Institutionalizing Disaster Lessons towards Proactive Investment for DRR - the Japanese Experience -

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Today’s Outline

Disaster Reduction & Sustainable Development
Japanese History of Disasters
Disaster Reduction in Modern Japan
1<sup>st</sup> Epoch 1959 Ise-wan Typhoon

Evolution of Seismic Standards
2<sup>nd</sup> Epoch 1995 Hanshin Awaji EQ
Lessons Learnt & Necessity for Seismic Retrofitting
Nationwide Movement for DR

3<sup>rd</sup> Epoch 2011 Great East Japan EQ
Effectiveness of Preventive Approaches
Sendai City’s Pre-Disaster Investment

Institutionalization of Lessons Learnt
Cultural Assets for Disaster Reduction

Sharing Experiences Across Borders
# Ranking of Earthquakes 20-21st Century

## Strong Earthquakes

<table>
<thead>
<tr>
<th>Year</th>
<th>Place</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>Chili</td>
<td>9.5</td>
</tr>
<tr>
<td>1964</td>
<td>Alaska</td>
<td>9.2</td>
</tr>
<tr>
<td>2004</td>
<td>Indonesia Sumatra</td>
<td>9.1</td>
</tr>
<tr>
<td>2011</td>
<td>East Japan</td>
<td>9.0</td>
</tr>
<tr>
<td>1952</td>
<td>Kamchatka</td>
<td>9.0</td>
</tr>
<tr>
<td>2010</td>
<td>Chili</td>
<td>8.8</td>
</tr>
<tr>
<td>1906</td>
<td>Ecuador</td>
<td>8.8</td>
</tr>
<tr>
<td>1965</td>
<td>Alaska Aleutian Islands</td>
<td>8.7</td>
</tr>
<tr>
<td>2005</td>
<td>Indonesia Sumatra</td>
<td>8.6</td>
</tr>
<tr>
<td>1950</td>
<td>Tibet, Assam</td>
<td>8.6</td>
</tr>
<tr>
<td>1957</td>
<td>Alaska Aleutian Islands</td>
<td>8.6</td>
</tr>
</tbody>
</table>

## Deadly Earthquakes

<table>
<thead>
<tr>
<th>Year</th>
<th>Place</th>
<th>Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>China Tangshan</td>
<td>242800</td>
</tr>
<tr>
<td>1920</td>
<td>China Ningxia</td>
<td>235502</td>
</tr>
<tr>
<td>2004</td>
<td>Indonesia Sumatra</td>
<td>227898</td>
</tr>
<tr>
<td>2010</td>
<td>Haiti</td>
<td>222500</td>
</tr>
<tr>
<td>1923</td>
<td>Japan Kanto</td>
<td>105000</td>
</tr>
<tr>
<td>2008</td>
<td>China Sichuan</td>
<td>87587</td>
</tr>
<tr>
<td>2005</td>
<td>Pakistan, Afghanistan</td>
<td>86000</td>
</tr>
<tr>
<td>1908</td>
<td>Italy Sicily</td>
<td>82000</td>
</tr>
<tr>
<td>1927</td>
<td>China Gansu</td>
<td>80000</td>
</tr>
<tr>
<td>1970</td>
<td>Peru</td>
<td>66794</td>
</tr>
<tr>
<td>2011</td>
<td>East Japan</td>
<td>18434</td>
</tr>
</tbody>
</table>
Hazards Confronting Vulnerable Communities Cause Disasters

Hazard
(risk assessment)

Disasters

Vulnerability
(societal conditions)
Less Disasters

Hazard  
(risk assessment)

Vulnerability  
(societal conditions)

