

## **Workshop: Restoration of Disaster-affected Documents in Japan**

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### **【Abstract】**

First, Lecture will be provided to give an introduction to the history of rescue activities and the changing treatment methods for disaster-affected documents in Japan. The focus will be on how the coping strategies were devised and subsequently improved during the two key turning points in Japanese disaster history (namely, the Great Hanshin Earthquake of 1995 and the Great Tohoku Earthquake of 2011), as well as on current rescue activities (first response, triage or prioritization, various forms of drying work, etc.). Future challenges in archive rescue work will be also discussed. After the lecture, demonstration and hands-on practice will follow with a purpose to give as many archivists as possible some experience with the basic techniques used in those methods. Demonstrations and practice session will involve the following: (a) Natural drying (air drying): This method involves placing the wet documents vertically, and drying them by air with equipment such as a fan. (b) Absorption drying: This method involves placing sheets of absorbent paper between each page to absorb water and dry the document. (c) Washing and air streaming: This method was devised by the Tokyo Document Recovery Assistance Force, a volunteer group formed to rescue documents damaged in the Great Tohoku Earthquake. The system incorporates cleaning and drying methods which had been used outside of Japan, and is designed to be carried out in the manner of flow production. (d) Prep work for vacuum freeze-drying: With this method, documents are frozen and then placed in a vacuum so that the water sublimates directly from a solid to a gas. Because this method requires the use of a vacuum freeze drying machine, in this workshop, participants will experience the pretreatment stage only.

### **【Biography】**

Ms. Mutsumi AOKI

Associate Professor at the National Institute of Japanese Literature (NIJL). She has been playing a leading role in projects to rescue records damaged by the Great East Japan Earthquake of 2011. Her major focus of research has been archival preservation since she first joined NIJL in 1981. Her long-time contribution to enhance a better understanding on the importance of archival preservation brought her an achievement award from the Japan Society for the Conservation of Cultural Property in 2012. She also has rich teaching and training experience at various institutions including the Graduate School of Fine Arts at the Tokyo University of the Arts. She holds a bachelor's degree in history from the Rissho University.

Mr. Tomohiro AKUTSU

Chief of the Conservation Section at the National Archives of Japan (NAJ). He joined NAJ in 2007, after he had finished a course on paper conservation at the Istituto per L'Arte e il Restauro, Palazzo Spinelli in 2005.

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\* Ms. Maki TAKASHINA will read the text prepared by Ms. Mutsumi AOKI, Associate Professor at the National Institute for Japanese Literature.

# The Latest Restoration Techniques in Japan



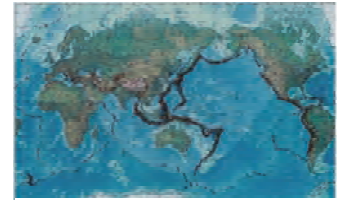
Maki TAKASHINA

## 0. Opening Remarks

### 0.1 Background of the Presentation

Restoration in times of emergency and disaster - Cases in Japan -

Japan is frequently troubled with disasters, and always threatened by natural hazards.



Hypocentral distribution in the world (Earthquake Research Institute of the University of Tokyo)



## 0.2 Aim of this presentation

The number of natural disasters has continued to increase in recent years.

We show how we rescue and restore documents damaged by disasters and that have rapidly deteriorated.

The aim of this presentation is to introduce and share how we prepare for disasters, know-how that we have developed in the restoration activities, and how we treat damaged documents with respect to each type of damage, and thus to establish ties with people in the world.

I hope our efforts will contribute to the further development of rescue and restoration techniques in the world.

## 0.3 Contents of the Presentation

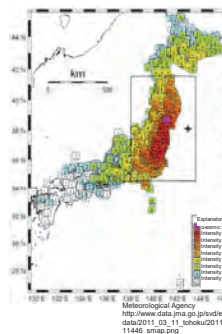
1. History of Natural Disasters That Japan Has Recently Suffered
2. Restoration after the Great East Japan Earthquake
3. Restoration of Private Archives
4. Restoration Techniques Applicable to Documents Damaged by Water
5. Conclusion

## 1. History of Natural Disasters That Japan Has Recently Suffered

Even after the Great East Japan Earthquake, Japan has suffered from many natural disasters including floods and earthquakes.

