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# Final Research Presentation

By

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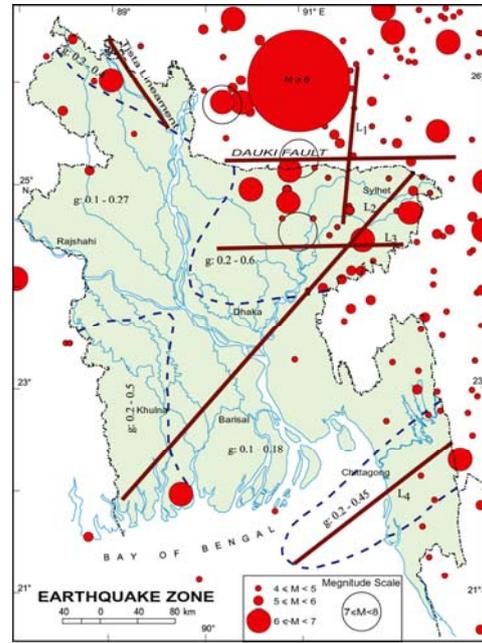
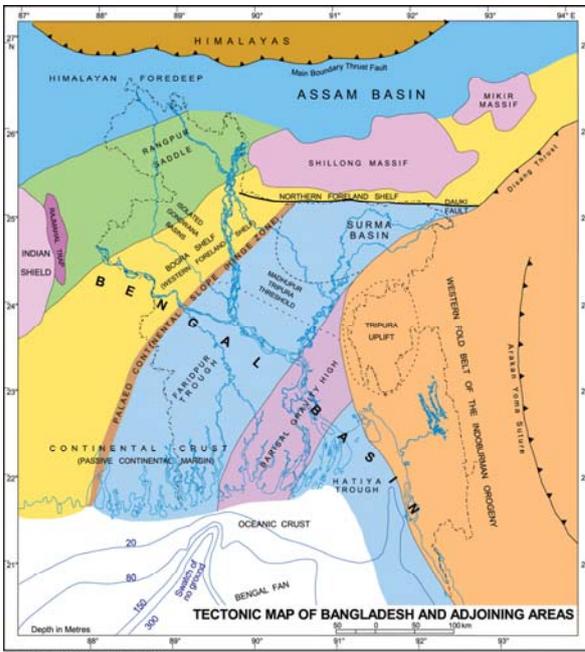


## Disasters in Bangladesh

<b>◆ Flood</b>	<b>Year</b>	<b>Disaster</b>	<b>Death</b>
◆ Tropical Cyclone	1970	Cyclone	300,000
◆ Storm Surge	1988	Flood	2,373
◆ Tornado	1988	Cyclone	5,704
◆ River Bank Erosion	1991	Cyclone	138,868
◆ Drought	1996	Tornado	545
◆ Earthquake	1997	Cyclone	550
◆ Arsenic	1998	Flood	918
◆ Fire	2004	Flood	747
◆ Landslide	2007	Flood	1,071
	2007	Landslide	129
	2007	Cyclone(SIDR)	3,406
	2009	Cyclone ('alia)	190
	2012	Landslide	119
	2012	Cyclone (Mahasen)	14

