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IMPROVING THE CONTRIBUTION OF CONSTRUCTION SECTOR IN REDUCING THE COMMUNITY DISASTER RISK : CASE OF EARTHQUAKE RISK IN INDONESIA

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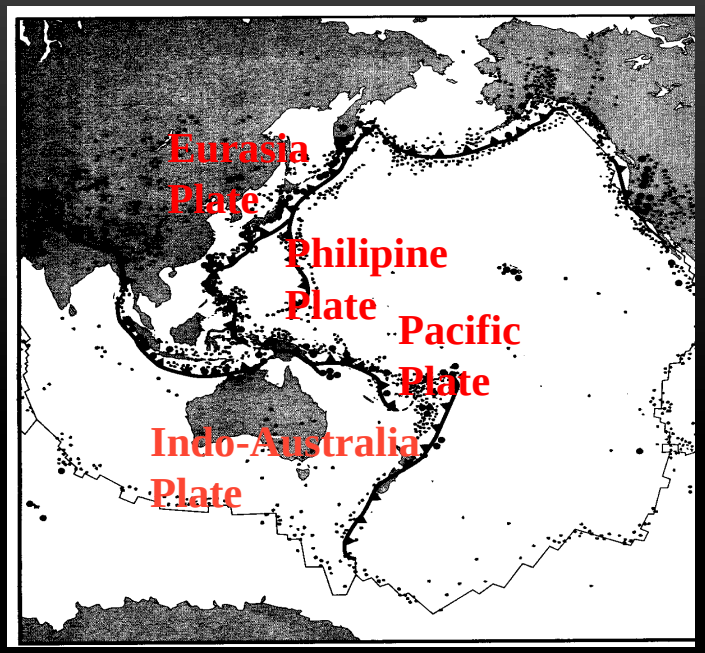
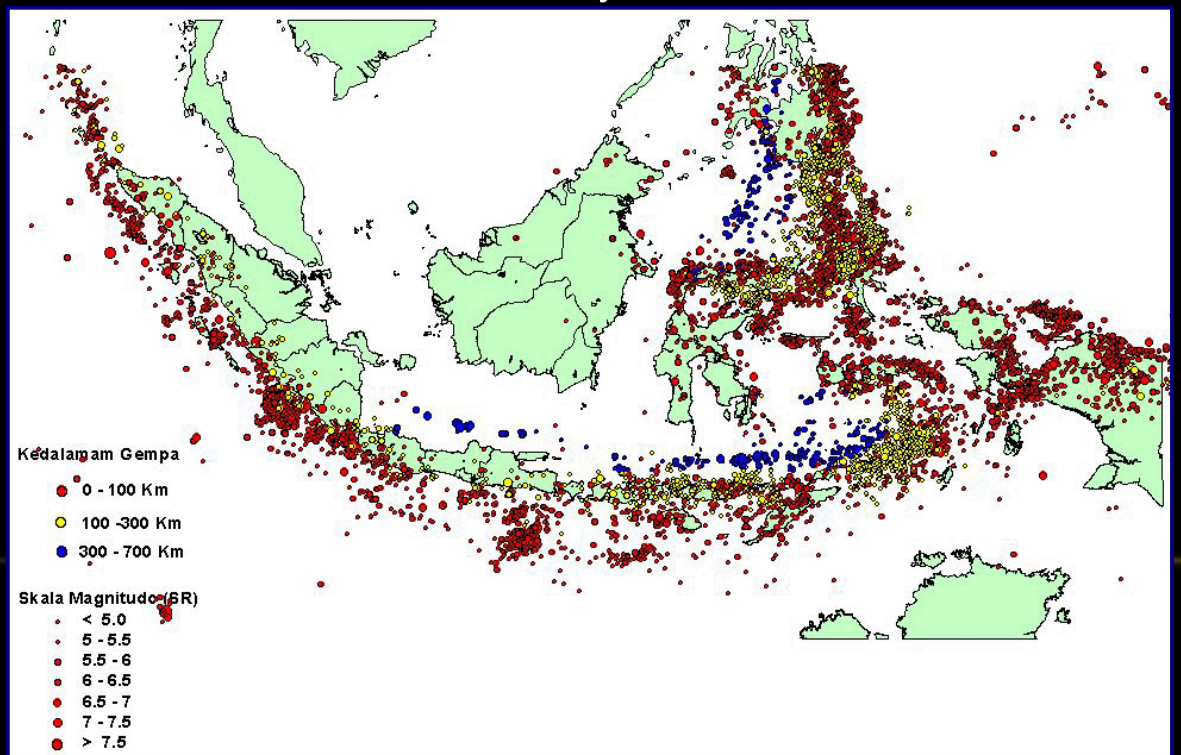
PRESENTATION OUTLINE