Disasters
## Disasters bring serious damage to economies

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Disaster type</th>
<th>Loss (billion US$)</th>
<th>Loss/GDP</th>
<th>GDP of Country (billion US$)</th>
<th>Income level by World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tajikistan</td>
<td>2008</td>
<td>ExtremeTemp</td>
<td>0.84</td>
<td>23%</td>
<td>3.72</td>
<td>low</td>
</tr>
<tr>
<td>Haiti</td>
<td>2010</td>
<td>Earthquake</td>
<td>8.00</td>
<td>123%</td>
<td>6.48</td>
<td>low</td>
</tr>
<tr>
<td>Samoa</td>
<td>2012</td>
<td>Cyclone</td>
<td>0.13</td>
<td>20%</td>
<td>0.64</td>
<td>low</td>
</tr>
<tr>
<td>Guyana</td>
<td>2005</td>
<td>Floods</td>
<td>0.47</td>
<td>59%</td>
<td>0.79</td>
<td>medium low</td>
</tr>
<tr>
<td>Guyana</td>
<td>2006</td>
<td>Floods</td>
<td>0.17</td>
<td>21%</td>
<td>0.82</td>
<td>medium low</td>
</tr>
<tr>
<td>Chile</td>
<td>2010</td>
<td>Earthquake &amp; Tsunami</td>
<td>30.00</td>
<td>17%</td>
<td>171.96</td>
<td>medium high</td>
</tr>
<tr>
<td>Thailand</td>
<td>2011</td>
<td>Floods</td>
<td>40.00</td>
<td>13%</td>
<td>318.52</td>
<td>medium high</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Japan</th>
<th>year</th>
<th>Loss in yen</th>
<th>Loss/GDP</th>
<th>GDP of the year</th>
<th>Fiscal Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Kanto EQ</td>
<td>1923</td>
<td>5.5billion</td>
<td>40%</td>
<td>13.3billion yen</td>
<td>1.5billion yen</td>
</tr>
<tr>
<td>Ise-wan Typhoon</td>
<td>1959</td>
<td>551.2billion</td>
<td>4.2%</td>
<td>13.1trillion yen</td>
<td>1.4trillion yen</td>
</tr>
<tr>
<td>Hanshin Awaji EQ</td>
<td>1995</td>
<td>9,600 billion</td>
<td>2%</td>
<td>502trillion yen</td>
<td>51trillion yen</td>
</tr>
<tr>
<td>Great East Japan EQ</td>
<td>2011</td>
<td>16,900 billion</td>
<td>3.5%</td>
<td>471trillion yen</td>
<td>92trillion yen</td>
</tr>
</tbody>
</table>
Repetition of Disasters bring Poverty

Economic Growth can be Expected

Disaster Reduction and Sustainable Development

Disaster Reduction enables Sustainable Development
The Poor Tends to Suffer Worse in the Vicious Cycle

~Disaster Reduction and Sustainable Development~

The Poor live in Cheap = Disaster Vulnerable Areas

Compelled to live in worse locations or even Homeless

Easily hit by Disaster

Repeatedly hit by Disaster

Loss of Assets & Means of Livelihood

Chain of Poverty Minus Growth Social Unrest

Vicious Cycle to Poverty
Mother Nature is not Gentle in Japan!

- Earthquakes
- Tsunamis
- Volcanic Eruptions
- Typhoons (July – October)
- Heavy Monsoon Rains (May – July)
- Floods
- Landslides
- Snow Avalanches

Number of earthquakes with magnitude of 6.0 or larger (2003-2013) Japan’s Unfair Share

18.5%
Japan’s long tradition of coping with natural disasters

- **416A.D. August, Yamato-Kochi Earthquake**
  The first written record of Earthquake in Japan within “Nihonshoki” the first official history book of Japan, edited in 8th century.

- **684A.D. November, Hakuho-Nankai Tonankai Earthquake** (Estimate Magnitude: 8.2-3) & Tsunami
  The first written record of Earthquake Tsunami in Japan within “Nihonshoki”.

