Experience Sharing with Japan
Practical urban resilience improvement measures taking examples of Japan and developing countries

Seminar organized by Government of Bangladesh, JICA and the World Bank
“An Integrated Approach to Enhance Urban Resilience in Bangladesh”
December 19, 2015

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Contents of presentation

1. Road map to safer buildings
2. Lessons from recent disasters
3. Effective implementation of building administration
Devastating damage by Gorlha EQ 2015

• Date: April 25, 2015
• Mw= 7.8 (USGS)
• Casualties: 8,898
• Heavily damaged buildings: 602,257

(UN Office for the Coordination of Humanitarian Affairs, as of August 7, 2015)
Heavy damage to RC buildings

- Not a few RC buildings in Kathmandu damaged heavily like collapse
Heavy damage to new high rise apartments

• Several new high rise apartment building got damage mainly in non structural members like cladding walls
Shaking motion by 2015.4 Gorkha Earthquake

- Recorded Peak Ground Acceleration (PGA) in Kathmandu: 164 gal recorded by USGS
Earthquake intensity scale

• MMI Scale (Modified Mercalli Intensity)
  - MMI VI

• JMA Scale
  - JMA 4 or 5-

Descriptive table of Modified Mercalli Intensity (USGS)
Shaking motion by the Great East Japan Earthquake

- Very strong shaking motion was observed in wide area
- The largest peak acceleration (Tsukidate): 2,933gal
  (max. horizontal element: 2,700gal)
- 18 observatory station in 6 prefectures recorded acceleration more than 1,000gal
- Areas with JMA 5-(around equivalent to MMI IV): areas of light orange including Tokyo
Causes of heavy damage in Nepal from observation of damaged buildings and interviews

- Inadequate design and detailing
- Poor construction workmanship
- Low quality of materials
- Little influence by the Structural code of Nepal

Capacity development of all the relevant stakeholder is necessary

Many people say “Building code and building permit could improve safety of buildings”. This is not true judging from experience in Nepal.
Major stakeholders and the relation among them

1. Administration
   - Building permit
   - Awareness raising

2. Customers
   - <Demand sector>
   - Order/instruction

3. Buildings
   - Technical services
     - Construction works

4. Construction industries
   - <Supply sector>
   - Technical standards
   - Qualification of engineers
   - License for contractors

5. Research community

Architects
- Engineers
- Contractors
  (engineers, foremen, workers)
- Manufacturers of building materials
Comprehensive approach with long term perspective

- Japanese experience (historical review)
  - modernization started at Meiji Restoration 1868
  - first step: introducing modern technologies by foreign engineers at the same time Japan made every efforts in education of leading researchers and professionals, occupational education/training of engineers, training of foremen and workers, introducing manufacturing industries of materials like brick, cement
  - second step: comprehensive building code and introduction of building permit for large buildings in 6 major cities in 1919
  - third step: expanding application of building permit to all the urban areas under the new legislation of Building Standard Law in 1950
Comprehensive approach with long term perspective

First step (about 50 years)
Establishment of basic conditions for safer buildings: human resource development and social/economical basis development

Second step (about 30 years)
Introduction of building control to high priority areas within implementing capacity of governments

Third step (about 65 years)
New legislation of Building Standard Law in 1950 to expand building permit to all the urban areas

Japan has reached to the current condition after about 150 years of efforts for safer buildings

Comprehensive approach with long term perspective is necessary
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### Overview of damage caused by Bohol EQ 2013, in the Philippines