- Introduction
- Disaster Risk and Construction
- Role of Construction Industry in Reducing Disaster Risk
- Survey on the Source of Seismic Vulnerability of Buildings in Construction Process
- Experience from Recent Earthquakes
- How to Improve Construction Sector in Reducing Earthquake Vulnerability
- Concluding Remarks

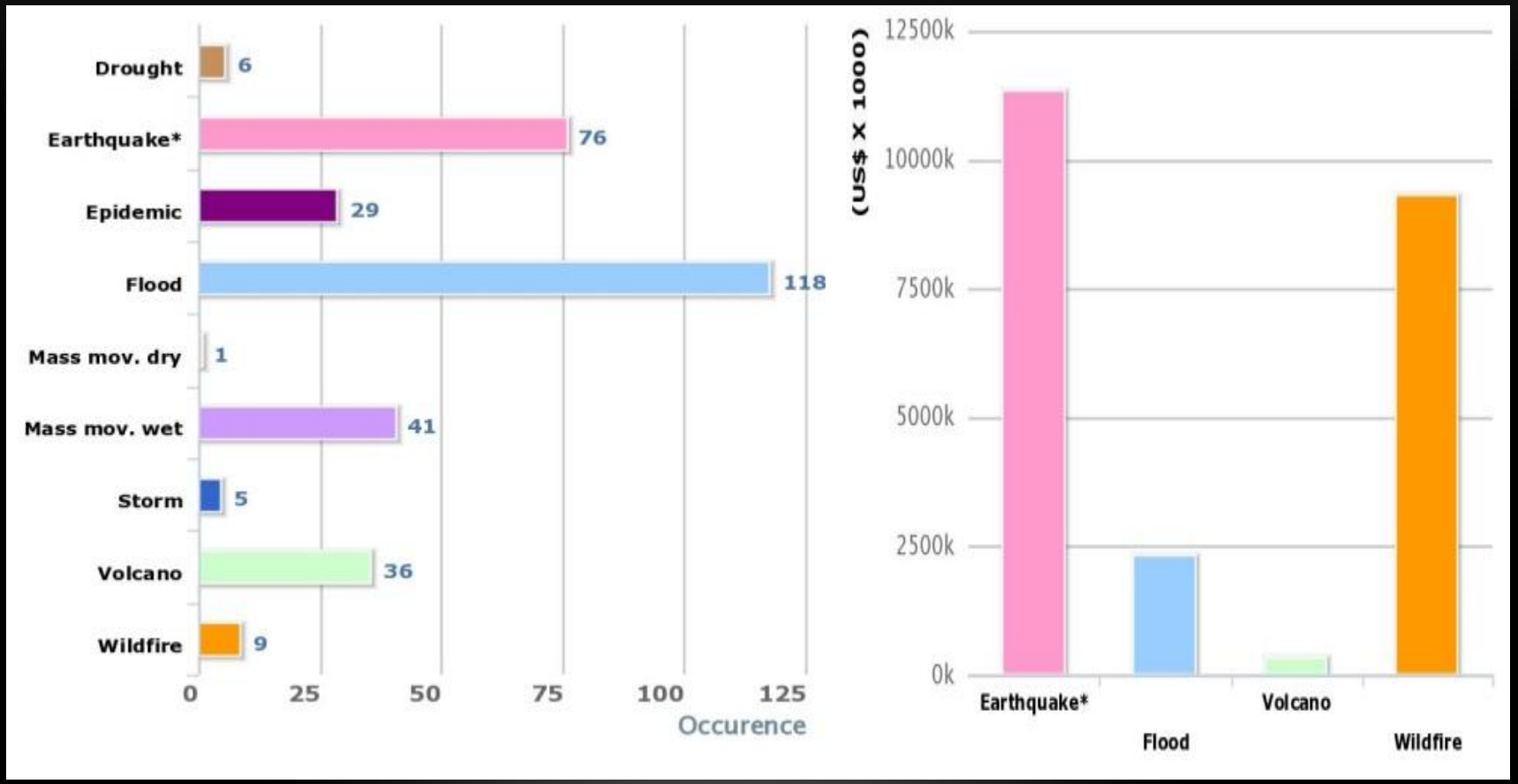
INTRODUCTION

- Indonesia, disaster prone country :
  - >13.000 islands,
  - 1.922.570 km2 of lands and
  - 3.257.483 km2 of marine territory





Indonesia :
Number of disaster and disaster losses from 1900 – 2011



(http://www.preventionweb.net/english/countries/statistics/?cid=80, accessed 8April 2013)

RECENT MAJOR EARTHQUAKES OCCURRENCES IN INDONESIA

No	Earthquake Event	Magnitude	Loss of life	Displaced person	Damaged Houses	Destroyed Houses
1	Aceh E/Q (and tsunami), December 26, 2004	M 9.4	110,000	700,000	57,137	69,932
2	Nias E/Q, March 28, 2005	M 8.6	850	40,000	71,891	12,010
3	Yogyakarta E/Q, May 27, 2006	M 6.8	5,700	600,000	260,000	154,000
4	Bengkulu E/Q, September 12, 2007	M 8.5	35		390,825	19,375
5	West Java E/Q, September 2, 2009	M 7.4	81	178,490	216,424	46,697
6	West Sumatra E/Q, September 30,2009	M 7.6	1,117	-	249,833	114,797

ROLE OF CONSTRUCTION IN DISASTER RISK

- Casualties and economic losses due to damages of both engineered and non-engineered buildings and infrastructure
- Buildings and infrastructure often performed poorly because of vulnerable construction materials and practices.
- Community vulnerability to earthquake in Indonesia caused by:
  - Unchecked development process under pressure of population and economic growth
  - People living under poverty line
- The construction sector (informal and the formal) may contribute to both building and infrastructure resilience and vulnerability at the same time,

DISASTER RISK AND CONSTRUCTION

- disaster risk is “the potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period” (UNISDR Terminology, 2010)
- Disaster risk factors : hazards, vulnerability, capacity

- **Construction :**
  - defines the vulnerability of the built environment.
  - Includes planning, design, procurement, construction, commissioning, operation and maintenance and demolition of the construction products
  - involves a series of institutional actors and regulations, manufacturing and distribution activities, project management, and site production activities

