response for mass preservation:** This involves basic and first-aid measures for consolidating the entire archive and preventing further damage and deterioration until document restoration can be undertaken. These response measures are taken with as little reliance as possible on chemicals, to avoid interfering with future conservation and restoration work.
3. **Further treatment for restoration and conservation:** While the quick response step determines whether the archival documents can be saved from further damage and deterioration, this step requires specialized knowledge and techniques of a high standard.

Preservation of historical information is also increasingly a digital effort. In Miyagi Prefecture, the GEJE tsunami destroyed about 30,000 historical documents; fortunately, these had previously been digitalized and saved as images in more than 70,000 electronic files.[57]

[56] https://www.iccrom.org/publication/first-aid-cultural-heritage-times-crisis
[57] International Recovery Platform (IRP) 2013.

Fujiyoshida, Japan. Photo by David Edelstein on Unsplash.

3. Resilient Recovery

In DRM for CH sites, the characteristics of heritage make it essential to reinforce prevention measures and to be prepared to act very quickly during an event to keep CPs intact. When a disaster occurs and affects CPs, however, efforts are normally focused on preserving what remains and repairing it based on detailed research, and with due consideration to authenticity of heritage in its different aspects, following the original materials, forms, location, craftsmanship, and fabrication techniques. This is important not only for the protection of the CPs themselves, but also for the role they play in society, as a testament to history and an important source of identity. CH contributes to the recovery of victims affected by disasters, both psychologically and as a source of livelihood for affected local communities that may be involved in their repair and reconstruction. This principle is currently becoming more relevant at the international level and is being standardized in the World Bank and UNESCO's innovative *Culture in City Reconstruction and Recovery (CURE) Framework*. The framework promotes a people-centered and place-based approach aimed at mainstreaming culture in the recovery process, including damage and needs assessment, policy and strategy, financing, and implementation phases.[58] The framework, which includes examples from Japan, highlights the importance of using the recovery processes to create more resilience in sites and communities following "build-back-better" principles.

The case of Kumamoto Castle provides a good example in this regard. The M 6.5 and M 7.3 earthquakes of April 2016 damaged about 200,000 buildings in the city, including the ICP of Kumamoto Castle. The castle and its stone walls were originally built in 1607. Remaining original turrets, gates, and other buildings were designated ICP, though the upper structure of the main keep—or fortified tower—was lost in the late 19th century and was rebuilt in 1960. The complicated reconstruction after the 2016 earthquakes involved the careful restoration of ICP buildings and stone walls and their original features, partially side-by-side with a modern reconstructed upper structure. The reconstruction became one of the top priorities in the city's reconstruction plan because of its symbolic value for the citizens

[58] United Nations Educational, Scientific and Cultural Organization; World Bank, 2018, *Culture in City Reconstruction and Recovery*. Paris: UNESCO. © UNESCO and World Bank, https://openknowledge.worldbank.org/handle/10986/30733

Tourists visiting Kumamoto Castle. Photo: Cheng Feng Chiang.

and the Japanese people in general. Supported by a proactive communications strategy and community involvement campaign, the restoration of the buildings of Kumamoto Castle has become a symbol of building back better in the city, and serves as a reminder of earthquake risks for future generations.

Generally, the objective of the recovery process is not just to reestablish the previous status of affected sites, it is to ensure the condition of the property is improved upon and vulnerabilities addressed to avoid or mitigate the impacts of possible future events. The recovery process is also an opportunity to identify risks that had not previously been taken into account, and the shortfalls of previous disaster mitigation and preparedness measures and systems. In CH contexts, however, building back better faces the challenge of preserving the values of integrity and authenticity while integrating structural improvements. Japan tends to prefer the faithful recovery of a property's previous status, keeping the same design and traditional materials where possible—although each particular case is usually the subject of careful discussion.

Japan has built its main body of experience in DRM on recurring events of a local and/or regional scale, constantly documenting lessons and improving its preparedness and emergency response systems. The two extreme disasters of recent times—the Great Hanshin-Awaji Earthquake in 1995 and GEJE in 2011—presented opportunities for stakeholders to engage in post-disaster recovery phases at a scale rarely experienced before, with DRM for CH sites applied and reviewed, and new mechanisms developed. This experience offers valuable lessons that are useful not only for Japan but for many other countries as well.

3.1 Experience from the Great Hanshin-Awaji Earthquake (1995)

The Great Hanshin-Awaji Earthquake struck on January 17, 1995, registering a magnitude of 7.3 and causing severe damage to CP in Hyogo Prefecture, where 173 designated CPs, including some designated as important, were affected.[59]

Recovery efforts by various actors

After the earthquake, the Ministry of Education set up an emergency disaster response headquarters to assess the damage in the education and culture sectors. One month after the earthquake, and once the emergency response measures were implemented, the ministry established a headquarters to lead the recovery of cultural and educational facilities and CP in affected areas. In parallel, the ACA created *Guidelines for the Implementation of the Rescue of Cultural Properties Affected by the Great Hanshin-Awaji Earthquake*. This rescue operation aimed to temporarily store at museums and at the owners' requests, CPs that were owned by temples, shrines, and individuals to prevent their being lost or discarded. In cooperation with affiliated institutes, such as research institutes and museums and professional societies, the ACA organized the **Committee for the Rescue of Cultural Properties Affected by the Great Hanshin-Awaji Earthquake** to implement this rescue operation, working with volunteers and experts from museums. The operation received 35 requests, resulting in 16 CPs being moved and stored.[60] Moreover, repair work to CPs, including structures, and arts and crafts, was supported by a supplementary or revised budget.

At the subnational level, Hyogo Prefecture assessed damage to CP in cooperation with municipalities and staff from other prefectures, from which they requested assistance. The assessment revealed that many of the affected CPs were buildings and structures. The prefectural government developed a three-year plan for the restoration of designated CPs, financing 50 percent of the recovery projects' costs to alleviate the burden on CP owners. It also provided subsidies for around 270 non-designated properties, which were part of cultural landscapes and had the potential to become CP-designated by the municipalities. Additionally, the **Recovery Fund for the Great Hanshin-Awaji Earthquake**, established in 1995 to provide middle- and long-term support to recovery efforts and complement the government's support framework, provided subsidies to 292 cases, amounting to approximately 1,042 million yen.[61] All of the recovery projects were completed in 2000.

Civil society actors also played significant roles in the recovery phase. The **Architectural Institute of Japan** (AIJ) took part in the assessment of damage to historic and cultural buildings, and local NGOs worked in cooperation with volunteers to rescue non-designated CPs, such as photos and albums owned by individuals. The **Committee for the Rescue of CPs and Other Materials Affected by the Great Hanshin-Awaji Earthquake** was also created at the request of the ACA. It consisted of representatives from national museums and CP research institutes, and from professional societies working for CH and the arts. The committee's wide range of expertise allowed for the preservation of CP and other materials, such as documents.

[59] Cabinet Office, "Great Hanshin Awaji Earthquake—Summary and verification—Assessment sheet," http://www.bousai.go.jp/kensho-hanshinawaji/chosa/index.htm

[60] The Great Hanshin-Awaji Earthquake Memorial Disaster Reduction and Human Renovation Institution, "The Journal of the Great Hanshin-Awaji Earthquake vol.1," http://www.dri.ne.jp/wordpress/wp-content/uploads/vol1.pdf

[61] See the Overview of the Hanshin-Awaji EQ Recovery Fund (only Japanese). Table 5 mentions that under the heading of "Subsidy for Historic Buildings and Structures," 292 cases were allocated a total of 1,041,772,000 JPY, https://web.pref.hyogo.lg.jp/kk41/documents/000036609.pdfhttps://web.pref.hyogo.lg.jp/kk41/documents/000036609.pdf

The ***Shiryō-Net*** network was created in February 1995[62] by a group of historians, students, and staff members of museums, archives, and libraries to help preserve historical material affected by the earthquake. It worked to collect information and donations, register volunteers, and connect municipalities in need with volunteers who were willing to work for the rescue of CP. Three months later, at the request of those affected by disasters, *Shiryō-Net* expanded the scope of its activities to "patrolling" of CP—that is, establishing surveillance around the CP areas. This effort, organized in collaboration with municipalities, revealed that more CPs had been affected by disasters than had been reported by owners, and quite a number of them had been discarded. The *Shiryō-Net* initiative was later expanded as an option for all of Japan as "CP Rescue Projects" and has been implemented in other disasters, including the GEJE.

Lessons learned

Activities conducted during the recovery phase and new initiatives emerging from the process revealed some pitfalls in the existing measures and system for the protection and management of DRM for CP. Below are some lessons learned and the measures taken to address them.[63]

- **Need for improvement of seismic resistance**

  The damage to CP structures during the Great Hanshin-Awaji Earthquake showed a need to improve buildings' seismic resistance. Accordingly, the ACA organized a **Committee of the Researchers Working on the Improvement of Seismic Resistance of Cultural Properties Structures** to discuss improvement measures, and issued *Guidelines for Ensuring Security of Cultural Properties Structures at the Time of Earthquakes*.[64] The guidelines pointed out that identifying concrete disaster risks beforehand and addressing them through repair work, along with regular maintenance, are the most effective DRM measures. They encouraged CP owners and managers to implement reinforcement work to the extent it could be carried out without damaging the CPs' value, and to improve the maintenance and usage of CPs in close cooperation with the ACA and prefecture boards of education. The *Guidelines for Assessing Seismic Resistance of Important Cultural Properties (Buildings)*, mentioned in the Risk Identification section of this report, also emerged in response to the lessons learned from the earthquake.

- **Protection of non-designated CP**

  While most designated CPs were well protected, the experience of the Great Hanshin-Awaji Earthquake revealed that people also wished to protect non-designated CPs representative of their communities. This provided an opportunity to reconsider what CP is and who it is for. At the same time, the Rescue Projects also found that a number of non-designated CPs had been destroyed or discarded without the knowledge of or review by the prefecture or municipal authorities. Based on these lessons, a CP registration system was established in 1996, which allowed for the protection of buildings with cultural value and more than 50 years of history by applying fewer rigid restrictions and regulations than designation.

  Another important measure taken was the issuance in 1997 by Kobe City of the *Ordinance Regarding the Protection of Cultural Properties of Kobe City* and the *Preservation of Cultural Environment Surrounding Cultural Properties*,[65] which provided for the designation of CP at the municipal level.

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[62] It expanded its network and *Shiryō-Net* are being established in other regions of Japan (see Section 3.4).

[63] See also Proposal by the Hyogo Prefecture Council for Protection of Cultural Properties, 2000, "For Transmission to the Next Generation and Cultural Creativity—On Cultural Property Administration of Hyogo Prefecture in the 21st Century," http://www.hyogo-c.ed.jp/~shabun-bo/gyouseisituhp/kengi/kengi1naiyou.PDF

[64] ACA, *On Ensuring Security of Cultural Properties Structures at the time of Earthquakes*, January 1996, http://www.mext.go.jp/b_menu/hakusho/nc/t19960117001/t19960117001.html

[65] Regulations for the Protection of Cultural Properties of Kobe City and the Preservation of Cultural Environment Surrounding Cultural Properties, etc., http://www1.g-reiki.net/city.kobe/reiki_honbun/k302RG00000971.html

- **Improving the relationship between local community and rivers to improve resilience**

  The experience of the Hanshin-Awaji earthquake and the fires that occurred after the tremor led locals to reconsider their distance to rivers, in relationship with DRM measures to counter flood hazards. Throughout history, the city of Kobe has been subject to flash flooding because of its proximity to rivers carrying the heavy rainfalls of the Rokko Mountains into the Setonaikai Sea. Over time, the rivers have been channeled deep below street level, between high walls, as a measure to prevent overflow. However, this presented a challenge for firefighting efforts, as water was not accessible for emergencies or other needs. Authorities addressed this issue by creating open public spaces and slopes for better access to the river, including paths for emergency vehicles and walking and jogging paths.

- **Community involvement and capacity building**

  The CP rescue initiative by local communities, residents, and volunteers that emerged in response to the earthquake highlighted the importance of involving communities in DRM at CH sites. Based on this experience, Hyogo Prefecture launched an initiative to build the capacity of those who are willing to participate in community DRM efforts, and in 2001 started offering Hyogo Prefecture Heritage Manager Training Seminars, in collaboration with the **Hyogo Association of Architect Building Engineers**. This initiative and the involvement of communities proved effective when Typhoon No. 23 struck Hyogo Prefecture in 2004. Heritage managers (HM) conducted a survey of historic buildings, while Kobe University's networks undertook an inventory of archives and historical materials in the region in cooperation with the government, local industry, academia, and the private sector.

  The success of the CP Rescue System was also a positive lesson learned from this earthquake for other places, and it was replicated and further developed in other prefectures and on other occasions. In 2000, Kyoto Prefecture launched its own CP Rescue System, together with CP managers, temples and shrines, and local residents and community members. The Rescue System's roles are to cooperate in fire prevention activities, and to provide first-aid firefighting and CP rescue activities until a fire brigade arrives.

According to Article 3 of the *Building Standard Law*, restoration or repair works on CP buildings designated by subnational authorities require the consent of the **Building Council**. Some building owners, however, completed work without going through the review and approval processes. The **Temporary Council on Earthquake Resistance** was created to coordinate studies for a precise understanding of earthquake damage to CP buildings, and of rehabilitation measures that enhance seismic resistance. It included architectural historians, structural engineers and researchers, conservation architects and other experts, and a government official responsible for CP. The council oversaw the following:

- Analysis of earthquake damage to CP structures;
- Assessment of the seismic resistance of CP buildings based on the results of structural diagnostics;
- Investigation of modes for providing the required structural enhancement where seismic performance was questionable; and
- Performance of tests and formulation of proposals for reinforcement methods utilizing new techniques in cases where the methods for structural reinforcement were unclear.[66]

[66] Murakami, Y., 2011, *Disaster Risk Management of Cultural Heritage based on the Experience of the Great Hanshin Earthquake*, http://www.nara.accu.or.jp/img/elearning/2011/risk.pdf

3.2 Experience from the Great East Japan Earthquake (GEJE, 2011)

On March 11, 2011, an earthquake of magnitude 9.0 struck the Tohoku region, followed by a massive tsunami. More than 22,000 people lost their lives, with nearly 20,000 deaths and 2,500 missing, and hundreds of thousands were affected. The earthquake and tsunami also affected CP. A total of 744 nationally designated and registered CPs were affected, a more severe outcome than that of the Great Hanshin-Awaji Earthquake. The damage caused by the earthquake included tangible CP (both structures as well as arts and crafts), loss of folk CP caused by the tsunami, and changes to geographical features in places of scenic beauty. Various actors, including the ACA, prefectures, municipalities, professional institutes, and societies, worked for the rescue, preservation, and recovery of affected CP, using measures that had been improved based on the lessons learned from the Great Hanshin-Awaji Earthquake.

