「地震に強い住宅に関する国際シンポジウム」報告書

〈世界共通の課題を一緒に考える〉

第三部　地震による死傷者を少なくする方策を考える－ノン・エンジニアドを中心に－

PROCEEDINGS OF INTERNATIONAL SYMPOSIUM 2008

- Discuss together on the keen and common issue -

Part3: Strategies to Mitigate Casualties by Earthquakes focusing on Non-engineered Construction

November 28-29, 2008

Building Research Institute (BRI)
National Graduate Institute for Policy Studies (GRIPS)
United Nations Centre for Regional Development (UNCRD)

独立行政法人 建築研究所　　GRIPS 政策研究大学院大学　　UNCRD

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目　次

＊この報告書では、地震に強い住宅に関する国際シンポジウム＜世界共通の課題を一緒に考える＞の
「第三部：地震による死傷者を減らす方策を考える－ノン・エンジニアド－」についてまとめたものである。

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*This Proceeding is report on “Part 3: Strategies to Mitigate Casualties by Earthquake focusing on Non-engineered Construction” of the Symposium.

Ⅰ. OUTLINE OF SYMPOSIUM
シンポジウム概要

「地震に強い住宅に関する国際シンポジウム」〈世界共通の課題を一緒に考える〉

1. 背景と目的

世界の地震地域では共通して、地震災害の軽減が喫緊の課題となっている。近年では、2008 年の中国・四川省大地震、2007 の年ペルー・ピスコ地震、2006 の年インドネシア・ジャワ島中部地震、2005 年のパキスタン北部地震が、社会に甚大な被害を及ぼした。日本でも 1995 年の阪神・淡路大震災で大きな被害が生じた。

地震による犠牲者の多くは、自分が住んでいる住宅が倒壊することによって亡くなる。世界の大部分の人は、伝統的な工法であるアドベ、レンガ、石や木材などによる、ノンエンジニアド住宅に住んでおり、耐震構造に関する工学的配慮に欠けているため地震に対して脆弱な構造となっている。最新の科学技術によっても地震を正確に予知することはできないことから、今後発生する地震による死者数や甚大な被害を減らすためには、これらの住宅を安全なものにすることが最も重要である。既存の住宅の耐震性を高めることができれば、地震による犠牲者を減らし、被災地の経済や社会活動の停滞を軽減することができる。いかに緊急事態の対応や救助活動が効率的に行われようとも、亡くなった人は戻らない。いかに効果のある耐震技術が開発されても、それが適用されなければノンエンジニアド住宅は安全にはならない。そこで「地震に強い住宅」に関する国際シンポジウムでは、地震に強いコミュニティづくりに向けて、ノンエンジニアド住宅の耐震安全性の向上策について、専門家の間で議論することを目的としている。

2. 日時

2008 年 11 月 28 日(金)午前・午後ー29 日(土)午後

3. 場所

政策研究大学院大学(GRIPS)内、想海楼(そうかいろう)ホール

〒106-8677 東京都港区六本木 7ー22ー1、代表 Tel:03-6439-6000)

4. 使用言語

英語および日本語(同時通訳使用)

5. 参加者数

62 名 (2008 年 11 月 28 日)

52 名 (2008 年 11 月 29 日)

主催:

- 建築研究所 (BRI)
- 政策研究大学院大学 (GRIPS)
- 国際連合地域開発センター (UNCRD)

後援:

- 国連防災戦略(UN/ISDR)
- ユネスコ(UNESCO)
- 内閣府
- 国土交通省
- 国際協力機構(JICA)

International Symposium 2008 on Earthquake Safe Housing
– Discuss together the keen and common issue –

1. Background and Objectives

Reduction of earthquake disasters is one of the keenest issues common in earthquake prone areas in the world. In recent years, our societies have been severely damaged by Sichuan Earthquake 2008 in China, Pisco Earthquake 2007 in Peru, Central Java Earthquake 2006 in Indonesia, and Northern Pakistan Earthquake 2005. Japan also suffered severe damages from 1995 Hanshin-Awaji Earthquake.

In most of deaths caused by earthquakes, people are killed by their own houses. Most of the world's population lives in vernacular houses that are built of adobe, brick, stone, and wood, and are non-engineered and thus vulnerable to earthquakes. Because earthquakes cannot be predicted precisely even by applying the most advanced science and technology, it is essential to make these houses safer in order to reduce the number of victims and the amount of severe damage caused by future earthquakes. The more resilient the existing houses are against earthquakes, the lower the death rate will be in the event of an earthquake, and the less drastic will be the disruptions to economic and social activities in the affected areas. No matter how effectively emergency management and relief activities are conducted, the lost lives can never be regained. No matter what effective technologies are developed, the non-engineered houses will not be safer unless these technologies are applied. This International Symposium on "Earthquake Safe Housing" therefore aims to discuss among the interested experts how we can improve the safety of houses, newly built and existing, towards safer communities against earthquakes.

2. Date

November 28-29, 2009

3. Venue

Sokairo Hall, National Graduate Institute for Policy Studies (GRIPS)

4. Language

English and Japanese (simultaneous translation is available)

5. No. of Participants

52 (November 28)

62 (November 29)

Organized by:

- Building Research Institute (BRI)
- National Graduate Institute for Policy Studies (GRIPS)
- United Nations Centre for Regional Development (UNCRD)

Supported by:

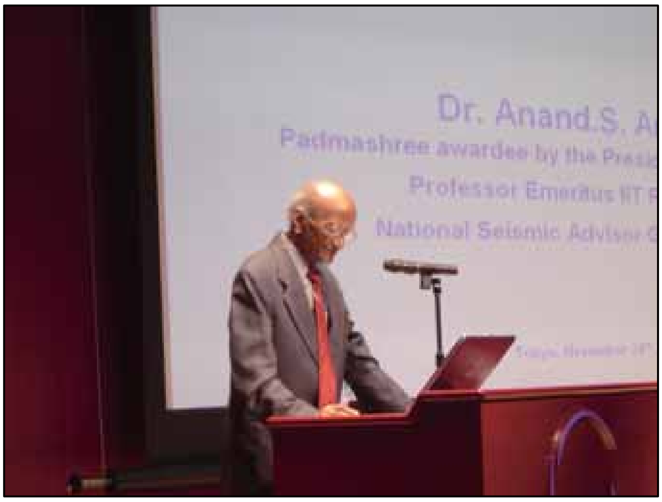
- International Strategy for Disaster Reduction (UN/ISDR)
- United Nations Educational, Scientific and Cultural Organization (UNESCO)
- Cabinet office, Government of Japan
- Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan
- Japan International Cooperation Agency (JICA)

Photo of Symposium

会場風景1

開会挨拶　建築研究所理事長　村上周三氏

Opening Address Dr.Shuzou MURAKAMI



基調講演　インド内務省国家地震顧問　アナンド・アリア氏

Key Note Speech　Dr. Anand.S. Arya

建築研究所国際協力審議役　楢府龍雄氏

General Coordinator of Research and Development Project　Dr. Tatsuo Narafu

Photo of Symposium
会場風景2

ポスター展示風景

Poster Presentation

ポスターセッション風景 1

Poster Session 1

ポスターセッション風景2

Poster Session 2

Ⅱ. PRESENTATION MATERIALS
発表資料

Opening Address
開会挨拶

International Symposium 2008 on Earthquake Safe Housing
- Discuss together on the keen and common issue –
「地震に強い住宅」に関する国際シンポジウム

Sokairo Hall,
National Graduate Institute for Policy Studies (GRIPS),
Tokyo, Japan
on Nov 29, 2008

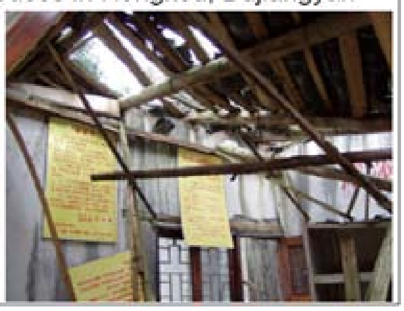
Shuzo Murakami
村上周三
Chief Executive, Building Research Institute Japan (BRI)

Introduction 開発途上国の甚大な地震被害

- Earthquakes cause serious damages to human societies
- Developing countries are more vulnerable


- Tragic Damages again in Sichuan, China in May, 2008
  2008年5月12日中国四川省地震の甚大な被害

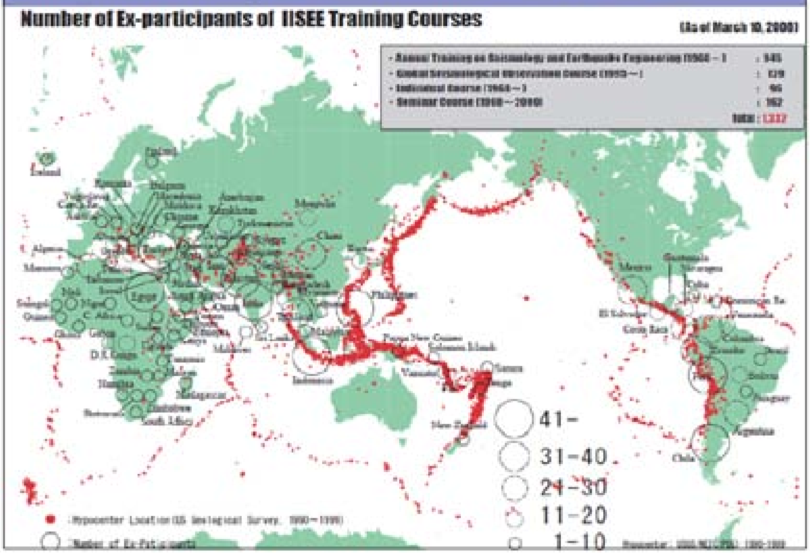
Un-reinforced brick masonry houses in Hongkou, Dujiangyan

Outline of Technical Cooperation for Developing Countries by BRI
建築研究所の開発途上国に対する技術協力の概要

- Training courses on Japanese ODA Programs by IISEE (International Institute of Seismology and Earthquake Engineering)
- BRI/JICA projects for establishment of R&D centers for earthquake disaster mitigation in developing countries
- Activities of R&D and dissemination

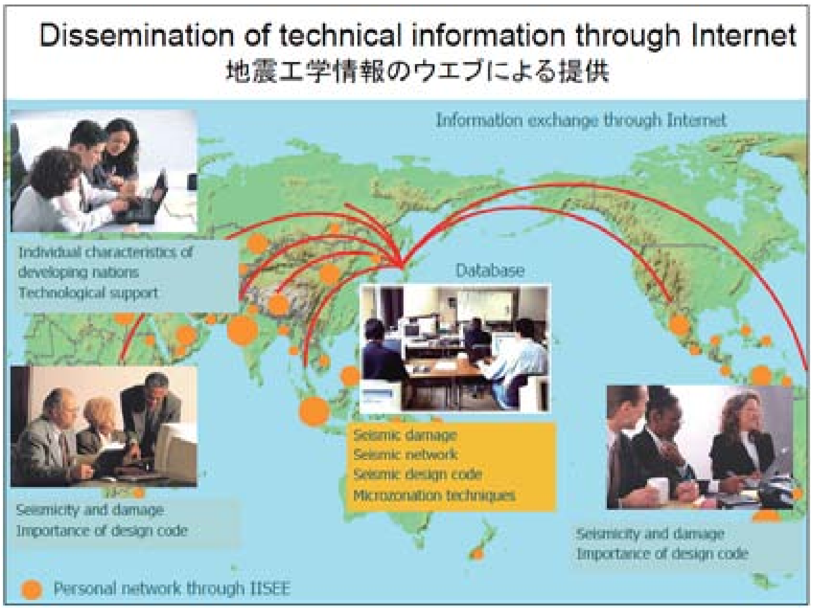
Participants of Training courses from all over the world 地震工学研修の実施

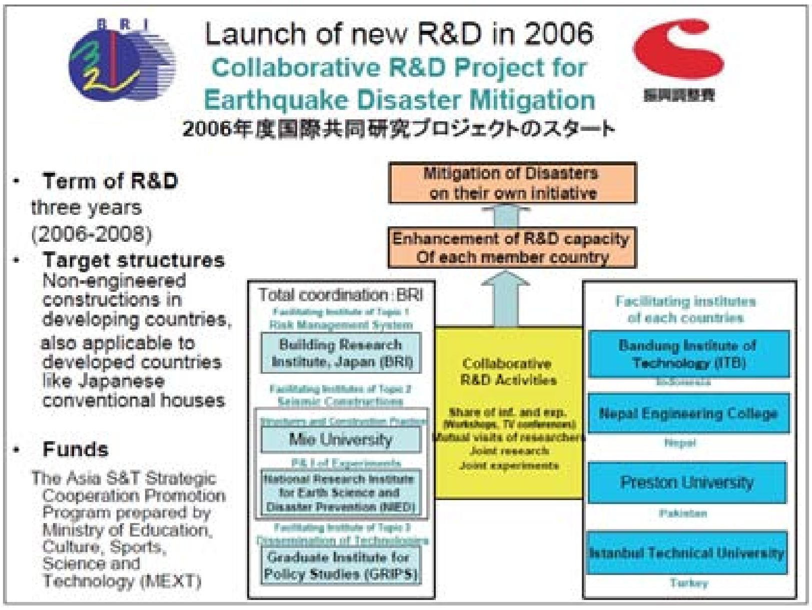


List of BRI/JICA projects for establishment of R&D centers for earthquake disaster mitigation
BRI/JICA 地震防災センタープロジェクト

	Country	Project	Period	Counterpart
	Indonesia	The project on the development of appropriate technology for multi-story residential building and its environmental infrastructures for low income people (Structure)	1993-1998	Research Institute for Human Settlements
	Peru	The Japan-Peru Earthquake and Disaster Mitigation Research Center Project	1986-1991	Japan-Peru earthquake and Disaster Mitigation Research Center
	Chile	The joint study project on earthquake disaster mitigation in Chile	1988-1991 1995-1998	University of Catolica
	Mexico	The earthquake disaster prevention project	1990-1996	National Disaster Prevention Center(CENAPRED)
	Turkey	The project for the establishment of Earthquake Disaster Prevention Research Center on the Republic of Turkey	1993-2000	Earthquake Disaster Prevention Research Center
	Egypt	The joint study project on the evaluation of seismic activities in the plate boundaries in Egypt	1993-1996	National Research Institute of Astronomy and Geophysics (NRIAG)
	Kazafstan	Continuation and improvement of the seismological monitoring system for earthquake preparedness and risk in the region of Almaty city in theRepublic of Kazakhstan	2000-2003	Institute of Seismology, Ministry of education and Science, Republic of Kazakhstan
	Romania	The project on the reduction of seismic risk for buildings and structures in Romania	2002-2007	National Center for Seismic Risk Reduction, Ministry of Transports, Constructions and Tourism (MTCT)


Outline of Romanian Project
ルーマニアプロジェクトの概要
Project title: JICA Project on the Reduction of Seismic Risk for Buildings and Structures in Romania
Term of Project: 2002-2007
Outline of Activities
-Strong motion observation
-Outdoor & indoor soil test
-Structural Test
-Dissemination


Dissemination of technical information through Internet
地震工学情報のウエブによる提供
Information exchange through Internet
Individual characteristics of developing nations
Technological support
Database
Seismicity and damage
Importance of design code
Seismic damage
Seismic network
Seismic design code
Microzonation techniques
Seismicity and damage
Importance of design code
Personal network through IISEE


Launch of new R&D in 2006
Collaborative R&D Project for Earthquake Disaster Mitigation
2006年度国際共同研究プロジェクトのスタート
Term of R&D
three years
(2006-2008)
Target structures
Non-engineered constructions in developing countries, also applicable to developed countries like Japanese conventional houses
Funds
The Asia S&T Strategic Cooperation Promotion Program prepared by Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Mitigation of Disasters on their own initiative
Enhancement of R&D capacity Of each member country
Total coordination :BRI
Risk Management System
Building Research Institute, Japan (BRI)
Seismic Constructions
Mie University
National Research Institute for Earth Science and Disaster Prevention (NIED)
Dissemination of Technologies
Graduate Institute for Policy Studies (GRIPS)
Collaborative R&D Activities
Share of inf. and exp.
Mutual visits of researchers
Joint research
Joint experiments
Facilitating institutes of each countries
Bandung Institute of Technology (ITB)
Nepal Engineering College
Nepal
Preston University
Pakistan
Istanbul Technical University
Turkey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Part 1
Earthquake Risk Perception and Disaster Reduction Policies
地震リスク認知と防災政策
Part 2
From Code to Practice: Challenge in Building Code Implementation
基準から現場へ –建築基準普及への挑戦-
Part 3
Strategies to Mitigate Casualties by Earthquake focusing on
Non-engineered Construction
地震による死傷者を少なくする方策を考える –ノンエンジニアドを中心に-

Wenchuan earthquake and its disaster

He Yongnian
China Earthquake Administration
November 2008

Wenchuan earthquake parameters

Original time: 14:28, May 12, 2008
Location: Southwest Wenchuan, Sichuan province, China (E. Lon 103.4°, N. Lat 31°)
Magnitude: 8.0
Focal depth: 15 km
Earthquake type: Main-shock--aftershock type

Wenchuan earthquake caused severe damage and losses of people's life and property. According to the statistics, the area of severe disastrous region is 33,174 Km2; the area of moderate disastrous is 448,291 Km2.

Wenchuan earthquake resulted in the most severe damage and losses with largest affected area since foundation of PRC. Its death toll is close to 90,000 people, and about 380,000 people injured. The economic losses are estimated to be more than 8450 billion Yuan (RMB).

Tectonic background of the Wenchuan earthquake :Collision of Indian plate northward is the essential cause.

The northwestward subduction of Pacific plate and Philippine plate to the China's continent; the Indian plate pushes northward to the Euro-Asian plate, which makes China's continent being at very high stress; Especially the Indian plate collision makes Qinghai-Tibetan massif situated in critical state; when strength of the crust there isn't large enough to resist the stress resulted from plate movement, the rock layers would be fractured and the earthquake may occur.

For the Wenchuan earthquake, there is more direct cause： the stress caused by Indian plate collision toward the Tibet-Qinghai plateau has been blocked by the vast Euro-Asian continent, resulted in east-ward and west-ward transmission along the Tibet-Qinghai massif. So both the eastern and western ends of the Tibet-Qinghai massif is earthquake-prone areas.