- **Most dreadful things historically in Japan for children**
  1. Earthquakes, 2. Lightning/Thunder, 3. Fire, 4. father(typhoon)
  
  Jishin  Kaminari  Kaji  Oyaji
  Not anymore
GYOKI the High Priest & his fellow monks built dams for flood control and irrigation.
Pagoda of Horyuji Temple built 680 A.D.
The Oldest Wooden “High-Rise” Building in Japan withstood numerous Earthquakes over the Centuries

Combination of semi-flexible timberwork joints and a central wooden pillar disperses and absorbs earthquake shocks

5 layered, 32m high
Traditional “UKIYOE” drawing after 1855 October Ansei-Edo Earthquake

Edo (Old name of Tokyo) citizens beating the legendary Catfish Monster which was believed to cause earthquake
Modern Japan is still full of Tragedies & Lessons Learnt

1896 Meiji-Sanriku Tsunami killed 22,000

1923 Great Kanto Earthquake destroyed Tokyo and killed 105,000
Statistics on Casualties by Natural Disasters in Japan 1945-2015

1st Epoch
Ise-wan Typhoon
6,062
4,897
5,868

2nd Epoch
Hanshin Awaji Earthquake
3,212
6,482

3rd Epoch
Great East Japan Eq. & Tsunami
22,466
Severe Damage by Series of Typhoons

<table>
<thead>
<tr>
<th>Year</th>
<th>Typhoon</th>
<th>Death Toll</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945</td>
<td>Makurazaki Typhoon</td>
<td>3,756</td>
</tr>
<tr>
<td>1947</td>
<td>Kathleen Typhoon</td>
<td>1,930</td>
</tr>
<tr>
<td>1948</td>
<td>Ion Typhoon</td>
<td>838</td>
</tr>
<tr>
<td>1950</td>
<td>Jane Typhoon</td>
<td>539</td>
</tr>
<tr>
<td>1951</td>
<td>Ruth Typhoon</td>
<td>943</td>
</tr>
<tr>
<td>1954</td>
<td>Toyamaru Typhoon (with big ferry shipwreck)</td>
<td>1,761</td>
</tr>
<tr>
<td>1958</td>
<td>Kanogawa Typhoon</td>
<td>1,269</td>
</tr>
<tr>
<td>1959</td>
<td>Ise-wan Typhoon</td>
<td>5,098</td>
</tr>
</tbody>
</table>
Ise-wan Typhoon, hit Nagoya 26 Sep. 1959

Lowest pressure 894 hPa, Max Wind Speed 75 m/s
1959 Ise-Wan Typhoon was the 1st Epoch-Making Turning Point

Ise-wan Typhoon hit Nagoya, the 3rd largest metropolitan area in Japan. 5098 killed.

- Response oriented approach to **preventive approach**
- Individual approach to **comprehensive multi-sectoral approach**
- **Investment** for disaster reduction
- National, Prefecture and Municipal Gov’ts were given **responsibilities**
Central Disaster Management Council chaired by the Prime Minister
National Coordinating Body with all relevant Ministers &
Japanese Red Cross, Public Broadcasting, Semi–Public Sectors
and the Academia (The National Platform for Disaster Risk Reduction!)

- Involvement of Semi–Public Private Sectors
  - Electricity, Gas, Telecom Companies
  - Railway and Bus Companies, Forwarders
  - Broadcasting Companies

Institutionalization of Disaster Reduction Actions

Designated Public Organs for Disaster Management

Annual Gov’t Official Report on Disaster Countermeasures
The Cabinet must officially report the disaster countermeasures to the
National Diet, with
the budget of the next FY and the statements of accounts of previous FY

Formulation of “National Basic Disaster Management Plan for Disaster
Prevention”

The Disaster Management Operation Plan (Sectoral)
The Prefecture and Municipal Disaster Management Plan (Regional, Local)
Disaster Countermeasures Basic Act 1961

Enabled Investment for Disaster Prevention

- Flood Control & Land Conservation, Forest Conservation
- Meteorological Observation Mt. Fuji Radar Site, Meteo-Sats
- Emergency Telecommunication Systems