Recovery efforts by various actors

National and subnational governments

Immediately after the earthquake, the ACA took the lead in efforts to recover CP, providing necessary guidance to prefectures, such as emergency assessment of CP buildings and archaeological excavations of buried CP during the reconstruction of neighborhoods. The ACA also dispatched its experts to the affected areas to assess the damage situation and work on the emergency response measures in cooperation with prefectures and municipalities, as well as other professional societies, experts, and volunteers. Moreover, the ACA set up the **Committee for the Rescue of Cultural Properties and Other Materials Affected by GEJE**, which consisted of representatives from 14 organizations and institutes, including museums, libraries, and *Shiryō-Net*. It carried out a wide range of preservation efforts, not only of local historical materials and arts and crafts, but also of zoological and botanical specimens and books.

To conduct the response and recovery measures effectively, the ACA allocated 3,200 million yen (USD 29.4 million) as a revised or supplementary budget in 2011 and 1,900 million yen (USD 17.5 million) in 2012 to repair and restore the nationally designated CPs that were affected by the earthquake. The ACA also supported a number of recovery projects through a subsidy scheme called Program for the Promotion of Tourism and the Revitalization of Local Communities, using the regular budget. The projects supported by this program included the damage assessment and documentation of folk CP and intangible CP; the digitalization of affected archives; the organization of a symposium to discuss the role of traditional cultures in the revitalization of communities; the organization of performances of traditional intangible CP; capacity building of successors of traditional intangible CP; the revitalization of museums and their promotion abroad; and the promotion of tourism in the affected areas to stimulate local economies.[67]

As part of the Special Disaster Recovery Budget for GEJE, designed to facilitate recovery of affected areas by alleviating the financial burdens of prefectures, the Reconstruction Agency, set up in 2012, financed the Great East Japan Earthquake Reconstruction Grant. Under the grant, the Reconstruction Agency allocated a special subsidy coordinated by the ACA of 1,790 million yen (USD 16.5 million) in 2013 to support owners and managers in repairing and restoring nationally designated CPs through the ACA, as the repair and restoration of CPs was considered one of the important reconstruction measures in need of additional assistance by the national government. In a process similar to the provision of subsidies for repair and restoration allocated from the regular budget, the ACA allocated the grant to each affected prefecture to support 50 to 85 percent of its recovery work financially. Activities supported by this grant supported research, excavation, and

[67] The lists of activities supported by this scheme are available on the ACA website, http://www.bunka.go.jp/seisaku/bunkazai/joseishien/chiiki_kasseika/index.html

BOX 8 CP Rescue Program in Miyagi Prefecture

In Miyagi Prefecture, which was severely affected by the earthquake and tsunami, expert teams rescued dozens of properties at 58 locations, such as museums, schools, private houses, and temples and shrines. At Ishinomaki Cultural Museum, for example, which was severely damaged by tsunami waves, these experts fumigated, cleaned, dried, and rehabilitated folklore materials, art, crafts, unearthed human bones, and historical maps. They then transported and stored these artifacts at other museums and at universities and private warehouses in Sendai and Tokyo. The experts rescued statues of the Buddha, sculptures, and scriptures from damaged temples. The scheme also covered zoological and botanical specimens at natural history museums. The Japanese Defense Force (JDF), which played a significant role in response work following the GEJE, helped transport heavy materials.

documentation of buried CP in the areas where reconstruction of houses and buildings was planned. All of these activities contributed not only to the preservation of CP, but also to the revitalization of local communities and their economies, and to the adequate planning of the reconstruction of the affected regions. Figure 19 illustrates how budget resources were allocated, and Figure 20 presents the example of Miyagi Prefecture's budget scheme.

Cooperation between governments and actors in civil society

For many CPs affected by the earthquake, located in various places, the government's recovery efforts alone would not be sufficient, and cooperation with experts and other professionals in civil society and the private sector was essential. The ACA launched two programs in the Tohoku region: the CP Rescue Operation and the CP Doctor Dispatch Project.

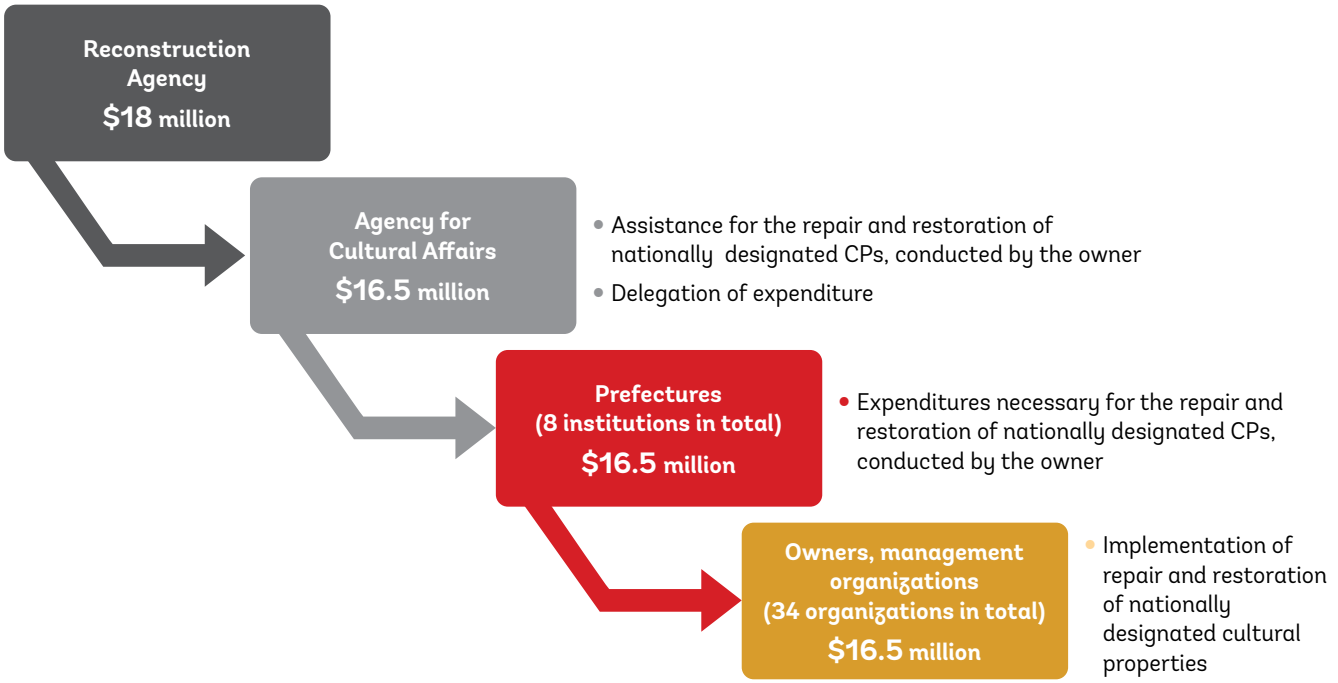
The CP Rescue Operation was established by the ACA in April 2011 in cooperation with civil society and the private sector. Its aim was to rescue movable CP from temples, shrines, individual's properties, museums, and archives. The focus was on locations that needed emergency measures to address damage and avert potential collapse. The CP Rescue Operation stored this movable CP in places where appropriate preservation space and measures could be provided.[68] This was aimed at preventing CP from being lost, demolished, scattered, or stolen. The program covered various types of movable CP, whether designated or not, such as paintings, sculptures, crafts, writings, archives, historical records, and folk CP. It was operated by the National Institutes for Cultural Heritage in cooperation with participating museums, libraries, and civil society organizations throughout Japan. The program enabled the flexible dispatch of experts and curators from other prefectures to rescue and store CP at safer places. A total of around 300 million yen (USD 2.8 million) was donated to this program, and 6,811 experts participated in it at 90 different locations for two years until the program's completion.[69]

[68] ACA Press Release, 31 March 2011, "Rescue of Cultural Properties Affected by the Great East Japan Earthquake (Cultural Property Rescue Programme)," http://www.bunka.go.jp/earthquake/rescue/pdf/bunkazai_rescue_jigyo_ver04.pdf

[69] ACA Press Release, 2013, "On the Abolition of 'Cultural Property Rescue Programme' after its achievement—Gratitude for two-year-activities and future prospects." http://www.bunka.go.jp/earthquake/rescue/chokan_201304.html and Japan ICOMOS National Committee, Progress Report of Great East Japan Earthquake Recovery: Present State of Affected Cultural Heritage, 2014.

FIGURE 19

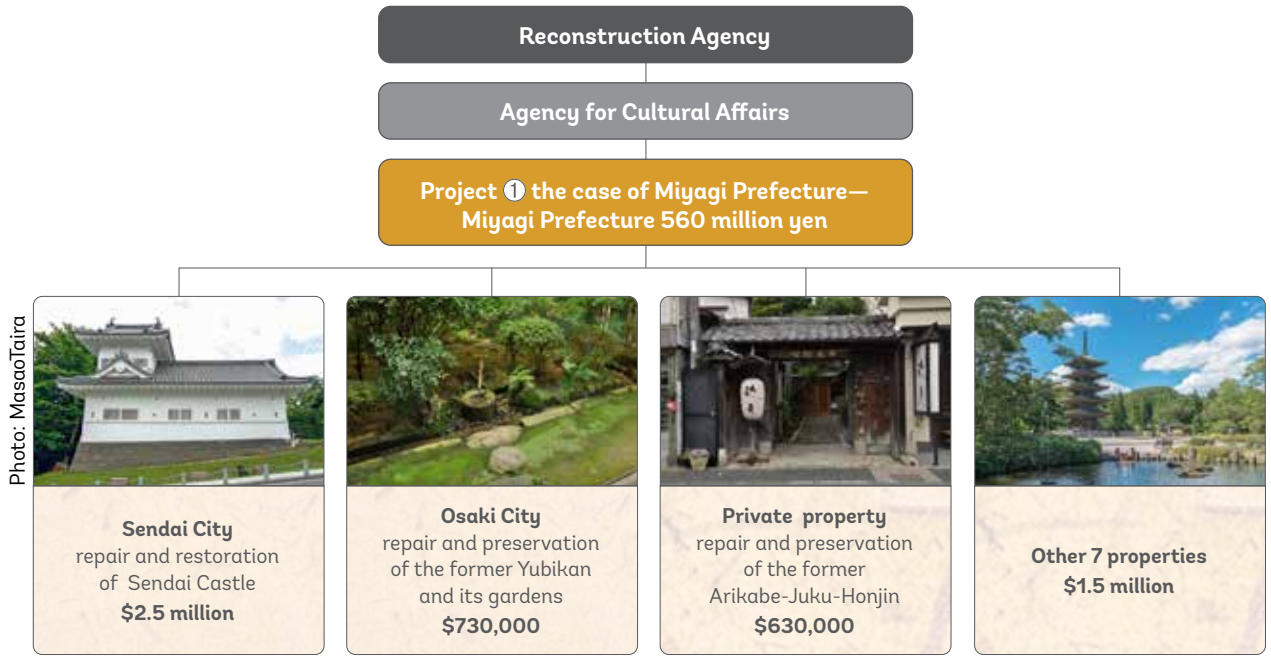
Budget scheme from Reconstruction Agency to ACA, to the prefecture, and to the owners



Source: Adapted from http://www.reconstruction.go.jp/topics/main-cat8/sub-cat8-3/reviewsheet/20140831_25_66.pdf

FIGURE 20

Example of Miyagi Prefecture budget scheme for restoration and recovery projects



Source: Adapted from http://www.reconstruction.go.jp/topics/main-cat8/sub-cat8-3/reviewsheet/20140831_25_66.pdf

BOX 9 **Save Our Culture: Fundraising campaign by public and private organizations for CP affected by the GEJE**

Save Our Culture was a fundraising campaign led by the Foundation for Cultural Heritage and Art Research (FCHAR) in the aftermath of the GEJE. The campaign was run in cooperation with the ACA, the WMF, the Samsung Japan Cooperation, and a famous novelist, Mr. Natsuhiko Kyogoku, all of whom joined forces to make fundraising appeals for the rescue and recovery of affected CP. The funds raised were used for subsidies for CP rescue and recovery projects, including the CP Rescue Program and the CP Doctor Dispatch Project. The assistance was given not only to registered CP but also to nonregistered CP that had value as CH. The campaign raised around 375 million yen (USD 3.5 million) in 2011 and 51 million yen (USD 4.7 million) in 2014, supporting 81 projects in the Cultural Property Rescue Program, and in the preservation and repair of CP.

Source: Foundation for Cultural Heritage and Art Research, "On the Cultural Properties Targeted by the Cultural Properties Preservation and Restoration Programme under the Support Programme for Cultural Properties Recovery Affected by the Great East Japan Earthquake," http://www.bunkazai.or.jp/report_20120521.html; and "Special Issue: Rescue and Recovery Support Programme for Cultural Properties Affected by the Great East Japan Earthquake," http://www.bunkazai.or.jp/img/tokusyu_2013.pdf

The CP Doctor Dispatch Project[70] was an emergency response and recovery project that targeted built heritage affected by the earthquake. It was aimed at carrying out a damage assessment and providing, upon owners' and managers' requests, technical assistance necessary for first-aid and recovery measures.[71] As with the CP Rescue Program, this project covered all categories of built CP. Under it, the ACA and the Recovery Support Committee (which included the Architectural Institute of Japan (AIJ), the Japan Institute of Architects, the Japan Federation of Architects and Building Engineers Associations, and the Japan Societies of Civil Engineers, among others), worked together to send experts ("Cultural Properties Doctors") to conduct damage assessments of affected CP buildings, and to provide first-aid measures and technical guidance for their preservation and recovery. For three years until the completion of this project, this scheme dispatched over 600 CP Doctors, who assessed and provided technical guidance for more than 4,000 historic buildings. A joint cooperation project of this scale between the government and experts from civil society was unprecedented.[72]

Additionally, a number of foundations and private institutes contributed financially to the safeguarding of intangible CP and the repair and restoration of CP buildings. The Meiji Yasuda Cultural Foundation, the World Monuments Fund (WMF), the Japan Foundation, and the National Trust are just a few examples of these bodies (Box 9). They provided subsidies to groups and individuals who worked for the safeguarding of folk CP techniques, built capacity, and contributed to the urgent repair and recovery of CP buildings, archaeological sites, cultural landscapes, and intangible CP that were not eligible for funding from national subsidies. All of these contributions proved very helpful in the recovery efforts.

