Institute of Disaster Mitigation for Urban Cultural Heritage

Ritsumeikan University

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Institute of Rits-DMUCH: Academic Disciplines

- Disaster and Mitigation
  - Architecture / Civil Engineering
  - Earthquake Engineering/Disaster Science/Urban Planning

- Conservation of Cultural Heritage
  - Preservation of Heritage
  - Art History/Historical Science/Conservation and Restoration for Cultural Properties Studies/
  - Historical Geography/Policy Science

- Protection of Cultural Heritage and Historic City

- Research and Development
- Human Resource Development
- International Contributions

- Disaster
  - Earthquake
  - Urban Disaster Fire, Flood, Land Slide
  - Man Made Disasters

- Properties
  - Artificial Handicraft/BUILDINGS/HISTORICAL CITY
  - Modern Heritage

For Worldwide Practice
Global Hub for Disaster Mitigation of Urban Cultural Heritage

Framework of Activities

Cultural Assets and Heritage
- Research Project
- Countermeasure/Package for Protection of Heritage from Disaster
- Research Platform
- Advancement of Research Practical Contribution

World-Standard Research Base

Young Researchers & Practicians
- Education Program
  - Dual Internship
  - Lecture & Presentation
  - On-site Training
  - Education Network
- Human Development
- Application
- Utilization

Only One Education Institution

World-Standard Experts

International Contribution

Global Hub for Disaster Mitigation of Urban Cultural Heritage
Research and Development

Research Projects

Cooperation
Interchange

1. Historical Disasters
2. Disaster Technology
3. Disaster Mitigation Planning
4. Animal/Man-made Hazards
5. Conservation Value and Policy
6. International Cooperation and Outreach

Development of Disaster Mitigation Package
→ Implementation

Mountain Side
Understanding
Proper Selection
Consideration
Development
Evaluation

Urban Area

Water Front

Country Side

Contingency Planning Package

Generalize

Global Education Program
FORMULATION of Disaster Risk Management Plan

**THEORY and METHODOLOGY** of Disaster Risk Management of Historic Urban Environment Located in *Earthquake Zone*

**LECTURES**

**SITE EXERCISE**

**CASE STUDIES** on Disaster Risk Management in *Kyoto and Each Site*

**WORKSHOPS**
: Risk Analysis Exercise, DIG…

**TEAM PROJECTS**
: Formulating Disaster Risk Management Plan for Historic Urban Environment in Participants’ Countries by Both Side Experts on Heritage Conservation & Disaster Mitigation

**Planning Process of Disaster Risk Management for Cultural Heritage**

Risk Assessment → Disaster Mitigation Plan → Emergency Response → Recovery Planning
Oversea Cooperation and International Contribution

- Cooperation with International Organization
  UNESCO, ICCROM, ICCOMOS, Asian Academy

- International Research Cooperation for Disaster Mitigation for Heritage
  Technical Aid, Collaboration and Sending Information on Disaster Mitigation Management

- International Educational Cooperation for Cultural Cities
  International Education Networks on Cultural Cities

Map showing collaborations between various countries and institutions:
- Poland: Krakow International Culture Centre
- Italy: Firenze Blanco Foundation
- Pakistan: National College of Arts
- Nepal: Tribhuvan Univ. IoE
- India: National Institute of Disaster Management
- Asia: Asian Academy
- Korea: Myongji University
- China
- Peru: National University of Engineering
- Taiwan: National Cheng Kung University
- Indonesia: University of Gadjah Mada
- Thailand: Thammasat University
- Ritumeikan
- India
- Nepal
- Pakistan
The Past and Future of Institute of DMUCH, Ritsumeikan

<table>
<thead>
<tr>
<th>Activity</th>
<th>21st COE</th>
<th>Global COE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual and NPO based Activity</td>
<td>Establishment</td>
<td>Global Implementation</td>
</tr>
<tr>
<td>Starting Up</td>
<td>Establishment</td>
<td></td>
</tr>
</tbody>
</table>

- **Establishment of Rits-DMUCH**
- The Director Kenzo TOKI got Prime Minister Award as the Frontier
- Establishment of Ph.D. Course
- Launch Complex Graduate School in 2011
- International Training by UNESCO Chair Program
- Start World-Wide Disaster Mitigation Projects
- Output Application Deliver Experts to the World
- Universal Mission
- Save Mankind, Protect Culture, Conserve Heritage

- **UN World Conference on Disaster Reduction (WCDR) in Kobe Ritsumeikan COE (Proposed Session)**
- Davos Conference
- The UNESCO Forum - University and Heritage as Host Institution
- Paris Conference Propose International Project on Disaster Mitigation for Cultural Heritage Ritsumeikan G-COE

17 Jan 1995 Hanshin-Awaji Earthquake
Thank you for your coming...

Please visit our website: http://www.r-dmuch.jp/en/
Earthquakes and secondary hazards (focus on Fire) over traditional buildings and Impact to livelihood

Research & Development for the Protection of Kiyomizu-dera Area from Fires Triggered by Earthquake in Kyoto

Takeyuki OKUBO
Prof. of Ritsumeikan Univ.,
Director of R-DMUCH,
Member of ICOMOS-ICORP,
Characteristics of Kyoto, Historical Wooden Cultural City of Japan

Structures: High percentage of wooden structures of traditional architecture (14 World Heritages, 15 National Treasures, 4 Important Preservation Districts of Historic Buildings, etc.)

The center of the city is densely-populated and vast.