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<tr>
<th>Municipality</th>
<th>buildings</th>
<th>Use</th>
<th>Structure</th>
<th>Non-structural walls</th>
<th>Ceilings</th>
<th>Others</th>
<th>Pictures in Figures</th>
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</thead>
<tbody>
<tr>
<td>Tagbilaran</td>
<td>Municipality office</td>
<td>x</td>
<td>Slight</td>
<td>Slight</td>
<td>Medium (partially fell down)</td>
<td>Medium (Parapet fell down)</td>
<td></td>
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<tr>
<td></td>
<td>University Hospital</td>
<td>x</td>
<td>—</td>
<td>Medium (Outer finishing fell down)</td>
<td>Heavy (most fell down)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>School of nursing</td>
<td>x</td>
<td>—</td>
<td>Extreme (most fell down)</td>
<td>Heavy (most fell down)</td>
<td>Slight (finishing)</td>
<td></td>
</tr>
<tr>
<td>Sagbayan</td>
<td>Municipal office</td>
<td>x</td>
<td>Medium</td>
<td>Extreme (most fell down)</td>
<td>Heavy (most fell down)</td>
<td>Extreme (stairway, gutter broken)</td>
<td>7,9,10,18,21,22</td>
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<tr>
<td></td>
<td>District Health care center</td>
<td>x</td>
<td>Medium (damage in beam, cracks in columns)</td>
<td>Medium (partition wall broken)</td>
<td>Heavy (most fell down)</td>
<td></td>
<td>11</td>
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<tr>
<td></td>
<td>School</td>
<td>x</td>
<td>Slight</td>
<td>Slight</td>
<td>No ceiling boards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catigbian</td>
<td>Municipal office</td>
<td>x</td>
<td>Medium (damage in columns)</td>
<td>Extreme (most fell down)</td>
<td>Medium (partially fell down)</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Market building</td>
<td>x</td>
<td>Medium</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
<td>Extreme (roof truss broken)</td>
<td>16,17,18,20,22</td>
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<tr>
<td></td>
<td>Hospital building 1</td>
<td>x</td>
<td>—</td>
<td>Heavy (most fell down)</td>
<td>Medium (partially fell down)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Hospital building 2</td>
<td>x</td>
<td>Slight</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Hospital building 3</td>
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<td>Slight</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
<td>Heavy (parapet fell down)</td>
<td></td>
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<tr>
<td>Loon</td>
<td>Market building</td>
<td>x</td>
<td>Medium</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
<td>Extreme (roof truss broken)</td>
<td>16,17,18,20,22</td>
</tr>
<tr>
<td></td>
<td>Hospital building 1</td>
<td>x</td>
<td>—</td>
<td>Heavy (most fell down)</td>
<td>Medium (partially fell down)</td>
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<tr>
<td></td>
<td>Hospital building 2</td>
<td>x</td>
<td>Slight</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
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<tr>
<td></td>
<td>Hospital building 3</td>
<td>x</td>
<td>Slight</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
<td>Heavy (parapet fell down)</td>
<td></td>
</tr>
<tr>
<td>Antequera</td>
<td>Municipal office building 1</td>
<td>x</td>
<td>Slight</td>
<td>Medium (partition wall down)</td>
<td>Extreme (most fell down)</td>
<td>Heavy (PC panels rotten)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Municipal building 2</td>
<td>50% (1st fl.)</td>
<td>—</td>
<td>Medium (2nd fl.)</td>
<td>Medium (2nd fl.)</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Barangay office</td>
<td>10% (temporary)</td>
<td>Heavy (2nd fl. Tilted)</td>
<td>Extreme (most fell down)</td>
<td>Extreme (most fell down)</td>
<td></td>
<td>12,19</td>
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<tr>
<td></td>
<td>District Health care center</td>
<td>20%</td>
<td>—</td>
<td>Medium (partition wall broken)</td>
<td>Medium (partially fell down)</td>
<td></td>
<td></td>
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</tbody>
</table>
Damage to Office building of Municipal government in Sagbayan, Bohol

Most serious damage in structural members

Damage to nonstructural damage in shelter walls, partition walls, ceiling boards
Situation of a hospital in Loon
Damage to roofing by the strong wind by Typhoon Haiyan A customer service center in Tacloban City
Total collapse caused by the strong wind by Typhoon Haiyan Convention Center in Tacloban City
Fire safety is another serious disasters in world wide scope