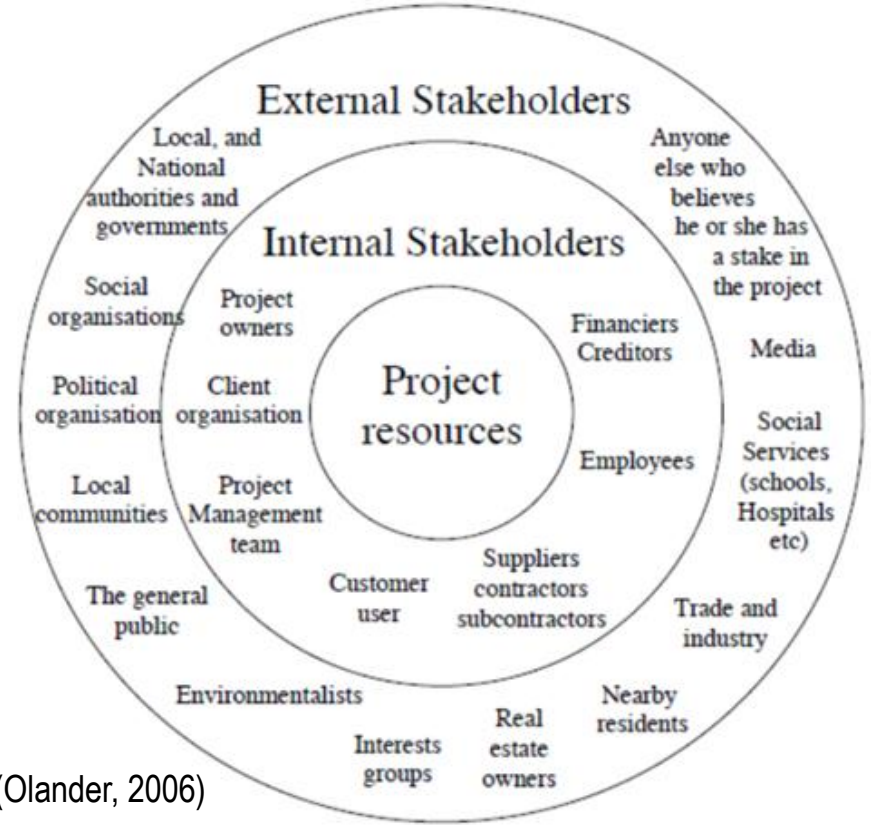
ROLE OF CONSTRUCTION INDUSTRY IN REDUCING DISASTER RISK

- role of the construction industry in disaster management : pre-disaster, during disaster, post -disaster
- pre- disaster vulnerability reduction activities : design and construction of structural construction projects to reduce vulnerability to disasters, land use planning etc.
- Post-disaster vulnerability reduction activities : anticipating and assessing future disaster risk in order to better prevent and/or prepare toward future disruptive shocks in the case of disaster event.
- “build back better “ construction process.

ROLE OF CONSTRUCTION INDUSTRY IN REDUCING DISASTER RISK

Role of the construction industry stakeholders :

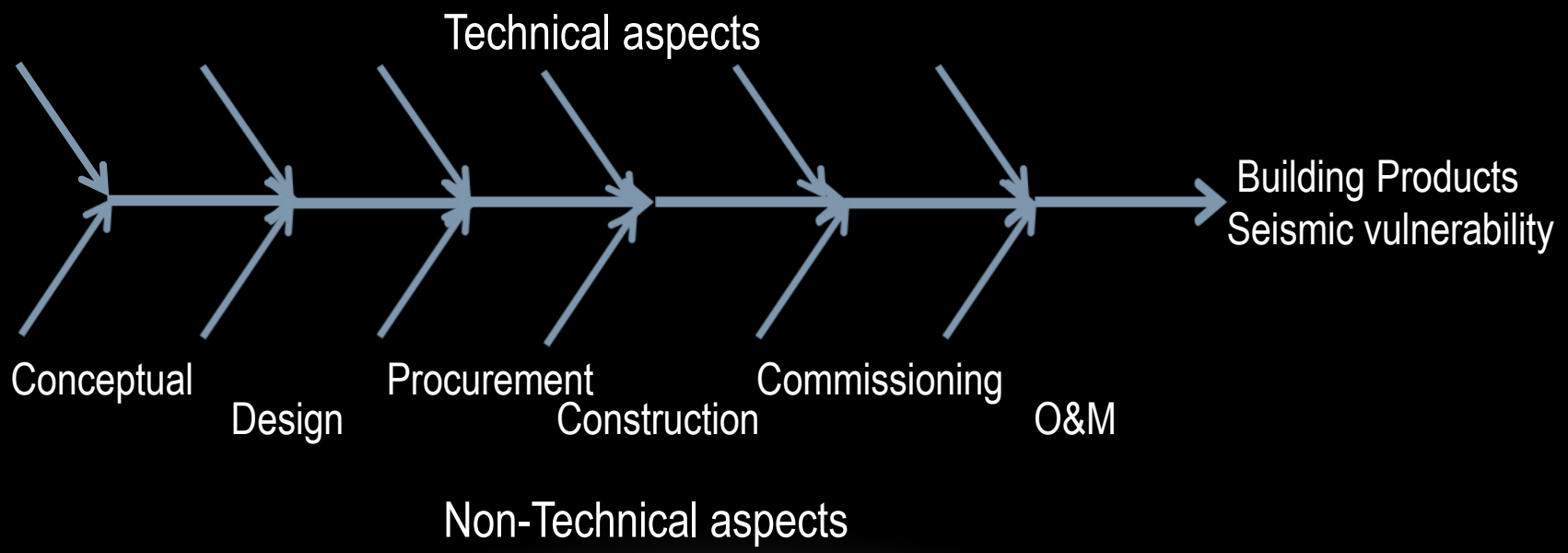
- internal stakeholders : defining values to be adopted by the construction process and ensuring that reducing disaster risk is part of the values
- external stakeholders : give pressures to the internal stakeholders in order values pertinent to disaster risk reduction implemented by the internal stakeholders.