[70] The project was set up with a limited duration for the GEJE case (April 2011–March 2012, according to ACA information). Since then, a CP Doctor Dispatch Project has been implemented for the Kumamoto Earthquake.

[71] ACA Press Release, 27 April 2011, "Support Programme for the Recovery of Cultural Properties affected by the Great East Japan Earthquake (Cultural Properties Doctors Dispatch Programme)," 27 April 2011, http://www.bunka.go.jp/earthquake/pdf/bunkazai_doctor_jigyo.pdf

[72] The International Expert Meeting, 2015, The Third Meeting of the World Conference on Disaster Risk Reduction, "Cultural Heritage and Disaster Resilient Communities," https://ch-drm.nich.go.jp/wp-content/uploads/2016/07/H27CulturalHeritageandDisasterResilientCommunities_Proceedings_TokyoSymposium.pdf

Lessons learned

The DRM measures and operations carried out in the aftermath of the GEJE were based on the lessons learned from the Great Hanshin-Awaji Earthquake. Both non-designated and registered CP was better covered in rescue operations after the GEJE. For example, the CP rescue programs were better organized; and the collaboration between public and private organizations was stronger and more effective. Nevertheless, the GEJE was an event of unprecedented scale, and DRM operations faced several different challenges, which allowed the country to draw new lessons from the experience. Although Japan is still considered to be in the process of recovery, several reports and proposals by national, subnational, and civil society actors point out valuable lessons, among which are the following:[73]

- ***Need for substantial budget for restoration***

  Damage on the scale of that caused by the earthquake and tsunami means repair costs for the owners of affected CP are enormous. Initially, the national subsidy was intended to cover half the repair costs of nationally designated CPs, with 20 percent added in the case of large-scale disasters. Miyagi Prefecture submitted a request to the prime minister to raise the subsidy rate and expand the scope of CP the subsidy could cover. As a result, the maximum subsidy rate that could be applied during an extreme disaster was modified to 85 percent, with a special tax allocation of 80 to 100 percent to alleviate the burden of subnational governments. While this is an improvement, the burden of CP owners and subnational governments is still significant, as the scope of CP that can be covered by the subsidy remains unchanged, and a number of CPs designated by municipalities have not been able to start full repair work.

- ***Include repair and recovery of non-designated and nonregistered CP***

  While the registration system that was introduced after the Great Hanshin-Awaji Earthquake allowed for the protection of more CP, the challenge of protecting nonregistered (that is, not officially protected) CP remains. The report by Miyagi Prefecture points out that this is due to the principle of the separation of church and state, and the private ownership of properties, which make it difficult for authorities to intervene. A system needs to be created to safeguard these unrecognized CPs.

- ***Need for more systematic cooperation between national and subnational authorities, and civil society and professional organizations based in the affected regions***

  The cooperation between authorities and actors in civil society proved effective in rescuing CP from disasters. It would be even more effective if the cooperation were organized in a more systematic way, even before the disaster response stage, with the different entities working together for disaster preparedness for CP. The cooperation needs to be reinforced by human resource exchanges, information sharing, and funding, and the CP database should also be organized to provide a systematic understanding of the locations and characteristics of CP in the region. In this regard, universities in the region can play a substantial role.

[73] Report to the Prime Minister of the Reconstruction Design Council in response to the Great East Japan Earthquake, 2011, *Towards Reconstruction "Hope beyond the Disaster,"* http://www.mofa.go.jp/announce/jfpu/2011/7/pdfs/0712.pdf

Science Council of Japan, "Proposal: Transmission of Cultural Properties to the Next Generation—Aiming at the establishment of protection measures given the disaster risks," 2014, http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-22-t193-6.pdf

Miyagi Prefecture Board of Education, "Records on the Restoration and Recovery of Cultural Properties, etc., Affected by the Great East Japan Earthquake (Mid-term report)," From 11 March 2011 to March 2016, http://www.pref.miyagi.jp/pdf/bunkazai/sinsaifukkou.pdf

Sensō-ji temple, Asakusa, Tokyo.

- ***Lack of CP experts in municipalities***

  Municipalities are important actors that are locally based and contribute to the recovery of communities. The role of CP in the community recovery process is significant, and it is the responsibility of municipalities to protect and conserve local cultures for social inclusion and engagement. It is therefore essential that municipalities have knowledge and skills in DRM for CP. There are, however, municipalities that do not have experts or staff in this field; hence, the deployment of experts to these location and capacity building of existing staff are needed.

- ***Conservation of remnants of disasters as heritage***

  The remnants of properties affected are an important testimony of disasters of unusual scale and destruction, and become useful tools for passing on lessons learned to later generations. The Science Council of Japan recommends their conservation, pointing out that these remnants have significant historical and cultural meaning as a repose of souls, as a repository of historical fact, a lesson in disaster, and a symbol for recovery.

- ***The role of CP repairs in healing for community members and as a stimulant for community recovery***

  Many reports point out the importance of CPs in the community and the roles their repairs can play during the community recovery and regeneration process. Conservation and repairs of built CPs and arts and crafts; the organization, conservation, and transmission of traditional activities such as festivals; and the reconstruction and repair of affected museums and libraries all contribute to safeguarding local history and culture, thus maintaining communities' identities. Cultural activities and festivals can also encourage those affected by disasters and stimulate the community to work together for recovery. This aspect of culture needs to be taken into account in DRM in other places and after other events.

3.3 Experience from the earthquake in Central Tottori Prefecture

In October 2016, an earthquake of magnitude 6.6 struck the central part of Tottori Prefecture. The affected region included Kurayoshi, which is a nationally designated Preservation District of Groups of Traditional Buildings. The scale of the earthquake was medium, and damage to CP structures included the leaning of earthen walls and plaster and tiles falling off historic buildings. This case provides a good example of the experience of and lessons learned from a medium-scale earthquake. In contrast with massive disasters such as the Hanshin-Awaji earthquake or the GEJE, which require a national deployment but tend to happen infrequently, middle-scale earthquakes are likely to occur more often and require subnational government bodies to take the lead in response and recovery.

Recovery efforts by subnational governments and heritage managers

Immediately after the earthquake, Tottori Prefecture sent three staff members to Kurayoshi to work on response and recovery with the municipality.[74] Kurayoshi usually has ten municipality staff members working on CP at all times, which is a relatively large number for municipalities, whereas Tottori's board of education has a staff of fifteen, three of whom are responsible for the Preservation District. After the earthquake, municipality staff focused on communicating with residents, surveying damage to CP, and coordinating with **Heritage Managers (HM)**. They also made records of their response actions. The damage survey was conducted, with interviews of CP owners through a "townscape preservation group" comprised of mostly residents and shop owners, and with the help of HM.

HMs played an important role in the response and recovery phases of the earthquake in Tottori. Three days after the event, the Tottori Prefecture made use of close contacts in Hyogo Prefecture to request the assistance of HMs in the surrounding region. A week later, they called for HMs who could draw plans and make the necessary calculations for buildings to be repaired. Although travel expenses, accommodations, and fees were not provided, and HMs were expected to participate on a purely voluntary basis, 30 were recruited from four prefectures near Tottori.

The HMs were divided into 10 groups, each of which was supported by municipality staff. They were tasked with drawing plans for buildings that did not have measured drawings before the earthquake and conducting damage assessment to understand the damage and calculate repair costs. The damage assessment determined that only buildings were affected, with some mud walls collapsing and roofs broken, but infrastructure was intact.

Based on these assessments, the municipality estimated the cost of repair and recovery work and integrated it into the budget. Once the budget was approved, architects produced a detailed implementation plan and cost estimate. The surveys made by the HMs proved useful to this process and helped save a lot of time. The recovery work started in December 2016 with a national subsidy. The plan was for 227 buildings in the Preservation District to be repaired from 2017 to 2019.

[74] Information for this section was gathered from records and interviews of Tottori Prefecture staff in charge of CP.

Lessons learned

As a medium-scale earthquake, the event in the central Tottori Prefecture was a case in which subnational governments needed to take the lead in response and recovery, with the help of HMs based in the surrounding prefectures. This circumstance provided the following different insights and lessons learned compared to those from large-scale earthquakes:

- ***Usefulness of HMs in avoiding hasty demolition of affected CPs***

  HMs' involvement in the recovery process shortly after the earthquake played an important role in giving a sense of assurance to residents and in preventing the demolition of historic buildings. According to one report, a resident stated that an architect who was not an HM said the resident's house had to be demolished because of the severity of the damage to it, but an HM determined that repair work would be sufficient. In this case, the HM had the special knowledge of the conservation of wooden architecture needed to prevent the unnecessary demolition of a historic building, and the presence of HMs saved all but one of the buildings in the Preservation District. On the other hand, a number of damaged empty buildings outside the Preservation District were either demolished or abandoned.

- ***Importance of day-to-day management and maintenance***

  The damage assessment revealed that historic buildings that had undergone repair and reinforcement work had not suffered major damage from the earthquake. Much of the damage found was in places where the state of conservation was not good. In the Preservation District, plans, basic information, and records of past repair work were available for many of the buildings, and this was useful for damage assessment and recovery work. After the earthquake, the municipality provided subsidies to all building owners willing to undertake repair work.

- ***Preservation of registered buildings and non-designated, nonregistered CPs***

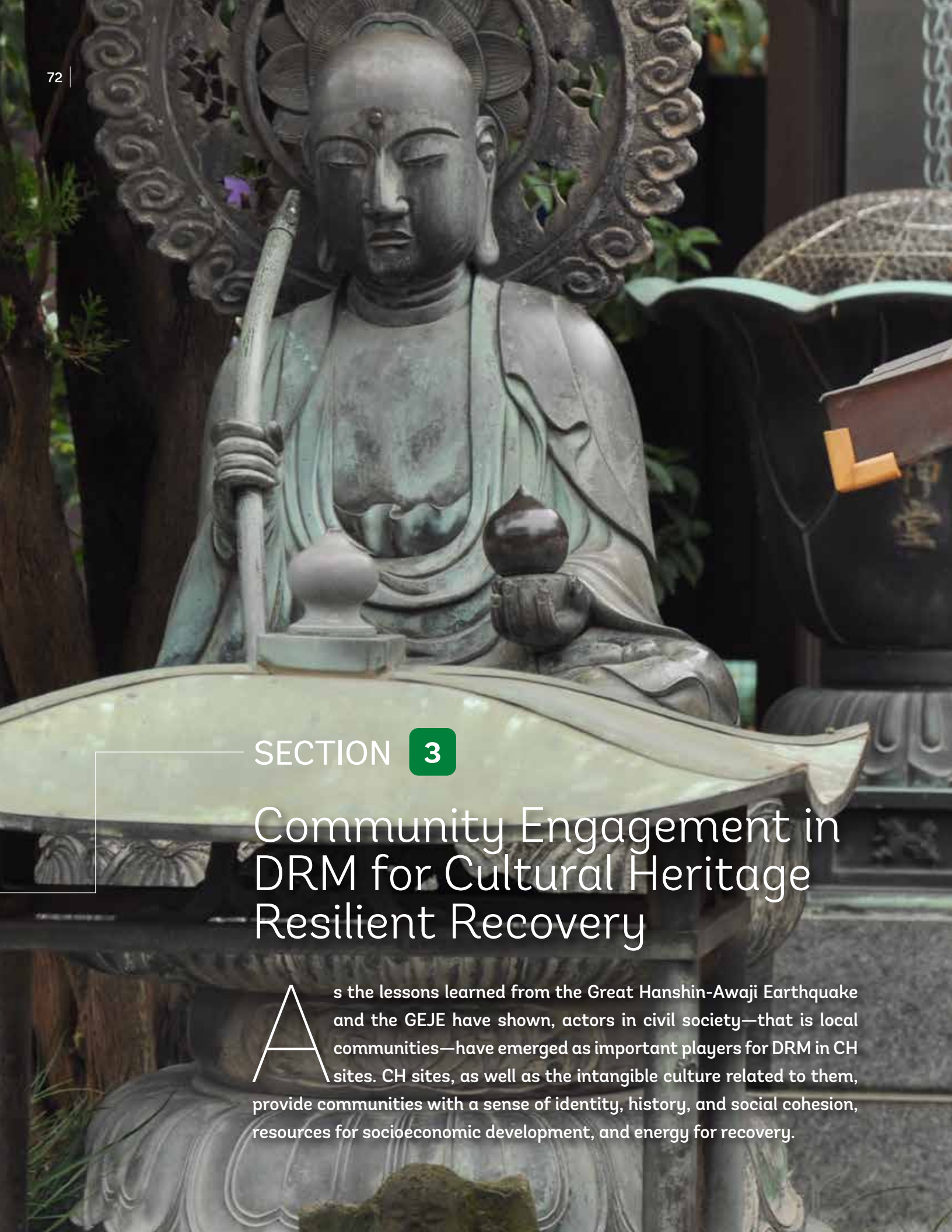
  As with other earthquakes, the preservation of non-designated and nonregistered CPs was a challenge. A number of old temples and shrines were damaged and not properly preserved. Moreover, registered CPs were usually not entitled to receive subsidies for repairs. After the earthquake, however, several municipalities changed their guidelines to enable the provision of subsidies for repairs to registered CPs. As maintenance and repairs are essential for mitigating disaster risks, this measure has strengthened the DRM of registered CPs.

- ***The roles of prefectures and municipalities***

  In the case of a medium-scale disaster like the 2016 earthquake in Tottori, municipalities have no choice but to attend to both disaster response and the day-to-day work of their communities. Moreover, municipalities and their staff members are highly likely themselves to have been affected by the disaster. All of these situations make the support and the role of prefectures crucial to help municipalities make sound judgments and decisions, especially immediately after the disaster. On the other hand, the role of municipalities in communicating and consulting with CP owners and local residents is essential, as they have long-established relationships and trust between them. They cannot be replaced in this role by other actors.

- ***The participation of HMs***

  In the case of this particular earthquake, it turned out that the HMs within Tottori Prefecture were not very active in the recovery work, and most help was provided by HMs from other prefectures. At the time of the earthquake, 40 to 50 people in Tottori had received training as HMs, and 25 to 30, half of whom were from Kurayoshi, had completed the curriculum. The reasons for the limited participation of HMs within the affected prefecture are yet to be analyzed, but it poses a challenge in how to involve more trained HMs in the recovery phase.