Tectonic background of continental seismicity in China

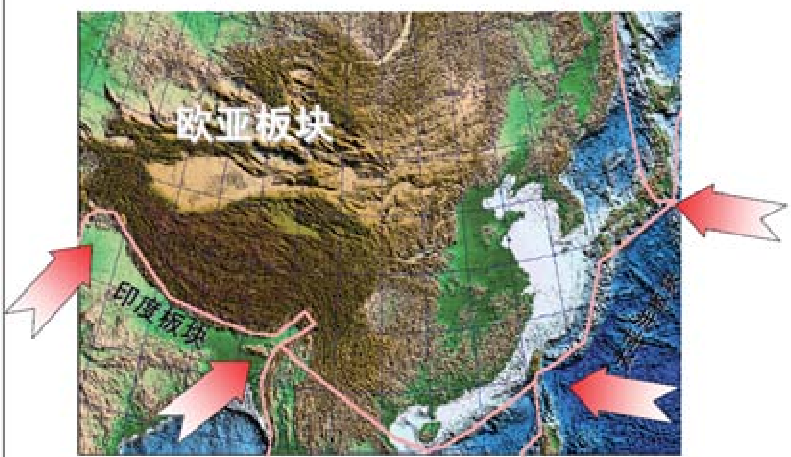
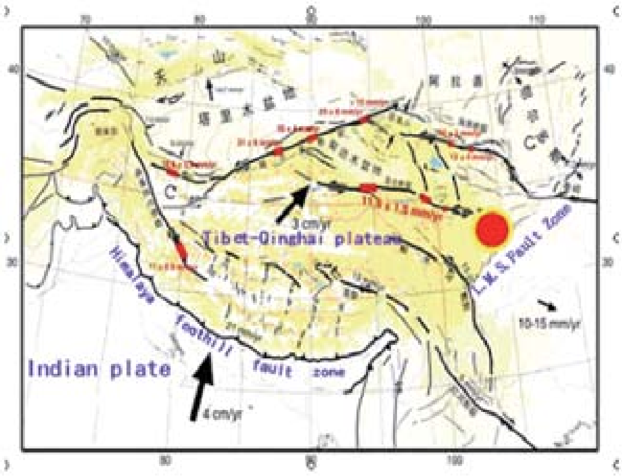
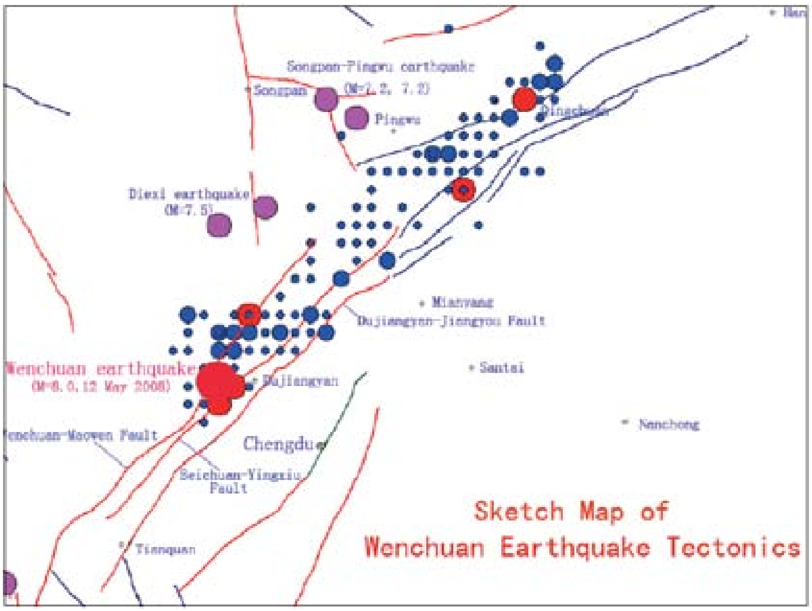


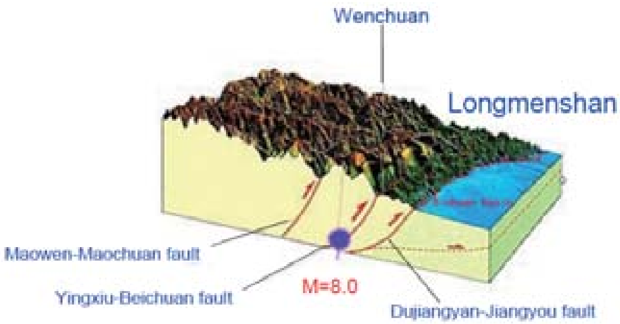
Plate movement causes strong earthquake activity



Epicenter of Wenchuan Earthquake; L.M.S.: Longmenshan

When the stress transmitted eastward and reached the eastern boundary of the Tibet-Qinghai massif—Longmenshan fault zone, triggering the sudden slip of the Yingxiu--Beichuan fault, the central fault of Longmenshan fault zone and a M=8.0 earthquake occurred. That is the Wenchuan earthquake.





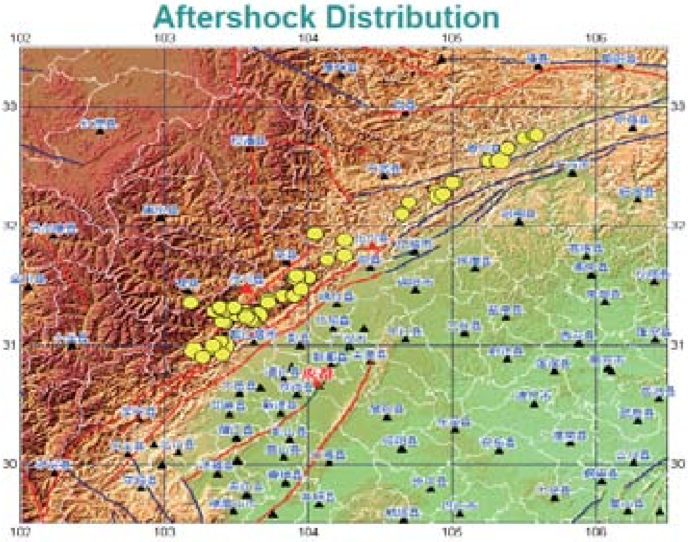
The fracture process of Wenchuan earthquake lasted about 2 minutes, and caused a long ground fracture zone with a NE strike, which extended about 300 km.

The fracture is single directional, that is, the fracture stated from Yinxiu town and extended northeastward, however, there isn't the southwestward fracture found.

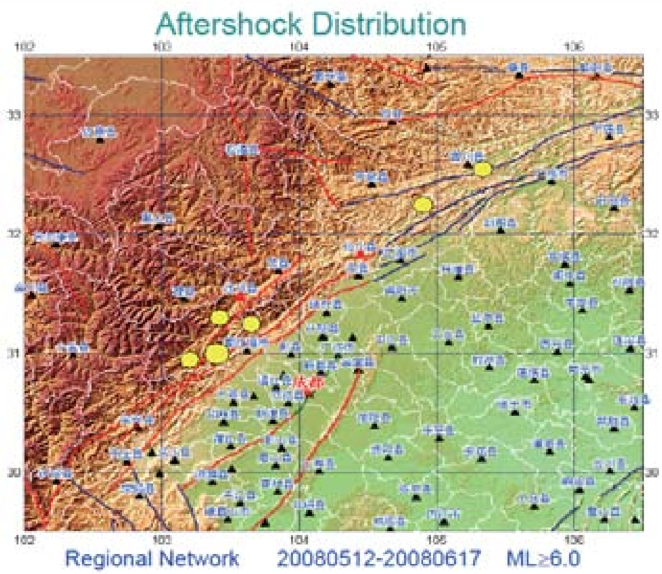
According to the observational data, there were 28529 events up to September 08, 2008; among them the events with M= 4.0--4.9 are 222 times, the events with M=5.0—5.9 are 31 times and the events with M=6.0—6.9 are 18 times; the maximal magnitude of aftershocks is 6.4, which occurred on 25 May, 2008.

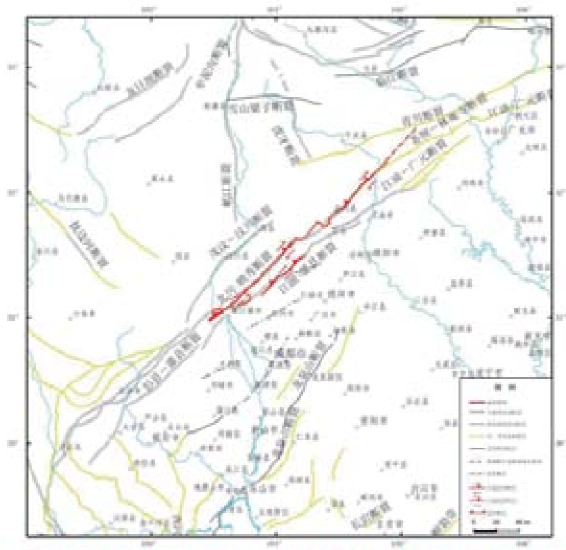
The following slides show the distribution of aftershocks, which is basically coincided with strike of Longmenshan fault zone.

Aftershock Distribution



Regional network 20080512-20080617 ML≥5.0

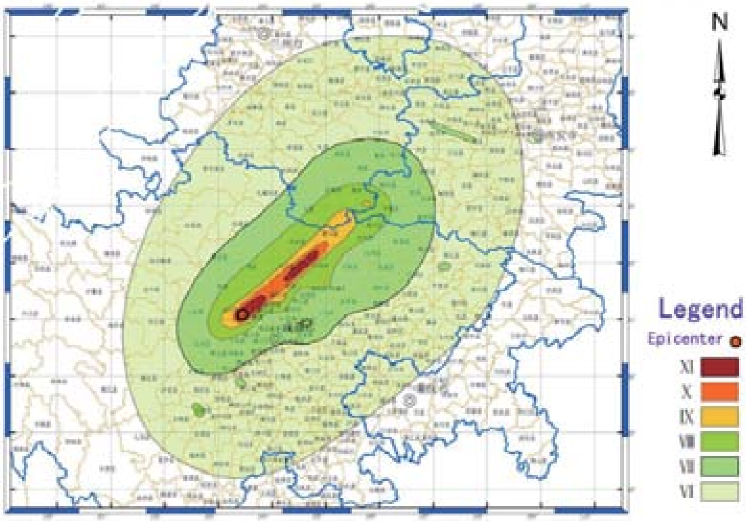




Ground fissure zone caused by Wenchuan earthquake

Wenchuan earthquake brought about serious disaster in the earthquake-stricken region. The following slides will show you the related situation in the epicenter regions, where the seismic intensity will reach XI degrees (MMS). The region with intensity of XI covered an area of about 2420 Km2 . The intensity investigation The maximal intensity extent appears as an elongated region centralized with Yingxiu town, wenchuan county and Chengguan town, Beichuan county. Totally, the area with higher than VIII is larger than 500,000 Km^2 .

Intensity Contour of Wenchuan Earthquake with M=8.0



A remarkable feature of earthquake disaster in Wenchuan region

Wenchuan earthquake induced severe secondary disaster, mainly, it is geological disaster, including landslide (5117 sites), mountain collaps(3575 sites) ,mud flow (358 sites) and barrier lakes (34 sites), which resulted in huge losses and casualty and difficulty for emergency relief and rescue.

Disaster

Panorama of Beichuan county (1)

Panorama of Beichuan county (2)

Beichuan county

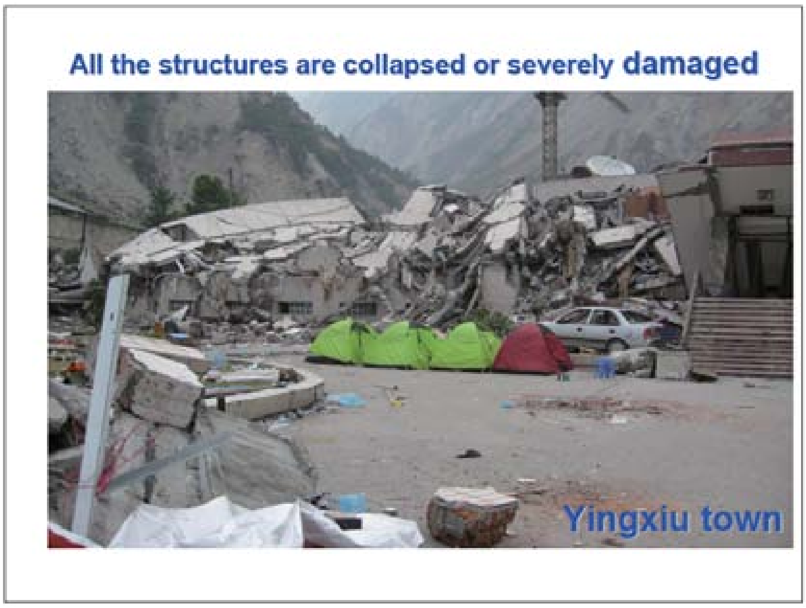
All structures are almost ruined (1)


All structures are almost ruined (2)
Beichuan county


Fallen rocks damaged the houses
Beichuan county


It was busy commercial street
Beichuan county


Intensity of XI
Panorama of Yingxiu Town


All the structures are collapsed or severely damaged
Yingxiu town


Inclined and damaged building
Yingxiu town

The building collapsed and the cars crushed

The damaged bridge in Beichuan town

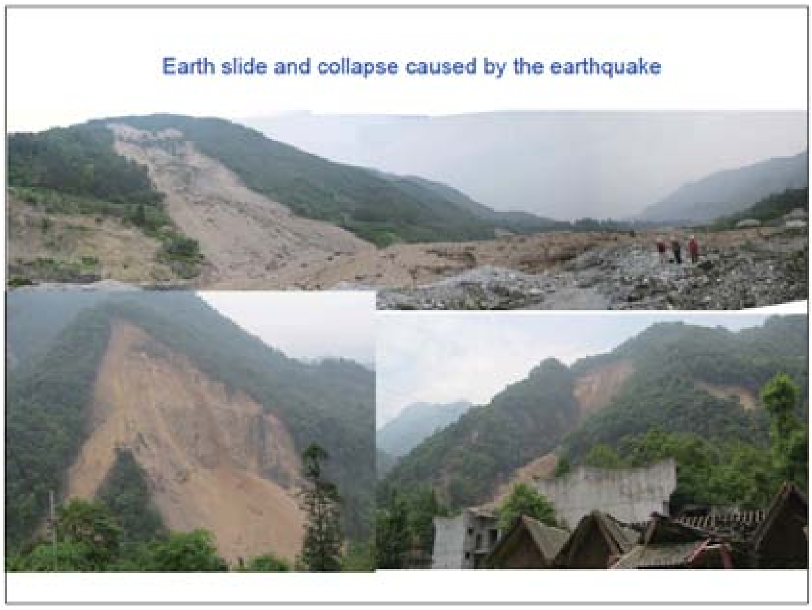
The Collapsed bridge in Beichuan town

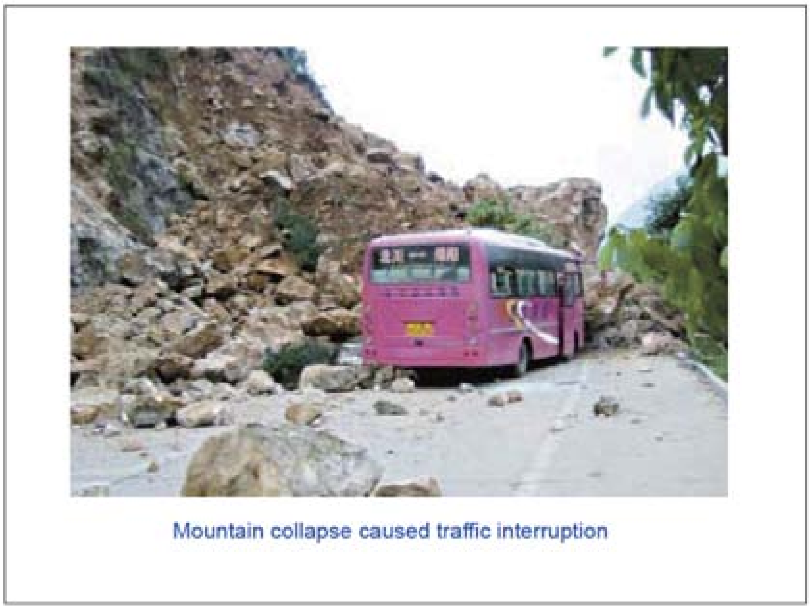
Rail track damaged and the train derailed

Mountain collapse blocked the road in Qingchuan county

Ground fissures

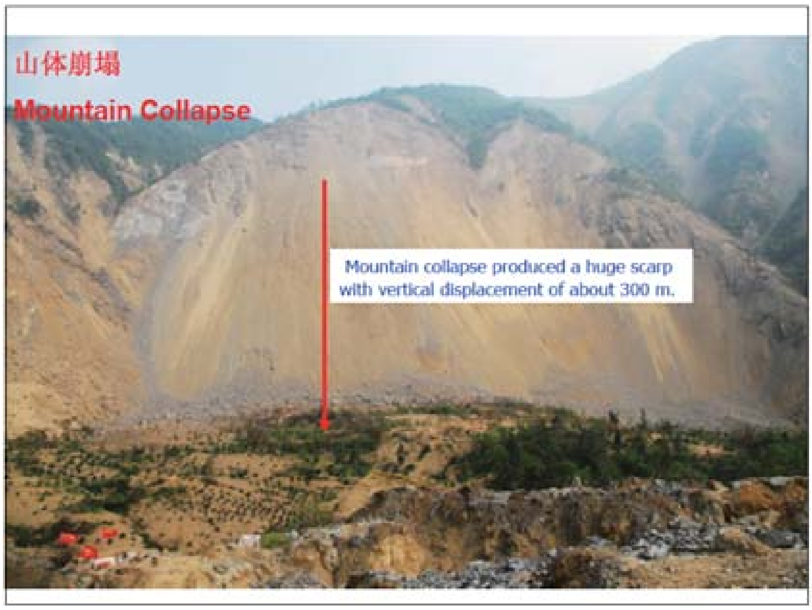

Earthquake –caused earth slide buried a village
Yingxiu town


Earth slide and collapse caused by the earthquake


Mountain collapse caused traffic interruption


Land slide in Beichuan region


滑坡与山体崩塌
Landslide and rockfall
Beichuan Town


山体崩塌
Mountain Collapse
Mountain collapse produced a huge scarp with vertical displacement of about 300 m.

Dammed lake in Wenchuan earthquake-stricken area

Tangjiashan barrier lake caused by Wenchuan

Some Remarks on Wenchuan earthquake

★ The southern segment of Longmenshan fault zone was considered as an active part, and the northern and middle segments were inactive; however,the Wenchuan earthquake indicated that the whole Longmenshan fault zone is active.

★ The seismic intensity of Longmenshan region was determined VII (MMS), it is underestimated. Now the seismic intensity of the region is re-determined as VIII.

★ There wasn't remarkable precursor of seismicity found before the earthquake with M=8.0 through careful check of the regional seismicity. Either, there were not other precursors found before the earthquake.

★ Wenchuan earthquake showed a large scale fracturing process, from the focal region propagated northwestward till southern Shanxi province, the ground fission zone reached more than 300 km. Accordingly, some seismologists consider that the "seismic focus" of this earthquake should be a "plane" rather than a "point".