It is predicted that Japan may experience big earthquakes in the metropolitan area and the Nankai Trough (from off the coast of Shizuoka Prefecture to Shikoku and the coast of Kyushu) within 30 years from now with a probability of 70%.

## 1.1 The Great East Japan Earthquake in 2011



Debris in front of the disaster-stricken Kamaishi City Hall

### 1.2 Public Records and Archives Suffered due to Fire in 2015



Kamaishi City Hall, which suffered a second disaster due to fire after the Great East Japan Earthquake

### 1.3 Heavy Rains in the Kanto and Tohoku Regions in 2015



From Yomiuri Shimbun Newspaper: YOMIURI ONLINE  
[http://www.yomiuri.co.jp/photo/photo/geo/geo/15/150911\\_0YTS86079&g=CO018831](http://www.yomiuri.co.jp/photo/photo/geo/geo/15/150911_0YTS86079&g=CO018831)

- Joso City Hall. The first floor was swamped by river flooding.

### 1.4 The Earthquake in Kumamoto in 2016



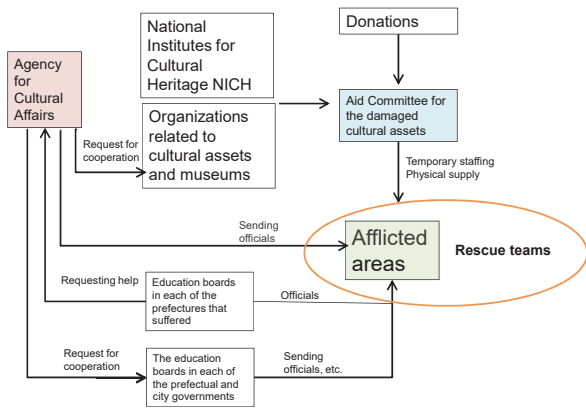
- Uto City Hall. The fourth floor collapsed.

### 1.5 Predictable Devastation with Respect to the Type of Disaster

	Damage by Fire	Damage by Water	Soilure	Break	Bad smell	Changes in color	Mold	Corrosion
Flood	-	●	○	○	○	○	○	○
Fire	●	●	○	○	○	○	○	○
Earthquake	○	○	○	○	-	○	○	△

## 2 Rescue Work after the Great East Japan Earthquake

### 2.1 Framework of the Rescue Work in Japan



### 2.2 The Structure of Organization for Activities



Organizations for rescue planning had engaged in tasks of coordination to facilitate activities smoothly. Necessary supplies were provided from institutions concerned and supporters of activities. Operations were exercised under collaboration with the Committee of Rescue for Damaged Heritage. For important issues concerned, we could accept advices from the viewpoint of restoration science by the Committee.

### 2.3 Personnel of Rescue Teams That Support the Activities

The photo shows rescue activities for official documents damaged by the East Great Earthquake at Kamaishi City Office.



Rescue teams that organized in devastated areas under the leadership of specialists, researchers, archivists, and curators are working in cooperation with volunteers to implement activities.

Since there are enormous number of materials, activities are seemed to take long duration, and, therefore, patient support and cooperation are required.

### 3 Restoration of Private Archives

#### 3.1 Private Archives Collections Held Privately

The center issue of this presentation is to introduce techniques for restoring official documents. For this purpose, before introducing official documents, the followings are cases of rescuing for comparison with archives.

113 items of the Yoshida Document influenced by the Earthquake, tangible cultural properties by Iwate prefecture, were treated cleaning, desalination and vacuum-freeze drying at Iwate Museum. After these measures, items are exercised cleaned and restored by conservators at the National Diet Library.

Archives, different from official documents, are recognized its importance, and are required permanent use and preservation. On the other hand, the quantity items of official documents is enormous, and these materials include time-limited documents that will be abolished after the deadline.

The restoration techniques applied to official document archives and ancient documents (designated as cultural properties) are different.