Designation of “Disaster Prevention Day”

Public Awareness Programs, Disaster Drills & Exercises

1 September (Annual Nationwide Event)

Institutionalization of Disaster Reduction Investments

Great Success in decreasing Typhoon & Flood Casualties
Tectonic Plates Surrounding Japan
# Severe Damage by Earthquakes (1945-1995)

<table>
<thead>
<tr>
<th>Year</th>
<th>Earthquake (Magnitude)</th>
<th>Death Toll</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945</td>
<td>Mikawa Earthquake (M6.8)</td>
<td>2,306</td>
</tr>
<tr>
<td>1946</td>
<td>Nankai Earthquake (M8.0)</td>
<td>1,330</td>
</tr>
<tr>
<td>1948</td>
<td>Fukui Earthquake (M7.1)</td>
<td>3,769</td>
</tr>
<tr>
<td>1952</td>
<td>Tokachi-oki Earthquake (M8.2)</td>
<td>33</td>
</tr>
<tr>
<td>1960</td>
<td>Chile Earthquake &amp; Tsunami (M8.5)</td>
<td>139</td>
</tr>
<tr>
<td>1964</td>
<td>Niigata Earthquake (M7.5)</td>
<td>26</td>
</tr>
<tr>
<td>1968</td>
<td>Tokachi-oki Earthquake (M7.9)</td>
<td>52</td>
</tr>
<tr>
<td>1974</td>
<td>Izu-hanto-oki Earthquake (M6.9)</td>
<td>30</td>
</tr>
<tr>
<td>1978</td>
<td>Izu-Oshima Kinkai Earthquake (M7.0)</td>
<td>25</td>
</tr>
<tr>
<td>1978</td>
<td>Miyagi-ken-oki Earthquake (M7.4)</td>
<td>28</td>
</tr>
<tr>
<td>1983</td>
<td>Nihonkai Chubu Earthquake &amp; Tsunami (M7.7)</td>
<td>104</td>
</tr>
<tr>
<td>1984</td>
<td>Nagano-ken Seibu Earthquake (M6.8)</td>
<td>29</td>
</tr>
<tr>
<td>1993</td>
<td>Hokkaido Nansei-oki Earthquake &amp; Tsunami (M7.8)</td>
<td>230</td>
</tr>
<tr>
<td>1995</td>
<td><strong>Hanshin-Awaji &lt;Kobe&gt; Earthquake (M7.3)</strong></td>
<td><strong>6,437</strong></td>
</tr>
</tbody>
</table>
Fukui Earthquake (M.7.1) 1948

3,769 casualties

Wooden houses collapsed caught fire
Tokachi-oki Earthquake (M7.9) 1968

52 Casualties

Collapsed RC buildings
Miyagi-ken-oki Earthquake (M7.4) 1978

Sendai City Experience

28 Casualties

Crashed concrete block wall

School children crushed to death

Pancake-collapsed building
Evolution of Japan’s Anti-Seismic Building Code

1923  The Great Kanto Earthquake (M7.9: Tokyo devastated 105,000 dead)
1924  First Seismic Building Code
1948  Fukui Earthquake (M7.1: 3,769 dead)
1950  Building Standard Law
1968  Tokachi-oki Earthquake (M7.9: 52 dead)
1978  Miyagi-ken-oki Earthquake (M7.4: 28 dead)

1981 Revision of Building Standard Law
requirements:
➢ No damage against medium scale (JMA scale 5+) earthquakes,
➢ To be able to continue use after these medium earthquakes.
➢ No collapse & safety of people inside against large scale (JMA scale 6+ to 7) earthquakes

1995  Hanshin-Awaji(Kobe) Earthquake (M7.3: 6,347 dead)
1995  Revision of Building Standard (encourage metal reinforcement to wood joints)
2000  Revision of Building Standard (ground strength check made mandatory)