SECTION 3

Community Engagement in DRM for Cultural Heritage Resilient Recovery

As the lessons learned from the Great Hanshin-Awaji Earthquake and the GEJE have shown, actors in civil society—that is local communities—have emerged as important players for DRM in CH sites. CH sites, as well as the intangible culture related to them, provide communities with a sense of identity, history, and social cohesion, resources for socioeconomic development, and energy for recovery.

Sensō-ji temple, Asakusa, Tokyo.

Communities are fundamental to developing DRM for CH for two major reasons. First, communities are often the main users and custodians of CP; they interact with and have an interest in it, and thus play a crucial role in its conservation and management. Secondly, communities can also respond quickly to disasters, since they know the environment and can reach affected places before emergency teams and authorities can. In short, developing DRM activities at the community level at CH sites is essential in ensuring preparedness and proper emergency response in case of an event, for the ultimate protection of the CH assets.

DRM is not only a top-down process. As the examples from Japan show, the process works better when national and subnational governments work together with communities. It is therefore essential to make sure communities are engaged in all phases of DRM: risk identification, risk reduction, preparedness and emergency response, and resilient recovery. The sections below provide some examples of community engagement mechanisms at CH sites through the different phases of DRM.

1. Risk identification by local communities

Hazard maps are usually prepared by municipalities. There are, however, other risk identification methods that involve communities and help with the identification of risks from their viewpoints.

Community-based disaster mitigation mapping is a risk identification method often used by local communities in Japan. The resulting map presents potential disaster risks in visual form, as well as DRM-related information identified by community members based on the actual local situations. The community members work in cooperation with the local authorities, usually through workshops, to develop the map. An important characteristic of these community-based maps is the inclusion of points of view, perceptions, and needs from a wide range of social profiles (for example, different age groups, genders, and occupations), which strengthen social inclusion and cohesion through collaboration. Many Important Preservation Districts in Japan, such as Chikugo-Yoshii in Fukuoka Prefecture, Kitano-cho Yamamoto-dori in Kobe City (Box 12), Sasayama in Hyogo Prefecture, and Yosano-cho Kaya and Miyama-cho Kita in Kyoto Prefecture have created their own community disaster mitigation maps, together with community DRM plans.

One of the most popular methods of creating a community-based disaster mitigation map is the Disaster Imagination Game (DIG). DIG is a tabletop exercise for DRM developed by T. Komura and A. Hirano in 1997,[75] based on the know-how developed for the command post exercises of the Japan Self-Defense Force (JSDF). This method allows participants to identify potential risks at their CH sites by imagining disaster situations, representing them on a map, and holding group discussions. DIG participants are appointed to virtual command posts for disaster relief activities and are tasked with recording a detailed disaster situation affecting CH assets on maps, based on local characteristics, to identify and simulate disaster prevention measures (Box 10). Through role play including different community stakeholders, participants come to understand how they can or cannot act quickly in response to disaster situations to protect and/or rescue CH assets (Box 11).

DIG is simple, participatory, and creative, as well as cost effective game. While prior and specialized DRM knowledge is not required from the participants, facilitators need to be well-trained experts who are able to lead participants to understand the state of emergency simulated during the workshop and exercise. The game allows participants to visualize potential disasters and strengths and weaknesses related to DRM in their CH sites and areas, and to conduct virtual DRM exercises. The participants' exchange of ideas and views helps raise their awareness of CH vulnerabilities, builds their capacity in DRM, and contributes to the development of a DRM of CH network by getting to know each other through the exercise.

[75] Takashi Komura and Atsushi Hirano, 1997, "On Disaster Imagination Game," *Papers of the annual conference of the Institute of Social Safety Science,* no. 7, pp. 136–139, https://ci.nii.ac.jp/naid/110007090848

BOX 10 DIG standard instructions

Preparation: Map, transparent sheets, pens, erasers

How to play:

1. Form a group consisting of community members, including some heritage managers or government officers related to CH protection, and some firefighters or civil protection officers, that is overseen by a facilitator familiar with DRM for CH. Participants[76] should come from similar locations or areas to facilitate the identification of common challenges, and to foster the discussion of potential solutions. Before starting the session, the facilitator explains the natural hazards and potential disaster damage.
2. The group works on the local map related to the community area, locating green areas, water resources, CH sites, and people who may need support to evacuate.
3. Adding another transparent layer to the map, the group imagines some hazardous events and identifies potential damage they may cause—for example, damage to or collapse of buildings, landslides, or the spread of fire.
4. The group discusses and simulates DRM measures, such as first response to fire, safe evacuation routes, support for people in need of assistance, use of water resources, and rescue actions, among others. In doing so, participants build a clear image of the disaster situation on the map, identify their challenges and problems, and discuss possible solutions specific to their district.

Based on the outcome of the DIG workshop, all participants should go out and walk in the town to survey each district, checking the actual situation, DRM equipment and tools, locations of emergency devices, availability of water resources, and other things discussed during the session. The outcomes of the DIG workshop contribute to bottom-up disaster management planning, integrating the ideas of the local community into concrete DRM measures that can be developed at the CH site.

Source: http://www.bousaihaku.com/bousai_img/houkokusyo/kunren/g06.pdf

[76] The ideal maximum number of participants per group is eight, to encourage every participant to contribute equally to the discussion.

DIG has been effectively adapted to different scenarios, and integrated into the process of preparing DRM plans by many communities throughout Japan.

2. Communities' efforts to reduce risks

As seen in Section 2, the improvement of maintenance and management of CP has a significant impact on reducing disaster risks at CH sites. Private owners of CP, organizations, and community members living around and managing CP can have a significant impact on reducing risks at those CH sites. Their efforts and contributions, however small, can make a great difference.

Kiyomizu-dera Temple in Kyoto, for example, is part of a WH Site that attracts a great number of visitors throughout the year. By tradition, Kiyomizu-dera does not have an affiliated religious community of parishioners, and it relies on visitors and local communities for support. Its surroundings include Sannei-zaka, which is a sloping area that has been nationally designated as an Important Preservation District for Groups of Traditional Buildings since 1976. Traditional wooden buildings concentrated along narrow alleys and steep slopes leading to the temple make this area particularly vulnerable to fire. Fire could spread around the area and through the temple if, for instance, streets were to get blocked with damaged structures during a strong earthquake, hampering firefighting activities. Therefore, furnishing this area with systems and equipment that allow community members and visitors to react immediately to fire has been considered a fundamental priority for a long time.

BOX 11 Example of DIG in Kiyomizu-dera area of Kyoto

Materials:

- Base map of Kiyomizu Temple (Kyoto)
- Transparency paper (2 per table)
- Government/stakeholders role cards
- Colored pens; Post-It notes.

Instructions:

Using the base map, colored pens, and Post-It notes:

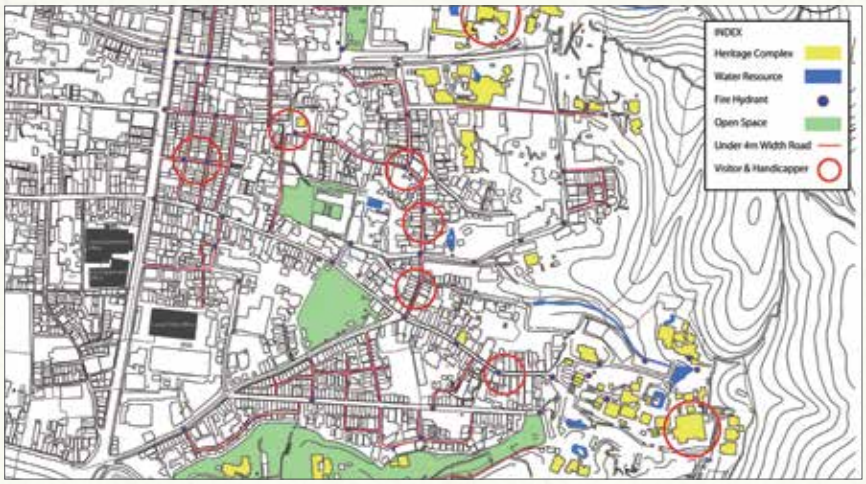
1. Identify key points on the map:
    a. Heritage buildings
    b. Water resources for firefighting
    c. Open/safe areas
    d. Vulnerable areas for residents, tourists, and any other key points.

Using the first transparency paper:

2. Imagine a severe earthquake strike. Using the pens and Post-Its, identify:
    a. Possible collapsed buildings
    b. Blockage of narrow streets (less than 4 m in width)
3. Mark RED crosses "×" on the routes where road blockages could occur: emergency response teams may not gain access; firefighting or sheltering would be difficult.
4. Consider water and power outages: Mark BLUE crosses "X" on hydrants or water equipment connected to the city water network; and firefighting systems or well pumping systems connected to the electrical grid. The water and electrical systems may be damaged.
5. Imagine that a fire starts. Mark the 1–3 points where you believe a fire may start with RED 火. Identify the direction of the spreading fire.

Scenario and roles:

Each participant picks a role card (local government officials and stakeholders, who have joined the Kiyomizu Temple DRM Committee). The first order of business is to understand the risks facing the area and the people who reside and visit there.



6. Discuss potential firefighting methods, including water delivery. Using the colored pens and Post-It notes, trace and explain the possible routes to dispatch emergency teams and firefighting crews, and gain access to water, etc.

Using the second transparency paper:

7. Draw a red circle with 50 m radius around the fire points (indicating the potential area affected if firefighting is not successful after 60 minutes).
8. In and around the red circle areas, imagine the evacuation options from buildings to safe spaces. Remember (i) routes cannot go through blocked "X" roads, and (ii) routes should lead to safe areas (GREEN). *Using the colored pens and Post-Its*, trace and explain the possible routes.

Discuss in groups:

9. Identify: (i) What is at risk? (e.g., specific cultural sites, residents, tourists, etc.); (ii) How exposed are these to hazards? (i.e., how and how often will hazards affect this?); (iii) How vulnerable? (i.e., what are the specific vulnerabilities, such as flammability, lack of awareness, etc.?); and (iv) How bad? (i.e., What would happen to people/the site? Could the people/items be rescued? Could the site be repaired or replaced?)
10. Identify the 2–3 top measures that could have reduced the damage and effects, particularly on cultural heritage, or could have improved preparedness: (i) What measure would have helped? (ii) How would this measure reduce the risk or improve preparedness? (iii) What are the challenges to implementing this measure?

BOX 12 Community-based disaster mitigation map of Kitano-cho Yamamoto-dori in Kobe

Kitano-cho Yamamoto-dori, designated an Important Preservation District in 1980, was severely impacted by the Great Hanshin-Awaji Earthquake and a fire in 1995. To develop a DRM plan, Kobe City organized a workshop with the help of experts from Ritsumeikan University in 2013 at which local community members, residents, and local authorities discussed the challenges of improving DRM measures for this historic district. The workshop included a DIG based on an imaginary fire caused by an earthquake to focus efforts on identifying problems and challenges in firefighting activities and evacuations.

The DIG allowed the participants to identify various issues, such as lack of water resources, blind spots, malfunction of fire extinguishers, residents who might need assistance during evacuation, foreign visitors who do not understand Japanese, and narrow streets inaccessible to fire rescue equipment. Based on those findings, the participants discussed the measures needed to improve their preparedness, as well as simple actions each of them could start initiating.

A disaster mitigation map was the outcome of that exercise, presenting challenges, solutions, and implementation actions. Additional symbols conveyed other important information, such as locations of fire hydrants and cisterns, roads that may become blocked during an emergency situation like an earthquake, open space available for shelter, and additional potential problems in particular locations.

The workshop allowed the local communities and authorities to jointly understand DRM challenges in this particular historic district, and to discuss specific measures for improvement, to be reflected in the DRM plan.

Source: Kobe City Board of Education, 2013, "Report 7: On disaster risk mitigation plan for the important preservation district of historic buildings of Yamamoto-dori, Kitano-machi, Kobe-shi."

In this regard, two major efforts have been made to reduce fire risks. One has been the development of a community-based fire prevention system for the historic urban areas around Sannei-zaka: in the event of an earthquake when the regular water supply systems may shut down, or should a massive fire require additional water supply, alternative water sources are essential to keep the fire from spreading. Since 2006, efforts have been made to secure water resources in the Sannei-zaka area on the west side of Kodai-ji Temple. Beneath Kodai-ji Park, an earthquake-resistant cistern with a capacity of 1,500 m^3 has been installed to collect rainwater. It includes a pressure-transporting water system, which uses gravity to pressurize water without any pumping system and can supply water during a shortage (See 2.2.2, Fire). Installation of another seismic-resistant water cistern of the same capacity is planned, using the natural elevation in the Kiyomizu-dera area. Moreover, hydrants and water outlets have been installed at the sides of streets in private property areas, which can be operated by community members.

The second effort is aimed at reducing the risks of disasters by establishing systematic cooperation between the owners and staff of the temple and the local community around it. Community members near Kiyomizu-dera, for example, take an active part in the regular firefighting and earthquake evacuation drills conducted in the temple precinct, while the temple staff cooperates with the community and provides access to its premises for evacuation and shelter in an emergency. Having good communication and relationships among all the stakeholders in a CH site is extremely important in preventing and responding effectively to disasters.

Another good example of an effort to reduce fire risks through collaboration between a religious institution and the local community is provided by Myoshin-ji, a temple complex and head temple of Zen Buddhism in Kyoto. Myoshin-ji is composed of 46 sub-temples built in the middle of a residential area. As the head temple, it serves mainly as a center

for coordination of the education program conducted by other affiliated temples and does not have its own parishioners, so it traditionally does not have close contact with the surrounding local community. A fire simulation undertaken by the temple, however, has demonstrated that if a fire were to break out there, the risk of it spreading to nearby houses would be very high; similarly, a fire in a private house could spread to the temple.

As Myoshin-ji is a protected CP, its owners have received support from the local government in the form of subsidies to equip the temple complex with fire prevention systems, which have been planned, designed, and installed in consultation with the local government, integrating expert advice to meet the requirements of the temple owners and local community. These water shield systems (WSSs) are designed to prevent fires from spreading to the temple from the surrounding residential areas, while protecting the surrounding areas from fires started in the temple. The temple owners have also renewed or added water reservoirs. With these systems already in place, the next challenge is to strengthen communication channels and develop a practical approach for collaboration between the religious and the local communities to ensure protection of the CH site and keep the whole area safe.