★ Wenchuan earthquake induced severe secondary geological disaster, which made the disaster more serious and obstructed the emergency relief and rescue.

On damage of buildings and structures

The earthquake field investigation shows that those buildings, constructed according to the building code issued since 1989, and have good construction quality, damaged lightly; they are most of framing structure with shearing walls. On the contrary，those buildings, constructed in early times and the earthquake resistance level was lower, damaged severely, and the building types are mainly masonry structure of brick-frame construction.

On reconstruction of Wenchuan earthquake stricken region

In the light of mountainous features of the disaster stricken region, its rehabilitation and reconstruction will be divided into several sub-areas: in the mountain front area the disaster is relatively light, the focus of reconstruction will be put on reinforce of the damaged buildings to restore the life and productive order of the towns and villages as soon as possible. In Longmenshan region, where the disaster is severe, the first thing is to formulate the regional reconstruction plan based on local natural capacity, population and resources and so on. The infrastructure layout, minority custom, requirement of social and economic development and control of town and village scale and others should be considered. At same time, reconstruction must pay attention to escape the fault zones and sites, where the geological hazards may frequently occur.

Thank you very much!

Challenges for Safer Non-Engineered Constructions

Dr. Anand.S. Arya
Padmashree awardee by the President of India, 2002
Professor Emeritus IIT Roorkee
National Seismic Advisor GoI – UNDP

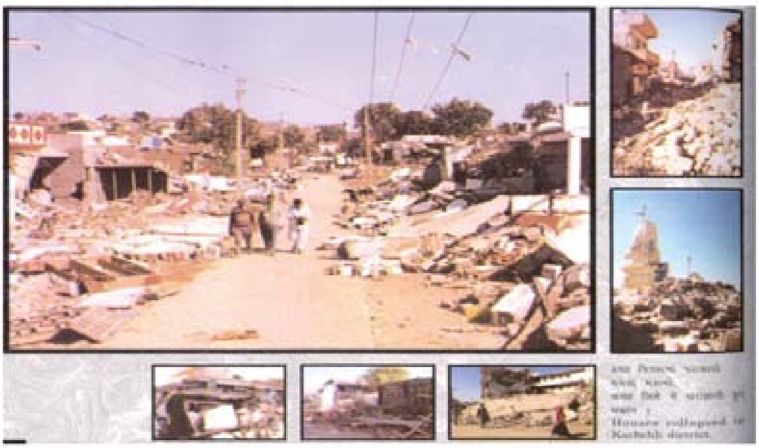
Tokyo, November 29th, 2008

KACHCHH EARTHQUAKE IN GUJARAT

Date of Occurrence	:	26th January 2001
Time	:	8.46 a.m.
Epicenter	:	23.6 ⁰ North Latitude and 69.8⁰ East Longitude, 20km North East of Bhuj
Magnitude	:	6.9 Richter Scale 7.7 Moment magnitude 7..9 Surface Wave magnitude
Intensity, maximum	:	IX-X MSK Scale

A Terrible Human Tragedy

Over 1.1 million homes affected; 4 Kutch towns in ruins



A Terrible Human Tragedy

Over 5,000 Health units damaged / destroyed

Bhuj General Hospital

Over 50,000 School rooms damaged / destroyed

High School of Dudhai Village

A Terrible Human Tragedy

Over 50,000 artisans lost their livelihood.

Over 10,000 small and medium industrial units went out of production.

A Terrible Human Tragedy

- Massive damage to telecom, power, water supply and transport infrastructure.

IMPACT: A LARGER PICTURE

Direct losses

- Human lives
- Livestock, other animals
- Private property
- Municipal infrastructure
- Power/ telecommunications infrastructure
- Health/ education assets

- Gujarat earthquake estimate: Rs 15308 Crores
- $ 3364 Mn

Indirect losses

- Export/ import
- Agricultural output
- Industry/ services output
- Remittance income
- Fall in earning potential (due to disability, trauma etc.)
- Unemployment
- Health hazards

- Gujarat earthquake estimate: Rs 3047 Crores
- $670 Mn

Tertiary losses

- Long-term development
- Overall investment climate
- Funds reallocation
- Community migration/ relocation

- Gujarat earthquake estimate: Rs 10067 Crores
- $2213 Mn

The need of the hour...

An agency to carry out...

- Implementation of massive Relief, Rehabilitation and Reconstruction work
- Co-ordination between Govt. of Gujarat and several donors, funding agencies like WB, ADB
- Quick Policy Making
- Effective Financial Management
- Monitoring and Quality Inspection
- Planning for long-term Disaster Management
- Disaster Mitigation

The Answer - GSDMA

- The Gujarat State Disaster Management Authority was constituted by the Government of Gujarat vide its GR dtd.08/02/2001 (just 12 days after the disaster)
- It was found an effective response to the enormous challenges posed by natural calamities.

Objectives of GSDMA

- To undertake relief, rehabilitation and reconstruction of social and economic activities to restore normalcy.
- To minimize the impact of natural calamities through mitigation programmes.
- To study and conduct Risk and Vulnerability Analysis of Gujarat.
- To suggest remedies to prevent or minimize the effects of natural calamities.
- To optimize the use of funds, grants, donations, assistance received from GOI, donors and other funding agencies

EMERGENCY RESPONSE

•Rescue Equipment (5449): JCBs, Cranes, Bull Dozers, Excavators, Dumpers, Trucks, Gas Cutters

•Vehicles (5022): Jeeps, Ambulances, ST buses

•Personnel (29140): Technical, Non-Technical, Labourers, Medical Terms

•International rescue teams arrived: Netherland, France, Japan, Ukrain, Switzerland, UK, Russia, Germany, Bulgaria and Israel

•Injured: 167,000 cases treated (19,000 serious nature)

•Army Hospital at Bhuj opened its door to civilians

•Hospitals set up by State Government & IMA, Israel, France, Ukrain, Denmark, Red Cross Societies of Norway, Finland & Germany

EMERGENCY RESPONSE

•All emergency telecommunication services restored within 24 hours

•Essential services like water,power, railway traffic, road ways restored in 36 hours in Bhuj and within 48 hours in entire Kutch

•Essential supplies of wheat, groundnut oil & sugar rushed to Kutch district for free distribution

•Free community kitchen services provided

•Cashdoles given to 9,11,096 Families, house hold kits to 3,72,027 Families

•Death Compensation paid to 13,378 Cases, Injury Assistance given to 19,648 Cases

•Emergency Shelter to 2,48,947 families

Biggest Challenge

Safer Reconstruction of Houses and other Buildings

HOLISTIC APPROACH

The reconstruction program has been designed to address the needs of beneficiaries comprehensively...

ASSESSMENT OF DAMAGE

- A very ticklish and difficult task
- Preparation of proformas for non-engineered buildings
- Preparation of proformas for reinforced concrete buildings
- Organization of teams for carrying out assessment of damage house by house (the teams consisted of an engineer, a revenue staff and a village head man.
- Establishment of grievance redressal mechanism
- Many issues and problems erose necessitating repeat damage surveys in some areas

A rational and reliable system of damage assessment needs to be developed

TYPES OF CONSTRUCTION

1. Non-engineered Building Construction.

2. Engineered Constructions including buildings and infrastructure.

Non-engineered buildings are those which are spontaneously and informally constructed in various countries in the traditional manner without any or little intervention by qualified architects and engineers in their design.

Engineered constructions include reinforced concrete buildings and structures used for various purpose which are normally designed by Architects and Engineers working in various Govt. departments or consulting organization.

BAD PERFORMANCE OF MASONRY BUILDINGS

i Old decaying buildings predating modern construction practices

ii New buildings not built to Indian earthquake Codes – Lack of knowledge

iii Improper detailing of masonry building

iv Poor materials, construction and workmanship used

v Absence of 'header' or 'through' stones and long corner stones

vi Buildings having poor quality foundations or foundations built on poor soils

TABLE 1 – BUILDING TYPES IN FIVE DISTRICTS OF GUJARAT

Wall Type	No. of Houses and percentage of Total in District									
	Kachchh	%	Jamnagar	%	Banaskantha (incl. Patan)	%	Rajkot	%	Surendranagar	%
Category A	276,390	70.72	215,135	52.04	268,790	54.90	295,005	46.81	281,475	85.04
Category B	56,995	14.58	183,050	44.28	202,185	41.29	310,925	49.34	43,705	13.20
Category C	42,135	10.78	9,980	2.41	6,705	1.37	15,15	2.46	2,870	0.87
Category X	15,290	3.91	5,210	1.26	11,955	2.44	8,760	1.39	2,9	0.89
Total	390,810	100	413,375	100	489,635	100	630,205	100	330,995	100

Source: Vulnerability Atlas of India, 1997

Category A - Building in field-stone, rural structures, unburnt brick houses, clay houses

Category B - Ordinary brick buildings; buildings of the large block and prefabricated type, half-timbered structures, buildings in natural hewn stone

Category C - Reinforced building, well built wooden structures

Category X - Other types not covered in A,B,C. as of biomass, metal sheets etc. These are generally light

Approach adopted by Gujarat Government

- Total 213685 houses to be reconstructed in 290 villages and four worst EQ affected towns
- Two broad approaches adopted for reconstruction of houses damaged/destroyed by the EQ

- Owner Driven Reconstruction (176012 houses 82%)

- Public Private Partnership Program (PPPP) (37673 houses 18%)

RECONSTRUCTION AND RETROFITTING OF BUILDINGS

- Ensuring Earthquake Resistance
- Available Technical know how
- Development of Appropriate guidelines
- Appropriate Awareness Creation
- Capacity building for carrying out the works
- Control and assurance of required quality of construction
- Facilitation of the constructions through materials banks

Available Technical Know how

A. Indian Standards (Codes/Guidelines)

1. IS: 1893-2002 *"Criteria for Earthquake Resistant Design of Structures, Part 1 (Fifth Revision)"* July 2002.
2. IS: 13920-1993 *"Ductile Detailing of Reinforced Concrete Structures subjected to Seismic forces- Code of Practice"* November 1993.
3. IS: 1326-1993 *"Earthquake Resistant Design and Construction of Buildings-Code of Practice (Second Revision)"* October 1993.
4. IS: 13828-1993 *"Improving Earthquake Resistance of Low Strength Masonry Buildings-Guidelines"* August 1993.
5. IS: 13827-1993 *"Improving Earthquake Resistance of Earthen Buildings-Guidelines"* October 1993.
6. IS: 13935-1993 *"Repair and Seismic Strengthening of Buildings-Guidelines"* November 1993.

B. Guidelines Published by BMTPC, Ministry of Urban Development, Government of India

7. *"Improving Earthquake Resistance of Buildings – Guidelines"* by Expert Group, pub. by Building Material and Technology Promotion Council (BMTPC), 1999.
8. *Vulnerability Atlas of India*, by Expert Group, Published by (BMTPC), 1997.
9. *Damage Assessment and Post-Earthquake Action* (after Jabalpur Earthquake of 1997, authored by Dr. A.S. Arya pub. by BMTPC, 1997)
   Part 1: *Earthen Houses with Clay Tile Roofing*
   Part 2: *Brick Houses with Clay Tile Roofing*
   Part 1: *Brick Houses with RC Slab or Stone Patti Roofing, or R.C. Frames* pub. by BMTPC, 1997.
10. *Damage Assessment and Post-Earthquake Action* (after Chamoli Earthquake of 1999, authored by Dr. A.S. Arya pub. by BMTPC, 2000)
    Part 1: *Visual Damage Identification Guide for Affected Areas*
    Part 2: *Repair and Retrofitting of Damaged Buildings in Affected Areas*
    Part 3: *Reconstruction and New Construction of Buildings in Affected Areas*

C. International Monographs

1. Arya A.S. et al, *Earthquake Resistant Non-Engineered Construction*, Monograph pub. by International Association for Earthquake Engineering, 1980, Revised 1986. (translated into Spanish for use in various Spanish countries).

2. Arya A.S. *Construction of Educational Buildings in Seismic Areas*, Digest No. 13, pub. by UNCSCO, Bangkok, 1987 (translated into Persian for use in Iran).

C. Guidelines Published by Gujarat State Disaster Management Authority (GSDMA) authored by Dr. A.S. Arya as Capacity Building Advisor

1. *Reconstruction and New Construction of Houses in Kachchh Earthquake Affected Areas of Gujarat*, first printing June 2001 and 2nd printing in January 2002.
2. *Control on Quality of Construction in Earthquake Affected Areas of Gujarat*, printed in June 2001.
3. *Guidelines for Construction of Compressed Stabilised Earthen Wall Buildings*, printed in December 2001.
4. *Guidelines for Cyclone Resistant Construction of Buildings in Gujarat*, printed in December 2002.
5. *Restoration and Retrofitting of Masonry Buildings in Kachchh Earthquake Affected Areas of Gujarat*, printed in March 2002.

Reconstruction through NGOs

•The decision on the relocation/in-situ reconstruction of the village is passed through Gramsabha (all voting adults of the village)

•The relocation of village is done only when the majority of the community agrees on it.

-Only 5225 houses (2.5% of the total) are fully relocated
-10299 houses (5% of the total) are partially relocated
-For rest of the houses, reconstruction is done in-situ

Owner-driven Reconstruction

•Houses constructed by the owners themselves

-It ensures that the design of the houses are determined by the owners themselves, as per their needs and preferences

-Also ensures that instead of being uniform, the houses reconstructed are of different patterns as found in case of organic evolution of the common villages

-Approach ensures `Technology Transfer' to the community and subsequently the sustainability of program.

Owner-Driven Reconstruction

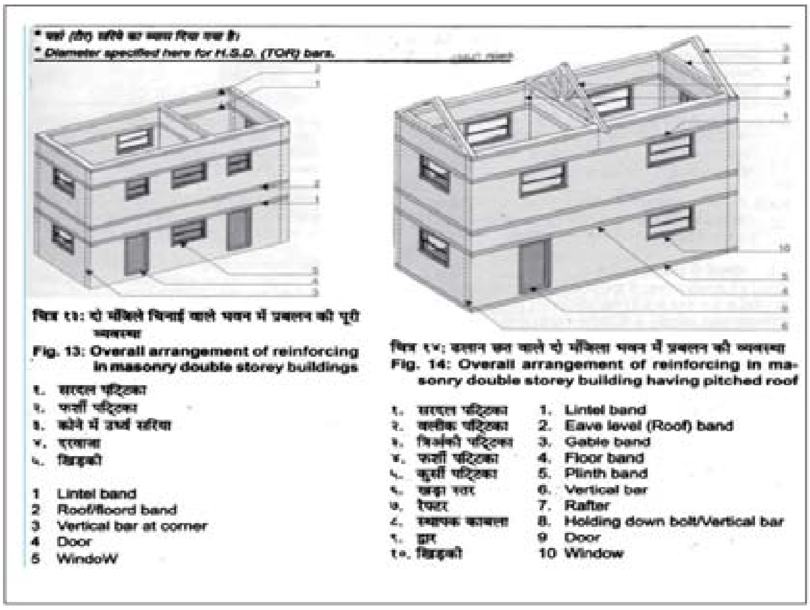
• Financial, technical & material assistance provided by the government

•The designs for seismic reconstruction of houses provided by the government

•The material assistance provided through 1082 material banks (cement bags and other materials provided at subsidised rates)

•More then 180 public consultations held for town planning.

•Design of 20 model houses provided to the public to choose from with an option to have one's own design



Restoration and Seismic Retrofitting of Existing Buildings and Infrastructure Elements

(i) Identification of Critical Buildings

- Educational Buildings
- Health Buildings
- Other Community Buildings
- Buildings used for Gathering - Cinemas, Marriage Halls
- Religious Buildings – Temples, Mosques, Churches
- Disaster Management Staff Quarters & V.I.P Residences,etc

(ii) Infrastructure Elements

- Water Supply Structures
- Electric Sub-Stations
- Telephone Exchanges
- Railway Stations
- Fire Stations
- Airport Structures, etc.

(iii) Awareness, Incentives & Disincentives to the People

Damaged
POLICE STATION BUILDING AT RAPAR

Retrofitted
POLICE STATION BUILDING AT RAPAR
FLAG HOISTING CEREMONY

AWARENESS CREATION

- Publications
- Public Displays
- Demonstrations
- Audio-Visual
- Trainings and Workshops
- Exhibitions

AWARENESS CREATION

- **4 Shake Table Demonstrations** and video shows
- Displayed messages on hazard resistant construction on **600 state transport buses** in five worst affected districts.
- Seven types of **hoardings** at strategic locations in the state
- Disaster management taken as permanent agenda in **18000 Gram Sabhas** conducted during a period from 12th Jan'03 to 24th Jan'03 and in May '03

Shock No: 11,T.M Collapse ,I.M End Wall Cracked

Improved Building Ready For Shock No:14

AWARENESS CREATION

- Exhibitions conducted on safe construction; disaster reduction; disaster preparedness; progress of GEERP
- **Information dissemination** through
  - Pamphlets, Nirdeshika, posters, seismic construction guidelines by Dr. Arya, training literature, pocket booklets, booklets, handbills, press advertisements etc.
  - CDs on progress, video and audio cassettes on multi-hazard resistant construction using folk music, street plays, dance, jokes etc.
  - A **calendar** has been printed for awareness regarding "Do's and Don'ts in wake of disasters".
  - Publication of Plain Truth.

AWARENESS CREATION

EXTRA COST OF EARTHQUAKE SAFETY ELEMENTS IN BUILDINGS

Buildings constructed using the Indian Standard Codes and Guidelines:

Masonry Building

Seismic Zone III	2-3%
Seismic Zone IV	3-4%
Most severe seismic Zone V	4-6%

Reinforced concrete buildings of 4 – 8 storeys

Seismic Zone III	2.6-3.2%
Seismic Zone IV	3.2-4%
Seismic Zone V	5-6%

(in each case, including about 0.7% only for ductile detailing)

Retrofitting of buildings, not initially designed for earthquake will cost:

2 to 3 times as much as the above mentioned costs.