JMA scale 5+ ⇒ almost equivalent to Mercalli scale VII
JMA scale 6+ to 7 ⇒ almost equivalent to Mercalli scale VIII to IX
1995 Hanshin-Awaji (Kobe) Earthquake (M7.3) was the 2nd Epoch-Making Turning Point

- Fire in a city center
- Collapsed houses
- Damaged railway track
- Damaged office building
- Collapsed viaducts of an expressway

6,437 Casualties
Kobe Municipal Government Headquarter

Built after 1981 Building Standard

Built before 1981 Building Standard
1995 Hanshin-Awaji (Kobe) Earthquake (M7.3)

5520 Direct Deaths

Old timber structure with heavy tile roofs collapsed, crushing residents to deaths, Blocked the streets.

Old RC structure condominiums built before 1981 collapsed

- Collapse of houses not only kills people inside,
- Loss of shelter,
- But also debris blocking streets & reconstruction
- Existence of debris depress the affected population.
Collapse of old houses built before 1981 standard was the main cause of death

5,520 direct deaths (+917 relevant deaths)
83% immediately killed by building collapse

Prevention & Mitigation

Ensure Building Safety!

1995 new Act on Promotion of Seismic Retrofit of Buildings
Public awareness campaign on housing seismic safety
Public campaign on affixing furniture and room safety
Act on Promotion of Seismic Retrofit of Buildings
Formulated and Revised based on bitter lessons from Deadly Earthquakes

1995 Hanshin-Awaji Earthquake ⇒ 1995 New legislation

2004 Niigata Chuetsu Earthquake ⇒ 2006 1st revision:
National Gov’t to indicate policy target for seismic retrofitting, Local Gov’ts to formulate their own seismic retrofitting policy/plans

Enabled Sendai City to formulate Earthquake Resilience Policy in 2008

2011 Great East Japan Earthquake ⇒ 2013 2nd revision:
Mandatory Earthquake Resistance Analysis & Disclosure of Large Commercial & Public-use Buildings
Paradigm shift after 1995 Hanshin-Awaji (Kobe) Earthquake

Most of the initial search & rescue done by family members and neighbors. How can we encourage disaster preparedness at community level?

Importance of building safety re-recognized.
Who owns the houses and buildings? Who can take care of safety inside the house or in the office?

Business Continuity Planning is important for reducing economic loss. Who decides on BCP of companies?

Importance of Pre-disaster measures re-recognized.
Pre-assessment for each possible large scale earthquakes & floods. Disaster reduction strategy based on pre-assessments.

Government centered disaster reduction Multi-stakeholder approach to disaster risk reduction
Paradigm shift after 1995 Hanshin-Awaji (Kobe) Earthquake

Call for a Nation-Wide Movement for Disaster Reduction Actions

Self-action

Mutual-action

Public-action

Self-help action by individuals, families and companies
Mutual-help action at neighborhoods and local communities
Public-action by governments
Consumer’s Awareness changes
Advertisement of Condominium

“This condominium has **seismic base isolation structure**”

One of the 4 important sales points!
People’s Demand for Earthquake Safety Creates New Supply of Affordable Engineering Methods
2004 Niigata-Chuetsu Earthquake (M6.8)
Epicenter was shallow 13km => Strong Ground Motion