(Olander, 2006)

A SURVEY ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

- Survey to respondents representing different stakeholders in the construction process



SURVEY RESULT ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

Phase	Technical	Non-technical
Conceptual	• Vulnerable location (limited options, incompliance to land use) • feasibility and EIA studies not available or just formalities • Inappropriate need assessment • Concept not following stakeholders requirement	• Traditional values and beliefs, • Fatalistic attitude • Ignorance to earthquake and earthquake resistant technology • Following traditional forms or "imported" building style (material, form) while ignorant to the structural consequences • Inadequate dissemination, no risk awareness • Political aspiration of the local ruler, not need based • Deviation to land use plan due to political and economical pressure • Bad coordination among agencies • High cost for risk and environmental impact assessment • Weak law enforcement

A SURVEY ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

Phase	Technical	Non-technical
Design	• Inadequate or invalid data (soil, hazard etc.) • Hasty design process • Owners do not obey earthquake resistant requirements • Incomplete design criteria, drawing and specification • Incompetent designer/engineer	• Earthquake prone area selected due to various reasons • Not enough information on land use plans • Traditional forms not suitable to new building materials (masonry/concrete) • Inconsistencies in applying building regulation (only for government buildings) • Low capacity from the community for hiring professional engineers • Budget limitation and lower priority for earthquake resistance

A SURVEY ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

Phase	Technical	Non-technical
Procurement	• Inadequate building permit process, building permit only as formality, no design verification • Incompliance to building permit • Improper procurement process resulting in incompetent contractors, no “value for money”, just cheapest • Inadequate risk assessment to A/E and contractors • Unsuitable project delivery method	• Disobeying issued building permit • Lowest price approach • Incompetent builders selected due to various reasons • Political intervention in appointing contractors

A SURVEY ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

Phase	Technical	Non-technical
Construction	• Non-compliance to drawing and specification • Discontinuity of materials supply, resulting in different material quality • Inadequate supervision and control • Inadequate details in the design • Repeated design changes during construction • Inadequate material inspection and quality control	• Non-standardized skills of autodidact builders/tradesmen • Non-compliance to specification as a "culture" to increase profit margin • Inadequate commitment of supervisor/inspector • Traditional collective work with inadequate technical knowledge • Pressure from outside groups (money extortion for security reason) • Bellow-standard materials (exp. Steel reinforcement bars) due to weakness in government control • Corruption • Inadequate field inspection from building control agencies

A SURVEY ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

Phase	Technical	Non-technical
Commissioning	• Inadequate commissioning procedure • Inadequate acceptance criteria • Underestimating commissioning procedure • maintenance training	• building occupation by owner before commissioning • regulation on the assessment for occupational worthiness not in place

A SURVEY ON THE SOURCE OF SEISMIC VULNERABILITY OF BUILDINGS IN CONSTRUCTION PROCESS

Phase	Technical	Non-technical
O & M	• No or inadequate operation and maintenance manual • no or inadequate operation and maintenance training • inadequate maintenance • use of building beyond its operational life • building use different with initial building function which change the loading characteristics • inadequate assessment for building occupational- worthiness • modification of building ignoring existing capacity of structural elements	• low awareness on the need of proper maintenance • maintenance considered as waste • reactive maintenance instead of preventive maintenance • absence of regulation on routine maintenance • maintenance budget not prioritized • policy for reducing or omitting maintenance budget to save money (in short term)