CAPACITY BUILDING

- **In more than 50 training programmes, 6563 engineers and 29679 masons have been trained**
- **Workshops conducted for training engineers**
- **Q&A booklet based on various queries distributed.**
- **Five Booklets on Reconstruction and Retrofitting guidelines.**
- **Advertisements in local newspapers on earthquake resistant construction.**
- **Videocassettes on earthquake resistant designs and techniques shown on local cable television**

RECONSTRUCTION HIGHLIGHTS

- Third party quality audit, NCCBM inspected 2,10,210 houses
- Payment of installments after engineers' certification
- Joint ownership of house by husband and wife
- Grievance redressal at village and district levels
- Insurance to 14 types of hazards
- District judge as ombudsman
- Payment made directly in bank accounts
- Excise duty exemption for building materials procured in Kutch
- Minimal relocation and secondary displacement
- Choice of relocation decided by village community
- Multi-hazard resistant reconstruction
- 1082 material banks have distributed over 18 Mn cement bags

Social Buildings through Community Participations

• Village Civil Works Committee constituted for repair of schools in rural areas

-over 42000 primary school rooms repaired so far through the committee

• Ward Civil Works Committee formed to repair schools in urban areas

•- 1426 school rooms restored through the committee

A SUCCESS STORY

- A comprehensive reconstruction and rehabilitation program
- Progress during the first two years, no parallel elsewhere
- Awareness, capacity building and information dissemination
- Involvement of expertise and specialized knowledge of institutions and individuals
- Effective community participation
- Medium and long-term perspective

THE CHALLENGES FOR SAFER NON-ENGINEERED CONSTRUCTION IN INDIA AS A WHOLE

BUILDING TYPES IN INDIA

Various Building Type by Wall Materials in India

Wall Type	Number of Housing Units				Damage Vulnerability in MSK Intensity		
	Census 1991		Census 2001				
	Millions	% of Total	Millions	% of Total	VII	VIII	IX
Earthen Walls (mud, unburnt brick)	74.7	38.29	73.80	29.63	M	H	VH
Stone Walls	21.7	11.10	25.48	10.23	M	H	VH
Burnt Brick Walls	68.60	35.18	111.89	44.93	L	M	H
Concrete Walls	3.96	2.03	6.54	2.62	VL	L	M
Wood & Ekra Walls	3.12	1.60	3.19	1.28	VL	L	L
GI & Other metal Sheets	1.01	0.52	1.99	0.80	VL	VL	L
Bamboo Thatch, Leaves etc.	21.63	11.09	26.18	10.51	VL	VL	L
TOTAL	195 (Approx)		249 (Approx)				

INCREASE IN BUILDING CONSTRUCTION

- Increase in housing units per year is 2.5%
- But increase in masonry units about 5 %
- So far the added units are not all earthquake resistant except those which are in the Central Govt. sector. Some State governments do provide ER elements in their buildings.

GOVERNMENT POLICIES & STRATEGIES

- Creation of Disaster Management Authority in 2005 to take care of preparedness & mitigation measures against natural & man-made disasters.
- Creating awareness amongst various sectors.
- Sensitisation amongst various stake holders.
- Demonstrative constructions including retrofitting.
- Training of architects & engineers in earthquake safe design & construction.
- Improvement of building bylaws to include hazard safety in design & construction.
- Training of masons and bar benders through various industrial training institutions and their certification.
- Establishment of Hazard Safety Cells in various States as well as undertakings.
- Inclusion of Hazard safety aspects in the technical education of architects & engineers.

ACTIONS ALREADY TAKEN IN REGARD TO SAFER CONSTRUCTION

- Building codes are being improved though Bureau of India Standards.
- Amendments to the Building Bylaws governing their construction in various levels of Urban & Rural Local Bodies *drafted* and being shared with State Govts. for implementation.
- Addition to professional curricula drafted and sent to various Governing Councils.
- The designs of schools & additional school rooms being constructed all over the country have been provided earthquake resistant measures and being executed in all States under the Sarva Shiksha Abhiyan (Education for All Movement).

ACTIONS ALREADY TAKEN IN REGARD TO SAFER CONSTRUCTION

- Construction Industry Development Council established by Planning Commission for training of industrial workers (Programme covers about 50 trades including masons, bar benders, carpenters etc. in which several thousands have already been trained).
- The responsibility has also been placed on the State as well as District Disaster Management Authorities established under the Act of Parliament to work towards Preparedness, Mitigation as well as Response. Safe construction activity including retrofitting of unsafe critical buildings forms an important task. Funds are being allocated under the *five year development plans*.
- A number of four page brochures in simple illustrative form have been prepared and distributed all the country for wider dissemination of safe construction practices to be adopted.


▪National effort is being made to save life and reduce trauma.
▪The tasks are difficult and time taking but the initial steps are taken.
▪Miles to go, just move on and on……
Chirai Veti ! Chirai Veti !!


THANK YOU
FOR YOUR ATTENTION

CHALLENGES FOR SAFETY OF NON-ENGINEERED CONSTRUCTION

By

Dr.Anand S. Arya

Padmashree awarded by the President of India, 2002

Professor Emeritus IIT Roorkee,

National Seismic Advisor, GoI-UNDP

Introduction

The following may be listed as the main challenges for achieving safer non-engineered constructions in the earthquake prone areas:-

1. Non-Engineered buildings exist on a massive scale throughout the developing world. The developed countries also have large proportion of existing non-engineered buildings coming down in traditional way through centuries.
2. There is wide spread ignorance about the earthquake risk even in earthquake prone areas. People in general do not believe that a damaging earthquake will occur in their area and destroy their building. They always ask the question: In so many generations before, there has been no earthquake occurrence, why should we be concerned about such an eventuality? Hence, there is a lack of interest in pursuing *earthquake resistant construction*, about which they have also the impression that it will make the construction much costlier.
3. In the developing countries there is a definite *lack of resources,* which include financial capability, availability of building materials, lack of trained workmen involved in the traditional constructions in which one could incorporate earthquake resisting elements, and lack of now-how in general in those who are involved in such construction activities.
4. There are a number of competing societal demands, as for example, improvement in health facilities and education, providing safer drinking water and better quality food and clothing, alleviation of poverty by livelihood generation, building sanitary facilities etc. etc.. In all election times *roti, kapda aur makaan* (Bread, clothing and housing) become the major slogans of the various political parties.
5. Consequently, there is lack on motivation of the part of the governments to include earthquake safety as the major initiative, particularly in view of the fact that although the consequences of a damaging earthquake are serious but frequency of occurrence of such events is very low and the life of the elected governments is only five years!

It has taken more than 50 years in India for the Central Govt. to become proactive in this regard and many of the state governments still need motivation to formulate policies and strategies towards earthquake safe constructions. The situation in other developing countries may be no better.

Approach towards Acceptable Solutions

Starting in 1959 with an all India seminar on earthquake engineering at the University of Roorkee, we made a multi-pronged approach including: research & development, dissemination of the *generated know-how among the scientist, engineers & other professionals*, about earthquake safety measures; covering all structures including Non-Engineered Buildings. Co-operation of structural and geo-technical engineers, geologist & seismologist was ensured as a result of which the first Indian Standard IS:1893 was brought out in 1962 and the Indian Society of Earthquake Technology established soon after. The first Code of Practice on Design & Construction of Non-Engineered Buildings, IS:4326, was brought out in 1967. The know-how was spread amongst engineering teachers from technical colleges through 2-3 week training programmes held at the University as well as in a number of State capitals. Seismic consultancy was provided to all major engineering projects being taken up in the country under the Five Year Development Plans including major bridges, dams, Industries and atomic power plants. This necessarily included housing for the employees of these undertakings which had to be constructed with earthquake resisting features such as given in figure 1. However, all other constructions whether in private or in the Govt. sector by and large continued in the traditional manner without earthquake resisting elements.

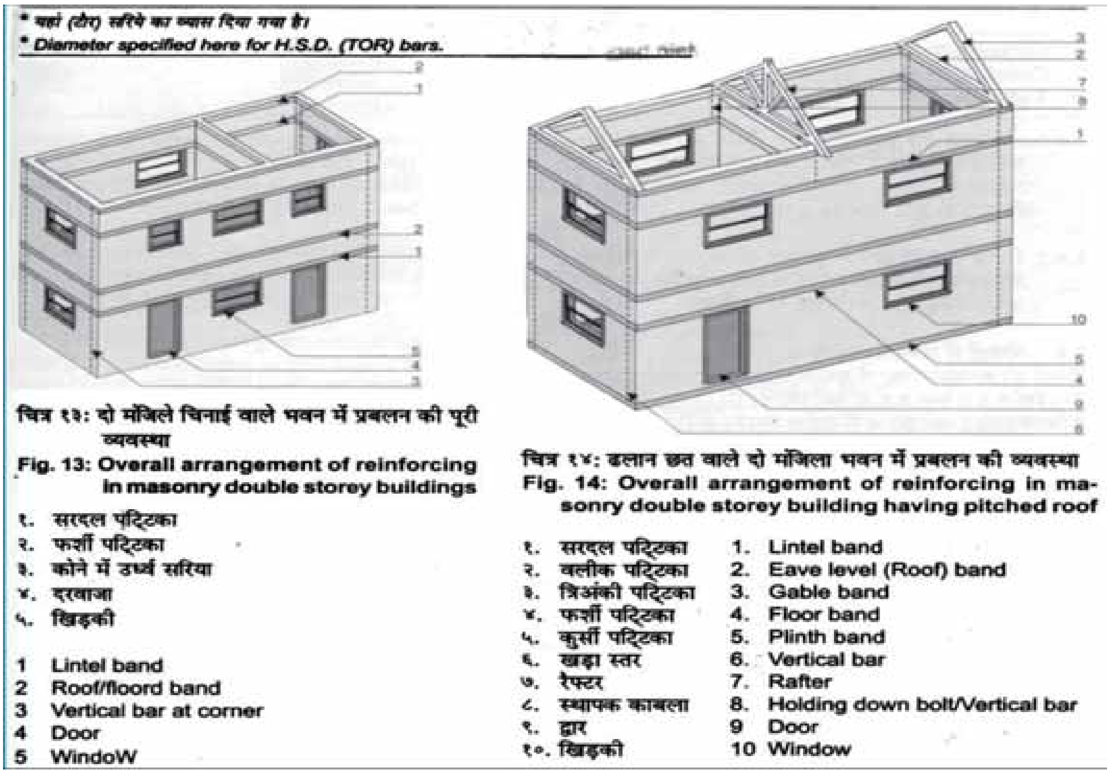


Fig. 1 Earthquake Resistant Masonry Buildings

The real impetus for *earthquake resistant* construction came after the occurrence of a series of earthquakes, namely: Uttarkashi 1991, Killary 1993, Jabalpur 1997, Chamoli 1999 and most damaging earthquake of Kutch 2001. The super cycone in Orissa in 1998 and the earthquake in Kutch prompted the Central Govt. of India to take up the issue of earthquake safety at the National level and established the National Disaster Management Act, in 2005 which requires the establishment of following major administrative institutions:-

- National Disaster Management Authority at Central level for looking after Preparedness and Mitigation
- State Disaster Management Authority at the States to look after all pre and post disaster Management.
- District Disaster Management Authority to take disaster management action at the local level.

Techno-Legal Regime

It has been realised that the Development Control Regulations and the Municipal Building Bylaws are deficient since they do not deal with the safety of habitations including buildings from the impact of disasters. This has been attended to in an affective manner and Model Regulations developed by the author through a National Expert Group which have been sent to all States for implementing in the Building Bylaws in such a way that all building plan approvals compulsorily require the provision of earthquake safety elements in all buildings. To strengthen this effort and to make it practically feasible, large training programme has been undertaken to train practising architects and engineers including Municipal engineers in the subject of earthquake protection engineering.

Training of Building Construction Workers

It has been considered necessary to give appropriate safe construction training to masons, carpenters, bar benders and construction supervisors, since these are the tradesmen involved in the construction of non-engineered buildings in the informal sector without any reference to architects and engineers. Experience of reconstruction after the Kutch earthquake, wherein more than 200,000 residential buildings, schools, health facilities etc. had to be constructed, shows the importance of such a training and more than 35000 masons were trained during the reconstruction process. The houses were constructed through non-government organisations, but mostly by the beneficiaries themselves maintaining strict quality controls while disseminating earthquake resistant technology to the rural and semi-urban population..

Preparation & Publication of Guidelines

In meeting the challenges of safer non-engineered construction effectively, the availability of simple, practically feasible and inexpensive construction guidelines can not be over-emphasized. A few formal guidelines which are legally acceptable, are listed in Annexure 1.

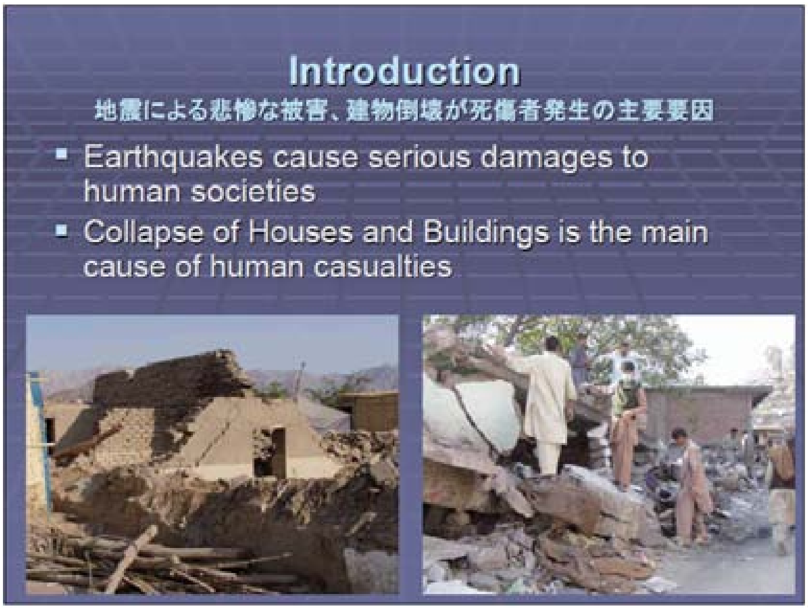
Closing Remarks

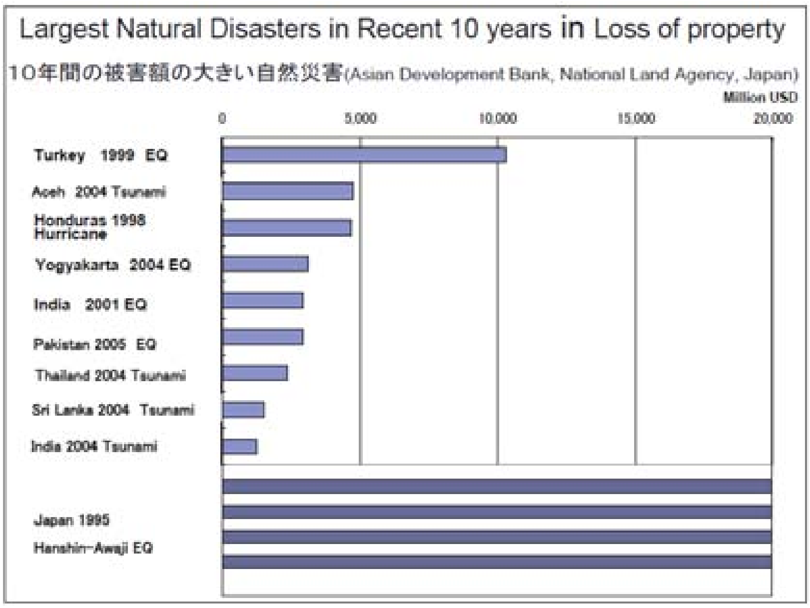
It is indeed a most challenging task for achieving earthquake safety of Non-Engineered Buildings for a variety of reasons as highlighted in this paper. However, a proactive effort is to be made at the National as well as at the local levels for creating awareness and sensitisation among the various stake holders. Also, the available technical know-how has to be brought to the notice of the top level and also down to the building construction workers, immense improvements can be made towards minimising the impact of future earthquakes and reducing the resulting trauma to the individuals and the society as a whole. In any big task, initial steps have always to be , then we gradually move towards the final aim. In our Vedic knowledge, there is an important instruction "*Chirai Veti Chirai Veti*" which means move on and on and on….

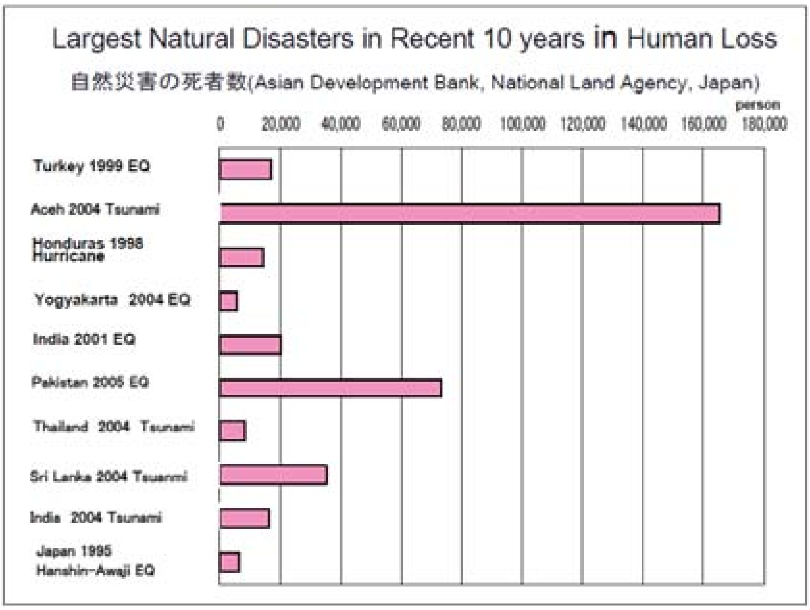
Annexure 1

1. IS: 1893-2002 *"Criteria for Earthquake Resistant Design of Structures, Part 1 (Fifth Revision)"* July 2002.
2. IS: 4326-1993 *"Earthquake Resistant Design and Construction of Buildings- Code of Practice (Second Revision)"* October 1993.
3. IS: 13828-1993 *"Improving Earthquake Resistance of Low Strength Masonry Buildings-Guidelines"* August 1993.
4. IS: 13827-1993 *"Improving Earthquake Resistance of Earthen Buildings-Guidelines"* October 1993.
5. IS: 13935-1993 *"Repair and Seismic Strengthening of Buildings-Guidelines"* November 1993.
6. *Arya A.S., et al.,"Improving Earthquake Resistance of Buildings – Guidelines"* by Expert Group, pub. by Building Material and Technology Promotion Council (BMTPC), 1999.
7. Arya A.S. et al, *Earthquake Resistant Non-Engineered Construction,* Monograph pub. by International Association for Earthquake Engineering, 1980, Revised 1986. (translated into Spanish for use in various Spanish countries).
8. Arya A.S. *Construction of Educational Buildings in Seismic Areas,* Digest No. 13, pub. by UNECSCO, Bangkok, 1987 (translated into Persian for use in Iran).
9. *Arya A.S., Reconstruction and New Construction of Houses in Kachchh Earthquake Affected Areas of Gujarat,* first printing June 2001 and 2nd printing in January 2002.
10. *Arya A.S., Control on Quality of Construction in Earthquake Affected Areas of Gujarat,* printed in June 2001.
11. *Arya A.S., Guidelines for Construction of Compressed Stabilised Earthen Wall Buildings,* printed in December 2001.
12. *Arya A.S., Guidelines for Cyclone Resistant Construction of Buildings in Gujarat,* printed in December 2002.
13. *Arya A.S., Restoration and Retrofitting of Masonry Buildings in Kachchh Earthquake Affected Areas of Gujarat,* printed in March 2002.