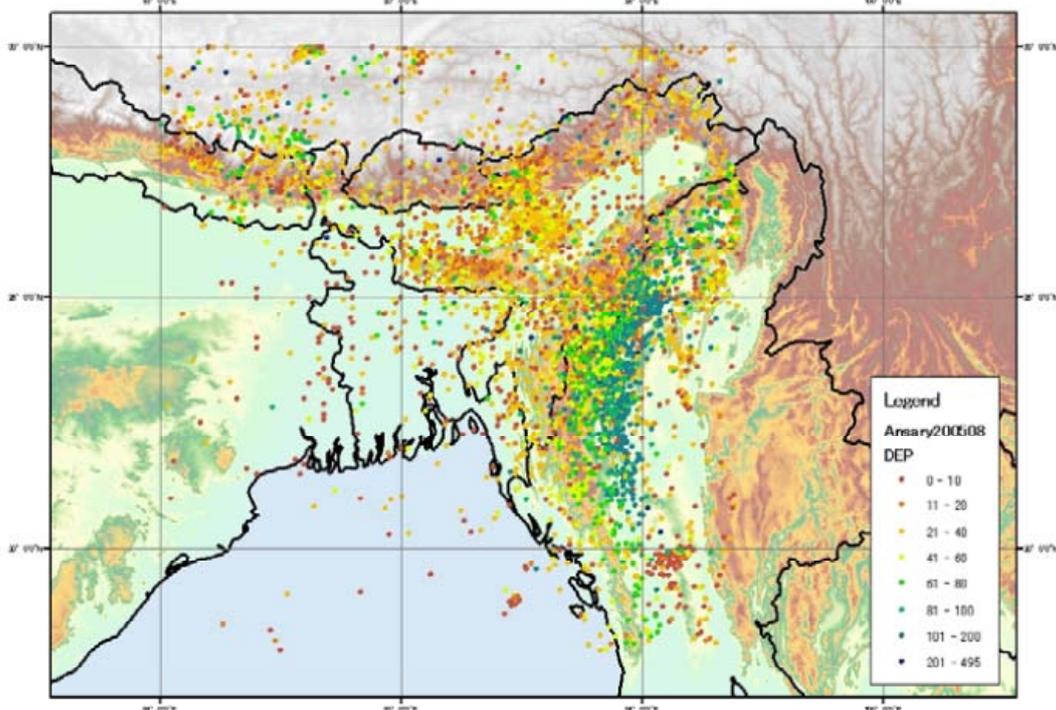
# Why Bangladesh is Vulnerable to Earthquake ?

Bangladesh stands on the junction of three tectonic plates - the Indian plate, the Eurasian plate and the Burmese micro-plate.



# Why Bangladesh is Vulnerable to Earthquake ?

Epicentres of Historical Earthquake in Bangladesh (1664-2007)





## Why Bangladesh is Vulnerable to Earthquake ?

Major earthquakes in Bangladesh during the, last 150 years.

Date	Name	Epicenter	Magnitude
October 11th, 1737	Kolkata	22.60N, 88.40E,	7.0
January 10, 1869	Kachar	Jainati Hills	7.5
July 14, 1885	The Bengal Earthquake	Bogra Fault	7.0
June 12, 1897	The Great Indian Earthquake	Shillong Plateau 26.00N, 91.00E	8.7
July 8, 1918	Mymensingh	24.50 N, 91.00 E	7.4
July 3, 1934	Dhubri	24.50 N, 91.00 E	7.1
January 15, 1934	Bihar-Nepal	Darbhanga	8.3
August 15, 1950	Assam	Arunachal Pradesh	8.5
23rd October, 1943	Dergaon Assam	26.80 N , 94.00 E	7



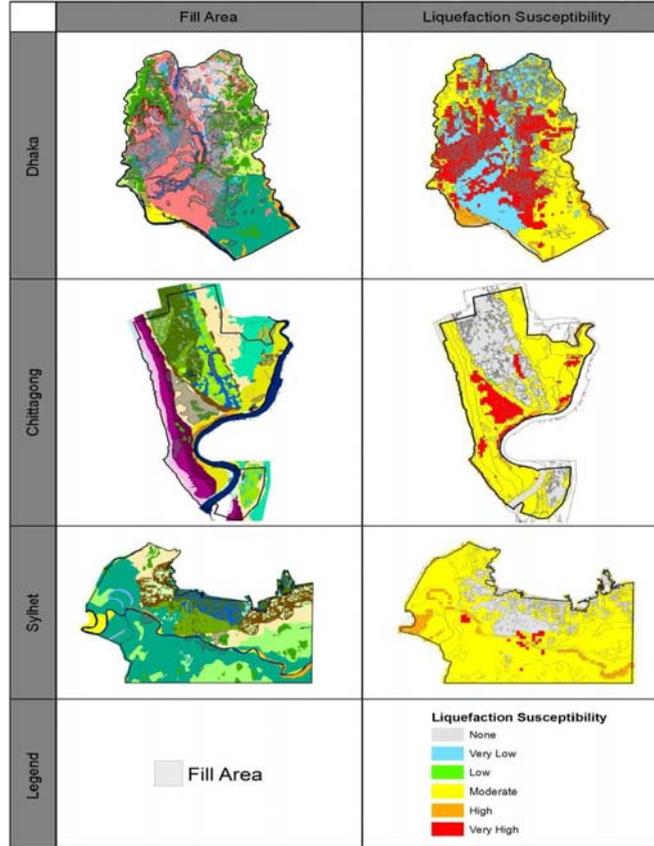
## Why Bangladesh is Vulnerable to Earthquake ?