3. Preparedness and response actions taken by communities

Ensuring that local communities are prepared against potential disasters at CH sites enhances initial emergency response in a disaster situation. Especially in situations combining more than one event, such as an earthquake followed by fires, the firefighting actions at CH sites might be jeopardized by the disruption of the official disaster prevention systems or services. In some cases, CH sites are located in areas with difficult access, such as deep in the mountains or in crowded urban areas with narrow alleys that a fire brigade might not be able to reach. In such cases, local communities in proximity to the CP in danger can make a significant contribution if they are trained in how to respond to the situation.

In Kyoto, the fire department has, since 2000, been developing a project called the **Citizen Rescue System for Cultural Heritage** to promote cooperation between local community members and owners and managers of CPs, including temples and shrines, to protect the CPs from fire. Under this system, the Kyoto City Fire Department provides the necessary equipment and organizes joint drills and trainings to prepare participants for fire prevention, initial firefighting, and immediate rescue of CPs. Currently, 238 Citizen Rescue Systems are established in Kyoto City,[77] and they organize voluntary activities, such as CP rescue training, DIGs, discussions on fire prevention, and patrolling. These activities reinforce the preparedness of the local community and allow for an immediate initial response in the event of fire.

Also in Kyoto is Ponto-cho, a traditional historic neighborhood where the local community is leading the development of preparedness measures. The narrow alleys of Ponto-cho are packed with both traditional wooden buildings and modern buildings (Figure 21), which are mainly used as restaurants and bars. Ponto-cho has been subject to fires for centuries, the most recent in 2016. This fire started in a restaurant and quickly spread to four other buildings. The combined efforts of the fire brigades and fire corps formed by local citizens mobilized for firefighting made it possible to extinguish the fire within a few hours, avoiding major casualties. Fortunately, the fire outbreak did not happen during a busy time of day, and the evacuation was carried out in an organized manner by locals and business owners working in cooperation with the police.

While the fire was quickly contained and the damage kept to a minimum, this experience raised the awareness of the local community about the importance of developing DRM

[77] Some illustrative examples available at (Japanese only), https://www.city.kyoto.lg.jp/shobo/page/0000223262.html

measures and gave Ponto-cho an opportunity to learn from the fire situation and reconsider and improve it. After this event, various stakeholders gathered and discussed the challenges of preserving a historic neighborhood such as Ponto-cho and the need to develop better mitigation and preparedness measures, especially against fire. As a result, the **Ponto-cho Fire Prevention Measures Network** was established, which organizes meetings to discuss DRM challenges related to fire, share information, and plan future actions. The meetings gather together four key stakeholders: the local community, the town planning council, the local police, and the administration office of Nakagyo-ku Ward, under the leadership of the fire department, and provide a space to discuss measures against fire disaster in Ponto-cho. Moreover, the municipal government, together with the local town planning council, the local police, the local fire department, and other relevant actors, joined forces to establish the **Ponto-cho Town Protection Unit** (*Pontocho Kono Machi Mamori Tai*), which also includes representatives from the local community, such as business owners, residents, and representatives of the geisha associations based in Ponto-cho. This unit regularly organizes DRM drills and awareness-raising activities for local communities, and it checks DRM facilities, such as water resources and pipe connectors to buildings throughout the area, to make sure anyone from the local community can take an initial response action in an emergency.

The local community also responded well to the challenge, recognizing the importance of participating in fire extinguishing drills and learning about evacuations adapted specifically to the area's narrow alleys. Ponto-cho community members took the initiative in adding their own measures to the regulations of the National Building Code for fire prevention and response. For example, they decided each shop and restaurant would be equipped with at least one fire extinguisher, even in buildings smaller than those for which they were required by the National Building Code. All the DRM activities of the unit are led by the local community, and the administrative authorities and experts remain in an advisory role.

FIGURE 21

Narrow Ponto-cho alley and the restaurants affected by the fire in 2016

4. Communities' roles and initiatives in resilient recovery

Section 2 showed the importance of communities' engagement in disaster recovery processes and how this has increased in Japan since the Great Hanshin-Awaji Earthquake. As noted, the Committee for the Rescue of Cultural Properties and Other Materials affected by the Great Hanshin-Awaji Earthquake was established in 1995 by the ACA, integrating experts from national museums, CP research institutes, and other professional societies related to cultural heritage and the arts. Similarly, the *Shiryō-Net* (Network of Historical Documents) was created in 1995 to rescue historical documents and archives affected by the Great Hanshin-Awaji Earthquake. It brought together museums, archives, and libraries, as well as historians and graduate students in the region. The *Shiryō-Net* expanded its network, and *Shiryō-Net* based in other regions have been or are in the process of being established in 14 different parts of Japan, including Fukushima, Iwate, Kanagawa, Miyagi, and Miyazaki.

In 2003, community members and government officials from Miyagi Prefecture established the **Miyagi Network for Preserving Historical Materials**, which became a not-for-profit organization in 2007. The objective of this network of volunteers was to locate, document, and archive important historical records before the next disaster. Local communities' records targeted by this initiative include old documents, antique works of art, and folk craft articles used in agriculture, fishing, and forestry, inter alia.

This network demonstrated its importance when the GEJE struck the prefecture in 2011. The Miyagi *Shiryō-Net* conducted damage surveys and rescue activities in different affected areas just a few weeks after the tsunami. Universities and research institutions supported community volunteers by providing basic knowledge and techniques in preservation and repair to be used during the emergency process. More than 800 volunteers helped rescue historical records and sent them to Sendai City, the capital of Miyagi Prefecture, for further conservation measures. The network was also critical in providing a communication channel among CP owners, local community experts and historians, and government officials, all of whom had been involved in preservation activities before this devastating earthquake.

The initiative taken by communities was expanded during the GEJE when the CP Rescue Program for the rescue of movable heritage and the CP Doctor Dispatch Project for built heritage were conducted with the support of and in cooperation with the ACA and local governments (see Section 2).

The *Shiryō-Net* model was replicated in many parts of Japan, such as in Ibaraki Prefecture, which was also affected by the GEJE. Ibaraki *Shiryō-Net* was established in 2011 as a volunteer organization for the rescue and preservation of CP and historical records affected by the earthquake and tsunami.

Even years after the GEJE, the work of these networks to clean and save historical records is ongoing. Their activities are now mainly maintained by donations and the support of experts and volunteers.

Conclusion

Aso shrine, Kumamoto during restoration after 2016 earthquake.
Photo: Amehime/Shutterstock.com.

Japan has developed a large body of experience in DRM for CH over years of history and disasters—and the country continues to learn from new challenges. The lessons and examples reflected in this document need to be understood within the Japanese context. This report is not intended as an exhaustive guide to be used or replicated in other contexts; rather, it is aimed at inspiring other countries, regions, and sites to develop creative solutions to improve the resilience of their own CH, developing measures and appropriate solutions to their social, cultural, economic, and institutional contexts.

In this regard, this document focuses on best practices and lessons learned that might be of assistance in other contexts. However, while Japan takes the protection of its CH very seriously, exposed as it is to a vast range of hazards, the country also faces several challenges and obstacles in operationalizing DRM for CH. For example, an issue faced throughout Japan is a situation, such as in the Kyoto's Sannei-zaka area, where local residents no longer live in the traditional homes in the neighborhood because they are often too expensive to restore or upgrade for use in contemporary contexts. In some cases, permissions may be hard to obtain for their adaptive use, resulting in many empty properties that look impressive from the street but are in fact uninhabited (or inhabited only for limited periods). This is both a cause and a consequence of the erosion of the local community. Similar challenges are found in old towns in European countries, such as Italy or the United Kingdom.

Some specific lessons highlighted in the example of Japan include:

1. **Documenting and categorizing CH is a critical first step to understanding risks to CH and protecting it.** Identification, inventory (including geospatial references), value assessment, and classification of cultural heritage, such as the system to designate CPs in Japan, help to organize and prioritize support and assistance to develop DRM measures. Likewise, the development of studies and researches to complement documentation and data collection is better achieved with cooperation from academia and universities.

2. **Investing in interagency cooperation before disasters improves performance throughout the DRM process.** Investing in communication and collaboration that connects actors at different levels before a disaster occurs improves the ability of all actors to protect CH proactively and reduce the costs and potential losses from disaster events. Examples of this are the ACA-Prefectures-Municipalities dialogue and the explicit budget and incentive mechanisms in Japan.

3. **Involving the local community in CH sites—for risk identification, reduction, preparedness and response, and recovery—provides these sites with better protection.** The key lesson from Japan is that community engagement improves the performance of all DRM functions and helps build social capital. Capacity building, drills, low-tech solutions, and measures or equipment that can be used and maintained by locals are key to ensure that they are ready to act in case of an emergency, and protect visitors and CH assets. Such solutions include gravity pressure–type water supply facilities, and engagement tools such as the disaster imagination game (DIG).

4. **Integrating CH into existing risk identification processes and conducting targeted multi-hazard risk assessments for CH assets and sites make action easier and more likely.** Integrating CH into hazard maps and developing risk identification guidelines and checklists can help communities and policy makers better understand risks and prepare mitigation and response measures.

5. **Risk-informed monitoring and maintenance of historic sites allows better prioritization of conservation efforts, while culturally informed DRM measures help better protect sites' intrinsic values.** As seismic interventions at important CP sites in Japan demonstrate, structural assessments, and monitoring of temperature, humidity, and changes in vibrations help site managers to identify and implement structural reinforcement measures. Ensuring that protection measures integrate the cultural and aesthetic values of the site, such as the slope stability and monitoring system in Kiyomizu-dera, is a key element of DRM for CH.

6. **Adopting a mix of "hard" and "soft" measures for risk reduction, preparedness, and response for CH sites can provide a useful protection against natural hazards.** In Japan, this includes hard measures for monument-level interventions, such as technically advanced firefighting systems, and infrastructure strengthening, such as flood protection. It also includes such critical soft measures as the development of guidelines and manuals that can be implemented at the local level, and community engagement.

7. **Traditional knowledge may provide clues to better protect traditional—and even new—structures.** Examples from Japan show how keeping traditional locations, techniques, and materials can help protect CP, such as in the case of the replacement of temple roofs in Kyoto. Likewise, traditional practices and systems such as the *Sabo* system may even become a CP in itself, strengthening the practice of DRM of CH.

8. **Rapid resilient recovery efforts may make the difference for preventing unnecessary losses.** Some CH may be salvaged by trained officials and even volunteers able to conduct rapid damage assessments after a disaster event and to implement temporary stabilization measures, which can be improved later. Including CH experts in physical recovery efforts can help avoid the unnecessary demolition of important CP, as the case of the Heritage Managers (HM) system developed following the 1995 Great Hanshin Awaji earthquake shows.

9. **The DRM of CH sites may be improved through coordination with the tourism sector.** Most CPs and CH worldwide are tourist destinations, meaning that crowds not familiar with the sites may be vulnerable to disaster events. Integrating visitors into DRM plans for CH sites can help better manage related risks, as authorities in Kyoto do through the translation of key information, and through communication during emergency evacuations.

10. **The replication of initiatives and good practices should be promoted country wide.** National authorities can help promote local innovations and good practices, such as the *Shiryō-Net* volunteer organization, which was developed after the GEJE to rescue and preserve CP and historical records and has now extended to different regions in Japan. The Cabinet Office and the ACA, as well as other national and subnational authorities and academic and technical institutions, also play a key role in documenting lessons learned—both positive and negative—for national and international audiences.

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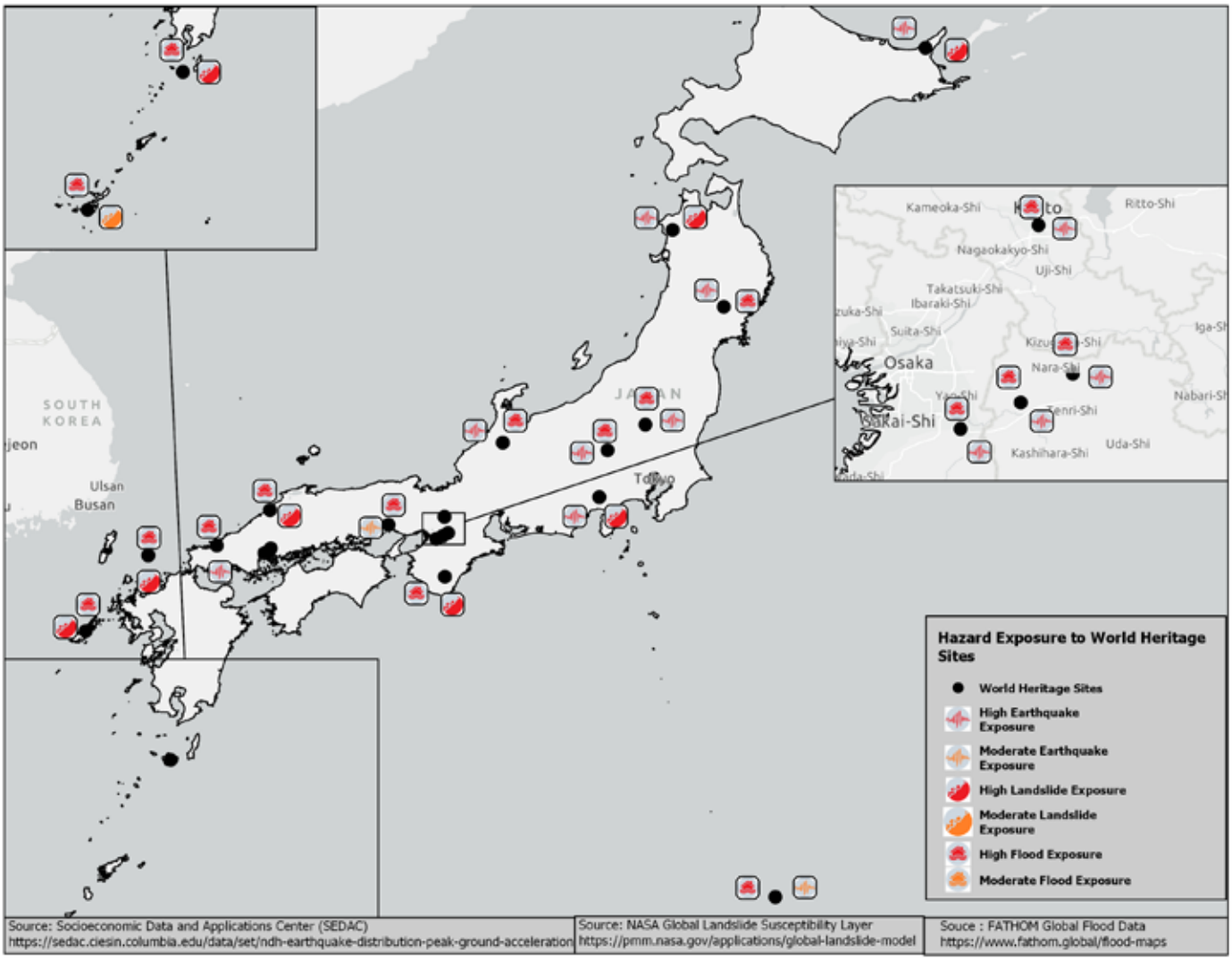
Annex I

Methodology and Results of Hazard-Exposure Mapping of World Heritage Sites in Japan

Figure A presents the UNESCO World Heritage Sites in Japan and their exposure to earthquakes, floods, and landslides. The exposure to each of the three hazards has been classified as low, moderate, and high, as derived from the relevant literature for that hazard.