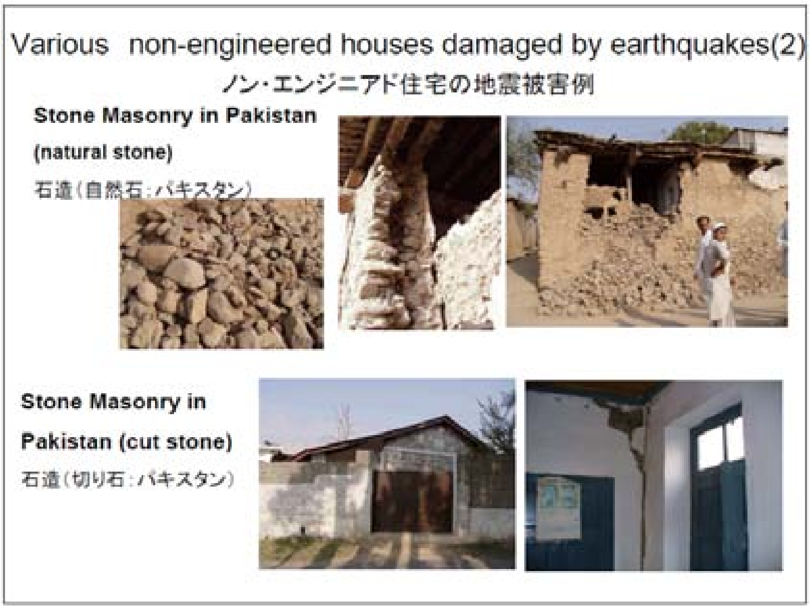

Lessons from recent earthquakes and
Brief introduction of R&D project
近年の地震被害の教訓とアジア諸国との共同研究開発の取り組み
Dr. Tatsuo Narafu, BRI


Introduction
地震による悲惨な被害、建物倒壊が死傷者発生の主要要因
Earthquakes cause serious damages to human societies
Collapse of Houses and Buildings is the main cause of human casualties


Largest Natural Disasters in Recent 10 years in Loss of property
10年間の被害額の大きい自然災害(Asian Development Bank, National Land Agency, Japan)
Million USD
0
5,000
10,000
15,000
20,000
Turkey 1999 EQ
Aceh 2004 Tsunami
Honduras 1998 Hurricane
Yogyakarta 2004 EQ
India 2001 EQ
Pakistan 2005 EQ
Thailand 2004 Tsunami
Sri Lanka 2004 Tsunami
India 2004 Tsunami
Japan 1995
Hanshin-Awaji EQ


Largest Natural Disasters in Recent 10 years in Human Loss
自然災害の死者数(Asian Development Bank, National Land Agency, Japan)
person
0
20,000
40,000
60,000
80,000
100,000
120,000
140,000
160,000
180,000
Turkey 1999 EQ
Aceh 2004 Tsunami
Honduras 1998 Hurricane
Yogyakarta 2004 EQ
India 2001 EQ
Pakistan 2005 EQ
Thailand 2004 Tsunami
Sri Lanka 2004 Tsunami
India 2004 Tsunami
Japan 1995 Hanshin-Awaji EQ


Various non-engineered houses damaged by earthquakes(1)
ノン・エンジニアド住宅の地震被害例
Adobe houses In Peru
アドベ造(ペルー)
Confined Masonry in Indonesia
RCフレーム付レンガ組積造(コンファインドメーソンリー:インドネシア)


Various non-engineered houses damaged by earthquakes(2)
ノン・エンジニアド住宅の地震被害例
Stone Masonry in Pakistan (natural stone)
石造(自然石:パキスタン)
Stone Masonry in Pakistan (cut stone)
石造(切り石:パキスタン)

Various non-engineered houses damaged by earthquakes(3)
ノン･エンジニアド住宅の地震被害例

Brick houses in Indonesia
レンガ造（インドネシア）

Concrete Block houses in Pakistan
コンクリートブロック造（パキスタン）

Various non-engineered houses damaged by earthquakes(1)
ノン･エンジニアド住宅の地震被害例

Houses with mixed materials in Pakistan
混構造（自然石、切り石、コンクリートブロック、レンガの混合：パキスタン）

Reinforced Concrete in Pakistan
RC造（パキスタン）

How large is the intensity of EQ motion?
地震の強さ？

- Buildings collapsed, but furniture withstand!! ? ?

建物は倒れても家具はそのまま!!??

(Primary school in Bantul, Province of DIY, Indonesia)


9

Almost no falling down of furniture

Also TV, pictures and clocks remained
家具、テレビ、額、時計も大丈夫

Houses in Bantul, Indonesia

Primary school in Bantul, Indonesia

Damages by Pisco EQ in San Jose de Los Molinos 250km from the epicenter
- Most of houses are collapsed
- No one was killed

2007年ピスコ地震の被害
イカ市郊外の状況

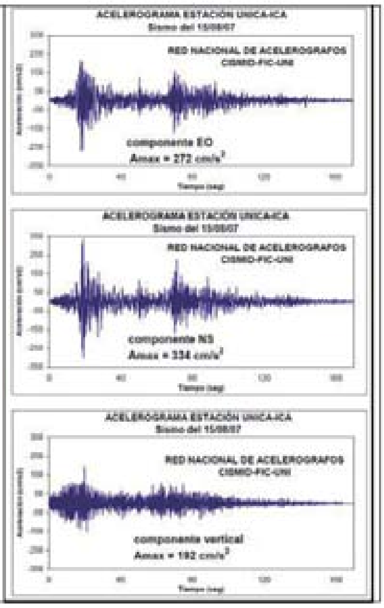
Comparison of damages
Pisco EQ 2007and Central Java EQ 2006
ピスコ地震とジャワ島中部地震の比較

Year	Earthquake (M)	Country	Casualty		Damage to houses	
			Dead	Injured	Collapsed	Damaged
2007	Pisco (M=8.0)	Peru	519	1,844	52,887	22,939
2006	Central Java(M=6.3)	Indonesia	5,778	46,305	139,859	468,149

12

- The long duration of shaking motion with two peaks caused large damages to houses and buildings
長くピークの2つある地震動が建物被害を大きくした

- The two peaks gave people time to escape from their houses before the collapse (proved by interviews to residents)
2つのピークの間に避難することが可能であった



Comparison of two types of structures non-engineered and engineered
ノンエンジアドとエンジニアドの比較

Aspects/items	conventional/non-engineered	Engineered
Materials	Available in the area No control	Usually controlled in size, quality, etc.
Construction workers	Non/semi-skilled workers	Skilled workers
Technical intervention	No/little intervention	Intervention in design, construction procedures, etc.
Users/residents	Low/middle income people	Middle/high income people

- Conventional/non-engineered constructions are completely different from engineered ones
- Each type needs its own appropriate strategy

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Japanese Initiative for Mitigation of Earthquake Disasters managed by BRI focusing on Non-engineered construction <Comprehensive Approach>
ノンエンジニアドの地震被害軽減を目指した研究開発

- Collaborative Research and Development Projects with research institutes in four Asian countries and four Japanese institutes supported by Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- Duration: three years (2006 – 2008)

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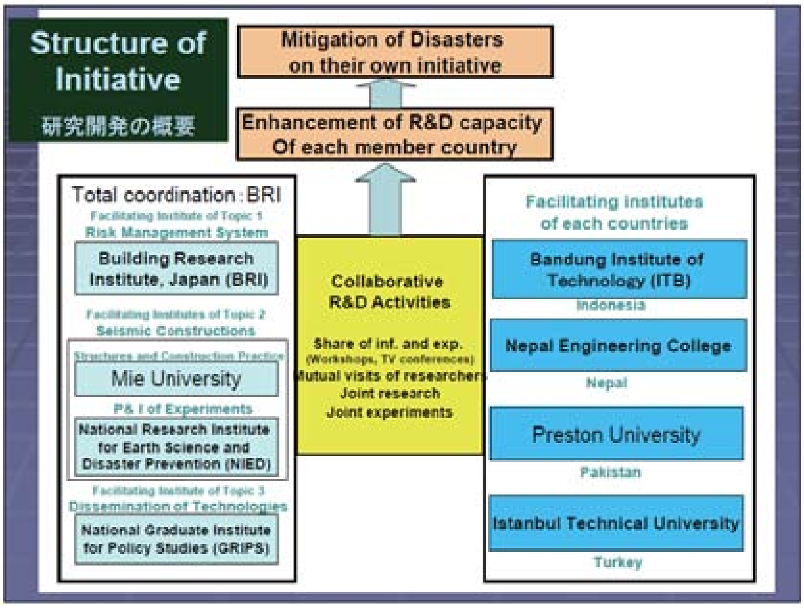
Japanese Initiative for Mitigation of Earthquake Disasters managed by BRI <Comprehensive Approach>

- Participating organizations: National Institute for Earth Science and Disaster Prevention (NIED), National Graduate Institute for Policy Studies (GRIPS) and Mie University
- Counterpart countries: Indonesia, Nepal, Pakistan, Turkey and Peru

NIED GRIPS 振興調整費



- **Feasible and Affordable Seismic Constructions** 実践的な耐震工法

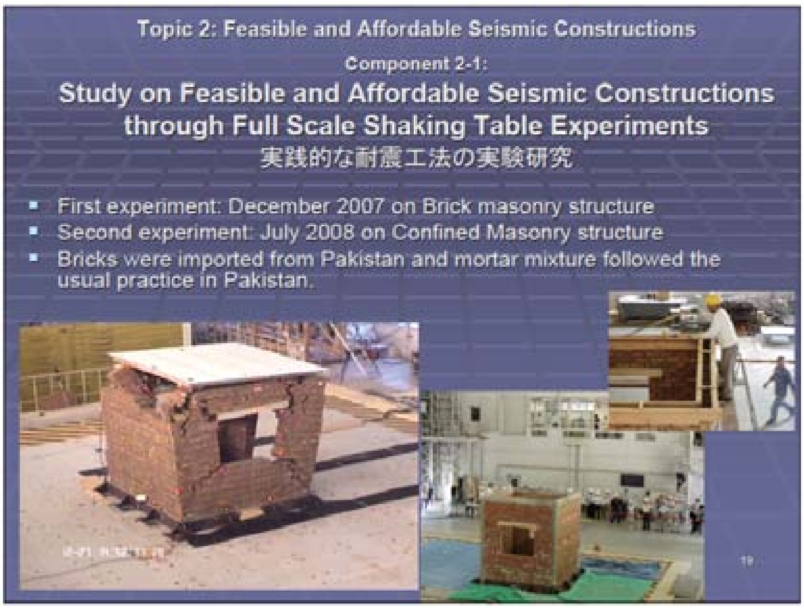
  To develop appropriate seismic structures and construction practices, which will be expected to be accepted by communities, and to verify them by a series of joint experiments

- **Strategies for Dissemination of Technologies to Communities** 技術の普及方策

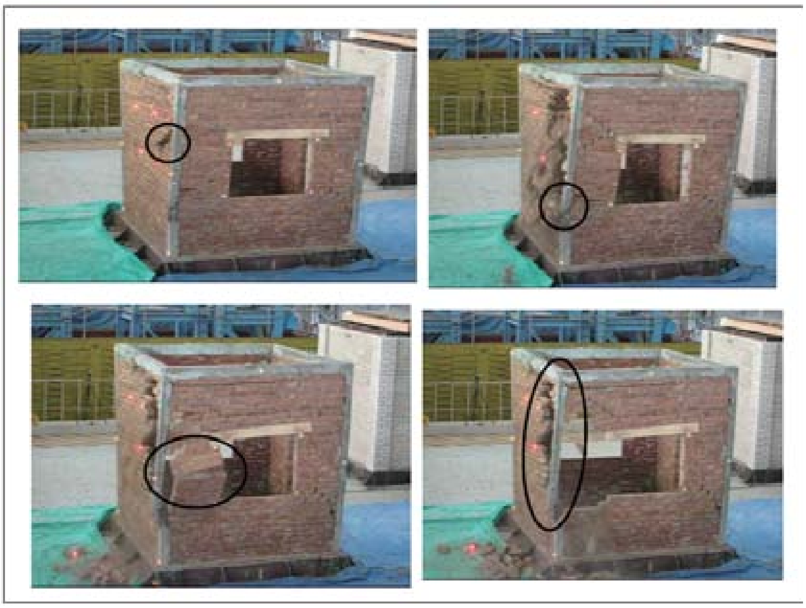
  To develop strategies and tools for dissemination of technologies to people and communities such as consecutive workshops in communities, demonstrations, capacity development of housing facilitators

- **Risk Management System** リスク管理システム

  To develop systems for evaluation of seismic risks with assumed earthquakes, conditions of buildings etc., and to manage them through development of new strategies to mitigate disasters


Topic 2: Feasible and Affordable Seismic Constructions
Component 2-1:
Study on Feasible and Affordable Seismic Constructions through Full Scale Shaking Table Experiments
実践的な耐震工法の実験研究
First experiment: December 2007 on Brick masonry structure
Second experiment: July 2008 on Confined Masonry structure
Bricks were imported from Pakistan and mortar mixture followed the usual practice in Pakistan.
19

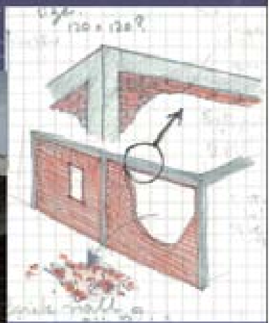

Shaking table experiment on confined masonry on July 4, 2008
コンファインドメーソンリーの振動台実験
At National Institute for Earth Science and Disaster Reduction (NIED) in Tsukuba, Ibaraki, Japan



Main causes of damages
被害の主要な原因

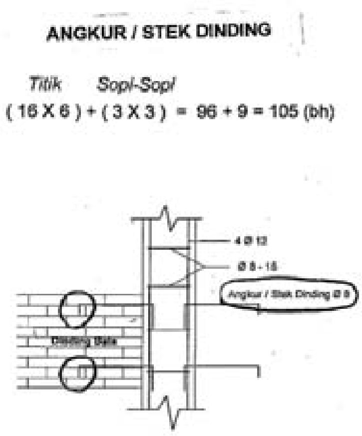
- Separation of RC frames and walls because of insufficient bonding between walls and RC members
  RC部材と壁との分離

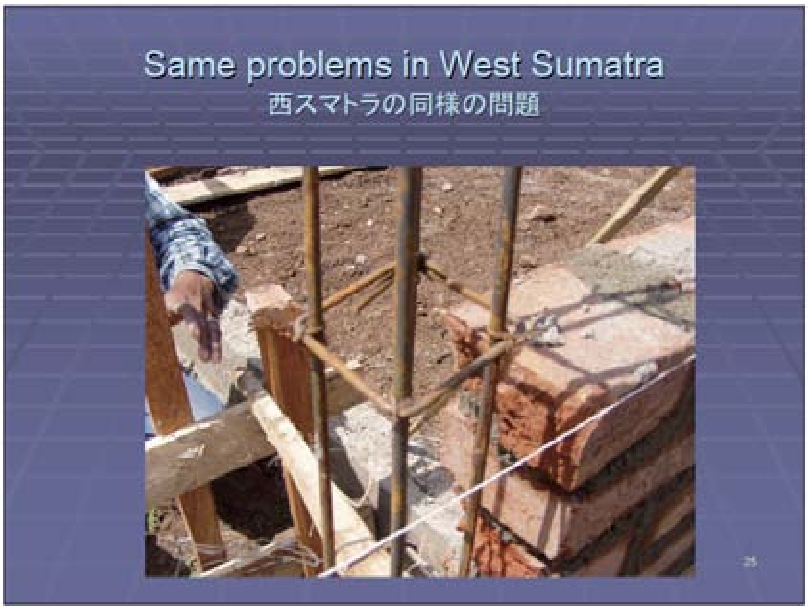
An example of damaged house in Banda Aceh
RC部材と壁との分離の被害の実例



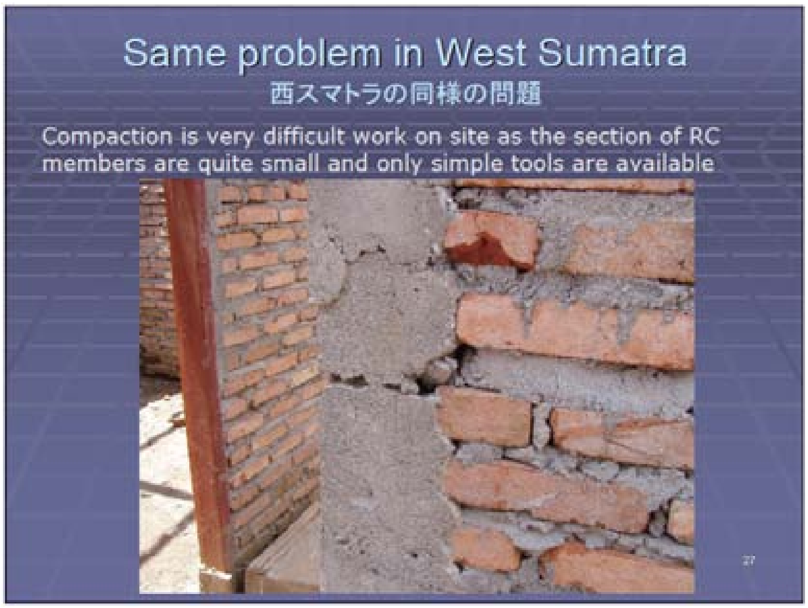
Construction works to be improved in Aceh
改善すべき施工方法

- Anchor of brick walls to columns is also a critical point




Same problems in West Sumatra
西スマトラの同様の問題
25


Another Main cause of damages
もう一つの被害の原因
▪ Failure of a RC column because of insufficient compaction of concrete
コンクリートの充填不足


Same problem in West Sumatra
西スマトラの同様の問題
Compaction is very difficult work on site as the section of RC members are quite small and only simple tools are available
27

Poster Presentation　ポスター展示の概要

Collaborative R&D Project　研究開発の概要

- Risk Management System
- Feasible and Affordable Seismic Constructions
- Strategies for Dissemination of Technologies to Communities

Activities for Reduction of Earthquake Disasters
連携・協力機関の地震防災の活動紹介

- United Nations Center for Regional Development (UNCRD)
- Asia Disaster Reduction Center (ADRC)
- Railway Technical Research Institute (RTRI)
- Ex-Volunteers Association for Architects (EVAA)

