

## Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University

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### Outline

Institute of Disaster Mitigation for Urban Cultural Heritage, Ritsumeikan University (R-DMUCH) based in Kyoto and Shiga, the rich repository of cultural heritage, has been aiming at establishing a base hub for education and research in “Disaster Mitigation of Cultural Heritage and Historic Cities.” This considers preservation of arts and culture and disaster mitigation measures to protect the community as a whole. Protection of cultural heritages and the surrounding historic cities, this only can be achieved through comprehensive research of various disciplines. This makes it possible to reflect development of technology and research outcomes into actual social policies. R-DMUCH aims to be a global leading education and research center that provides policies for the development of cultural and safe society both in Japan and the rest of the world.

### Research Groups

R-DMUCH consists of five academic research groups and a program.

**Historical Disasters:** Investigating the wisdom of disaster mitigation in the past by construction of database and mapping using GIS to analyze and verify the validity of wise practices in combination with the latest modern technology. **Human and Animal-Induced Disasters:** Developing social frameworks and technologies in order to protect cultural heritage from human-made disaster, as well as damage by animals such as raccoons, which has been reported to be increasing recently.

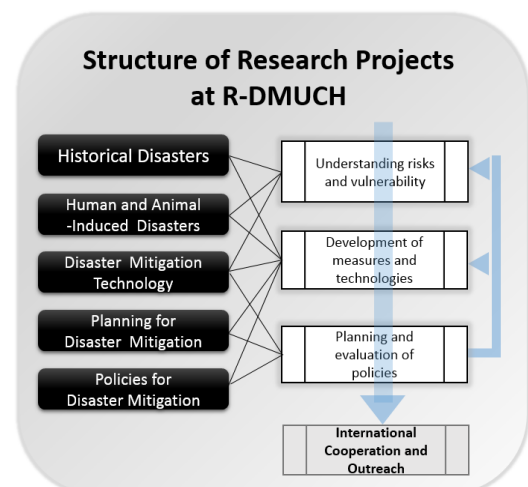
**Disaster Mitigation Technology:** Main threats of natural disasters at cultural heritage site are examined. Further, developing techniques that increase the resistance of cultural heritage in facing such hazards. **Planning for Disaster Mitigation:** Drawing up plans to provide for the suitable environment and conditions for disaster mitigation in historic cities. Establishing the requirements and evaluation methods, and promoting research for the disaster mitigation-based and historic town development. **Policies for Disaster Mitigation:** Promoting research on policies for compatibility between disaster mitigation for cultural heritage and tourism targeting cultural heritages. Also conducting research on policies and budget planning for the preservation and transmission of cultural heritage. **International Cooperation and Outreach:** Supporting training projects on disaster mitigation of cultural heritage in the world. Further, developing methods to share the information about disaster mitigation of cultural heritage by GIS technology to archive and open information gathered by five research groups.

### Outreach Activities

■ **Conference on Disaster Mitigation of Cultural Heritage and Historic Cities** and publication of the academic journal “**Disaster Mitigation of Cultural Heritage and Historic Cities**”

■ **International Training Course on Disaster Risk Management of Cultural Heritages** since 2006 in cooperation with relevant international organizations, such as UNESCO, ICCROM, etc.

■ **Map Contest for Community Safety** offering opportunities for school children and their parents to share the information about safety and security of their communities through making their original maps.



## Research Achievements and Challenges

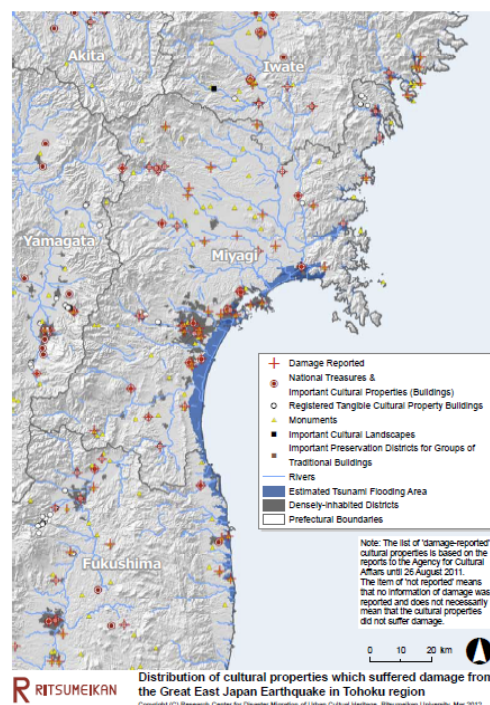
### Important research achievements

The major achievements of R-DMUCH activities are summarized in 'Handbook for Disaster Mitigation of Cultural Heritage' published in 2013. The handbook has English and Japanese versions so that it provides a comprehensive guide of concepts and items to be examined for protection of cultural heritages from disasters for both domestic and international readers. The activities of our five research groups are integrated into three broad stages of disaster mitigation of cultural heritages. **Understanding of risks and vulnerability** entails diverse activities of data collection and risk assessments of cultural properties associated with various kinds of disasters. **Development of measures and technology** covers both extraction of traditional mitigation from historical records and development of modern technologies to preserve cultural heritages in historic city settings. **Planning and evaluation of policies** develops guidelines and city plans to be carried out to attain the goal of disaster mitigation of cultural heritages in actual situations. Furthermore, R-DMUCH provides various **Outreach** activities, particularly the international training program on 'cultural heritage and risk management', on the basis of the research. Major topics and achievements at R-DMUCH are listed in the followings:



### Understanding of risks and vulnerability

- Geospatial information infrastructure was developed for managing and sharing disaster risks and vulnerability of cultural heritage and historic cities.
- To enhance the readability of hazard maps, the web GIS (geographic information system) site, 'Safety and Security 3D Maps of the Historical City of Kyoto', was released for disseminating hazard information over 3D cityscape through the Internet.
- The GIS based maps of geographic distributions of cultural heritages which suffered damage from the Great East Japan Earthquake were disseminated soon after the disaster occurred for supporting restoration of local culture in damaged areas.
- A nation-wide social survey revealed that not a small portion of sampled temples and shrines experienced crime and animal-cause damages to their sites and cultural properties.
- Field surveyed data of temples and shrines damaged by raccoons are analyzed in a GIS environment to obtain geographic features of the risk of raccoon invasion into historical wooden buildings in the vicinity of Kyoto-city.
- The databases of Kyoto disaster chronology from 8<sup>th</sup> century to the present and disaster articles in newspaper in modernization age were completed. These are expected to be fundamental information sources when the disaster history in Kyoto is examined.



### **Development of measures and technology**

- A new information system using mobile network to share alarms of fire outbreaks in a neighborhood was invented (patented) and tested by a pilot experiment in Sasayama-city and Miyama area in Kyoto.
- A high performance hydrant which is easily used by ordinary citizens even for their daily watering activities was developed (patented) and implemented by local residents in Higashiyama-ward of Kyoto-city.
- A specialized monitoring system was devised for prevention of man-made disasters, such as arson to historical buildings and robbery of cultural properties, at temples and shrines by detecting anomalous behaviors of persons monitored.
- Methods to assess traffic capacity in disaster situations were developed and applied to evacuation routes from the main historic attractions of Higashiyama-Ku, Kyoto-city.
- Hydrological analysis was conducted to evaluate countermeasures to flooding at the Ayutthaya world heritage site in Thailand.
- An agent based model was designed to evaluate evacuation measures and signs in Himeji Castle in Hyogo prefecture.

### **Planning and evaluation of policies**

- The comprehensive manual concerning aseismic and slow-burning repairing of historical buildings was edited for the preservation district for groups of historic buildings in Takayama-city.
- Several measures were proposed for not increasing vulnerability of historical buildings affected by the relaxation of Building-Standards-Law for promoting townscape conservation in historical zones.
- A gaming simulation was developed to learn economic policies of the Ayutthaya world-heritage site that seriously suffered from flooding.
- Assorted guidelines were formulated for water supply of disaster mitigation, prevention of slope disaster and transportation management in disaster situations in the context of historic cities.

### **Outreach/training programs**

R-DMUCH also aims to develop human resources that will be engaged in disaster mitigation of cultural heritage as researchers or practitioners. Especially we have offered an international training course on 'cultural heritage and risk management' as a UNESCO Chair Programme. Since 2006 we have annually implemented this program with invited practitioners and researchers of cultural heritage conservation and disaster prevention fields from various countries. The accumulated number of trainee reaches 80. This training opportunity has been taking on the role as an international network hub for the field. The training guide reflecting the essence of this program was published in English in collaboration with UNESCO and ICCROM. Besides, we held a follow-up training course in India, the 11th Ritsumeikan & Thammasat University joint workshops and several social events in cooperation with citizens via several organizations, particularly "tomorrow of Kyoto - cultural heritage platform".

### **Major research challenges**

- (1) Development of systematic methodologies to determine conservation priority of cultural heritage by considering both cultural values and vulnerability/risk,
- (2) Enriching collections of traditional wisdom for disaster mitigation both in domestic and overseas case studies for providing wider options of disaster mitigation measures in various contexts,
- (3) Advancements of state-of-the-art technologies to promote both the safety of cultural heritages and maintenance of their cultural values to empower policy makers, city planners and citizens, and
- (4) Accumulating practical studies of actual contribution to promoting disaster mitigation in historic cities.

## **Suggestions for the Disaster Research Roadmap**

Diverse culture and cultural heritage are indispensable elements for development of human society, but many important cultural heritages in the world have lost because of disasters year by year.

The impact of the Great East Japan Earthquake is not limited to tangible cultural properties such as buildings, historic sites, and famous locales. Intangible cultural heritage such as festivals and annual events also suffered damage from this disaster. For example, the props, costumes, and masks used for traditional dance forms as well as many of the individuals who embodied living cultural traditions were lost in the tsunami. In some regions, whole communities were displaced and scattered.

However, many survivors of this natural disaster found the impetus to recover through the shared culture that had been preserved within their local communities. Intangible heritage supported the resurrection of the spirit, and tangible heritage supported the inheritance of memory. They both provided the vital energy needed for the rebuilding of lives and the recovery of towns.

It is essential that we turn our attention to the disaster mitigation of cultural heritages and historical cities at the foundation of our daily lives. As we continue studying on disaster mitigation for cultural sustainability, we must ensure its inclusion in regional and national disaster preparedness plans and response systems. Capacity building and international network development on this research fields are also needed.