FIGURE A

Exposure of Japan's World Heritage Sites to Earthquakes, Floods, and Landslides



Source: Authors, Gaurav Bhardwaj, GFDRR.

The sites are classified as high exposure if either of the hazard exposures is marked high. For instance, if for Fujisan exposure to earthquakes is categorized as high, floods as low, and landslides as high, the overall exposure is marked as high. More detailed methodology is presented in this Annex.

TABLE I

Hazard-Exposure Composite Scores for World Heritage Sites in Japan

World Heritage Sites	Flood	Earthquake	Landslide
Buddhist monuments in the Horyu-ji area	High	High	Medium
Fujisan, sacred place and source of artistic inspiration	Low	High	High
Gusuku sites and related properties of the Kingdom of Ryukyu	High	Medium	Medium
Hidden Christian sites in the Nagasaki region	High	Medium	High
Himeji-jo	High	Medium	Low
Hiraizumi—temples, gardens, and archaeological sites representing the Buddhist Pure Land	High	High	High
Hiroshima Peace Memorial (Genbaku Dome)	High	Medium	Medium
Historic monuments of ancient Kyoto (Kyoto, Uji, and Otsu Cities)	High	High	Medium
Historic monuments of ancient Nara	High	High	Medium
Historic villages of Shirakawa-go and Gokayama	High	High	High
Itsukushima Shinto Shrine	High	Medium	High
Iwami Ginzan Silver Mine and its cultural landscape	High	High	High
Mozu-Furuichi Kofun Group: mounded tombs of ancient Japan	High	High	Medium
Ogasawara Islands	High	Medium	Medium
Sacred Island of Okinoshima and associated sites in the Munakata region	High	Medium	High
Sacred sites and pilgrimage routes in the Kii Mountain Range	High	High	High
Shirakami-Sanchi	Medium	High	High
Shiretoko	Medium	High	High
Shrines and temples of Nikko	High	High	High
Sites of Japan's Meiji Industrial Revolution: iron and steel, shipbuilding, and coal mining	High	High	Medium
The architectural work of Le Corbusier, an outstanding contribution to modern movement (2016)	Medium	High	Medium
Tomioka Silk Mill and related sites	High	High	High
Yakushima	High	High	High

Earthquake: The earthquake data has been derived from Global Earthquake Hazard Distribution dataset hosted on NASA's Socioeconomic Data and Application Center (SEDAC) portal. The dataset predicts localities where there exists a 10 percent chance of exceeding the peak ground acceleration (PGA) of 2 meters per second in a 50-year time span. The United States Geological Survey (USGS) has developed an instrumental intensity scale, which maps PGA and PGV on an intensity scale similar to the felt Mercalli scale. Using this scale, the heritage sites have been categorized for exposure to earthquakes: low, medium, and high.

TABLE II

Earthquake Hazard-Exposure Methodology

Instrumental intensity	Acceleration (g)	Perceived shaking	Potential damage	Exposure classification
X+	> 1.24	Extreme	Very heavy	High
IX	0.65–1.24	Violent	Heavy	High
VIII	0.34–0.65	Severe	Moderate to heavy	High
VII	0.18–0.34	Very strong	Moderate	Medium
VI	0.092–0.18	Strong	Light	Low

Floods: The flood data used for this analysis came from FATHOM Global Floods Data and shows the maximum expected water depth in meters at 10 different return periods. One in 50-year pluvial and fluvial flood data was used to perform the analysis. A buffer of 2 km was created around the cultural heritage sites and a threshold of 0.5 m was set for the depth of flood water. From the literature (1), a threshold (4 percent) was set for the percent of area covered by the flooded pixels. Any site above the two-set threshold was marked as having high exposure to floods, sites with flooded area less than 4 percent were marked as medium exposure, and sites with flood water level less than 0.5 m were marked as having low exposure.

TABLE III

Flood Hazard-Exposure Methodology

World Heritage Sites	% Area flooded	Exposure classification
Buddhist monuments in the Horyu-ji Area (1993)	20.7	High
Fujisan, sacred place and source of artistic inspiration (2013)	0.64	Low
Gusuku sites and related properties of the Kingdom of Ryukyu (2000)	10.51	High
Hidden Christian Sites in the Nagasaki Region (2018)	4.3	High
Himeji-jo (1993)	13.85	High
Hiraizumi—temples, gardens, and archaeological sites representing the Buddhist Pure Land (2011)	9.08	High
Hiroshima Peace Memorial (Genbaku Dome) (1996)	6.85	High
Historic monuments of ancient Kyoto (Kyoto, Uji, and Otsu Cities) (1994)	9.55	High
Historic monuments of ancient Nara (1998)	25.32	High
Historic villages of Shirakawa-go and Gokayama (1995)	9.24	High
Itsukushima Shinto Shrine (1996)	5.41	High
Iwami Ginzan Silver Mine and its cultural landscape (2007)	38.3	High
Mozu-Furuichi Kofun Group: mounded tombs of ancient Japan	8.92	High
Ogasawara Islands (2011)	4.06	High
Sacred Island of Okinoshima and associated sites in the Munakata region (2017)	9.24	High
Sacred sites and pilgrimage routes in the Kii Mountain Range (2004)	11.78	High
Shirakami-Sanchi (1993)	2.31	Medium
Shiretoko (2005)	2.79	Medium
Shrines and temples of Nikko (1999)	7.17	High
Sites of Japan's Meiji Industrial Revolution: iron and steel, shipbuilding, and coal mining (2015)	7.25	High
The architectural work of Le Corbusier, an outstanding contribution to modern movement (2016)	3.03	Medium
Tomioka Silk Mill and related sites (2014)	6.93	High
Yakushima (1993)	17.83	High

Landslides: The landslide data have been derived from NASA's Global Landslide Susceptibility Layer. The categorization is done by fuzzy logic to determine the "possibility" of a pixel belonging to a certain category as computed by the model. These categorizations are mapped to the relevant heritage sites depending on what pixels they intersect with. Three categories of site exposure to landslides were derived.

TABLE IV

Landslide Hazard-Exposure Methodology

Fuzzy susceptibility values	Data classification	Exposure classification
< 1.0	Very high	High
< 0.75	High	High
< 0.67	Moderate	Medium
< 0.49	Low	Low
< 0.11	Very low	Low

Annex II

Fire and Crime Prevention Checklist for Tangible CPs

Excerpts of fire and crime prevention checklists provided by the ACA and used at CPs in Japan are provided below. They are designed to enable owners and managers of CP to carry out quick checks by themselves. The original checklists in full versions, only in Japanese, are available here: http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/check_list.html

Fire and crime prevention checklist for tangible CP (structure)

CHECKLIST 1 **Characteristics of buildings**

Item	Check	Examples	Possible disasters	Examples of countermeasures
(1) Special characteristics of buildings				
Are roof materials flammable?	☐ yes	Organic materials such as cypress bark, split shingles, thatch.	• Fires from sparks of fireworks and/or nearby fires.	• When combustible materials catch fire, the fire spreads quickly and it takes a long time to extinguish. Therefore it is crucial to take fire prevention measures.
	☐ no	Tiles, stone slabs, copper plates, iron plates, etc.		• Take measures as described above, even where only part of the roof is made of combustible materials.
Is the structure made of wood?	☐ yes	Organic materials such as wood.	• Fire spreading from a neighboring building or spread from fire in the vicinity due to leaping flames or sparks. • Fire outbreak inside the building itself.	• In the case of wooden buildings, the fire spreads fast, so it is important to stress early detection as the basis for countermeasures. In particular, in cases where the outer wall is wooden, it is necessary to take measures against arson. Additionally, it is important to undertake initial fire extinguishing action and measures to prevent the spread of fire until the fire engines arrive.
	☐ no	Materials such as earthen walls, stone structure, brick structure, concrete.	• Fire outbreak inside the building itself.	• Take measures as described above. Even where the building uses combustible material only in part, these measures should be taken.
(2) Premises of buildings				
Is there insufficient space around the building, making firefighting difficult?	☐ yes	Buildings are packed in the premises with no space in the surrounding areas.	• Firefighting is difficult. • Fire spreading from a neighboring building.	• When there is not enough open space on the premises, firefighting activities are difficult to undertake. Unnecessary objects should not be put in places were they could become obstacles to firefighting. • If the adjacent house is close, take measures to prevent the spread of fire.
	☐ no	Buildings are in a park or in an open-air museum.		• Take measures as described above, and revise them as necessary. • Where there are vacant lots, there may be places where the alert system may be inadequate. Revise the alert system to reduce or remove blind spots.

Item	Check	Examples	Possible disasters	Examples of countermeasures
(3) Location of buildings				
Is the property located in an area with a high ratio of wooden buildings?	☐ yes	Located within protected areas such as preservation districts of historic buildings.	• Fire spreading from a neighboring building or spread from fire in the vicinity due to leaping flames or sparks. • It is likely that firefighting and evacuation activities may become difficult.	• If the property is located in an area with high density of wooden buildings, there is increased risk of the fire spreading over a large area. It is important to take measures to prevent fires from starting or spreading. In particular, preservation districts for important traditional buildings need to increase the firefighting capacity of the area as a whole. When considering fire prevention measures for important CP (buildings), take into consideration aspects such as the width of surrounding roads, public fire extinguishing equipment, and the types of water resources and their distribution.
	☐ no	Not an area with high ratio of wooden buildings, but there are many buildings around the building considered.	• It is likely that firefighting and evacuation activities may become difficult.	• Review disaster prevention measures with an emphasis on fire countermeasures, according to needs.
Is the property in a remote location, such as in mountainous area or on an island?	☐ yes	No houses in the surroundings.	• Early detection of disaster is difficult. • Difficult to obtain cooperation of local firefighting capacities. • Fire caused by lightning.	• When properties are located in a mountainous area or on an island, make sure that any fire alert signal may be received, and make sure that a communication and contact system is established that focuses on early detection. The basic rule is to take fire prevention measures that are adapted to the management system of the owners, while assuming that in some cases local cooperation may not be available.
	☐ no			• Take measures as described above, and revise them as necessary.
(4) Other (e.g., stored in museums)				
Is the property stored in other buildings such as wooden protective structures?	☐ yes	Stored in a protective structure, stored in miniature shrines or similar structures within the main halls of shrines and temples.	Spread of fire damage.	• Where the protective structure is wooden, the basic rule is to take firefighting measures for the protective structure together with the important CP (building) as a whole.
	☐ no			
Is the property stored in a building which is not made of wood?	☐ yes	Stored in museums or storage.		• The basic rule is to consider disaster prevention measures for the storage building (such as museums) and the buildings that are stored as a whole.
	☐ no			

CHECKLIST 2 **Characteristics related to utilization**

Item	Check	Examples	Possible disasters	Examples of countermeasures
(1) Attributes of users				
Is the property used by a large number of people?	☐ yes	• Facilities visited by many worshippers, visitors, and tourists. • School facilities or public halls.		• It is necessary to have an understanding of the number of users, and consider the necessary measures in detail. Assume that a disaster such as a fire may occur while the public is using the building in large numbers, and consider fire prevention measures including evacuation plans, while obtaining guidance from the fire department.
	☐ no	• Basically not open to the public and used only by specific people.		• Take measures as described above, and revise them as necessary.
(2) Usage of fire				
Is open flame used in activities such as religious rituals?	☐ yes			• The basic rule is to strengthen the monitoring system when fire is being used.
	☐ no			

CHECKLIST 3 **Management system**

Item	Check	Examples	Possible disasters	Examples of countermeasures
(1) Day-to-day management system				
Are there few or no staff managing the property?	☐ yes	• No regular staff. • There are regular staff but they are only elderly people, so there is a possibility that they may not be able to take initial response measures in case of disaster.	Discovering disaster is delayed. Not possible to set up an early response system.	• The basic rule is to take fire prevention and crime prevention measures in accordance with the actual state of management. Where there are blind spots in time or location, there should be a proper understanding of the situation, and fire and crime prevention measures taken according to the actual management system (number of people, etc.).
	☐ no			• Take measures as described above, and revise them as necessary.
Are different management systems in place for daytime and nighttime?	☐ yes	• There is nobody (or very few people) present on-site at night.		• The basic rule is that fire prevention and crime prevention measures should be taken in accordance with the actual state of management. In cases where there are blind spots in time or location, there should be a proper understanding of the situation, and fire and crime prevention measures are to be taken according to the actual management system (number of people, etc.).
	☐ no			• Take measures as described above, and revise them as necessary.

CHECKLIST 4 Fire prevention equipment

Item	Check	Examples	Possible disasters	Examples of countermeasures
(1) Maintenance of fire prevention equipment				
Are check-ups on the fire prevention equipment conducted regularly?	☐ yes			• In addition to the legally specified inspection, make sure that the system is operating even after a lightning strikes. • Check the pipes for any leaks in the fire hydrant equipment. If more than 30 years have passed after installation, it is recommended that a detailed inspection be conducted.
	☐ no			• Periodic inspections should be made and if malfunctions or dysfunctions do occur, repairs must be undertaken immediately in order to keep the system operational. If regular checkups are not possible, notify the relevant parties and organizations in advance and be very careful.