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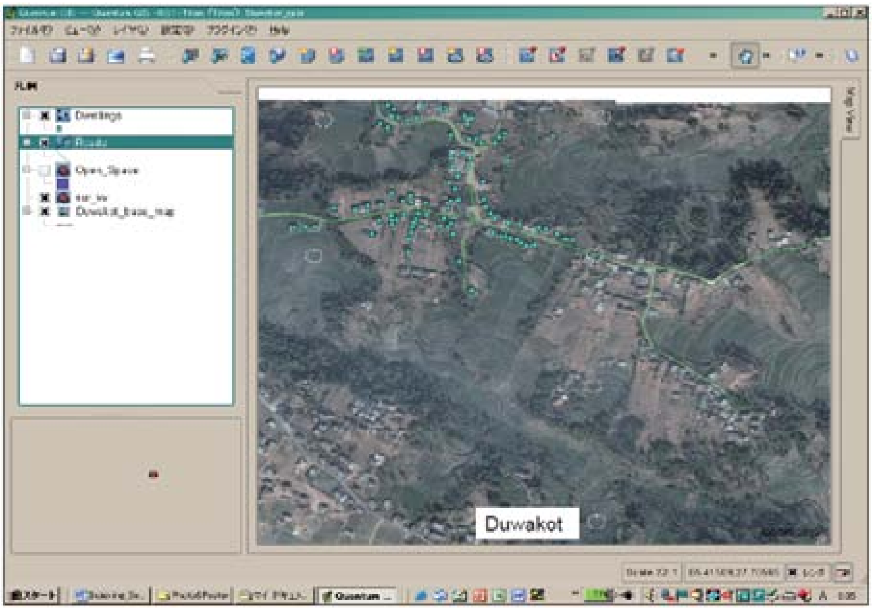
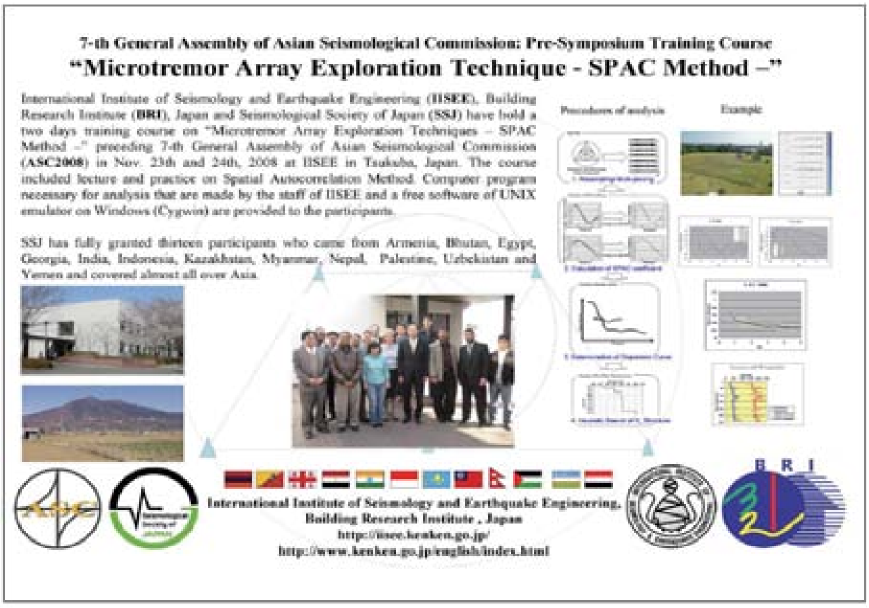
「地震防災に関するネットワーク型共同研究」TOPIC1:地震リスク認知

建築研究所　横井俊明



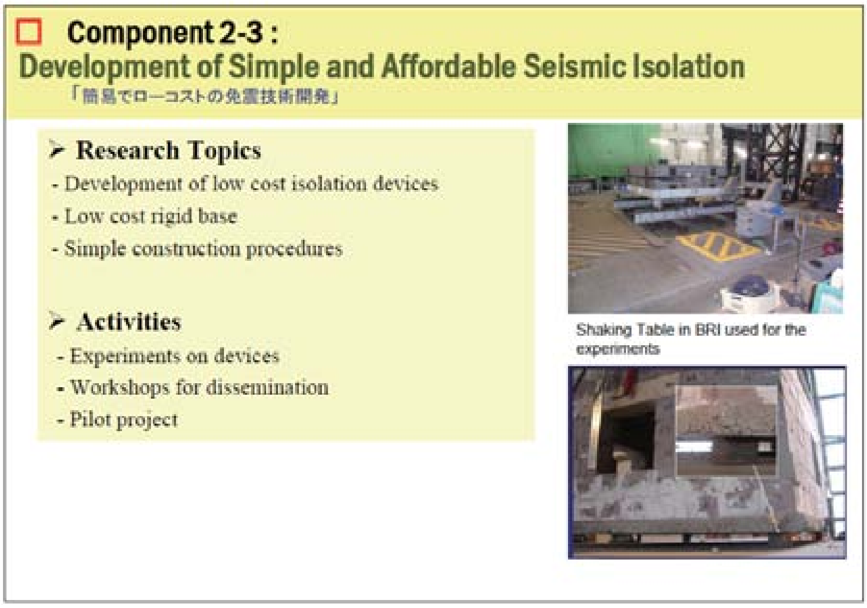


「地震防災に関するネットワーク型共同研究」TOPIC2:実践的な耐震工法の研究開発

建築研究所　今井弘

「地震防災に関するネットワーク型共同研究」TOPIC2:実践的な耐震工法の研究開発

建築研究所　今井弘

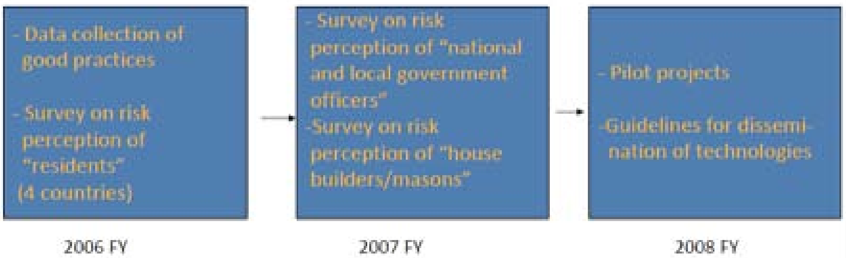


Component 3
Strategies for Dissemination of Technologies to Communities (by GRIPS)

- To develop guidelines to disseminate and broadly apply the recommended technologies for retrofitting of conventional houses at community level.

➢ Survey on the risk perception (2007-2008)
➢ Development of Guidelines for Dissemination of Technologies (2007-2008)
➢ Pilot Projects (2008)

Component 3: Strategies for Dissemination of Technologies to Communities



Activities 2006-2008

Survey on seismic risk perception

2007-2008, GRIPS

- This survey aims to better understand the earthquake risk perception of the residents, national/local government officers, and house builders/head masons, and how they want to avoid such perceived risk.
- Joint research with:
- Institute of Technology Bandung (ITB), Indonesia
- NSET-Nepal, Nepal,
- Preston University, Pakistan
- Istanbul Technical University (ITU), Turkey

- Centre for Appropriate Technology & Development (CATD), Fiji
- Philippine Geographical Society (PGS), Philippines
- Indian Institute of Technology Bombay (IITB), India, and
- University of Tsukuba, Japan

UNCRD の活動紹介

UNCRD　安藤尚一

UNCRD の活動紹介

UNCRD　安藤尚一

UNCRD の活動紹介

UNCRD 安藤尚一

PROGRAMS IN EARTHQUAKE DISASTER MANAGEMENT LIFE CYCLE

(CASE: YOGYAKARTA EARTHQUAKE)

BY
IMAN SATYARNO

DEPARTMENT OF CIVIL AND ENVIRONMENT ENGINEERING
GADJAH MADA UNIVERSITY, INDONESIA

2008

Background

- Like other regions in Indonesia, Yogyakarta has high potential earthquake disaster
- The population is quite dense
- Community knowledge and awareness on earthquake resistant house are limited
- Potential losses and casualties are huge

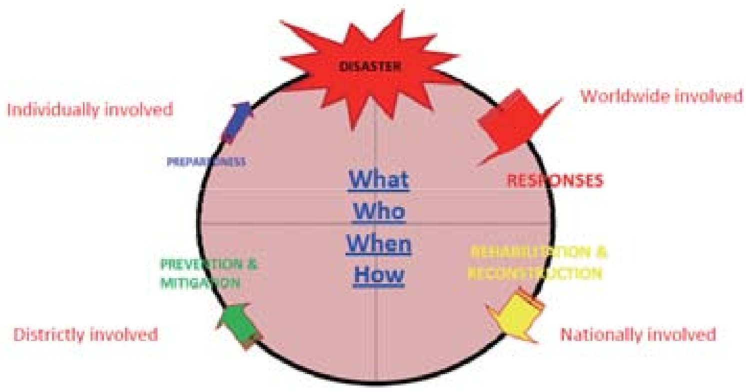
FACT:

YOGYAKARTA EARTHQUAKE, 27 MAY 2006

- More than 200,000 houses were collapsed or damaged
- About 50,000 were injured
- Around 6,000 people lost their lives
- More than US$ 2.92 billion losses
- At least US$ 0.54 billion central government budget was spent for rehabilitation and reconstruction

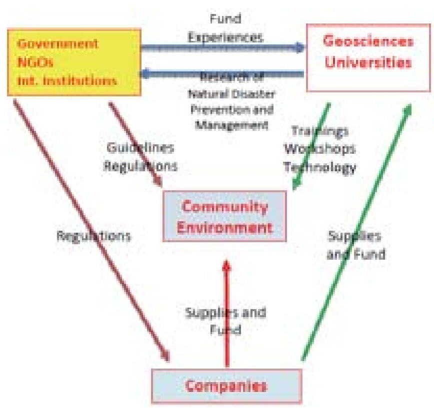
Programs Objectives

- Increase community knowledge and awareness on earthquake resistant house
- Suppress the number of losses and casualties
- Preserve national budget



PROGRAMS IN DISASTER MANAGEMENT LIFE CYCLE

PROJECT IMPLEMENTATION PLAN TROUGH COMMUNITY EMPOWERMENT PROGRAM



What
Who
When
How

RESPONSE

- Ground acceleration records
- Buildings damage or collapsed,
- People got killed or injured
- People need accommodation and facilities immediately:
  - Building Occupancy Resumption Program
  - Temporary shelter

REHABILITATION AND RECONSTRUCTION

- Damaged buildings are rehabilitated
- Collapsed buildings are reconstructed

PREVENTION AND MITIGATION

- Updated Guidelines and Codes
- Trainings of construction workers
- Rapid Visual Screening
- Detail Evaluation
- Retrofit and Strengthening
- Demolition

PREPAREDNESS

- Lesson learned
- Awareness
- Drill and Simulation

What

- Guidelines
- Materials
- Equipments

Who

- Community
- Universities
- Non Government Organisations
- Government
- International Institutions
- Companies

When

- Started
- Finished

How

- Scheme
- Coordination
- Procedure
- Evaluation
- Report
- Record
- Research

What
Who
When
How

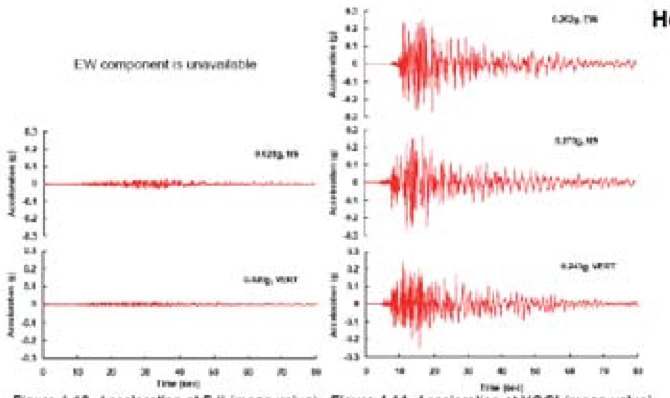


Figure 4.10 Acceleration at BJI (mean value) Figure 4.11 Acceleration at YOGI (mean value)

Elnashai et.al (2007)


Massive losses


Enormous casualties


No more belongings nor families

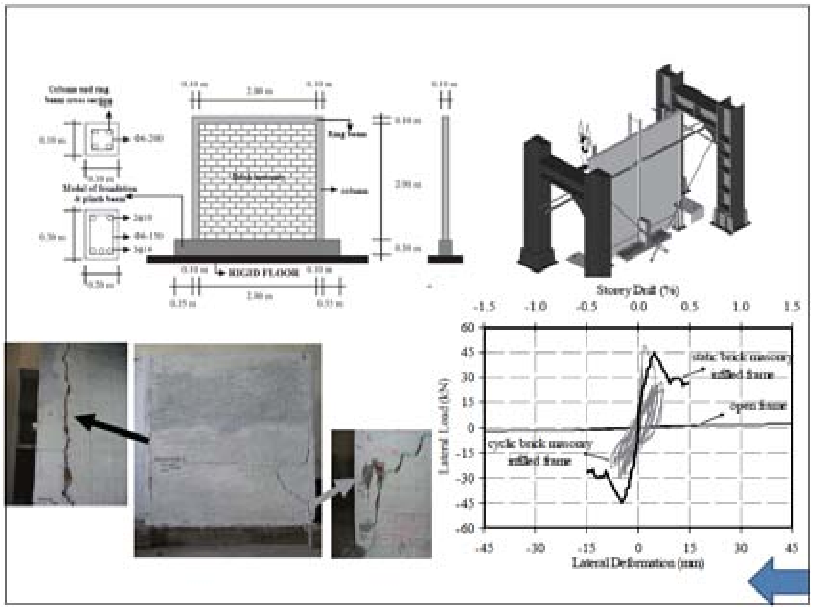

What
Who
When
How


What
Who
When
How


What
Who
When
How


Community


JICA
JOGJA
REVIVESI
Inventory & Review of Housing Support for Yogyakarta
ytb
& WATSAN


Ring beam
column
RIGID FLOOR
Storey Drift (%)
Lateral Load (kN)
Lateral Deformation (mm)
static brick masonry infilled frame
open frame
cyclic brick masonry infilled frame


Holcim
Pelatihan
Akademi Ahli Bangunan Holcim
Company participation in disaster mitigation

CHALLENGES AND OPPORTUNITIES OF INFORMAL HOUSING FOR EARTHQUAKE SAFETY IN THE PHILIPPINES: NOTES FROM THE FIELD

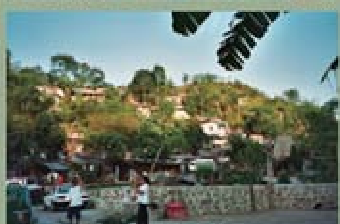
Dr. Marqueza L. Reyes, EnP
School of Urban and Regional Planning
University of the Philippines
International Symposium on Earthquake Safe Housing,
GRIPS, Tokyo
November 29, 2008

Increasing Urban Disaster Risk of Metro Manila, Philippines

- Rapid population growth and urbanization from the 1950s
- Uncontrolled land use and development
- High rate of increase of housing and land prices
- Inadequate provision of basic social services and infrastructure, including housing
- Growth of slums and informal settlements or informal housing
- 30% of residents live in slums and informal housing (ADB)
- 76% of housing stock did not comply with the building code (1990, UNCHS)

Informal Housing in the Philippines

- Dwellings that are rent-free with or without the consent of legal owners (or informal settlements)
- Occupies land that is not owned by the residents (called informal settlers).
- Self-built housing – constructed by family members
- Built by a construction foreman (unlicensed skilled technician) and not designed or supervised by registered professional engineers/architects
- Formal housing sector – contains unknown percentage of non-engineered housing

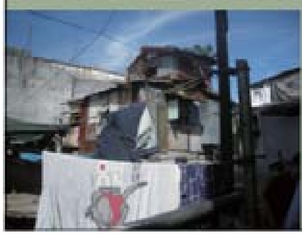


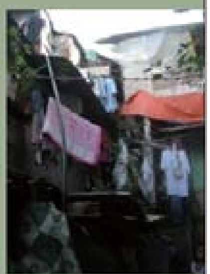



Non-Engineered Housing in the Philippines

- Preliminary insights from the case of Bgy. Rizal, Makati City, Metro Manila, Philippines.
- Non-engineered housing is associated with informal housing.
- Have been living there for as long as 40 years.
- Some have been given titles to their land by the government.
- Informal housing, in the urban context) is characterized by slum conditions, over-congestion and blight.

Non-Engineered Housing in the Philippines



- Unreinforced/Reinforced concrete type – maybe supervised by a construction "foreman" (not registered engineers but may have long experience)
- Light weight materials – looks deceivingly temporary

Non-Structural Challenges of Informal Housing to Earthquake Safety

1. Unwillingness to abide by the building code – may not be intentional and not a matter of choice for informal settlers
   - Security of land tenure – How would informal settlers be motivated to invest in properly constructed houses if there is always the possibility of being resettled in another location?
   - Issue of affordability – financial capacity to reconstruct and willingness to pay for earthquake-resistant construction
2. Level/Degree of awareness and knowledge about earthquakes – there are many misconceptions about EQ
3. Low awareness on earthquake-resistant construction of informal settlers

Non-Structural Challenges of Informal Housing to Earthquake Safety

4. Fatalistic and cavalier attitude towards earthquake disasters – act of God, taking no responsibility (nobody is to blame)
5. Motivations to act towards earthquake adaptation – typhoons and floods are more frequent, but flood adaptation techniques have not been common
6. Vulnerability of non-engineered housing in the formal sector – only ¼ of building stock in Metro Manila are code compliant
7. Vulnerability of engineered housing - may be below minimum standards of building code (cutting corners to minimize cost, no building permits) and may be poorly constructed due to poor workmanship and construction practices.

Opportunities of Informal Housing in Earthquake Safety

1. **Resettlement?** – question of earthquake safety of low-cost housing arises, aside from thorny social acceptance issues
2. **Rebuilding and redevelopment?** – engineered, high-density, multi-family dwelling, community-driven master planning
3. **Retrofitting of unreinforced/substandard RC frame structures** (add to this, the low-cost housing and socialized housing common in the country)– may require a different set of guidelines, cost effectiveness and techniques for earthquake safety.
4. **Community-based retrofitting ?** – participatory approaches since most houses are self-built/built by family members, requires training
5. **Community-based training and capacity building programs on making houses safer**, e.g. bolting of furniture and fixtures.
6. **Effective information, education and communication strategies** to increase awareness, knowledge and motivations towards **earthquake safe housing**.


Thank You!

International Projects for Community-Based Disaster Management

Kenji Okazaki
Professor
National Graduate Institute for Policy Studies
(GRIPS)

Why Community Based Disaster Management (CBDM)?

- Local people respond first and are the last remaining to rebuild safer communities
- Disasters reflect local conditions, of which local people are well ware
- Participatory decision making process leads to ownership of risk and actions

RADIUS Project (1996-1999) by UN/IDNDR Secretariat

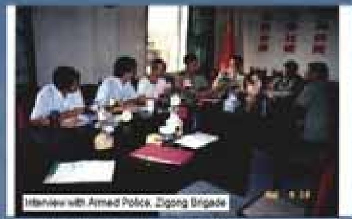
Motivation of local people for urban seismic reduction

- Capacity building
- Local leadership and ownership
- Awareness raising

Nine (9) case study cities:
Addis Ababa (Ethiopia), Antofagasta (Chile), Bandung (Indonesia), Guayaquil (Ecuador), Izmir (Turkey), Skopje (TFYR Macedonia), Tashkent (Uzbekistan), Tijuana (Mexico), Zigong (China)

The stakeholders identified seismic risk and developed action plans by themselves.