40 Direct Deaths

Reminded the necessity of seismic retrofit of buildings

Numerous landslides

Collapse of houses built before 1981

Baby boy rescued after 5 days
### Case of Miyagi-ken Earthquakes

<table>
<thead>
<tr>
<th>Date</th>
<th>Magnitude</th>
<th>Focal depth</th>
<th>Max. JMA seismic intensity</th>
<th>Deaths</th>
<th>Collapsed houses</th>
<th>Half-collapsed houses</th>
<th>Partly damaged houses</th>
<th>Injured</th>
<th>Half-collapsed houses</th>
<th>Partly damaged houses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1978/06/12</strong></td>
<td>7.4</td>
<td>40 km</td>
<td>5</td>
<td>28</td>
<td>1,183</td>
<td>5,574</td>
<td>60,124</td>
<td>1,325</td>
<td>21</td>
<td>2,342</td>
</tr>
<tr>
<td><strong>2003/05/26</strong></td>
<td>7.0</td>
<td>71 km</td>
<td>6 lower</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
<td>174</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2005/08/16</strong></td>
<td>7.2</td>
<td>72 km</td>
<td>6 lower</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>856</td>
<td>91</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case of Miyagi-ken Earthquake
1978/06/12

28 Casualties

Crashed concrete block wall

**school children crushed to death**

Pancake-collapsed building
Case of Miyagi-ken Earthquake
2003/05/26

No Casualties

Fallen outside wall

Cluttered room
Case of Miyagi-ken Earthquake
2005/08/16

No Casualties

Fallen inner ceiling of indoor swimming pool
Recognized Possibilities of large-scale M8 earthquakes and tsunamis in Japan (pre-2011)

- Tokyo Inland EQ
- Tokai EQ
- Tonankai & Nankai EQ
- Japan Trench & Chishima Trench EQs
- Miyagi-ken Oki EQ 99% possibility within 30 years

Sendai
Risk Assessment of Miyagi-ken Oki EQ (M7.6-M8.2) published in 2006

<table>
<thead>
<tr>
<th>Damage Type</th>
<th>Damage Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings heavily damaged/collapsed</td>
<td>14,000 ~21,000 buildings</td>
</tr>
<tr>
<td>Road damage/blockage</td>
<td>30</td>
</tr>
<tr>
<td>Water supply interruption</td>
<td>250,000 households</td>
</tr>
<tr>
<td>Electricity stoppage</td>
<td>520,000 households</td>
</tr>
<tr>
<td>Gas supply stoppage</td>
<td>170,000 households</td>
</tr>
<tr>
<td>Casualties</td>
<td>90~290 deaths</td>
</tr>
</tbody>
</table>

Risk Assessment showed that such damage may come within 30 years with 99% possibility.
2011 Great East Japan Earthquake (M9.0) 
The 3rd Epoch-Making Turning Point

Tohoku was prepared for a Miyagi-ken Oki EQ of M7.6-M8.2, but what came was M9 EQ & Tsunami

Energy of M9 earthquake is 32 times stronger than M8 earthquake

Enormous Destruction by the Tsunami!
Massive Evacuation!

Approx. 500,000 people in the Tsunami inundated area. Majority escaped. **But 20,000 did not make it!**

Mortality rate of Tsunami Inundated area
2004 Indian Ocean Tsunami: 40%
2011 Great East Japan EQ&Tsunami: 4% Difference comes from preparedness

Photos by ADRC
Lessons from Disasters

What went wrong with pre-disaster countermeasures?
What went right with pre-disaster countermeasures?

It is no use crying over spilt milk,
but
We must make best of the lessons learnt.

SFDRR priority 3
“Investing in disaster risk reduction for resilience”

How to make effective investment beforehand?
Risk was identified! ⇒ What Next?
Hints from the Sendai Experience.

Sendai City: population 1,046,000 (2010 census)
Previous experience of 1978(M7.4), 2003(M7.0), 2005(M7.2) earthquakes
Probability of another Miyagi-ken Oki EQ estimated as 99% within 30 years!
Risk is imminent! ⇒ Policy & Action by Sendai City

Nov. 1999 “Sendai City Building Assets Seismic Safety Target”
Sept. 2005 “Sendai Disaster Reduction Expo” with Cabinet Office of Japan
April 2008 “Sendai City Earthquake Resilience Policy”

Examples of Action
- Seismic Retrofit of Schools
- Seismic Retrofit of Sendai City Hall
- Seismic Retrofit of Fire Stations
- Subsidy to Earthquake Resistance Analysis of Private Housing
- Subsidy to Earthquake Retrofitting of Private Housing & more

Based on 2006 Revised Act on Promotion of Seismic Retrofit of Buildings

Minimized human casualties by the Great East Japan EQ (M9.0)
Hanshin-Awaji (Kobe) Earthquake (M7.3) 1995

Collapsed Kobe City Hall old building Kobe water department was in the crushed 4\textsuperscript{th} floor.