Recent Earthquakes in Bangladesh

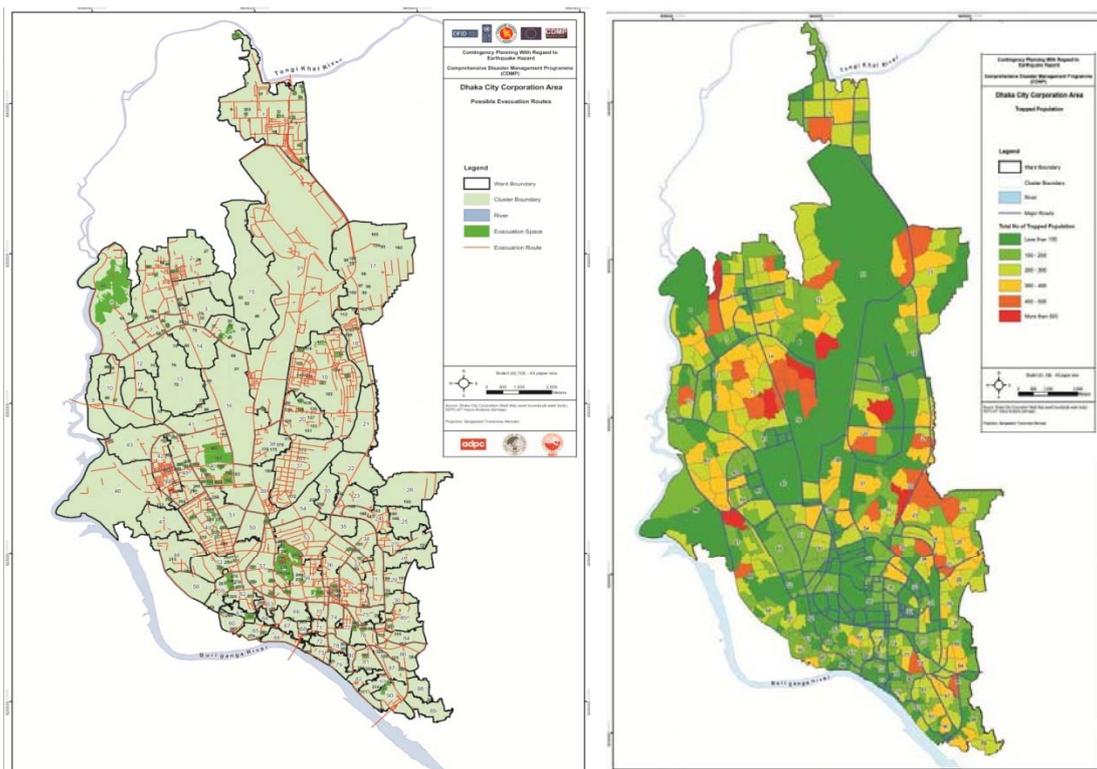
Date	Name	Epicenter	Magnitude
May 8, 1997	Indo-Bangla border	24.89N 92.25E	6
November 21, 1997	Chittagong Indo-Bangladesh Border	22.21N 92.83E	6
July 22, 1999	Moheshkhali Island	21.47N 91.90E	5.2
December 31, 1999	Indo-Bangladesh Border Region	Near Sonadia	4.3
January 4, 2000	Bungtlang (Tripura), India	22.13N, 92.77E	4.6
December 19, 2001	Kaliakoir, Dhaka	23.70 N 90.40 E	4.2
June 20, 2002	Rajshahi	25.80N 88.86E	4.6
March 25, 2003	Bhutan	27.260N 89.240E	5.1
July 27, 2003	Barkal-Rangamati	22.85 N 92.31E	5.6