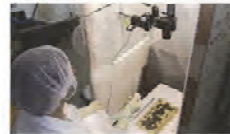
### 3.2 Validation Regarding Whether or Not Are Paper Documents Washable

Object	Drawing material	India ink Charcoal Pencil Pigment	Dye Watercolor Water-based ink
Japanese paper	Form Condition	Simple Good	Complex Fragile
Non-Japanese paper (medium-quality paper, high-quality paper)	Immersion /rinsing	Possible (including items requiring treatment for restoration to their original form)	Impossible

Reprinted from "Stabilization processes" of the Otsu Project for Conservation of Cultural Property Devastated by Tsunami (revised in 2015)

Devised by Hideo Akanuma of Iwate Prefectural Museum

### 3.3 First Stage Stabilization Process: Rinsing and Vacuum Freeze-Drying



1. Photography



2. Protection with non-woven fabric



3. Rinsing with tap water



4. Cleaning and sterilization using a sodium hypochlorite aqueous solution at a concentration of 400 ppm

Reprinted from "Stabilization processes" of the Project for Conservation and Restoration of Cultural Property Devastated by Great Tsunami (revised in 2015)

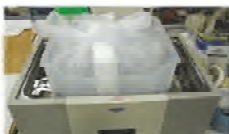
### 3.3



5. Desalination using tap water

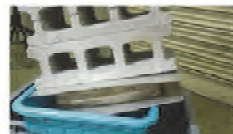


6. Measurement of the chloride ion concentration contained in the desalination liquid



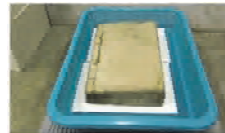
7. Ultrasonic cleaning using tap water

8. Ultrasonic cleaning using purified water



9. Water removed using additional pressure

### 3.3



10. Natural air drying (partial drying of the asset)



11. Examination of a document dried naturally



12. Protection with oil-proof paper and nonwoven fabric



13. Preliminary freezing

3.3



14. Vacuum freeze-drying



15. Document sterilization (fumigation by sterilizer)

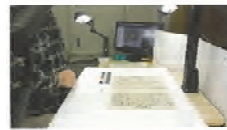


16. Examination of fumigated documents



17. Emergency repair of detached portions

3.3



18. Digitalization of old documents

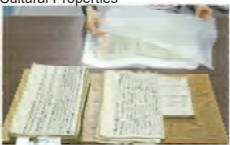


19. Storage in a box made from acid-free paper.



20. Follow-up observation

3.4 The Second Stage: Restoration of Damaged Ancient Documents Designated as Tangible Cultural Properties



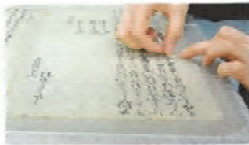
1. Pre-washing preparation



2. Washing



3. Flattening out of wrinkled and folded areas



4. Mending

3.4

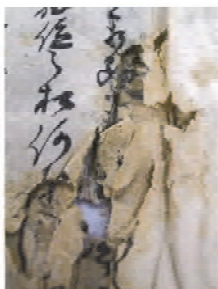


5. Leaf casting machine

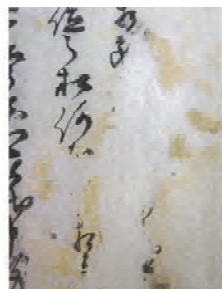


6. Repair process using a leaf casting machine

3.4

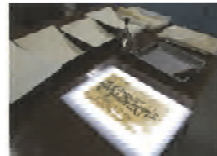


7. Pre-casting



8. Post-casting

3.4



9. Front cover repair



10. Binding



11. Treated documents placed in newly created folding cases for book storage

## 4. Restoration Technique Applicable to Documents Damaged by Water

### 4.1 Restoration of Public Records and Archives

Public records are critical for the lives of the residents and also for administrations because of its accountabilities. Furthermore, these records are constituting an important part to transmit memories of the communities to future generations.

When local governments are damaged, the local officials should help and deal with the victims first through such as managing shelters, issuing Disaster Certificates and so on. Therefore, it is difficult for administrative officials to rescue the records only by themselves.

After the occurrence of the Great East Earthquake, the National Institute for Japanese Literature, the National Archives of Japan, archival agents nationwide and other groups concerned had engaged in operations of research, rescue and support.