The Great East Japan Earthquake (M9.0) 2011

Sendai City Hall temporary evacuated for safety check.
Safety confirmed in 1 hour and resumed functions.

Sendai City carefully examined the lessons learnt of Kobe 1995.
Seismic Retrofit of Schools

Seismic retrofit of schools based on Sendai City Earthquake Resilience Policy
April 2008

Progress of school seismic retrofitting : 99.6% done by April 2010

M9 Earthquake Came ! 11 March 2011

No structural damage to Sendai schools.
Not a single child killed in Sendai school.
Seismic Retrofit of Sendai City Hall

Sendai City Hall built in 1965 (before the 1981 seismic standard)
Earthquake Resistance Analysis done in 1996 ⇒ necessity for seismic retrofit
Seismic retrofit work done in 2007 to 2008

Seismic Brace with vibration damper inserted.

Seismic Brace & Seismometer installed on ground floor hall.

M9 Earthquake Came! 11 March 2011

Structural safety of City Hall confirmed in 1 hour.
City hall served as temporary shelter for stranded commuters & visitors.
Seismic Retrofit of Fire Stations

Seismic Retrofit of Sendai City Fire Stations based on Nov. 1999 “Sendai City Building Assets Seismic Safety Target” April 2008 “Sendai City Earthquake Resilience Policy”

M9 Earthquake Came! 11 March 2011

None of the Fire Stations structurally damaged by earthquake. Functioned as Emergency Operation base.
Earthquake Resistance Analysis of Private Housing

<table>
<thead>
<tr>
<th>In 2008, 17% of private housing stock in Sendai City was below seismic standard of 1981.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urgent need to improve the earthquake resistance of private housing stock to save lives. ⇒ Policy package for Earthquake Resistance of Houses</td>
</tr>
<tr>
<td>Policy Target: more than 90% of private housing to be above seismic standard by 2015.</td>
</tr>
<tr>
<td>1st Step: Subsidy to Earthquake Resistance Analysis of Private Housing</td>
</tr>
<tr>
<td>Private owners of detached wooden structure house built before 1981 can get earthquake resistance analysis with minimal fee (JPY14,580～JPY17,280)</td>
</tr>
<tr>
<td>Private owners of condominiums built before 1981 can get earthquake resistance analysis 50% subsidy as a group.</td>
</tr>
</tbody>
</table>
Earthquake Resistance Retrofit of Private Housing

2nd Step : Subsidy to Earthquake Resistance Retrofit of Private Housing

Private owners of detached wooden structure house built before 1981 can get subsidy of 50% earthquake resistance retrofit work.

Private owners of condominiums built before 1981 can get earthquake resistance analysis 50% subsidy as a group.

M9 Earthquake Came ! 11 March 2011

Tsunami Inundated area
647 killed, 26 missing

Non-inundated area,
11 killed
Heavy damage but not so fatal.
Since 2013, all the Hotels & Department Stores in Japan built before 1981 are obliged to do their Earthquake Resistance Analysis and disclose the results to the public.

Do foreign tourists want to stay in a fragile hotel? Probably NO.

Major Cities have prepared subsidy programs for seismic retrofitting of hotels built before 1981. (incl. Sendai City)

Incentives for Investment in Earthquake Resilience!
Some elements for earthquake safety of housing

Public Acceptance of Value of Safety

Local architects & masons

Seismology & Seismic Engineering
Numerous Efforts are Necessary to Save Lives and Livelihoods

All the necessary gears must fit each other

Science & Technology is required & embedded in each of these gears

All the necessary gears must fit each other
Somebody Must Bundle Together Various Elements

Culture of prevention must prevail

Elastic Band is Needed

All the necessary gears must fit each other
How can we prevail?