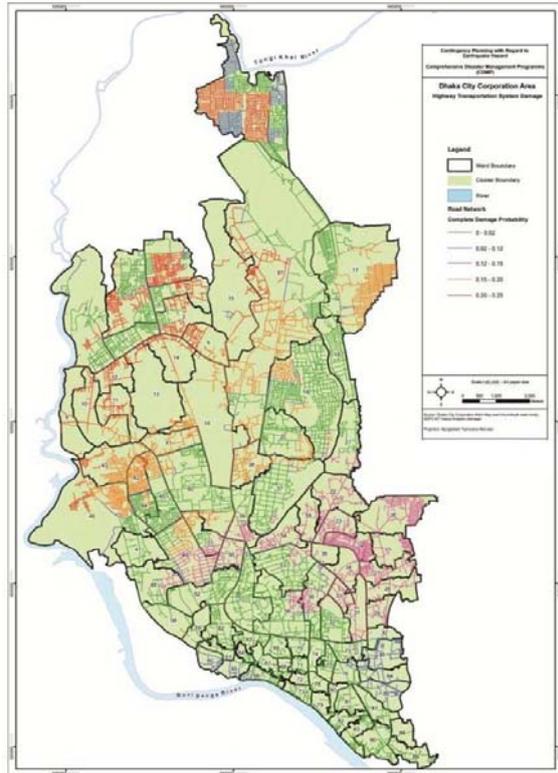
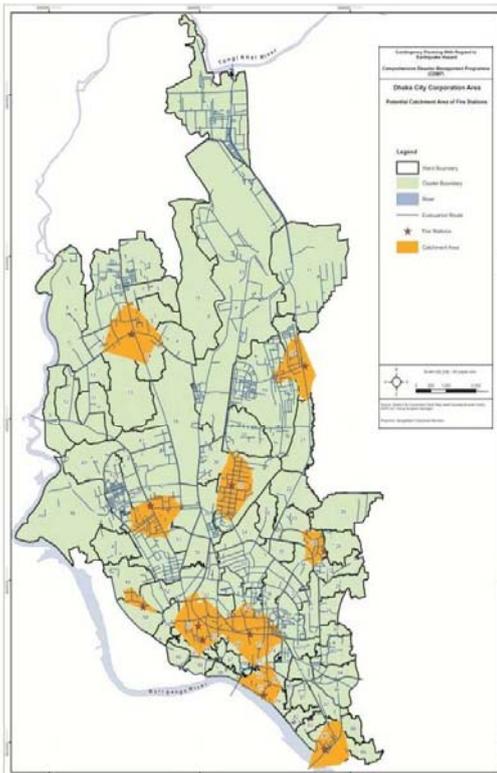
## Earthquake Seismic Hazard Assessment Map of the major Cities



