Dealing with Disaster Wastes in Japan

Prof. Shinichi Sakai, Kyoto University
Points:
- Flood & Storm (CC impact)
- All Region
- Asia (+ Urbanization)

Data Source: Center for research on the Epidemiology of Disaster
March 11, 2011

• 14:46 the Great East Japan Earthquake
  – M 9.0 (depth 24km) [2nd M 8.2; World 4th, 1900-]
  – 130km away from the seashore

• 16:00 Tsunami
Establishment of the JSMCWM (Japan Society of Material Cycles and Waste Management) task team

- **By 14 March**, many suggestions from young researchers of JSMCWM (Japanese society of material cycle and waste management) to deal with disaster waste.

- **18 March**: The Task team on Disaster Waste Management and Reconstruction was established.
  - More than 150 members, including not only researchers but also private engineers, citizens and personnel related to local authorities.

- Opinions and information have been exchanged actively through a website and a mailing list.
  - http://eprc.kyoto-u.ac.jp/saigai/
The objectives of establishing the task team

1. Establishment of a platform for information about disaster waste.
2. Networking of different stakeholders for better management against disaster waste.
3. Documentation and dissemination of experiences and knowledge obtained through activities in disaster area (Revision of the Japanese guidelines).

One of the major tasks was to make the manual “Strategy of separation and treatment of disaster waste” which is taken into account ....
Existing guidelines for disaster waste (2011)

- **In Japan**…2 Guidelines
- **In other countries**…US FEMA, EPA and some states in USA etc.
- **In the World**…
  - The WHO Technical Notes on Drinking water, Sanitation and Hygiene in Emergencies etc.

No information about TSUNAMI wastes or detailed management techniques
Field activity and fact (issue) finding from 25th March 2011

Development and dissemination of the manual

1st version (30 pages) on 4 April 2011

A book published in May 2012
Separation from the beginning

Wait their turn and report items

Sorted storage (e.g. WEEE)

Metals

Mixed waste (to separation)

Wood, tires, combustible waste, dishes, concrete, etc.

In Sendai city (2011)
Special care for some items

Governmental staff of Sendai city collected memorabilia. Volunteers removed dirt from them and posted at the entrance of a cultural center for finding. (April 2011, Sendai city)
Recycling for disaster waste

Almost 100% of Tsunami sediment (11,000 ton) was recycled.

Disaster waste components (1,000 ton; wet weight) beside Tsunami sediment:
- Concrete: 10,340
- Combustible: 2,554
- Incombustible: 4,783
- Metal: 654
- Wood: 1,346

Treatment method of disaster waste (1,000 ton; wet weight) beside Tsunami sediment:
- Recyclinng: 16,062
- Incineration: 2,384
- Landfill: 1,232

Improvement and challenges

Disaster waste-related system and guidelines centered on the Basic Disaster Countermeasures Act and Waste Disposal Law

Before disaster:
- disaster waste management plan

After disaster:
- disaster waste management implementation plan for Disaster X
- Disaster Waste Countermeasure guidelines, action guidelines/plans for large scale disasters
- disaster waste management guidelines for Disaster X

Continuous issues and progress of disaster waste measures

1. Cultivating knowledge from and reflecting on small scale disasters
2. Executing a system with progress in wide-scale coordination (connected to Basic Waste Disposal and Public Cleaning Policy and grants)
3. Investigating whether the 3Rs are being implemented for cultivated stock materials
4. Sharing experiences of disaster measures with various places around the world and international coordination

Great East Japan Earthquake (2011): management required a long period of time, became a social problem
A Strong Nankai Trough Earthquake: estimates of being over 10 times stronger than the Great East Japan Earthquake
Responses to the disasters constantly occurring every year (frequent and large scale)
Example of improvement in Japan after 2011 earthquake and Tsunami

- Waste Management Law
- Disaster Risk Management Basic Law
- Master Plan
- Disaster Waste management Policy
- DWM Master Plan
- Waste Management Plan
- Disaster Risk Management Plan (Regional/Prefectural)
- DWM Action Plan
- Municipal Waste Management Plan
- Disaster Risk Management Plan (City level)
- DWM Action Plan
- National
- Regional
- Prefectural
- City
- Town
- Village
- DWM Policy
- DWM Implementation plan
- Disaster
Disaster Waste Treatment Network (D.Waste-Net)
(Established on Sep.16, 2015)

MOE (Secretariat)

Group for initial motion/emergency response (initial)
- To secure/manage temporary storage sites, on-site support on how to treat items difficult to dispose of, etc.
- To support for collecting, transporting and disposing of residential waste (incl. waste from shelters) and clean up waste and so on

Group for recovery/restoration (medium to long term)
- Technical support for drawing out a disaster waste management action plan
- To construct a scheme to implement disaster waste disposal over wide areas, to coordinate acceptance at disposal facilities, etc.