## 4.2 Scope of the Rescue and Restoration Techniques Covered by This Presentation

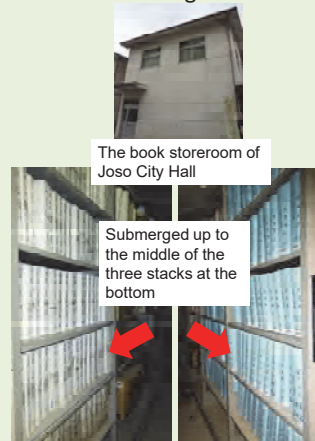


Joso City, Ibaragi Prefecture  
Devastated by the flood caused by heavy rains in the Kanto and Tohoku regions in September, 2015

## 4.3 Summary of Damaged Documents at Joso City Hall

**Joso** Freshwater (of rivers)  
 Number of damaged items: Approx. 25,000 items  
 Historical documents that are not currently used  
 → There were archives among the damaged documents.  
 Characteristics: They are moldy.  
 Items that are impossible to natural drying are involved.  
 They are movable outside of the city.  
 → Can apply vacuum freeze-drying.  
 Start Date of researching the situation: 25 September, 2015  
 Start Date of rescuing: 30 September, 2015 (20 days after the disaster)

### 4.3.1 The Damaged Book Storeroom of Joso City Hall



The book storeroom of Joso City Hall, which archived the documents to be preserved permanently, was damaged by the river flood caused by heavy rains in the Kanto and Tohoku regions. The damaged storeroom was located on the first floor of the two-story building. The lower three stacks at the bottom of the entire six stacks of the shelves were submerged. The shelves were power-operated; although local officials took out the documents in the bottom stack, they could not move everything out because the power was out. The shelves were submerged before everything was moved out. The photos show the book storeroom that two weeks have passed from the disaster. The bottom stack is empty because the documents were moved out.

### 4.3.2 The Disaster Situation of Joso City Hall



Approximately 20,000 documents that are to be preserved permanently were damaged at Joso City Hall by river water (freshwater). Among such documents, there are archives of administrative documents that the city took over from the amalgamated town/village before amalgamation and the official documents created after the amalgamation. They are historical records to see the truth of the administrative management. Affected documents are the document to be preserved permanently. They are managed as archives rather than historical records. Necessary documents on the business are managed by the relevant section, therefore, they are not used to browse frequently. a document it was possible to move to the area. For this reason, these documents were possible to be moved to outside of the town.

### 4.3.2 The Disaster Situation of Joso City Hall



The damaged documents were soaked. There were enveloped documents whose envelopes were difficult to peel off because water entered the envelopes and a long time had passed without draining. As a result, the documents and the envelopes adhered together firmly. Also, mold grew on those parts exposed to air. Black mold especially proliferated. Japanese paper is used for most of the documents; there were documents damaged by insects and rats before the disaster.

#### 4.4 Material Used for New Rescue and Restoration Methods (1)

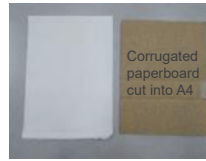


##### Paper towels

Sold at supermarkets and home centers, these are easily available even in devastated areas. Excellently absorbent, we used them in order to accelerate drying of the documents.



#### 4.4 Material Used for New Rescue and Restoration Methods (2)



##### Cardboard sandwiched between paper towels

Most of the relief supplies arriving at the devastated sites were packed in cardboard boxes; therefore, there were plenty of cardboard boxes available.

Most of the documents were A4 size. We cut the cardboard into A3 size and sandwiched it between paper towels. We consumed large quantities of cardboard, but it was easy to make. We could ask volunteers in remote areas to make and send them.

#### 4.4 Material Used for New Rescue and Restoration Methods (3)



##### Cushion compression bags

Just like paper towels, cushion compression bags were easily available because they are sold at home centers and on the Internet in Japan.

As they can be sealed, we could pack heavily molded items in them in order to move them preventing inhalation of mold, while absorbing water and drying the documents at the same time.

They were useful for keeping confidential documents.



#### 4.5 Rescue and Restoration Processes for the Damaged Documents in Joso City

##### Can dry naturally



##### Cannot dry naturally



First, we roughly classified the documents by the level of soaking damage and whether or not they can be dried naturally, and we then treated them by a method that suited their respective needs. We rescued and restored the documents mainly by the following two types of process.

It was easy to see that copy paper and thick Japanese paper can be dried naturally. However, regarding paper made by machine and thinner booklets made of Japanese paper, we thought that it would be difficult to plump out wrinkles, fix them, and let them dry naturally.