Who is This?

Institutionalization of Disaster Lessons ⇒ Legislation

This elastic band needs to be resilient against numerous criticisms.
The Paradox of DRR Administration

How can we sustain DRR efforts at National/Local Levels?
How can I secure budget for DRR!?

- Justifications are required to negotiate DRR budget with the Ministry of Finance.
- Unless budget for DRR are sustainable, cannot expect sustainable DRR at national and local level.
- Ad-hoc voluntary donations are unstable.
- A sustainable DRR cannot rely on “ad-hoc beauty contest for funding”.

DRR should be seen as Investments not Expenditures!

To justify investment, B/C (benefit per cost) needs to be explained

Basic Disaster statistics
- human casualties
- losses of housing
- physical damage numbers
- economic damage figures
The Annual Official Report on Disaster Countermeasures (White Paper on Disaster Reduction) since 1963 in Japan

2012 Edition

- Descriptive report on individual disaster damage & response
- Disaster statistics, Official recording
- Disaster reduction policies
- Measurements of achievements on risk reduction action
- Reports on expenditures of previous F.Y. and action taken by sector and by four phases of disaster reduction
- Budget for the coming F.Y. by sector and by four phases

◆ Must be submitted to the regular annual session of National Diet
◆ To be discussed in the Special Committee on Disaster Countermeasures in both houses of the National Diet

The cover picture is the winner of the Annual Disaster Awareness Poster Competition.

Institutionalization for continuous reporting

a way to table disaster reduction on the national agenda
a way to draw public attention to disasters in “peaceful years”
a way to maintain institutional memories of disaster reduction policies regardless of political changes
Budget Figures for Disaster Reduction in Japan

1995

2011
HFA to SFDRR: how can we proceed?

From “Saving Lives” to “Saving Lives & Livelihoods”

We Need

Engines, Fuels and Meters to Drive SFDRR forward

(finance & budget)

(national mechanism)

(statistics and measurements)

(with all stakeholders on board)
Stubborn strong leadership by Fudai village mayor saved his decedents in 2011 tsunami.

Great Watergate of Fudai, 15.5m high, Repelled the tsunami and all villagers inside was safe. Fudai was hit by the 1896 Meiji-Sanriku tsunami and the 1933 Showa-Sanriku tsunami.

The Watergate was constructed in 1984 at the strong initiative of the former village mayor Mr. Kotoku Wamura (1909-1997). At the time of construction he was criticized for this huge project but firmly stated that his descendants should never be killed by tsunami.

His fame is renowned and a explanation board commemorates his firm decision for risk reduction. Also a cultural asset for DRR.
Cultural Assets for Nepal DRR: Reconstruction and Resilience against future EQs

Are people aware of possible Earthquakes in the future?
Does earth science indicate existence of active faults near major cities?
Are there archives of past earthquakes?
How are the historical records inherited among generations?
Are there plans for publication of official archive document of 2015 EQ?
How can the culture of prevention be better fostered in Nepal?

Bhugol Park, New Rd, Kathmandu  1934 Earthquake Monument
How can we better share the lessons learnt?
Proverb by Japanese Physics Scientist Dr. Torahiko TERADA (1878-1935) who investigated the damage by 1923 Great Kanto Earthquake

「天災は忘れた頃にやってくる」

“Natural Disasters will hit us by the Time people have forgotten about it”

How to foster & inherit the Culture of Prevention

Thank you for your attention!
Reference Materials

(Chapter 6: Institutionalizing and sharing the culture of prevention: The Japanese experience written by S. Nishikawa)

(Chapter 1: written by S. Nishikawa)