Regional Environment Office (MOE)

Regional Block Network

- National Institute for Environmental Studies
- Japan Environmental Sanitation Center
- Japan Waste Management & 3R Research Foundation
- Japan Waste Management Association, etc.

- National Federation of Industrial Waste Management Associations
- Japan Federation of Construction Contractors
- Japan Cement Association
- Japan Federation of Coastal Shipping Associations, etc.

Municipal Governments

Source: MOEJ
Kumamoto Earthquake in 2016

- Outline of Kumamoto Earthquake:
  - Foreshock: Magnitude 6.5 beneath Mashiki town on April 14, 2016
  - Main shock: Magnitude 7.3 beneath Mashiki town on April 16, 2016

- Human damage: Death toll: 244
  Injured: 2,709

- House damage: Completely destroyed 8,664
  Half destroyed 34,026
  Partly destroyed 147,742

(As of Aug. 10, 2017)
## Amount of disaster waste generation classified by material type in Kumamoto Earthquake

<table>
<thead>
<tr>
<th></th>
<th>Waste disposal amount/estimated waste generation amount</th>
<th>Waste concrete</th>
<th>Waste wood</th>
<th>Waste metal</th>
<th>Others (remaining materials)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>Mixed waste (landfill)</td>
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<tr>
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<td></td>
<td></td>
<td>Combustible material</td>
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<td></td>
<td>Tile</td>
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<td></td>
<td></td>
<td></td>
<td>Others</td>
</tr>
<tr>
<td>Apr.- Aug. 2016</td>
<td>Disposal amount (thousand ton)</td>
<td>471</td>
<td>137</td>
<td>45</td>
<td>153</td>
</tr>
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<td></td>
<td>Ratio (%)</td>
<td>100.0%</td>
<td>29.1%</td>
<td>9.6%</td>
<td>0.9%</td>
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<td>32.4%</td>
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<td>14.5%</td>
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<td>9.6%</td>
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<td></td>
<td>3.8%</td>
</tr>
<tr>
<td>Sep. 2016 - Mar. 2018</td>
<td>Estimated generation amount (thousand ton)</td>
<td>2,422</td>
<td>1,233</td>
<td>411</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Ratio (%)</td>
<td>100%</td>
<td>50.9%</td>
<td>17.0%</td>
<td>0.4%</td>
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<td>10.9%</td>
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<td>2.6%</td>
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<td>10.4%</td>
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<td></td>
<td>7.9%</td>
</tr>
<tr>
<td>Total</td>
<td>(thousand ton)</td>
<td>2,893</td>
<td>1,371</td>
<td>456</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Ratio (%)</td>
<td>100%</td>
<td>47.4%</td>
<td>15.7%</td>
<td>0.5%</td>
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<tr>
<td></td>
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<td>14.4%</td>
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<td>4.5%</td>
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<td>10.3%</td>
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<td>7.2%</td>
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</tbody>
</table>

**Note:** Some totals don’t match due to calculations after decimal point rounding.

- **Waste generated mainly by household clean up**
- **Waste generated mainly by buildings demolition**
West Japan Flooding Disaster in July, 2018

- Outline of West Japan Flooding:
  - Heavy rain in western area as total of 1,200 – 1,800 mm during July 5 and 8, 2018
  - Most heavy main in 24 hours: 691 mm in Kochi prefecture

- Human damage:
  - Death toll: 220 (missing 9)
  - Injured: 366

- House damage:
  - Completely destroyed 5,851
  - Half destroyed 10,117
  - Water exposure damage 28,904

(As of July 31, 2018)

https://www.sankei.com/smp/west/news/180709/wst180...
Disaster Waste in West Japan Flooding 2018 (Tentative)

- Amount of Disaster waste: 2.9 million tons
  - Okayama Pref.: 413 thousand tons
  - Hiroshima Pref.: 1,958 thousand tons
  - Ehime Pref.: 530 thousand tons

- Heavily mixed waste just after cleanup activities
- Debris and waste mixed with soil and sand in Hiroshima and Ehime Prefectures
# Amount of Disaster Waste Generated in Japan