#### 4.5.1 Rescue and Restoration Processes for the Damaged Documents in Joso City(1)

For documents that are entirely damaged by water and are highly moldy, and cannot be dried naturally

Conditions: they are transferable

Remove from the book storeroom → Move to the drying site

Rinse in ethanol

Freeze

Vacuum freeze-dry

Open the booklets and clean

Status quo

Loosen the bindings, and rinse and dry

Rebind

※As of August 2016, we completed refrigeration and are waiting to vacuum freeze-dry.

#### 4.5.2 Rescue and Restoration Processes for the Damaged JOSO City(2)

For documents that are partly damaged and can be dried naturally

Conditions: they are transferable

Remove from the book storeroom

Move to the drying site

Rinse in ethanol

Apply the drying method with paper towels

Open the booklets and clean

Loosen the bindings, and rinse and dry

Rebind

Status quo

Status quo

※We did not loosen the bindings, and rinse, dry, and rebind all the documents.

#### 4.6 New Methods Implemented in Rescuing and Restoring the Damaged Documents of Joso City

##### Drying technique

- Drying using paper towels

For documents that can be dried naturally, we applied the drying technique using paper towels.

##### Vacuum freeze-drying

##### Rinsing

- Technique using floating boards
- Technique using air stream

For documents that cannot be dried naturally, we moved the documents out of the city and applied the technique of vacuum freeze-drying.

Also, although these techniques were not applied to all the documents, if the documents are expected to be stored over a long period of time as historical documents, we rinsed and dried them with floating boards and air stream method.

#### 4.7 Rescue and Restoration Processes for the Damaged Documents in Joso City

##### 4.7.1 How we took out the documents from the book storeroom, and put a number to each one of the documents



- We put a number to each one of the documents.

We put a number to each one of the shelves as we did in Kamaishi City Hall, and then also put a number to each one of the documents in order to restore the removed documents to their original state. By doing this, we could know exactly where on which shelves the documents were stacked.



The photo shows the document that was stacked on shelf "8-3-2".

The numbers were put in the order of "shelf# - row# - column# - document#".

In this case, the document was stacked on shelf 8, row 3, and the second column from the bottom. The document number is put at the same time it is removed from the shelves.

##### 4.7.2 Taking out the documents from the book storeroom and transferring them to the drying site



We put the documents removed from the shelves in containers and transferred them from the book storeroom for long-term storage to a different building on the City Hall's property that is used as the drying site. We used a pickup truck to transfer the documents.

The photo on the bottom shows how we lined up the documents transferred to the drying site, confirming the numbers put.



##### 4.7.3 Rinsing in Ethanol Where Mold Grows



We rinsed the documents damaged by mold with absolute ethanol at 75% dilution in order to soak the entire documents in ethanol.

When rinsing, we covered the documents with unwoven cloths. We used brushes to remove mold where mold had taken root.



##### 4.7.4 Freezing before Vacuum Freeze-Drying

For documents that are completely damaged by water, mold grows and they cannot be dried naturally.



For documents that cannot be dried naturally, we wrapped them up with plastic wrap over the unwoven cloths, leaving some room on the top, and put them in plastic bags and stored them in a freezer. Currently, they are waiting to be vacuum freeze-dried.



##### 4.7.5 Drying Method Using Paper Towels

For documents partly damaged by water and that can be dried naturally.



As we did in Kamaishi City Hall, we separated the files and the documents first. Then, dividing the documents into 2-3 cm in thickness, we sandwiched each one of them between paper towels arranging the shapes fixing dog-ears and warps in order to expedite water absorption.

We dried them naturally opening the windows and using electric fans.

Confirming the drying state as needed, we changed the paper towels for the documents whose drying process was slow in order to expedite water absorption.

When we found mold while checking the drying state, we removed the mold using brushes as needed.





#### 4.7.6 Opening the Booklets and Cleaning



For documents that are not rinsed, we cleaned them while they were open with scrubbing brushes, sponges, micro cloths, and paint brushes, as we did in Kamaishi City.