EXPERIENCE FROM RECENT EARTHQUAKES

- Non-engineered buildings , Central Aceh 3 August, 2013

EXPERIENCE FROM RECENT EARTHQUAKES

- Non-engineered buildings , Central Aceh 3 August, 2013

EXPERIENCE FROM RECENT EARTHQUAKES

- Engineered (school) building , Central Aceh 3 August, 2013

ENGINEERED BUILDING, EARTHQUAKE IN BANDA ACEH 2004

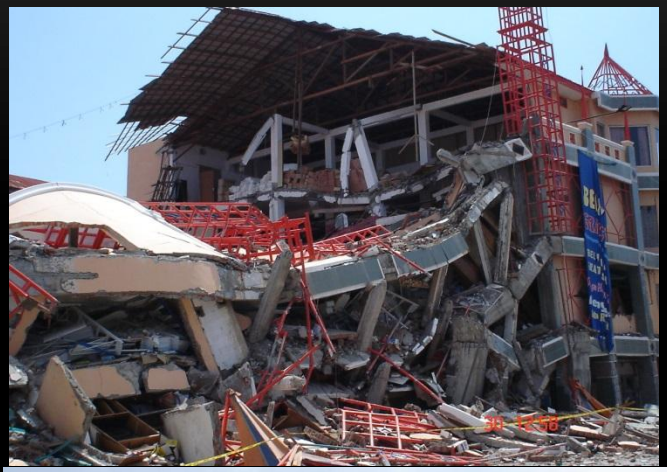


Photo source: Wayan Sengara, PhD.

ENGINEERED BUILDING, YOGYAKARTA EQ 2006

WEST SUMATRA 2009

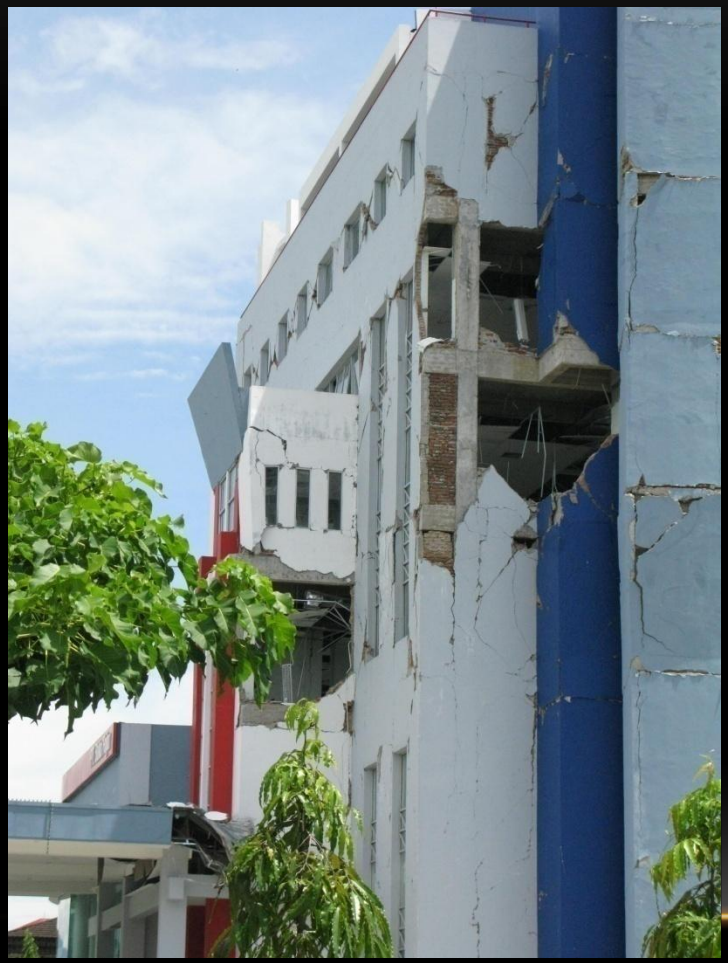


Foto: I Wayan Sengara, 2009

COLLAPSED ENGINEERED STRUCTURE IN PADANG, 26 SEPT 2009

Soft story collapse of a Government building

(Courtesy: Teddy Boen)

COLLAPSED ENGINEERED STRUCTURE IN PADANG, 26 SEPT 2009

- Damaged houses and buildings did not apply good earthquake resistant building practices as well as the prevailing building codes in Indonesia, such as the size and quality of reinforcement bars, proper dimension and spacing of stirrup, improper construction materials, in particular concrete mix and materials which produce very low quality of concrete.
- Many damaged houses were found to be using heavy concrete canopy in front of the house, tied to the small RC tie beams that connect the walls to the roofs. Dari wawancara di lapangan dengan pemilik bangunan dan tuka
- Most of the masons, carpenters and concreter and steel bar benders have very limited knowledge on earthquake resistance technology.
- Most of the house owners either build themselves their houses or assign builders to build their houses without awareness of the earthquake risk in the area. They just trust the local builders to design the structural features of the houses, without the capacity of ensuring whether the masons understand or not earthquake resistant technology.