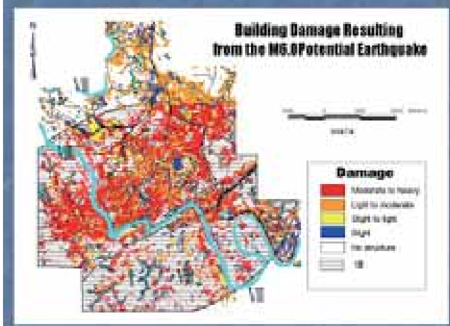
A training seminar in Japan



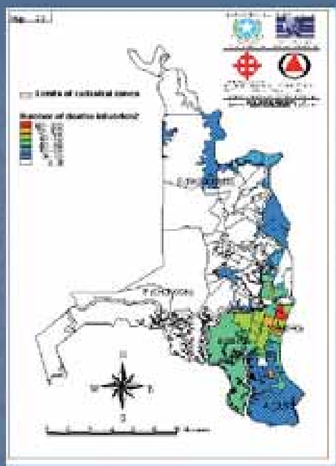
Interview with police officers in Zigong

Disaster seminar for students in Bandung

Action Plan Workshop in Tashkent



Building damage estimation (Zigong, China)



Human loss (Guayaquil, Ecuador)

Development of earthquake scenario

- Damage estimation of buildings and infrastructure
- Review of the damage estimation based on the interviews with various stakeholders.
- A journalist writes a scenario, which describes the progress of situations (after an hour, day, week, month) as well as response to them, with layman's words.

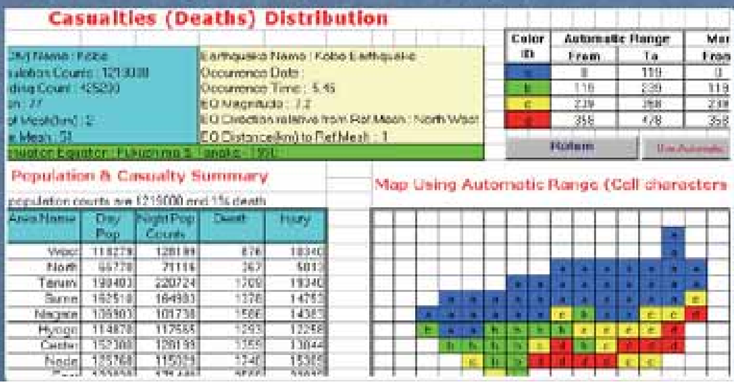
Comparative analysis of vulnerability of Cities

Seeds for GESI (Global Earthquake Safety Initiative) Method

Simplified tool for damage estimation

Input: Area, population, building types, (ground conditions)

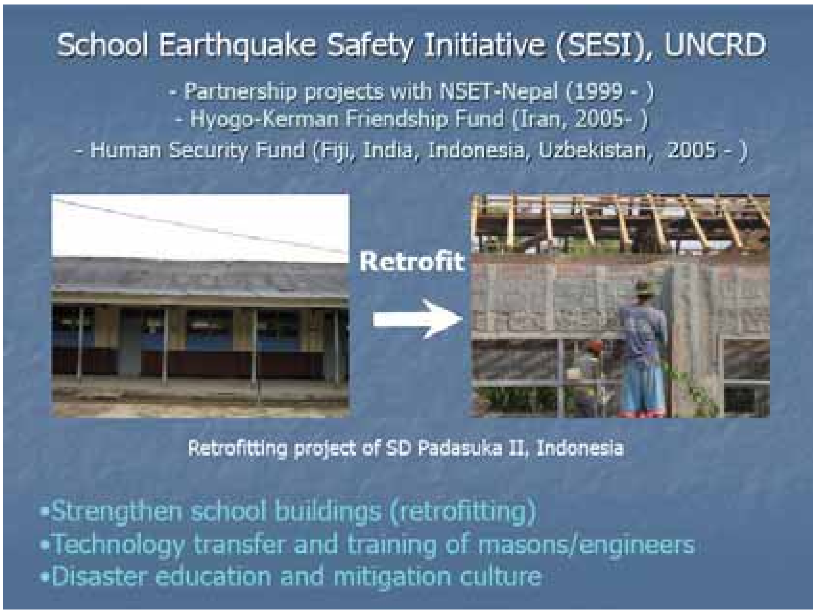
Output: Building damage, Human loss/injury



RADIUS initiative is sustainable

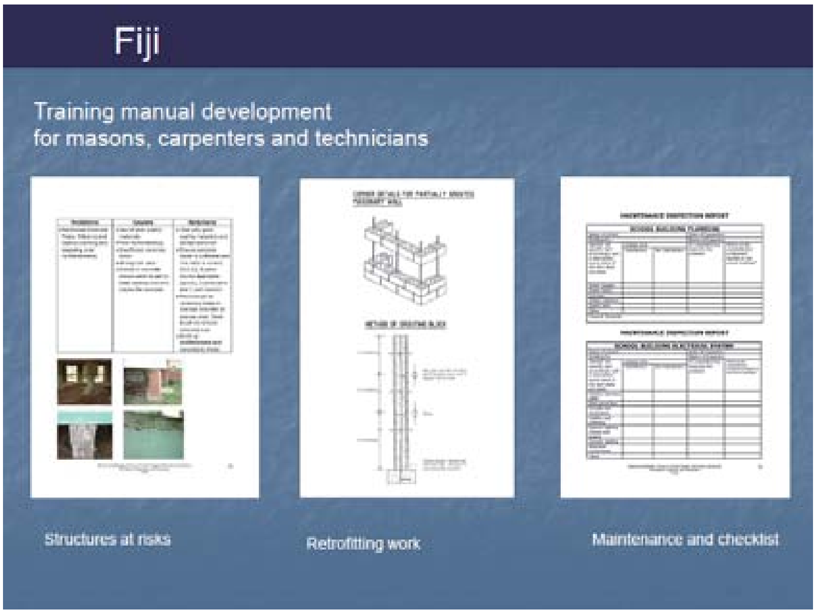
- Some local partnership sustains and efforts continue
  - Skopje adopted RADIUS recommendations in Master Plan.
  - Guayaquil created a new Division for Disaster Mitigation.
  - Bandung changed its building permit process.
  - Antofagasta generated US$ 1 million to remove schools from Tsunami areas.

-Tijuana created NGO called RADIUS.
-Experience is transferred to neighboring cities.


School Earthquake Safety Initiative (SESI), UNCRD
- Partnership projects with NSET-Nepal (1999 -)
- Hyogo-Kerman Friendship Fund (Iran, 2005-)
- Human Security Fund (Fiji, India, Indonesia, Uzbekistan, 2005 -)
Retrofit
Retrofitting project of SD Padasuka II, Indonesia
•Strengthen school buildings (retrofitting)
•Technology transfer and training of masons/engineers
•Disaster education and mitigation culture

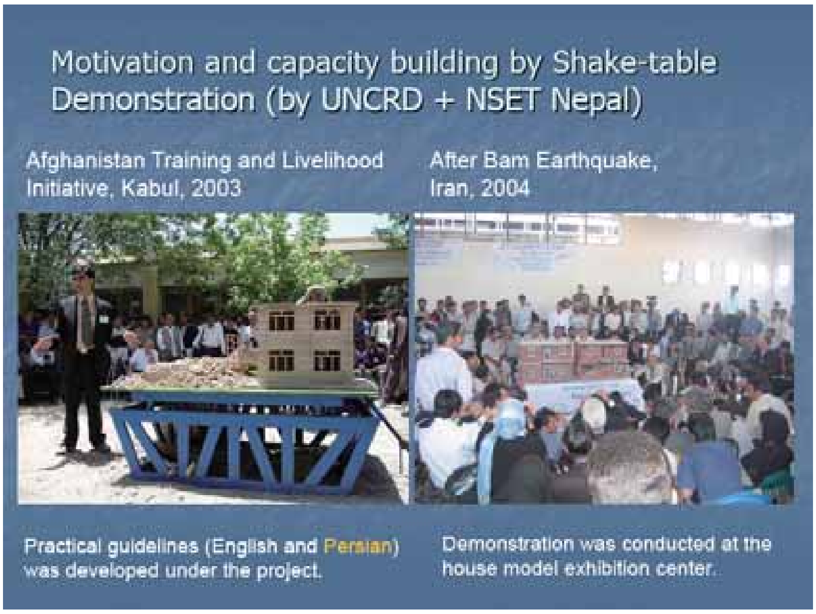

Bandung, Indonesia
Retrofitting design development (Krishna Pribadi)
Retrofitting work (Krishna Pribadi)
Finishing work (Krishna Pribadi)
Classroom after retrofitting work (Krishna Pribadi)

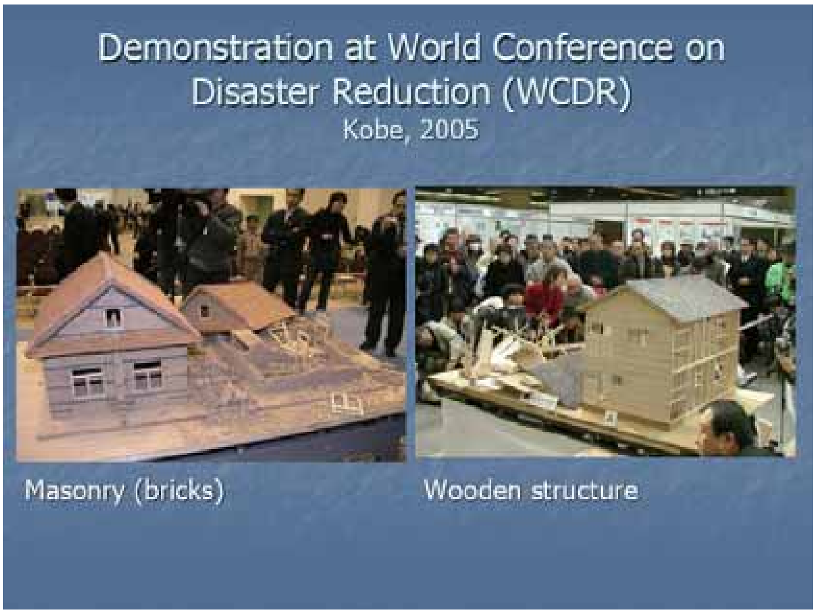

Tashkent, Uzbekistan
Retrofitting work by
Tashkent City Project
Workshop and seminar
Retrofitting works

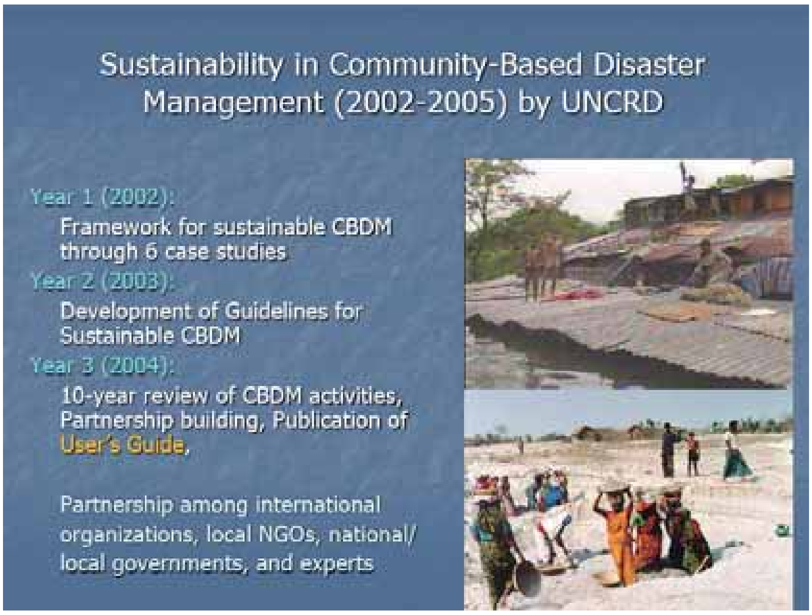

Fiji
Training manual development
for masons, carpenters and technicians
Structures at risks
Retrofitting work
Maintenance and checklist


India
Community Seminar
Shimla, India
Date: 2007.04.182007.04.18
Organized by: Shimla District Commissioner,
DIPECO, SEEDS, UNCRD
Students at the seminar
First Aid demonstration


Pantanka New-Life Project (Gujarat, India)
Rehabilitation after Gujarat Earthquake of January 2001
Focus on non-engineered construction
UNCRD with
EDM, NCPDP,
NGOs Kobe,
NSET-Nepal,
and SEEDS
Training
Education
Awareness
Confidence

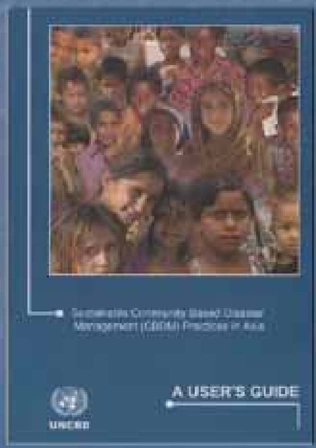

Motivation and capacity building by Shake-table Demonstration (by UNCRD + NSET Nepal)
Afghanistan Training and Livelihood Initiative, Kabul, 2003
After Bam Earthquake, Iran, 2004
Practical guidelines (English and Persian) was developed under the project.
Demonstration was conducted at the house model exhibition center.


Demonstration at World Conference on Disaster Reduction (WCDR)
Kobe, 2005
Masonry (bricks)
Wooden structure


Sustainability in Community-Based Disaster Management (2002-2005) by UNCRD
Year 1 (2002):
Framework for sustainable CBDM through 6 case studies
Year 2 (2003):
Development of Guidelines for Sustainable CBDM
Year 3 (2004):
10-year review of CBDM activities, Partnership building, Publication of User's Guide,
Partnership among international organizations, local NGOs, national/ local governments, and experts

User's Guide for CBDM

- Generic Guidelines
  This provides a complete discussion of the factors, best practices and examples that will enhance sustainability of CBDM.
- User-Specific Tools
  - Policymakers
  - National Disaster Managers
  - Local Disaster Managers
  - Trainers
  - Community Workers



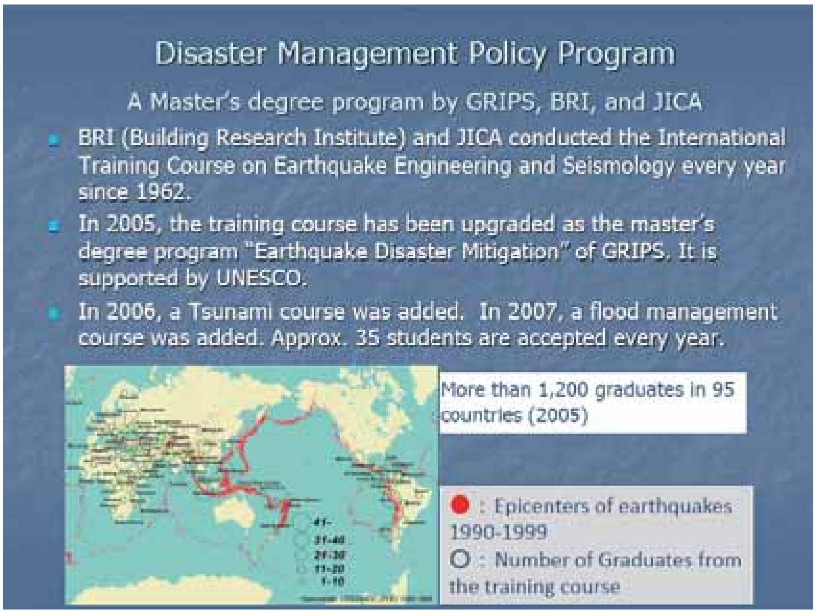
Collaborative R&D Project for Disaster Mitigation on Network of Research Institutes in Asia 2006-2008

- Strategies for Dissemination of Technologies to Communities
  To develop guidelines to disseminate and broadly apply the recommended technologies for retrofitting of conventional houses at community level.