CHECKLIST 5 Artefacts inside the buildings

Item	Check	Examples	Possible disasters	Examples of countermeasures
Are artifacts and objects of fine arts and crafts such as ICP stored in the buildings?	☐ yes	Objects such as sculptures, paintings, and painted sliding panels are stored or displayed.		• As a basic rule, consider disaster prevention measures to protect both buildings and works of arts and crafts that are stored in them, based on an understanding of the characteristics of the artifacts involved. When the artifacts cannot be easily moved in the event of a fire or other disaster, consider how they may be protected.
	☐ no			

Fire and crime prevention checklist for tangible CP (fine arts and crafts) [excerpts]

CHECKLIST 6 Locations where objects of fine arts and crafts are stored

Location	Check
Stored in inflammable structures (e.g., storage space of buildings)	
Stored in flammable structures (e.g., shrine and temple halls, pagodas, etc.)	
Placed outside	
Entrusted to museums	

CHECKLIST 7 Storage condition

Items	Check
Recently checked the storage conditions of objects of fine arts and crafts	☐ yes
	☐ no
Inventories (catalogues, photos) have been made and are managed	☐ yes
	☐ no

CHECKLIST 8 **Fire prevention measures**

Items	Check	Possible disasters
Fire is often used around the cultural properties	☐ yes	Accidental fire
	☐ no	
Fire prevention equipment or facilities are installed	☐ yes	
	☐ no	Fire
Management system for fire prevention and firefighting is in place	☐ yes	
	☐ no	Prompt firefighting is hampered
Regular patrols and surveillance are conducted	☐ yes	
	☐ no	Arson, accidental fire
Regular firefighting drills are conducted	☐ yes	
	☐ no	Prompt firefighting is hampered

Annex III
Selected Examples from the "Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies"

This Annex presents a translation of selected examples from an ACA publication, the *"Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies,"*[78] developed by the Cultural Properties Division. It showcases a collection of measures implemented to increase the earthquake resistance of important cultural properties, specifically buildings. In each case, measures implemented were selected after careful consideration of the value of the property concerned as a cultural asset and chosen as the best suited from solutions available at the time. Because cultural value is different for each property, careful consideration is required when referring to cases presented in this guideline to design measures for other sites or buildings[79].

Categories of measures:[80]

[I] Structural bracing and similar measures

[II] Roof changes, including design, material, and building technique, etc.

[III] Foundations/groundwork

[IV] Site management of the monuments' surroundings

[V] Other, including soft measures, etc.

[78] Agency for Cultural Affairs, 2017, "Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies," http://www.bunka.go.jp/seisaku/bunkazai/hogofukyu/pdf/kokko_hojyo_taisin16.pdf

[79] Authors' selection and translation from the introduction to the Guidelines.

[80] Authors' elaboration.

❶ National Treasure: Eihouji Temple, Kaizan-do and Kannon-do halls (Gifu Prefecture)

Two buildings with different levels of reinforcements were selected according to their respective structural characteristics and use.

Buildings' characteristics

Date of construction:	1333–1392
Location:	Gifu Prefecture, Tajimi-shi
Structures:	Buddhist temple hall buildings of wooden construction
Repair works:	November 2009–November 2012, reroofing and partial repairs, with earthquake resistance measures implemented simultaneously

Countermeasures adopted

Assessment:	Both halls are at high risk of collapse in the case of a strong earthquake.
Reinforcement:	Considering the impact on the use of each building and their value as cultural property, different reinforcement policies were adopted for the two buildings.

Categories of intervention

- Structural measures [I]
- Other management and use measures [V]

Kaizan-do

- There is no space where structural reinforcement can be introduced without being visible. Thus, any intervention would have a heavy impact on the aspect and heritage value of the building.
- Due to the very limited number of people actually entering and using the building, management provisions should ensure a safe evacuation even in the case of risk of collapse during an earthquake.
- Should the building suffer a collapse, careful repair should enable a proper restoration of its value as a cultural property.

The decision was adopted to:

- Apply a relatively high level of tolerance to damage "possible to restore," that accepts collapse of the building;
- Forego the installation of additional structural reinforcement;
- Apply strict management measures ensuring that only a limited number of people may enter the building; and
- Ensure that evacuation routes are properly secured.

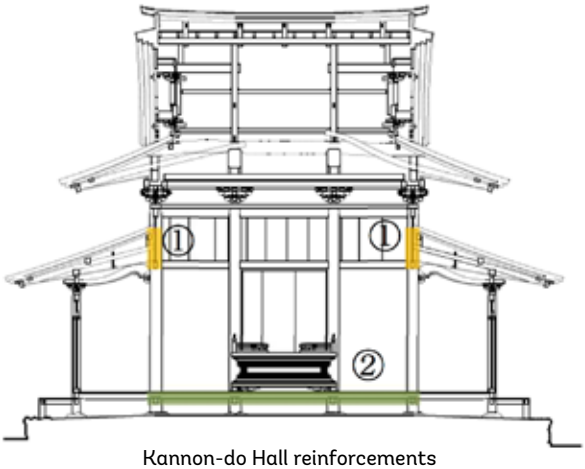
Kannon-do

- The building caters to a large number of users. Should the building collapse, there may be harm to human lives.
- Reinforcements can be concealed within the building's structure.

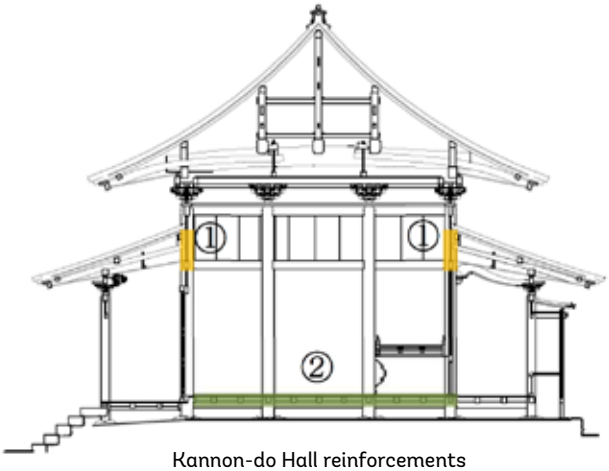
The decision was adopted to:

- Apply a low level of tolerance to damage "security is ensured," to prevent collapse in case of earthquakes;
- Introduce structural reinforcements inside the walls ① and under the floors ②.

FIGURE A



Kannon-do Hall reinforcements
(longitudinal section)



Kannon-do Hall reinforcements
(transversal section)

Reinforcement inside the wall (①)

Reinforcement under the floor (②)

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

❷ Important Cultural Property: Nyohoji Temple, Hall (Ehime Prefecture)

Conceal reinforcing elements with consideration to the design and details of the hall's interior

Buildings' characteristics

Date of completion:	1670
Location:	Ehime Prefecture, Ozu-shi
Structures:	Buddhist temple hall building with a wooden structure
Repair works:	November 2010–December 2014, half-dismantling repair, with earthquake resistance measures implemented simultaneously

Countermeasures adopted

Assessment:	The hall was considered at high risk of deformation that may result in the collapse of parts of it in the case of a strong earthquake.
Reinforcement:	Considering the impact on the current use of the building for religious purposes, reinforcement measures were adopted to ensure a "level of security" with a low tolerance for damage (the CP will not collapse in the event of a large-scale earthquake).

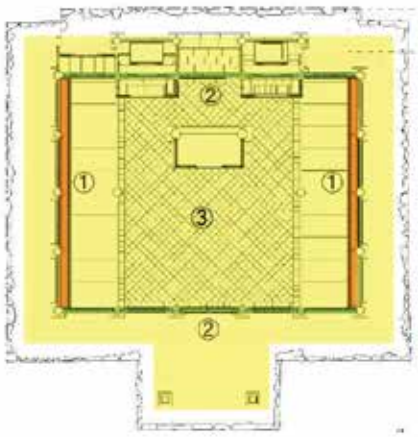
Categories of intervention

- Structural measures [I]
- Roof changes from tiles to split shingles [II]
- Other management and use measures [V]

Main structural reinforcement elements introduced

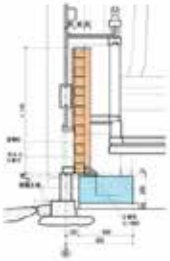
- Wall reinforcement panels and grids (with new wall panels added to conceal them) ① and ②
- Reinforced concrete foundations as counterweight in the under-floor space, connected with the walls ①
- Wooden bracing in the roof structure ③
- Metal fittings to reinforce connections and metal beams to support decayed beams in the roof structure

FIGURE B

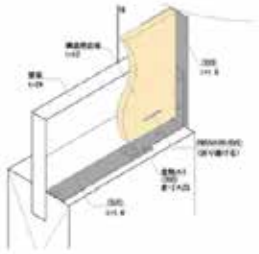


Location of reinforcements (floor plan)

Lattice wall reinforcements (①) (elevation)

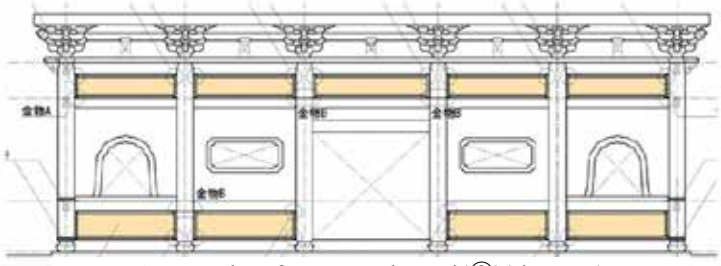


Lattice wall reinforcements (①)



Structural reinforcement plywood (②)

Structural reinforcement plywood (②) with finishing



Structural reinforcement plywood (②) (elevation)

Structural reinforcement plywood in the walls

Lattice wall reinforcements (①)

Structural reinforcement plywood in the walls with finishing

Lattice wall reinforcements concealed

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

❸ Important Cultural Property: Hassho-ji Temple Amida Hall (Kumamoto Prefecture)

Permanent and temporary reinforcements and management systems were combined to achieve maximum effect with minimum visual impact.

Buildings' characteristics

Date of construction:	Late 15th century
Location:	Kumamoto Prefecture, Kuma-gun, Yunomae-machi
Structures:	Buddhist temple hall building with a wooden structure
Repair works:	October 2012–December 2014, dismantling/reassembling repair with earthquake resistance measures implemented simultaneously

Countermeasures adopted

Assessment:	The hall was considered at high risk of deformation that may result in the collapse in the case of a strong earthquake.
Reinforcement:	The building is used for religious purposes. During restoration works, the roof design and materials were restored to their original configuration, resulting in a significant increase in surfaces that could be affected by high wind speeds. Reinforcement was achieved through a combination of permanent structural measures complemented by temporary ones. The combination of permanent and temporary, hard and soft management measures made it possible to realize an adequate level of resilience while keeping the visual impact of countermeasures to a minimum.

FIGURE C

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

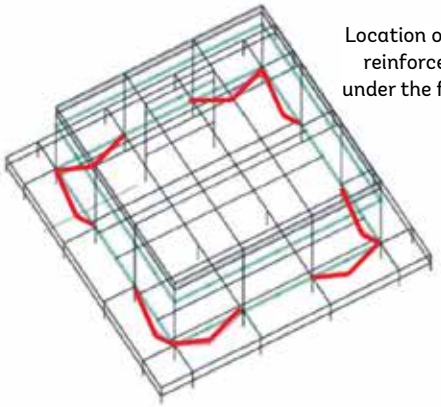
Categories of intervention

- Structural measures [I]
- Roof changes, including modification of the slope and replacing tiles with thatch [II]
- Foundations [III]
- Other temporary measures [V]

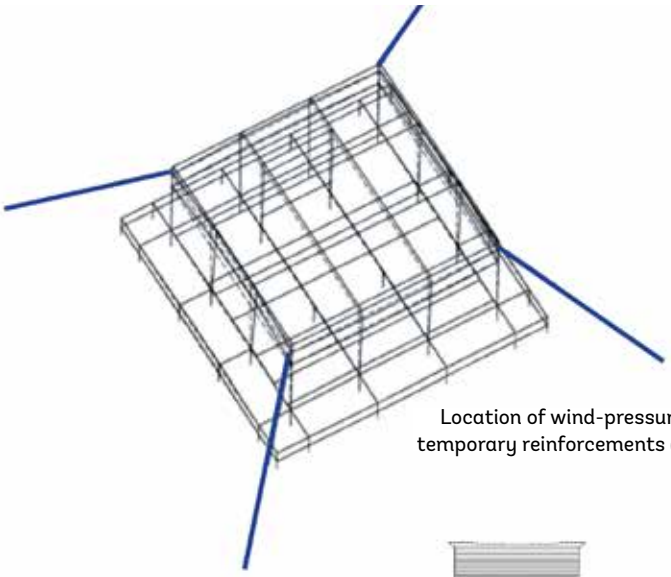
Main structural reinforcement elements introduced

- Structural reinforcements in the under-floor space ①
- Reinforcement rings on the four outer pillars to attach wires connected to counterweights buried in the foundations ②
- Changes in the management system needed for installation of the temporary reinforcement measures in preparation for typhoons

FIGURE D



Location of seismic reinforcements under the floor (①)



Location of wind-pressure temporary reinforcements (②)

Bracing under the floor and members connecting the foot of pillars (①)

Before repairs | After repairs

Comparison of the surface exposed to wind-pressure before and after repairs

Temporary wire reinforcement (②) installed

Reinforcement ring to attach the temporary wire (②)

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

❹ Important Cultural Property: Kasamori-ji Temple Kannon Hall (Chiba Prefecture)

Reinforcing the stairs with steel columns that resemble existing handrails.

Buildings' characteristics

Date of completion: 1597

Location: Chiba Prefecture, Chosei-gun, Chonan-machi

Structures: Buddhist temple hall building with wooden structure

Repair works: Earthquake-resistance assessment: 2010–2011, reinforcement measures works: 2012–2013

Countermeasures adopted

Assessment: Structural analysis suggested that in case of a strong earthquake, pillar bases may be dislocated from foundation stones and the staircase up to the hall could be at risk of collapse.

The soil in the hill on which the hall is located was unstable: repeated drying and wetting of the soil had caused oxidation and expansion of the iron in the ground, accelerating deterioration.

Reinforcement: The building is used for religious purposes and thus it was important to achieve a particular level of security. At an early stage, structural reinforcements combining metallic frames and wooden braces were considered. However, these were revised as their visual impact was too intrusive. After examination, the solution of installing steel columns made to visually match the existing handrail was adopted instead.