<table>
<thead>
<tr>
<th>Disaster</th>
<th>Year</th>
<th>Amount of Disaster waste</th>
<th>Amount of destroyed houses</th>
<th>Treatment Period</th>
</tr>
</thead>
</table>
| Great East Japan Earthquake      | March, 2011     | 31 million t             | Completely destroyed: 118,822  
Half destroyed: 184,615  | 3 years (excl. fukushima) |
|                                  |                 | (incl. 11 million t of tsunami waste) |                                                                                           |                  |
| Great Hanshin-Awaji Earthquake   | January, 1995   | 15 million t             | Completely destroyed: 104,906  
Half destroyed: 144,274  
Partially destroyed: 390,506  
Destruction by fire: 7,534 | 3 years          |
| The 2004 Mid-Niigata Earthquake  | October, 2004   | 0.6 million t            | Completely destroyed: 3,175  
Half destroyed: 13,810  
Partially destroyed: 103,854 | 3 years          |
| Hiroshima Landslide Disaster     | August, 2016    | 0.58 million t           | Completely destroyed: 179  
Half destroyed: 217  
Partially destroyed: 189  
Water exposure damage: 4,164 | 1.5 years        |
| Kanto-Tohoku Heavy Rainfall      | September, 2015 | 0.093 million t (estimation) | Completely destroyed: 53  
Half destroyed: 5,054  
Water exposure damage: 3,220 | 1 year           |
| Kukamoto Earthquake              | April, 2016     | 2.89 million t           | Completely destroyed: 8,664  
Half destroyed: 34,026  
Partially destroyed: 147,742 | 2 years          |
| West Japan Flooding 2018         | July, 2018      | 2.9 million t            | Completely destroyed: 5,851  
Half destroyed: 10,117  
Water exposure damage: 26,904 | ???              |
## Amount of disaster waste generated

<table>
<thead>
<tr>
<th>Year</th>
<th>Disaster</th>
<th>Amount of waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>The Great East Japan Earthquake</td>
<td>31 million t</td>
</tr>
<tr>
<td>2010</td>
<td>2010 Haiti earthquake</td>
<td>Around 23 - 60 million t</td>
</tr>
<tr>
<td>2009</td>
<td>Terremoto dell’Aquila (Italy)</td>
<td>Around 1- 3 million t</td>
</tr>
<tr>
<td>2008</td>
<td>2008 Sichuan earthquake (China)</td>
<td>20 million t</td>
</tr>
<tr>
<td>2005</td>
<td>Hurricane Katrina (U.S.)</td>
<td>76 million m$^3$</td>
</tr>
<tr>
<td>2004</td>
<td>Hurricane Frances &amp; Jeanne (U.S.)</td>
<td>3 million m$^3$</td>
</tr>
<tr>
<td>2004</td>
<td>2004 Indian Ocean earthquake and tsunami</td>
<td>10 million m$^3$</td>
</tr>
<tr>
<td></td>
<td>(only in Indonesia)</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Hurricane Charley (U.S.)</td>
<td>2 million m$^3$</td>
</tr>
<tr>
<td>1999</td>
<td>Marmara earthquake (Turkey)</td>
<td>13 million t</td>
</tr>
<tr>
<td>1995</td>
<td>The Great Hanshin-Awaji Earthquake (JPN)</td>
<td>15 million t</td>
</tr>
</tbody>
</table>

*Note: Some modification was made on review article by Brown et al.*
Aiming at reinforcing local measures for disaster waste, the Regional Environmental Offices sponsored and called for many municipalities, operators, etc. which potentially get involved in waste disposal in their district to participate and established 8 district block conferences nationwide.

As preparation during ordinary times, they coordinated parties concerned, aiming at drawing out an action plan for managing disaster waste by district block, and advised municipalities on how to draw out a disposal plan and cooperate in drills by municipalities, to begin with, aiming at holding joint drills in district blocks.

**Actions of Regional Block Network, etc.**

① Management of Regional Block Network, etc.
② Generation of action plans to manage disaster waste by regional block, etc.
③ Seminars/visit tours for municipalities, etc.
④ Support for devising an action plan for disaster waste management by municipalities
⑤ Joint drills in regional blocks
⑥ Basic research/technical research of actual situations of regional blocks
⑦ Generation of cartularies, etc. of disaster waste disposal of disasters which occurred

**Members**

Ministry of the Environment, Local branch offices of relevant government offices, Prefectures, Major municipalities, Experts of municipalities, etc.

*Source: MOEJ*
Support for Municipalities

Ministry of the Environment, Japan has supported the development of disaster waste management plan by municipalities by implementing 22 model projects from fiscal year 2015 for achievement targeted in Fundamental Plan for National Resilience (the development rate of disaster waste management plan: 80% of prefectoral governments and 60% of municipal governments). It’s expected also to put 72 model projects into effect until this fiscal year.