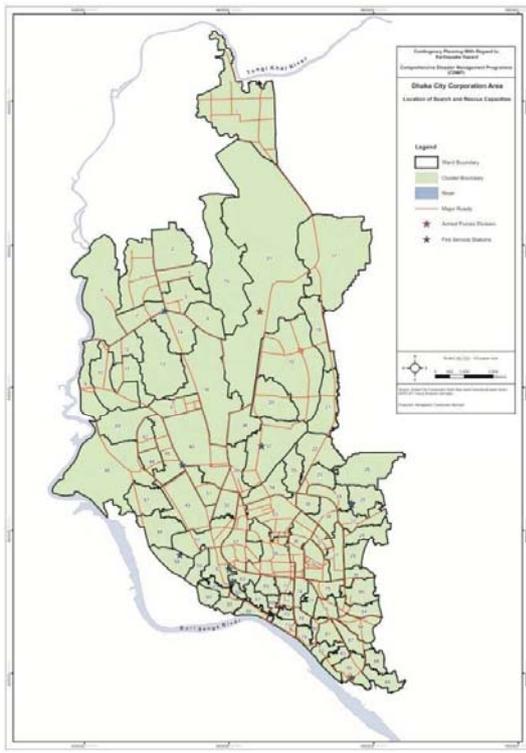
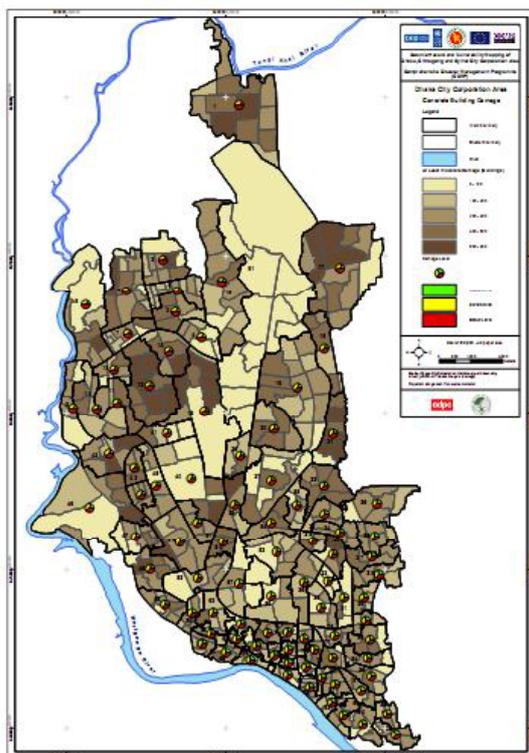
## Possible Evacuation Route & Trapped Population



# Fire Station Catchment Areas & Highway Damages



# Possible Damage Areas & SAR Capacities in Dhaka City





## Risk Assessment

- The earthquake in the worst case scenario will generate 72, 17, and 5 millions of ton of debris in Dhaka, Chittagong, and Sylhet city respectively.
- It will also trigger 107 ignitions of fire following earthquake in Dhaka, 36 ignitions in Chittagong, and 13 in Sylhet.
- It estimates the number of killed victims is 260,788, 95,183 and 20,708 for Dhaka, Chittagong, and Sylhet respectively if the earthquake occurs during night time (2:00AM).
- If the earthquake occurs during day time (2:00PM), the number of victims is 183,450, 73,213 and 14,276 for Dhaka, Chittagong, and Sylhet respectively.



## Research Topic

**An Integrated Framework for the Earthquake Preparedness: An Assessment of the Applicability of Japanese Experience in Bangladesh.**



## Background of Research

- Bangladesh, a densely populated country in the World.
- Tectonically, Bangladesh stands on the junction of three tectonic plates - the Indian plate, the Eurasian plate and the Burmese micro-plate.
- The north and north-eastern parts of Bangladesh are the most active seismic zones.
- Two major earthquake caused severe damage.
- About 20 moderate earthquakes occurred in Bangladesh, and surrounding areas in the years 1833 to 1988.
- Recently every years Bangladesh has experienced 5.0 to 5.5 magnitude earthquakes.



## Justification of Research

- In Bangladesh, Earthquake are still unreachable at the point of preparedness, emergency response and risk reduction.
- Nation shall have time bound implementable National Earthquake Risk Reduction Plan.
- The occurrence of earthquakes in Bangladesh and neighbouring regions are poorly documented. Few records of them are available in published and unpublished literatures.