• Japan experienced serious fire disasters again and again and improved situation in various ways like development of inflammable materials, effective detectors, secure fire escape and so on in addition to technical guidelines
Beijing in February 2009
Chóngqing in August 2010
Pusan in October 2010
Shanghai in November 2010
Basic procedures for buildings of better quality through technical guidelines and building permit

- Appropriate technical guidelines (not high level nor sophisticated one)

- Dissemination of the guidelines to all the stakeholders including customers/investors

- Understanding and application of guidelines by practitioners like engineers, architects, foremen

- Capacity development of workers to learn skills necessary to realize the design based on the guidelines

- Procedures are common in
  - all the hazards like earthquake, strong wind, and fires
  - all the aspects like structural members, nonstructural members, cladding materials
Building permit awareness raising

**Demand sector**
- Customers

**Supply sector**
- Construction industries
  - Investment
  - Design and construction
  - Technical services
  - Construction works

**Administration**
- Architects
- Engineers
- Contractors (engineers, foremen, workers)
- Manufacturers of building materials

**Technical standards**
- Qualification of engineers
- License for contractors

**Buildings**

**Research community**

**Major stakeholders and the relation among them**
- Seismic safety
- Safety against strong wind
- Fire safety

**Fire safety**
Comprehensive approach against multi hazards covering all the aspects

- Disasters: earthquake, strong wind/cyclones, fires, and so on
- Aspects to be targeted: each of disaster requires improvement of
  - structural members
  - nonstructural members like shelter walls, ceiling boards, and so on
  - cladding materials like roofing and so on
  - fire proof design and fire escape

Structural members are not always critical members against disasters

- All the approach by same kind of scheme: improvement of quality of building which could be realized by appropriate guidelines, good design and good construction works

- Strategy:
  Priority: impacts of disasters like casualties or economic loss
  Social acceptance: the more frequent is the disaster, the larger is the social acceptance
  Capacity of administration and possible social resources
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Effective implementation of building administration

- Dissemination of codes/guidelines to all the stakeholders
- Capacity development in collaboration with related organization like education, occupational training, administration of manufacturing etc.
- Development of implementing capacity (human and financial resources)
  - basic policy of building administration of Japan
    - “Do what we can do” by enhancement of “what we can do” (CD of governments) and by recruiting knowledgeable engineers from academia and practitioners
      - limit its application to important areas and buildings (large buildings in 6 major cities at first)
        - by mobilizing human resources through
          1) peer review scheme on structural design,
          2) technical evaluating committee on special structures like sky scrapers, seismic isolation,
          3) designate qualified private organization to conduct building administration
Effective implementation of building administration

● Collaboration with Qualification schemes for designers
  - Architects and engineers have to pass examination to do business, which contribute to ensure capacity of design and supervising (Kenchiku-shi Law)
  - Implementing organization could ensure compliance of technical services by the qualification schemes by suspension or cancellation of license upon incompliance to regulation and codes

● Collaboration with relevant stakeholders like financing organizations and others
  - Financing organizations which provide loan to investors/owners have strong motivation to quality of buildings because they are usually collaterals for the loan
  - Other groups could be this type of stakeholders in Bangladesh like buyers association of ready made garments and labor organizations
  - Another possibility: collaboration with water and electricity supply
Different types of implementation of building administration

**Japan**
- National government (MLIT: Ministry of Land, Infrastructure, Transport and Tourism)
  - Basic law for building administration
  - Technical guidelines
  - Qualification of architects and engineers
  - Issuing of building permit

**The Philippines**
- National government
  - Professional associations
  - Professional Regulatory Commission (PRC)

**Local governments**

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Japan

The Philippines
Summary and recommendation

- Comprehensive approach
  with long term perspective
  against multi hazards
  covering all the aspects
  on strategy on priority, social acceptance and capacity of administration

- Full mobilization of all the available social and human resources
Thank you for your attention