1. Development of disaster waste management plan

   - Item on occurrence scale of disaster waste
     • Amount of disaster waste and sewage generated
     • Amount of disaster waste according to the constitution
     • Necessary number of collection and transportation vehicles
   - Item on temporary storage sites
     • Estimation of amount of disaster waste generated by demolition process of collapsed houses
     • Calculation of the area of sites considered how to store disaster wastes
     • Selection of candidate sites where the topographical conditions are considered
     • Study on types of segregation of disaster waste and layout of sites
   - Item on disaster waste disposal
     • Study on disposal flow including segregation
     • Study on possible amount of disaster waste disposal in existing treatment facilities
   - Another related items
     • Implementation of exchange of views among municipalities, scholarship and regional environment office etc.
     • Field survey of candidate temporary storage sites etc.

   Support for development of disaster waste management plan by municipalities through the above studies

2. Proper handling of hard-to-handle items generated in the event of a disaster

   - Study on types and amounts of hard-to-manage wastes to disposal considering with regional characteristics
     • For example, waste of marine products, fishing nets, automobiles, leak of the oil from a large crude oil tank due to earthquake and tsunami damage
   - Proper treatment methods for hard-to-handle wastes
     • Study on processing flow according to type of waste
     • Study on proper storage and transportation of wastes
     • Hearing survey on acceptance in waste disposers and recycler etc.

3. Training on disaster waste treatment

   - Solution to problem of the disaster waste treatment system which become clear by the training
   - Feedback the solution to the local government’s disaster treatment system which is planned in disaster waste treatment plan
Current Disaster Waste Management (DWM) practice (Asia and the Pacific)...

- Ad-hoc response
- No systematic approach
- Lack of coordination
- Improper action

No review for relevant documents including plans and guidelines, (need more practically utilized)

- Need to reflect Asia and the Pacific context
- Lessons learnt and know-how accumulated in Japan especially after the Great East Japan earthquake and tsunami 2011
Policy of the Guideline

- Main Target: National, Local government officers in charge to be **practically utilized**
- Align with the **context of Asia and the Pacific** including **case studies**
- Prioritize “**Preparedness**” activities for emergency response in current **Waste Management System in place**
- Include **lessons learnt** accumulated in Japan, other Asian and the Pacific region
- Discuss the strategy to request for **necessary assistance** on DWM
- Highlight Continuous Process of **DRR/Resilience Building integrated the CCA context through DWM** (Enhance current waste management system to respond DWM)
- Discuss **outreach** of the Guideline to be practically used in Asia and the Pacific including being used as a training material
- **Collaborate** with UN Env./OCHA, MSB, JICA, SPREP and other stakeholders
Current Progress

- Systematic Review for DWM relevant case study reports and guidelines
- Review of institutional framework relevant to DWM in Asia and the Pacific
- Identify challenging issues on DWM
- Draft framework of the preparation for planning on DWM
Phase

Focused area

Planning (Development of Process) Process

Practices (Technical Aspect)

Monitoring/Review (Reporting/Review process)

Initial Response (Organize the DWM team)

Emergency (Assessment/Emergency Response)

Early Recovery

Recovery

Reconstruction

Range Covered

Theme specific and covered range

Disaster Waste Management Guidelines/MSB, UNEP/UNOCHA (2011)

Guidance Note Debris Management/UNDP (April 2013)

Flood Waste Management Guidelines for Bangkok – Targeting Flood

Planning for Natural Disaster Debris/EPA (March 2008)

Technical Notes on Drinking water, Sanitation and Hygiene in Emergencies/WHO (July 2013)

Post-Disaster Needs Assessment (PDNA) Guideline/EU and UN organizations (2013)

OXFAM’s Technical Brief/OXFAM (2002)

Public Assistance Debris Management Guide/IFEMA, July 2007


Planning

(Development of Process)

Monitoring/Review

(Reporting/Review process)

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Preparedness

Implementation

Early Recovery

Recovery

Reconstruction

Focus

Area

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OXFAM’s Technical Brief/OXFAM (2002)

Public Assistance Debris Management Guide/IFEMA, July 2007

GUIDELINE DEVELOPMENT +

**In 2016**
- Review GLs & plans
- Draft Outline of GL

**In 2017**
- Develop Full version of the GL

**In 2018**
- Information Hub (website)
- Workshop & Training
- Pilot Project
Thank you for your attention