## Specific Aims of this Research

- To understand tools and processes on earthquake preparedness at a national and local level in Japan.
- To review response models and ways of working with other key responders.
- To assess applicability of Japanese experience on earthquake response and recovery in Bangladesh.
- Replicating Japanese vast experience on earthquake risk reduction in Bangladesh.
- To prepare recommendations for improvement of the National Earthquake Risk Reduction Plan in Bangladesh.



## Research Activities

- Literature Review.
- Critical review of the current earthquake preparedness in Bangladesh
- Understanding the earthquake preparedness in Japan.
- Study of the case studies of great earthquakes in Japan to understand how well the Early Warning System and coordination worked.
- Understanding CBDRR programs conducted in Japan with special focus on Earthquake and compares the participation of the community in the DRR process.
- Learn how the community is prepared in Japan: learning, training, and drills.
- Field Visits to emergency operation centres/emergency services response centres of National, Prefectural and Local Governments to understand the networking and coordination for emergency response.
- Visits to DRR agencies such as Cabinet Office, JMA, and Disaster Management Authority etc. in Japan to understand their legal system & frameworks, organizational network and earthquake preparedness plan.



# Earthquake Prevention Comparative Study

Parameters of Comparison
Legal Frameworks
Institutional Frameworks
Earthquake Observations
Early Warning
Information & Communications
Emergency Response
Building & Infrastructures
Recovery & Rehabilitation
Education & Research
Community Awareness and Preparedness
Geo-databases & Maps
Budget



# Earthquake Prevention Comparative Study

Parameters of Comparison	Japan	Bangladesh
<b>Legal Frameworks</b>	<p><b>Act &amp; Laws related to:</b></p> <ul style="list-style-type: none"> <li>- Disaster Countermeasures Basic Act</li> <li>- Disaster Prevention and Preparedness</li> <li>- Disaster Emergency Response</li> <li>- Disaster Recovery and Reconstruction</li> </ul> <p><b>Disaster Management Planning:</b></p> <ul style="list-style-type: none"> <li>- Basic Disaster Management Plan</li> <li>- Disaster Management Operation</li> <li>- Local Disaster Management Plan</li> </ul>	<ul style="list-style-type: none"> <li>- Disaster Management Act</li> <li>- National Plan for Disaster Management</li> <li>- Standing Order on Disasters (SOD)</li> </ul>



## Earthquake Prevention Comparative Study

<b>Institutional Frameworks</b>	<p><b>Central Disaster Management Council</b> comprises with:</p> <ul style="list-style-type: none"> <li>- 23 Govt. ministries and agencies</li> <li>- 63 designated public cooperation including independent administrative agencies, Bank of Japan, Japanese Red Cross Society, NHK, electricity and gas companies and NTT.</li> </ul> <p><b>Prefectural Disaster Management Council:</b></p> <ul style="list-style-type: none"> <li>- Designed government organization and public corporations in Prefecture level.</li> </ul> <p><b>Municipal Disaster Management Council:</b></p> <ul style="list-style-type: none"> <li>- Designed government organization and public corporations in the local City, town and village level.</li> </ul>	<p><b>National Disaster Management Council (NDMC):</b> Headed by Prime Minister with 15 ministries and armed forces.</p> <p><b>Inter-Ministerial Disaster Management Co-ordination Committee (IMDMCC):</b> 31 ministries and Govt. agencies. District Disaster Management Committee: With district level all govt. and local govt. organizations.</p>
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## Earthquake Prevention Comparative Study