HOW TO IMPROVE CONSTRUCTION SECTOR IN REDUCING EARTHQUAKE VULNERABILITY

Elements in building the construction industry to contribute positively to the reduction of disaster risk (Ofori, 2004):

- Develop a regime of statutory regulations and codes which guides planners and designers to take preventive action, and contractors to produce items of the requisite quality and durability.
- Build an efficient and effective enforcement framework to give practical effect to the regulations.
- Instill within the construction industry an adequate capacity and capability to undertake designs which give due cognisance to the possibility of all forms of disasters in the particular context of the locations of the items, and in particular for Indonesia as an earthquake prone country, the capacity toward seismically safer buildings.
- Ensure that contractors should be able to produce sound construction.

HOW TO IMPROVE CONSTRUCTION SECTOR IN REDUCING EARTHQUAKE VULNERABILITY

(i) Human resource development at all level to equip construction professionals with the knowledge and skills required to undertake appropriate designs and construction .

(ii) Proper registration of contractors and builders to ensure that they will be updated in terms of construction technology required to reduce disaster risk

(iii) Ensure that good quality construction materials are available within the reach of various economical capacities of house and building owners.

(iv) Develop new materials and technology to cater to the need of various users in different parts of the country, in order that earthquake resistant buildings and houses are economically feasible and reachable.

(v) Develop the industry technical and technological capacity to handle various projects with enough protection to the disaster risk, catering the needs of different types of clients (formal and informal sectors) in pre- and post-disaster situation

(vi) Develop and disseminate user friendly information materials on method and good practices in disaster risk reduction, and in particular, earthquake vulnerability reduction, for the public and for the construction industry.

THE DISASTER RESOURCE PARTNERSHIP (DRP) INDONESIA

- A global alliance of Engineering and Construction (E&C) companies supported by the World Economic Forum.
- Aims to promote “cross- sector, professional, scalable and accountable humanitarian response to disasters that has the ability to meet growing demands to reduce suffering and save lives’ and that promotes an ongoing collaboration between the global humanitarian community, national governments and local E&C companies.” (WEF 2010).
- DRP Indonesia National Platform has ten member companies : PT. PP (Persero), PT. Wijaya Karya (Persero), PT. Jaya Konstruksi Manggala Pratama, PT. Total Bangun Persada, PT. Tatamulia Nusantara Indah, PT. Waskita Karya, PT. Amec Berca Indonesia, PT. Balfour Beatty Sakti Indonesia, PT. Yodya Karya (Persero), and Davy Sukamta & Partners.

THE DISASTER RESOURCE PARTNERSHIP (DRP) INDONESIA

Modes of intervention :

- Direct action: Member companies operating in the disaster affected location immediately engage in emergency relief such as distribution of food, water, medical supplies and non-food items
- Secondments: Companies second individual staff members into NGOs or humanitarian agencies to enhance their capacities (usually when the company is not operating in the disaster affected area).
- Local technical services: Companies at a national level partner with local or national governments, academics, or NGOs to provide technical assistance. This could include, for example, clearing debris, repairing critical infrastructure, damage assessment and design, project management and construction expertise.

THE DISASTER RESOURCE PARTNERSHIP (DRP) INDONESIA

Example of action :

- Post M 6.1 earthquake in Aceh, in July 2013, a team of experts from Indonesia DRP was deployed in coordination with key UN organisations and government departments to conduct :
- damage assessment of community health facilities and general hospitals in the affected area and assessment of local capacities for reconstruction
- training of local builders on construction quality and earthquake-resilient housing design and construction.
- identified significant areas of improvement such as the need for building safety personnel at health offices and hospitals, enforcement of building codes and the need for a vocational engineering and construction school at district level.

(Personal communications with Victor Rembeth, project manager DRP Indonesia National Platform)

END OF PRESENTATION
THANK YOU FOR KIND ATTENTION!