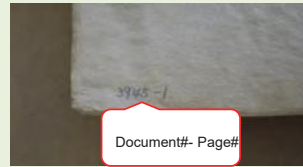
#### 4.7.7 Preprocessing of the Documents to Be Rinsed

Putting numbers to the documents as preprocessing work before rinsing



Before we rinsed the documents, we loosened the bindings and put document numbers and page numbers at the bottom of each page inconspicuously.

We followed the guidance of the National Archives of Japan as to how to clean, rinse, dry the documents.



#### 4.7.8 Cleaning with Boxes for Dry Cleaning



Using boxes for dry cleaning, which are made of acid-free paper and acrylic board, we brushed and cleaned each one of the pages of the documents.

There is a suction port at the bottom of a dry-cleaning box to connect to a vacuum cleaner. The cleaner vacuums powder dust, preventing us from inhaling the dust while cleaning.

We used soft-bristled drawing brushes for this.



#### 4.7.9 Cleaning with Floating Boards



The method was introduced to clean damaged documents in large-scale libraries and archives in Florence in 1966.

The method of cleaning using floating boards and air stream was introduced by the "Tokyo Document Recovery Assistance Force" in Japan as a method of rinsing and drying damaged documents safely after the Great East Japan Earthquake.

#### 4.7.10 Preprocessing and Cleaning for the Method Using Floating Boards



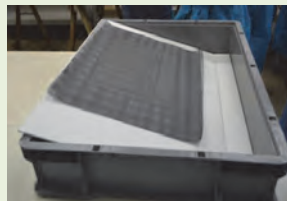
Sandwich each page of the document between two screens cut from a screen door. Spray ethanol at 70% dilution onto each one of the pages.

Prepare a vat filled with water and float a plastic form board. Place the screen that is sandwiching the page. Push the board gently with hands and get the dirt out with a brush.

Turn the board over and repeat the same process to clean both sides.



#### 4.7.11 Draining after Rinsing, and Preprocessing before Drying



Drain water from a corner of the vat.

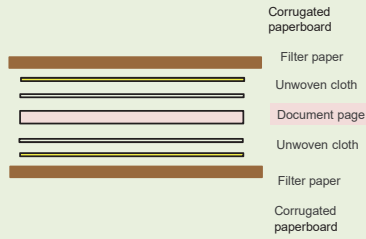
Using another vat that is not used for the process, lean the foamed plastic board upon the vat at an inclined angle. Put the screen on it to drain water.

Use a PVA sponge towel, which has a high water absorption rate, to dry the board.

Take the screens one by one and exchange them with unwoven cloths.



#### 4.7.12 Drying Method Using Air Stream

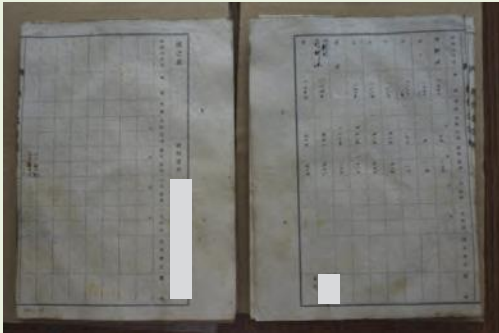


As is shown in the above chart, sandwich each page between corrugated paperboard and pile them up. Apply wind so that the wind passes through the cracks of the corrugated paperboards for drying. It takes about 3-4 hours to completely dry. With this method, you do not have to change absorbent paper.

#### 4.7.13 Before Rinsing



#### 4.7.14 After Rinsing



### 5 Conclusion

What it takes to realize and diffuse “rescue measures that anyone can do”

1. Anyone can do it easily and safely using everyday materials.
2. Show the appropriate work procedure so that anyone can work effectively.
3. Specialists who can observe the process at the site and make an accurate judgment are required.

【Role of the specialists】



### 5 To introduce the preservation techniques



The photo above shows the collaborative workshop organized by Joso City and the National Archives of Japan.

After the Great East Earthquake, many persons have been interested in rescue techniques for damaged documents.

As preparation for disaster, if widely diffused rescue skills in advance are spread, it is enable to deal with more documents appropriately. It is important to understand these techniques for not only specialists, but also ordinary persons. Furthermore, it is required to publicizing these techniques for faster response to disaster.

It is planned to make a guideline and a website to introduce preserving skills of documents actively in both of English and Japanese.