FIGURE E

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

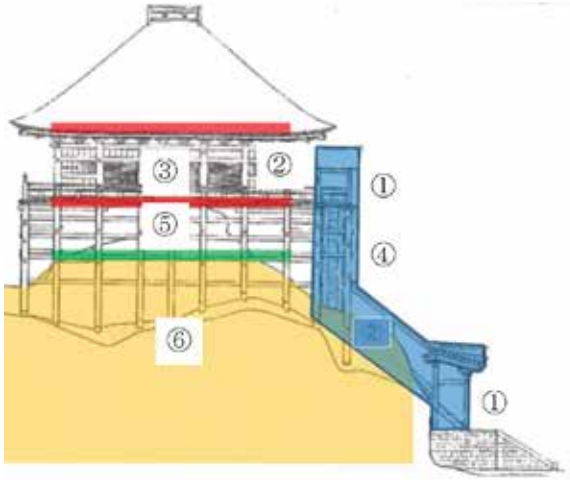
Categories of intervention

- Structural measures [I]
- Foundations [III]
- Site management (dealing with slope soil) [IV]
- Other temporary measures [V]

Main structural reinforcement elements introduced

- Structural reinforcements: steel columns and frames made to visually match the existing handrail (① and ②)
- Wooden structural reinforcements in the spaces under the roof and floors ③
- Metallic braces under the horizontal surfaces of the stairs and metallic fittings at the bases of columns to prevent outward sliding due to vertical loads ④
- Metal fittings to fasten column bases to foundations ⑤
- Protection and reinforcement of the soil with mortar colored to match the surroundings ⑥ and locking bolts inserted in the soil to secure foundations on the mortar surface

FIGURE F



Location of reinforcements

Steel columns reinforcing the stairs (①)

Steel frame reinforcement of the handrails (②)

Under-floor brace reinforcements of the stairs (④)

Metal fasteners to avoid the dislocation of columns (⑤)

Sprayed mortar colored to match (⑥)

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

❺ Important Cultural Property: Nagoya Castle, southwest turret (Aichi Prefecture)

Reinforcements in earthen walls were concealed by an additional layer to preserve the integrity of the building's design.

Buildings' characteristics

Date of completion: 1612

Location: Aichi Prefecture, Nagoya

Structures: Military building of wooden construction, covered with earth walls

Repair works: 2010–2014: Half-dismantling/reassembling repairs including earthquake resistance measures implemented simultaneously

Countermeasures adopted

Assessment: Structural analysis suggested that in case of a strong earthquake, the building was at risk of collapse. The stone walls on which it stands had collapsed in the past and had subsided in parts at the time of assessment. The floors were assessed as not needing additional reinforcement.

Reinforcement: Although visitors in general did not enter the building, a level of reinforcement was adopted to ensure security.

FIGURE G

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

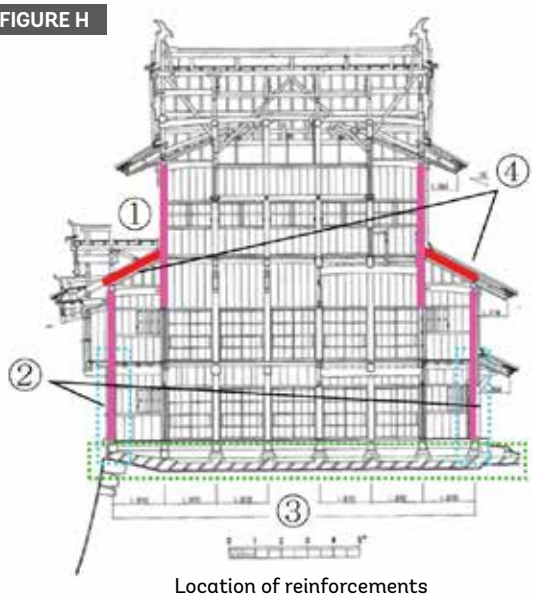
Categories of intervention

- Structural measures [I]
- Foundations [III]
- Site management (repair of stone walls) [IV]

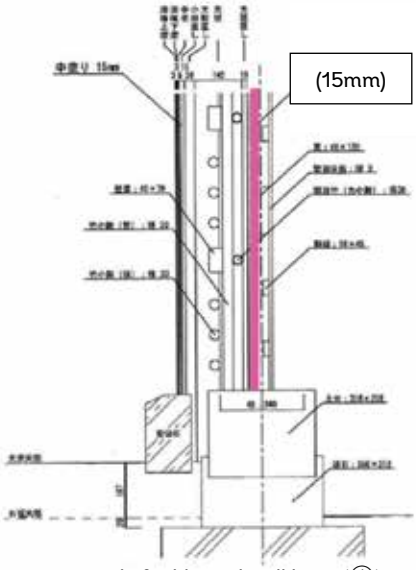
Main structural reinforcement elements introduced

- A hollow space between the earth walls and the wooden penetrating beams in the wall structure was filled with an additional layer of earth to increase the walls' resistance (①)
- The existing wall braces on the first floor were renewed with new ones added using new technology as appropriate (②)
- A new concrete mat foundation was introduced to distribute the weight of the building and alleviate pressure on subsiding foundations (③)
- The base layer of the first level's roof was reinforced (④)

FIGURE H



Location of reinforcements



Detail of additonal wall layer (①)

Bracing inside the walls (②)

Bar arrangement of the solid concrete foundation (③)

Location of reinforcements in the base layer of the roof cover (④)

❻ Important Cultural Property: Osaka Central Public Hall (Osaka Prefecture)

Install earthquake retrofitting/base isolation in order to limit reinforcements of the building's upper structure to the very minimum.

Buildings' characteristics

Date of completion: 1918

Location: Osaka Prefecture, Osaka

Structures: Public hall building of brick masonry construction on a metal frame

Repair works: Preservation and restoration works from March 1999 to September 2002, together with anti-seismic measures, implemented before the designation as an Important Cultural Property.

Countermeasures adopted

Assessment: Assessment made clear that the building had capacity for reaching only a third of required earthquake resistance. The ground and soil conditions were also unfavorable, and at risk of liquefaction in case of earthquake.

Reinforcement: Base isolation/retrofitting was adopted as a solution in order to keep reinforcements of the upper structure to a minimum.

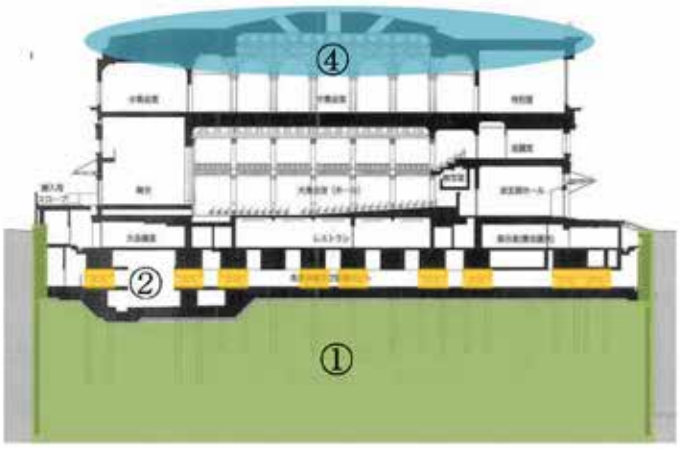
Categories of intervention

- Structural measures [I]
- Foundations [III]

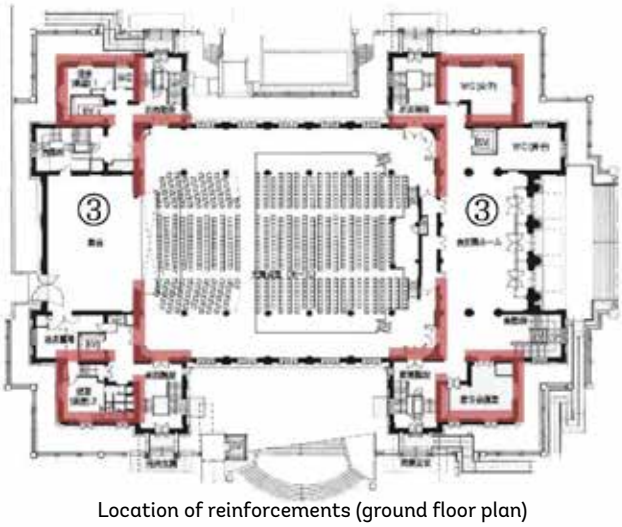
Main structural reinforcement elements introduced

- Steel pipe piles and continuous underground RC walls were installed to counter the risk of soil liquefaction (①)
- Base isolation/retrofitting was combined with lead plugs and steel dampers (②)
- RC seismic strengthening walls were set against the existing brick walls to reinforce them on the corners of the building (③)
- Steel bar braces introduced in the roof trusses reinforced them in the horizontal direction (④)

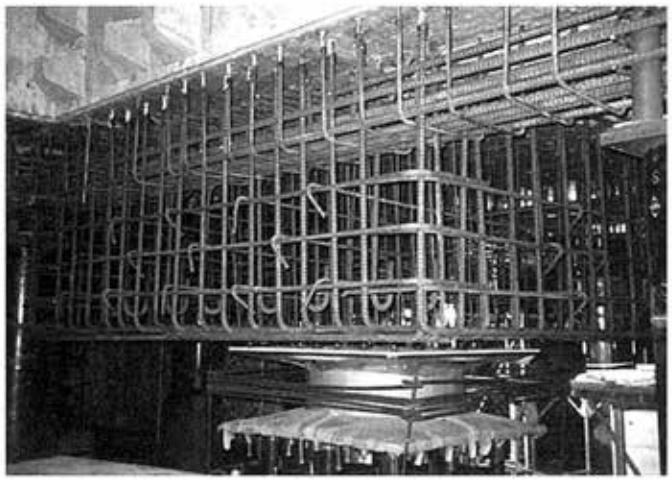
FIGURE I



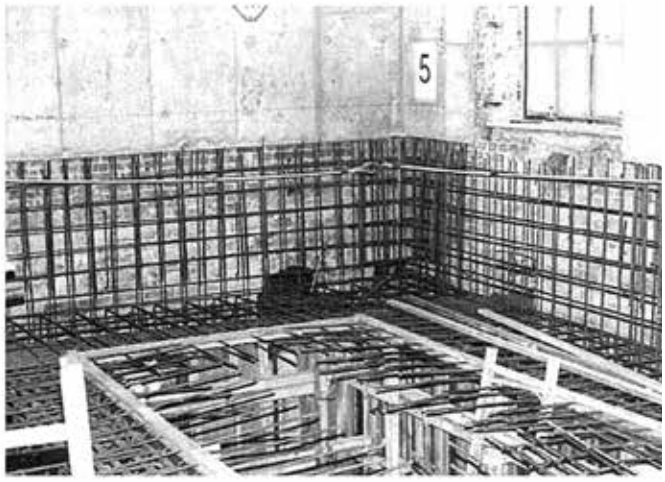
Location of reinforcements (section)



Location of reinforcements (ground floor plan)



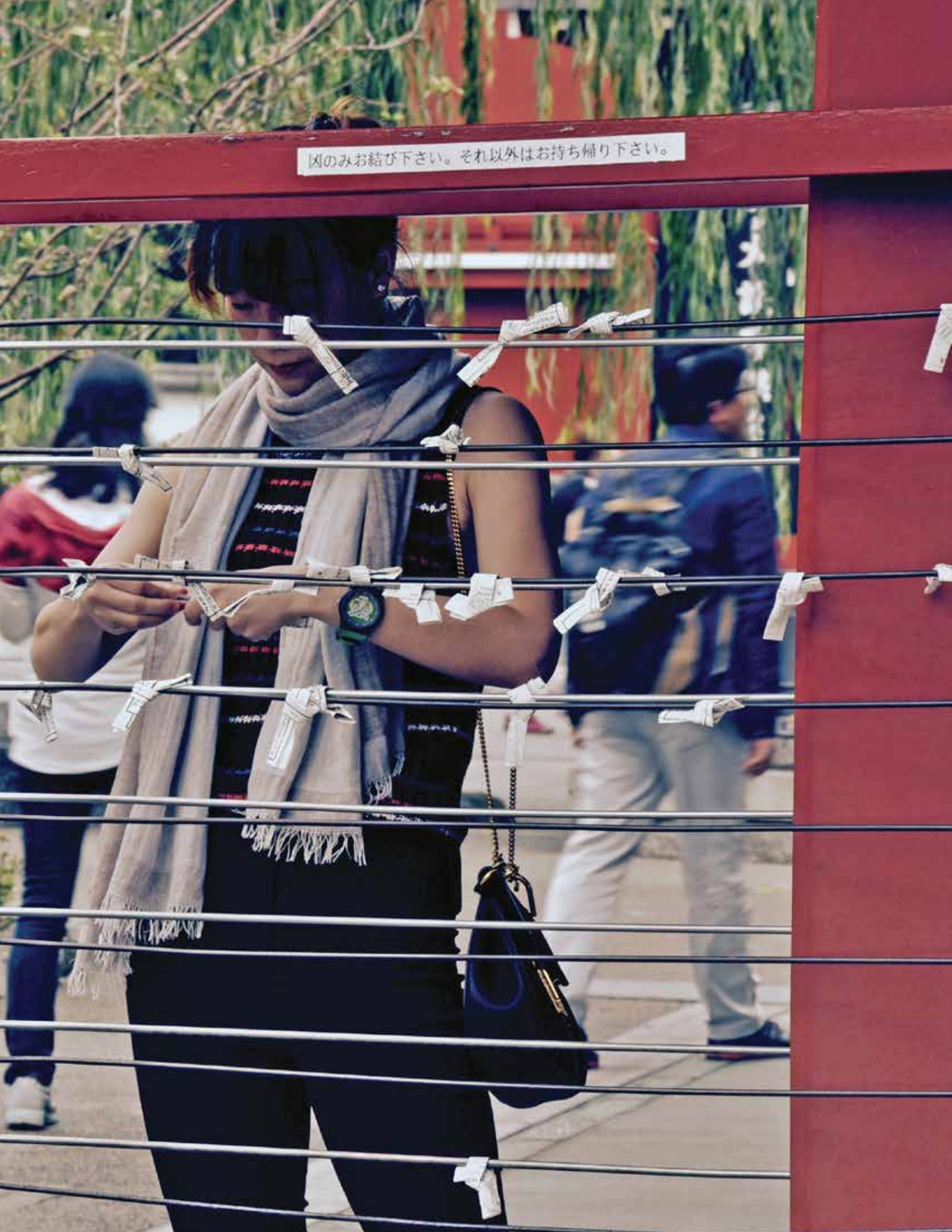
Seismic retrofitting (①)



Reinforced concrete side wall reinforcement (③)

Source: Revised Guidelines for Seismic Assessment and Seismic Reinforcement for Important Cultural Properties (Buildings): Case Studies, ACA, March 2017.

Sensō-ji temple, Asakusa, Tokyo.


凶のみお結び下さい。それ以外はお持ち帰り下さい。

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