Population: Higher percentage of persons age 65 and older than most cities, high percentage of persons who require assistance

Tourism: Many tourists, high percentage of persons unfamiliar with the area (Population: Approx. 1.5 million < Tourists: Approx. 50 million / year)
Cultural Heritages in KYOTO

World Heritage (wooden building); 14
National Treasure (wooden building); 15
Risk of Earthquake in KYOTO

The next one will be come in near future…
(Last one was in 1830)

Periodic Earthquakes in Every Century

3 Major Active Faults

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Imaginable Situations: Earthquake-Triggered Fires

• Since there are many narrow streets, even after an alarm, the possibility is high that fire-fighters may not make it to the scene, because of blocked roads, etc.

• The possibility is high that fire-fighting activities using hydrants and the emergency system of cultural properties could be disabled because of interrupted city water supply.

• The possibility of spreading fires is high, because of the inability to address multiple simultaneous outbreaks.

(Blocked road (Source: Yokohama HP)
Water pump damaged by earthquake disaster (ref: website of Iida city)
Fires after Hanshin-Awaji Earthquake (Source: Overseas HP)

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Response Policy in a Disaster Fire

- **It is not possible to rely entirely on governmental response in a disaster.**

- It is indispensable to develop a safe and secure living environment where instead of the city burning into ruin, **people can put out fires as soon as they break out.**

- **An uninterruptible “emergency water supply system” rooted in the area and the “fire-fighting power of the local community”** are important.

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Historical Districts in KYOTO

Site for Project

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For Establishing as Citizens’ Plan

○ To protect Cultural Heritages “with” surrounding regions is indispensable.

○ For building Safe and Beautiful Regions, “Citizens Participation” is indispensable.

1st Kiyomizu Residents’ Workshop (DIG) 
(16th/12/2004) 

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Work-flow of “Disaster Imagination Game”

Introduction

Group Classification & Map Making

Selection of the Treasurers to Protect

Draw the Condition of Predicted Damage

Image Fire Fighting Image Sheltering

Discussion and Brain Storming

Ex: By the areas of each Fire Corp.

- Where is the Water?
- Is the Fire Fight possible?
- What we need?

- about Issues
- about Ideas for provisions

- Collapse of Buildings
- Road Closures
- Suspension of Water Supply
- Electric Power Failure, etc.

- Does the roads work?
- Is there any space for sheltering?
- What we need?

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Example of workshop result 1 (disaster verification by citizens)
Example of workshop result 2 (ideas for provisions)
Necessary Performance of Firefighting Water

Efficient EWSS

To advocate
Fail-Safe / Redundancy

(1) from Diverse Water Resources
(2) for Multiple Fire-Fighting Phases
Started E.W.S.S. Project in Kiyomizu District from 2006

E.W.S.S. Project in Kiyomizu by Kyoto City from 2006～

To build the natural water (rain & river) network system for citizens’ and firemen’s usage

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E.W.S.S. Project in 2006 (1)
Rain Water Cistern and Pumping System

Koudai-ji Park

Water Pipe

1,500㎥ Rain Water Cistern

Pumping System

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Recent Condition of the First Cistern

- Rain Water Cistern (1,500t)
Recent Condition of the Pumping System

With Diesel Engine for Backup

(C) Kyoto City Department
E.W.S.S. Project in 2006 (2)
Shockproof Piping & Hydrants

Firefighting Equipments on road side (under construction)

Hose Box

Hydrants for Firemen

Hydrants for Citizens

Anti-seismic Pipe (polyethylene)

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Recent Condition of the Water Pipeline

Shock Proof Pipe (polyethylene)
Easy Hydrant System for Citizens’ Use

Wooden exterior for harmonization with atmosphere of historic district

Useable for daily basis
Scene of Fire Drill in 2008
Concept of [Easy Hydrant System] for Citizens (1st Fire-Fighting Stage)

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■ Site of Second Anti-seismic Cistern
(Completed in 2009)

Second Cistern is connected with existing water supply network for cross buck up.
1st stage; in case of small fire

2nd stage; firemen’s firefighting

3rd stage; in case of spread control
Research & Development of Equipments against Spread Fire

Water Shield System  WSS

延焼抑止街路壁面放水システム

延焼再現実験（壁面設定温度850℃）
約2分程度で延焼

WSS 放水実験（延焼抑止効果を確認）
延焼再現実験と同条件で加熱

放水冷却効果により
延焼に至らなかった。
壁面温度ほぼ260℃以下
加熱放水時間：7分
延焼防止に有効な
システムであると評価

特許共同出願中

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Water Shield System (W.S.S.) will be located on narrow streets between wooden building brocks.
Model Installation of Water Shield System in Houkan-ji Temple (completed in 2012)

(C) Kyoto City Department
Development Plan of Water Supply System in 2011 (by Kyoto City Department)
Natural Water Cistern on Underground River (under planning)

It is important to enable and invite the daily usage by citizens.

In this sense, river infrastructure that both makes the river accessible on a daily basis and secures a source of water for emergencies.

It is very effective for emergencies to use simple systems.
Natural Water Cisterns will be located on route of historic underground rivers as Kikutani-river and Todoroki-river.
Future Vision
(Comprehensive Disaster Fire Risk Management Plan)

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It is important for us to get back the natural water environment and communities in urban areas for protection of wooden cultural heritages from fire.

We should regenerate them to create a safe and natural environment that assures the preservation of wooden cultural heritage in the world, to leave for future generations.