<b>Earthquake Observations</b>	<ul style="list-style-type: none"> <li>▪ To monitor earthquakes, JMA operates an earthquake observation network with 200 seismographs and 600 seismic intensity meters. It also collects data from over 3,600 seismic intensity meters managed by local governments and the National Research Institute for Earth Science and Disaster Prevention (NIED).</li> </ul>	<b>No system for earthquake observation</b>
	<ul style="list-style-type: none"> <li>▪ Estimation of Earthquake P-Wave and S-Wave.</li> </ul>	
<b>Early Warning</b>	<p><b>According to the Meteorological Services Act:</b> Japan Meteorological Agency (JMA) issues EEW information to mitigate the damage by stopping trains and elevators, extinguishing flames or crawling under tables and get opportunity to take immediate safety measures by people.</p> <ul style="list-style-type: none"> <li>▪ <b>Introduction of J-Alert System.</b></li> <li>▪ <b>Earthquake of intensity 5 or greater is disseminated by Forecast and EW by JMA.</b></li> </ul>	<b>No system for Early warning</b>



## Earthquake Prevention Comparative Study

### Information & Communications

- When an earthquake occurs: JMA immediately issues information on its hypocenter, magnitude and observed seismic intensity.
- JMA maintains direct communication links with meteorological offices and central/local governments.
- JMA disseminates weather information and warnings via various channels to government disaster prevention agencies, local governments, the mass media and the public.
- J-Alert System - J-Alert is the system to immediately transmit emergency information such as Emergency Earthquake information.
- Introduction of Information Network for Disaster Prevention (INDiP).

After shock, Bangladesh Meteorological Department disseminate the magnitude.



## Earthquake Prevention Comparative Study

### Emergency Response

- An emergency team composed to grasp and analyze the disaster situation, and report the results to the Prime Minister.
- Inter-ministerial meetings are held to decide basic response policies.
- A government investigation team may be dispatched.
- Wide-area support mechanisms are mobilized
- The Self-Defence Forces and The disaster medical assistance teams (DMATS) are dispatched
- SAR Operations.
- Japan Disaster Relief (JDR) Search and Rescue Team.

According to Standing Orders on Disaster, Department of Disaster Management is responsible to emergency response by Civil Defence and Fire Service and Urban Volunteers.

Capacity Building Programme for Search & Rescue.



## Earthquake Prevention Comparative Study

<b>Building &amp; Infrastructures</b>	<p><b>Act &amp; Laws related to:</b></p> <ul style="list-style-type: none"> <li>- Building Standard Law</li> <li>- Housing Quality Assurance Act.</li> <li>- Act for Execution of Defect Warranty Liability under Housing Quality Assurance Act.</li> <li>- Act on Promotion of the Earthquake-proof Retrofit of Buildings.</li> </ul> <p><b>Assistance Scheme for Building Quake Proofing.</b></p> <p><b>Emergency Response and Communication System by Life line infrastructures like Osaka Gas Engineering Co. Ltd.</b></p>	<b>National Building Code.</b>
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## Earthquake Prevention Comparative Study

<b>Recovery &amp; Rehabilitation</b>	<p><b>Disaster Recovery Project</b></p> <p><b>Disaster Relief Loans</b></p> <p><b>Disaster Compensation and Insurance</b></p> <p><b>Tax Reduction or Exemption for affected persons.</b></p> <p><b>Tax Allocation to Local Governments and Local Bonds.</b></p> <p><b>Financial Support for the Livelihood Recovery of Disaster Victims.</b></p>	<p><b>Providing of Disaster relief for affected person:</b></p> <ul style="list-style-type: none"> <li>- Financial grants.</li> <li>- CI Sheet</li> <li>- Vulnerable Group Feeding Programme</li> <li>- Blanket</li> </ul>
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## Earthquake Prevention Comparative Study

### Education & Research

#### Basic Education on Disaster:

- Guide book and Sub Text book
- Video for disaster risk education
- Instruction based on manuals
- Lesson and experiment by experts of disaster prevention
- Earthquake experience by utilizing special cars
- Drill for disaster prevention
- Student's activities on Skill improvement, survival at camping, Volunteerism etc.
- First aid in time of disaster
- Visit to disaster prevention centre and fire station

Highly Prioritise Scientific and Technological Research in Disaster Reduction.

High quality educational and training institutions.

