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Unprecedented Severity of Urban Earthquake

Near Field earthquake $\rightarrow$ Unexpected Hazard
Urban Area $\rightarrow$ Huge Exposure
Japanese Disaster Mortality
1945–2000

Year

Mortality

- Earthquakes and tsunamis
- Flooding and land slides
Unexpected Scale of Hazards
2011.3.11

Mw=9.0 Earthquake → Rare hazard
Landscape scale Area → Huge Exposure

2011.3.11 Tohoku Earthquake and Tsunami Disaster (Mw=9.0)
Japanese Disasters by Mortalities
1945–2011

- Flooding & Land Slides
- Earthquakes & Tsunamis
## Activities Needed for Response and Recovery

<table>
<thead>
<tr>
<th>Activities</th>
<th>1Hrs</th>
<th>10Hrs</th>
<th>10²Hrs</th>
<th>10³Hrs</th>
<th>10⁴Hrs</th>
<th>10⁵Hrs</th>
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<tbody>
<tr>
<td><strong>Disorientation</strong> (Common Operational Picture)</td>
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<td><strong>Life Safety</strong></td>
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<td><strong>Restoration of Social Flows</strong></td>
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<td><strong>Reconstruction of Social Stocks</strong></td>
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<td><strong>Planning Logistics Finance &amp; Admin</strong></td>
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Two kinds of recovery （重建）

• *fukkyū* (復旧)
  • “return to status quo ex ante”

• *fukkō* (復興)
  • “adapt to the status quo ex post”
    • As a result of the unprecedented 1995 Kobe earthquake devastation
    • "Build Back Better" using the disaster as a chance

⇒ Hanshin–Awaji Earthquake Disaster
Basic Structure of Kobe Recovery Program

Individual Assistance for Victims

- Major Industries
- Small Business
- Housing Restoration
- Land Use Planning

Rehabilitation of Infrastructure
Three Goals of Kobe Recovery Plan

- **Physical Recovery**
  - Reconstructing Destructed Cities

- **Economic Recovery**
  - Revitalizing Local Economies

- **Life Recovery**
  - Helping Disaster Victims
Physical Recovery

Reconstructing Destructed Cities: Success
Long-term Physical Recovery
From July, 1995 to March, 2000

Residential Area
Higashinada Ward, Kobe City

Commercial/Residential Mixed Area
Nagata Ward, Kobe City
What was done

• Wise Land Use Planning
  • Planning First
  • Moratorium for the First Two months to prohibit building construction

• Quick Debris Removal: 1 year
  • Recycle debris by discriminating materials

• Quick Restoration of Infrastructure:
  • In 2 years
  • Basis of all kinds of recovery activities

• Providing Places to Live for Victims:
  • In 3 years, the number of newly constructed houses exceeded that of destroyed by the disaster
  • In 5 years, no temporary housings left
  • ‘building codes’ were enforced strictly for a higher seismic performance
Why we succeeded

• Based on Lessons Learned from Many Past Disasters
  • 1923 Kanto Earthquake,
  • Post WWII Reconstruction
  • Large Scale Fire Incidents

• Specific Numerical Targets helped to facilitate the process
  • In the First Five Years, Physical Recovery was Completed
Economic Recovery

Revitalizing Local Economies: Partially Success
Monitoring Economic Recovery by Power Consumption
Changes in GDP & GRP after Earthquake

- All Japan
- Tokyo
- Hyogo
- Kobe City
Three Basic Economic Recovery Patterns after Kobe EQ

1. Immediate boom & following slump
   - Ex. Building Reconstruction

2. Immediate slump & following recovery
   - Ex. Daily Consumption

3. Immediate slump & No full recovery
   - Ex. Economic Activities w/ Competitors
     Import & Export at Kobe Harbor
Monitoring Economic Recovery by City Statistics

Exports (Foreign Trade)

Imports (Foreign Trade)

Katatani & Hayashi (2002)
Why Partial Success

• Over-concentration of national government money and work for a very short time period killed local business recovery
  • Major Contractors in Tokyo got contracts
  • Little “Trickle-down” effect for local small business
  • 10 years worth housing renewal was completed in 3 years, followed by big economic slump

• Over-reliance on Public Spending by Victims
  • Little Initiative for Promoting a New Economy Development
  • Government was the only risk taker

• Customers Never Waited for recovery
  • Shift to competitors and never returned to old days
  • Importance of Business Continuation Plan
Life Recovery

Helping Disaster Victims:

Partial Success
Life Recovery

• New Concept and Development
• 3.5 million disaster victims
• Nobody Can Define
  • Scope of Work
  • Desired End State
  • Need for Ethnographic Inquiry of Meaning of Recovery
• Public Help was provided mainly for Low-Income and/or Senior Citizens
Seven Elements for Life Recovery

- Housing: 489 (30.1%)
- Social Network: 407 (25.1%)
- Community: 197 (12.1%)
- Disaster Preparedness: 154 (9.5%)
- Mental Physical Health: 154 (9.5%)
- Work & Income: 138 (8.5%)
- Governmental Assistance: 84 (5.2%)

N = 1623
Resilience Model for Life Recovery

Hazard-Specific Resilience

Disaster Preparedness

Multi-Hazards Resilience

Mental & Physical Health

Social Network

Personal Assets

Work & Income

Housing

Personal Basis for Living

Infrastructure/Community Culture/

Governmental Assistance

Social Infrastructure