- Earthquake education has incorporated into the curriculum for school children.
- Supplementary books for primary and secondary education level.
- Research on Earthquake has been prioritising for grants in the higher education institutes.



## Earthquake Prevention Comparative Study

### Community Awareness and Preparedness

Utilization Hazard Maps to Promote The Earthquake-Proofing Of Buildings.  
Integrated Disaster Management Information System.  
Earthquake-Proofing of disaster management bases (schools and other institutions) and key infrastructure.  
Issuing of Evacuation Order and Instruction.  
Disaster Reduction Drills and Exercises.  
Countermeasures against Large-scale Earthquakes.  
Improvement of evacuation areas  
Business continuity plans for companies.

- Try to develop community participation and awareness to reduce the vulnerability.
- About 18000 urban volunteers.
- Earthquake Drills and Activities: earthquake drills at 70,000 primary and secondary schools twice a year.
- Community awareness through media campaign, workshop and seminar.



## Earthquake Prevention Comparative Study

<b>Geo-databases &amp; Maps</b>	<ul style="list-style-type: none"> <li>▪ Geo-database on Earthquakes parameters.</li> <li>▪ Seismic Intensity Mapping.</li> <li>▪ Vulnerability Mapping.</li> <li>▪ Risk Mapping.</li> <li>▪ Models and Integrations related to earthquakes.</li> <li>▪ Hazard Mapping.</li> <li>▪ Remote sensing using satellite image.</li> <li>▪ Early damage assessment function using artificial satellites.</li> </ul>	Earthquake Vulnerability, Mapping, Risk Mapping and Seismic Hazard Mapping under Comprehensive Disaster Management Programme (CDMP).
<b>Budget</b>	The National Budget for disaster management is approximately 1.2 trillion yen (Initial Budget 2010FY).	National Budget for Disaster management is about 625 million USD.



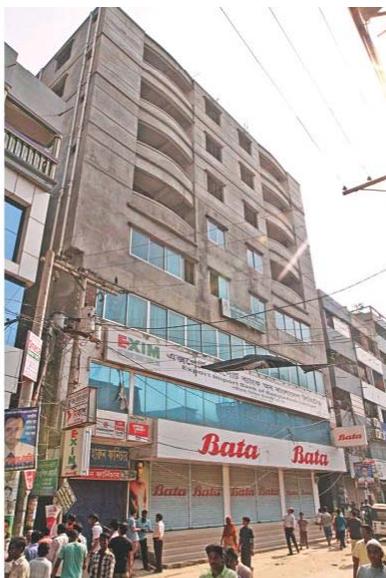
## Key Observations and Findings

Key Factors	Observations	Findings
Preparedness and response	The nation of Japan organizes a massive, speedy response. The Japanese people demonstrated a "culture of preparedness."	Robust catastrophic planning, preparedness, and mitigation make a society more resilient to disaster.
Communicating the risk	Japan relied heavily on formal early warning systems, evacuation plans, and alerts to limit loss of life.	Communications that effectively identify risks to the public by promoting measures and behaviours that avoid, minimize, prepare for, or respond to threats.
Sustainable Structure	Japan ensures enforcement of legal framework to develop sustainable structure.	Developed methods and capabilities to ensure sustainable structure.

## Recommendations

- Incorporation of earthquake countermeasures acts in the Legal frameworks to enforce structural sustainability.
- Establish Emergency Disaster Management Force under Ministry of Disaster Management and Relief for professionalizing the search and rescue operation.
- To ensure integrated disaster management system in the city planning.
- To develop contingency plan for earthquake prevention by Ward level.
- To raise massive public awareness through mass media and community campaign.
- Monitor and ensure enforcement of building code and soil testing
- Enhancement of response capacities of the responsible departments
- Arrange training on first aid, search and rescue for community people.
- To strengthen more effective public–private partnerships to build the business continuity plan for earthquake prevention.
- To develop sufficient open spaces in the cluster level for emergency evacuation.

## Rana Plaza Experience





Thank You