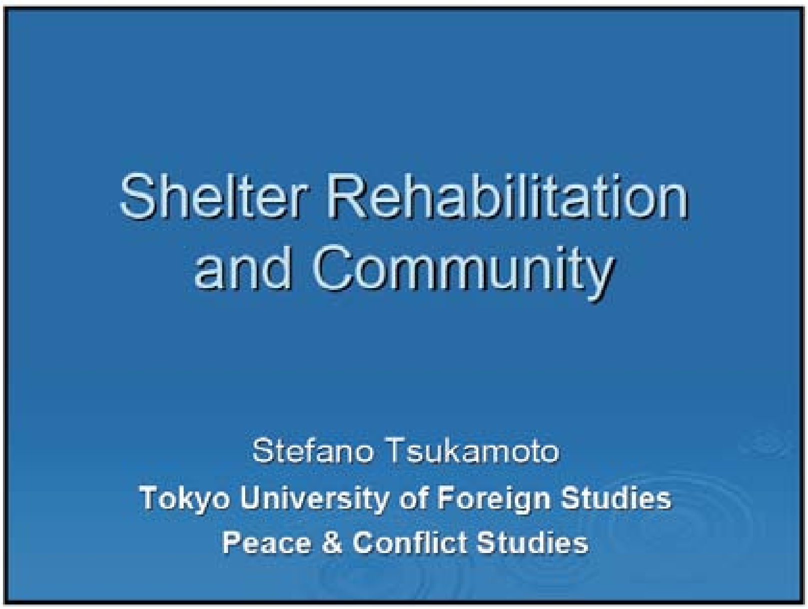
- Survey on the risk perception (2007-2008)
- Development of Guidelines for Dissemination of Technologies (2007-2008)
- Pilot Projects (2008)

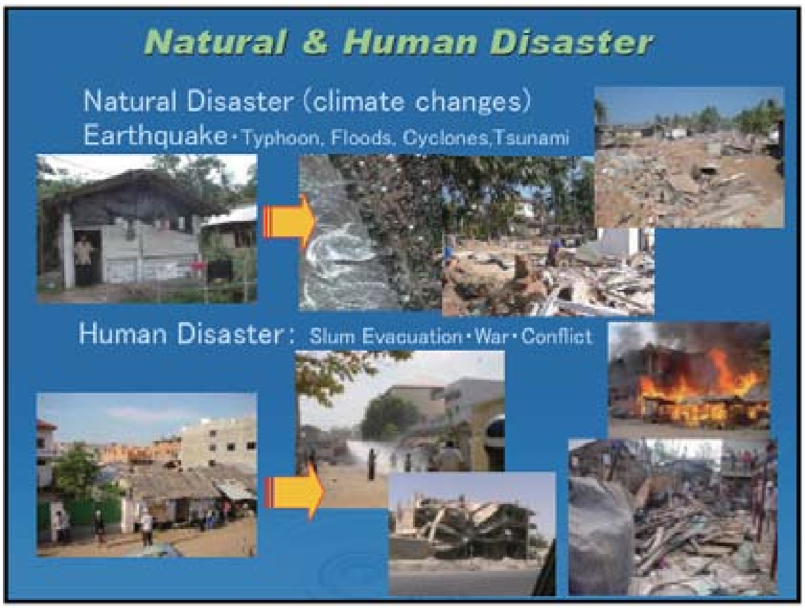
Keys for Sustainable CBDM

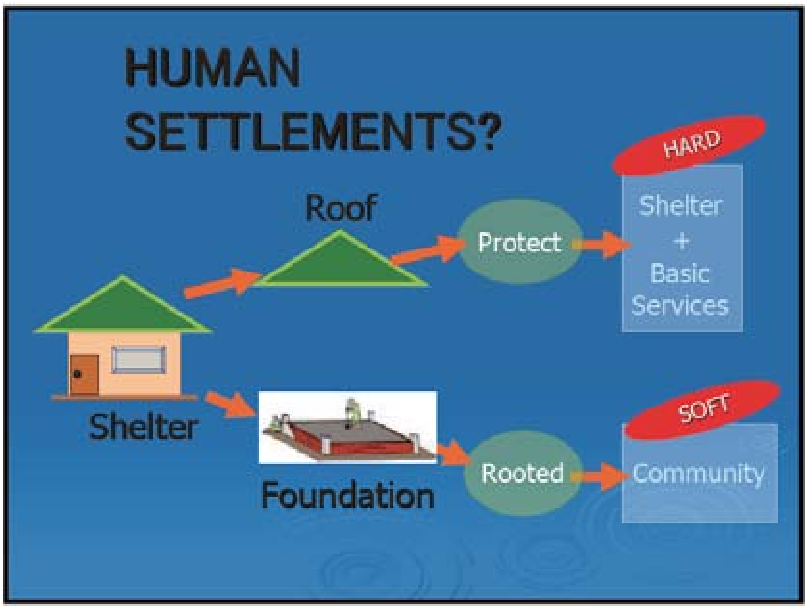
- Participation and ownership of a program
- Risk communication and motivation
- Affordability and practicality of non-engineered technology
- Multi-disciplinary cooperation among stakeholders
  >>> Local partnership + regional/international partnership


Disaster Management Policy Program
A Master's degree program by GRIPS, BRI, and JICA
BRI (Building Research Institute) and JICA conducted the International Training Course on Earthquake Engineering and Seismology every year since 1962.
In 2005, the training course has been upgraded as the master's degree program "Earthquake Disaster Mitigation" of GRIPS. It is supported by UNESCO.
In 2006, a Tsunami course was added. In 2007, a flood management course was added. Approx. 35 students are accepted every year.
More than 1,200 graduates in 95 countries (2005)
● : Epicenters of earthquakes 1990-1999
○ : Number of Graduates from the training course

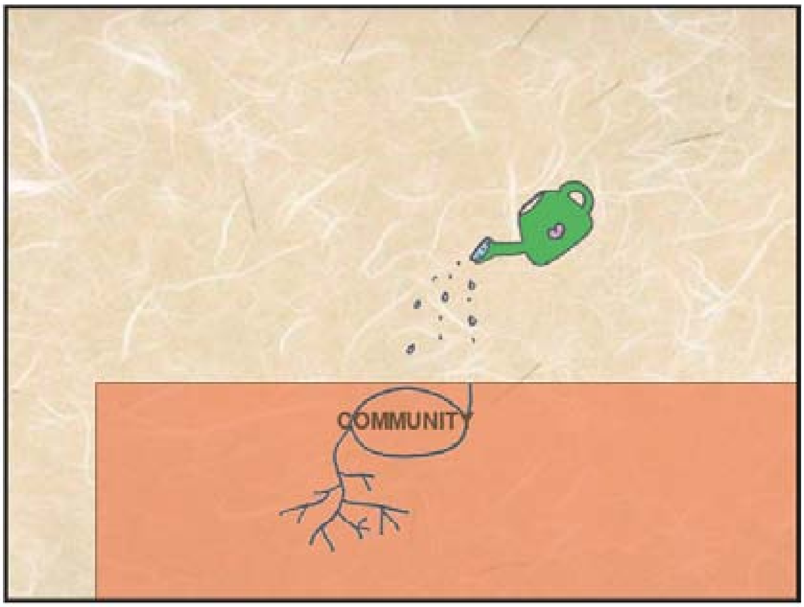

Disaster Management Program
Target Groups:
Technical officials, engineers, or researchers in the fields of earthquakes, tsunamis, water-related disasters, and disaster risk management policy, in developing countries
Degree:
Master of Disaster Management
Course Duration:
One year
(October–September)
Language of Instruction:
English

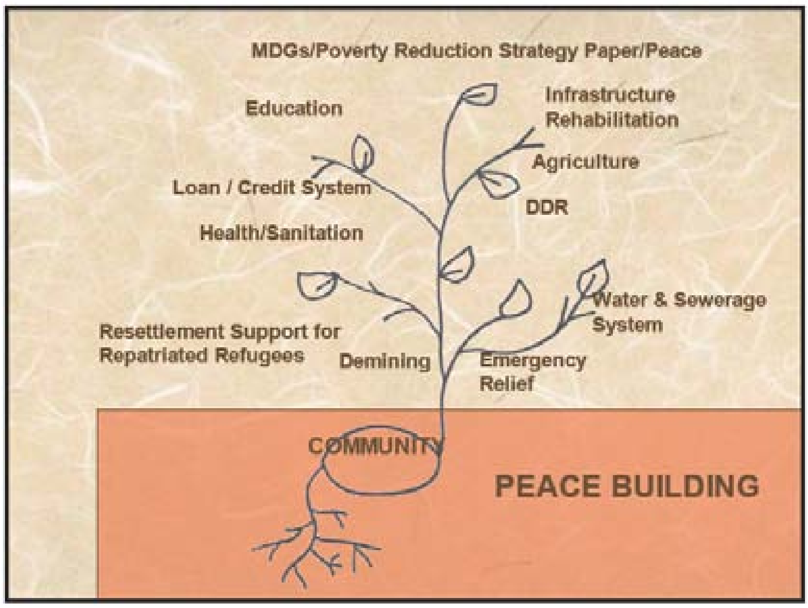

Shelter Rehabilitation and Community
Stefano Tsukamoto
Tokyo University of Foreign Studies
Peace & Conflict Studies

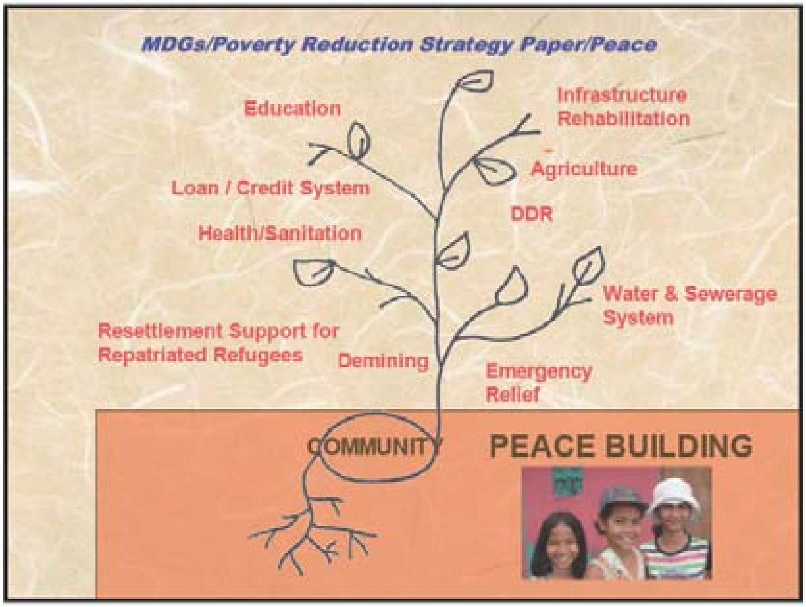

Natural & Human Disaster
Natural Disaster (climate changes)
Earthquake・Typhoon, Floods, Cyclones,Tsunami
Human Disaster: Slum Evacuation・War・Conflict


HUMAN SETTLEMENTS?
Roof
Protect
HARD
Shelter + Basic Services
Shelter
Foundation
Rooted
SOFT
Community

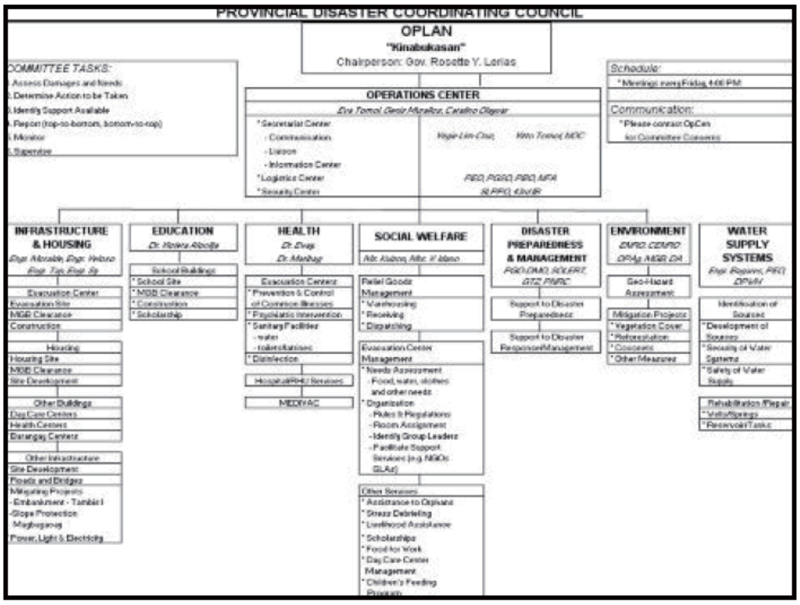

Rehabilitation of the shelter
is making the future of the people
Peace
(平和)
Community
(地域)
Health
(健康)
Income
(収入)
Livelihoods
(生計)
Education
(教育)

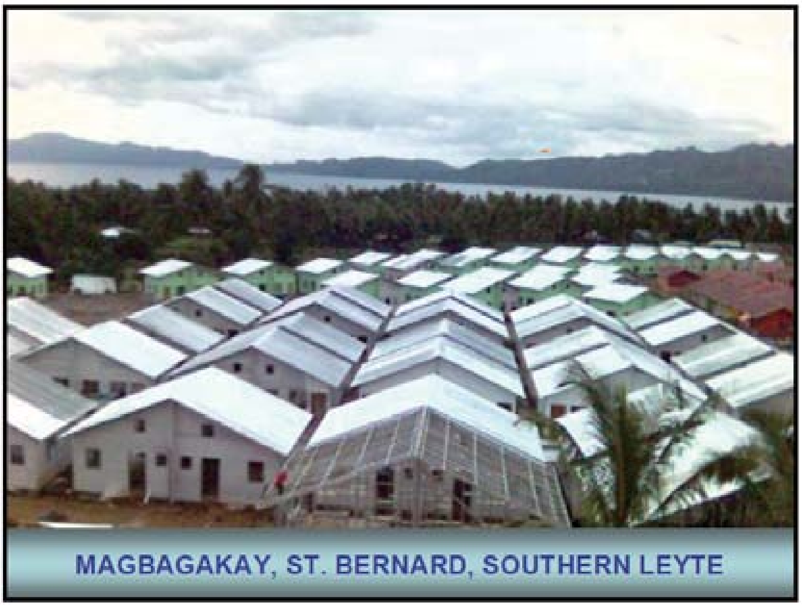

COMMUNITY

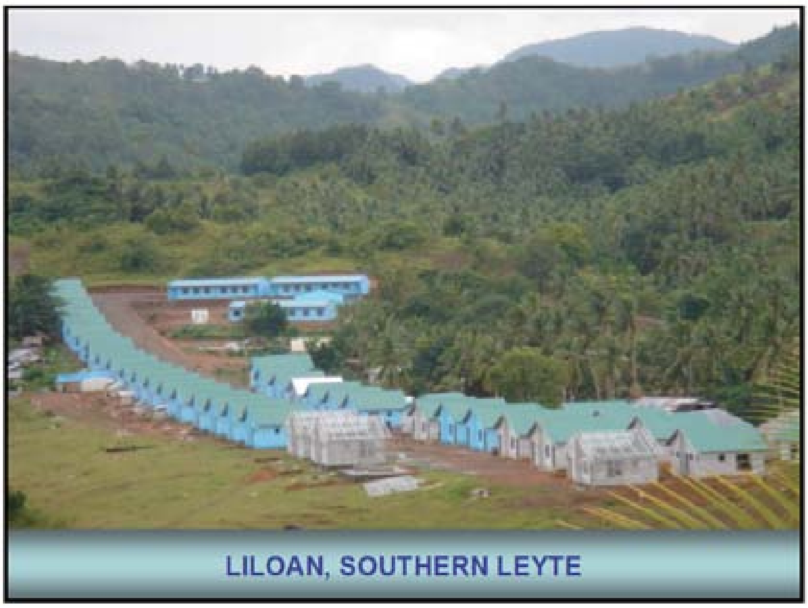

MDGs/Poverty Reduction Strategy Paper/Peace
Education
Infrastructure
Rehabilitation
Agriculture
Loan / Credit System
DDR
Health/Sanitation
Water & Sewerage
System
Resettlement Support for
Repatriated Refugees
Demining
Emergency
Relief
COMMUNITY
PEACE BUILDING

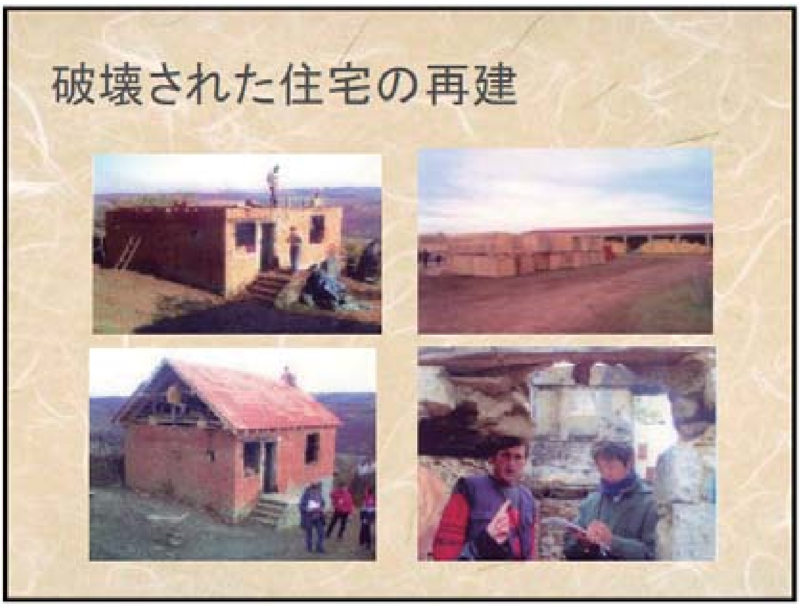

MDGs/Poverty Reduction Strategy Paper/Peace
Education
Infrastructure Rehabilitation
Agriculture
Loan / Credit System
DDR
Health/Sanitation
Water & Sewerage System
Resettlement Support for Repatriated Refugees
Demining
Emergency Relief
COMMUNITY
PEACE BUILDING

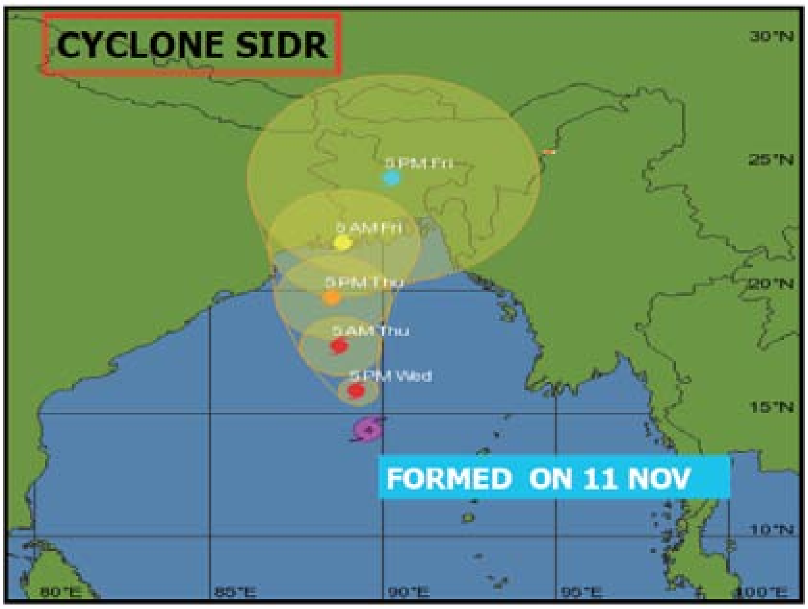

Community should have Immunity（免疫）
Sustainable Peace Building
"Recovery of Human Dignity" 尊厳の回復
"Being able to Negotiate " for their Rights
・Poverty Reduction
・Removal of Fear, Conflict & Disaster
・Empowerment of Individuals
・Empowerment of Community
・Keeping Security
Software
People / Community / Organization
Hardware
Settlements Improvement through Community Action Planning and Implementation


PROVINCIAL DISASTER COORDINATING COUNCIL
OPLAN
"Kinabukasan"
Chairperson: Gov. Rosette Y. Lerias
COMMITTEE TASKS:
Determine Action to be Taken
Identify Support Available
Report (top-to-bottom, bottom-to-top)
Monitor
Schedule:
Communication:
*Please contact OpCen
OPERATIONS CENTER
*Secretariat Center
- Communication
- Liaison
- Information Center
*Logistics Center
*Security Center
INFRASTRUCTURE & HOUSING
Evacuation Center
Evacuation Site
MGB Clearance
Construction
Housing
Housing Site
MGB Clearance
Site Development
Other Buildings
Day Care Centers
Health Centers
Barangay Centers
Other Infrastructure
Site Development
Roads and Bridges
Mitigating Projects
- Embankment - Tambis I
- Slope Protection
EDUCATION
School Buildings
*School Site
*MGB Clearance
*Construction
*Scholarship
HEALTH
Evacuation Centers
*Prevention & Control of Common Illnesses
*Psychiatric Intervention
*Sanitary Facilities
- water
*Disinfection
MEDIVAC
SOCIAL WELFARE
Relief Goods Management
*Warehousing
*Receiving
*Dispatching
Evacuation Center Management
*Needs Assessment
- Food, water, clothes and other needs
*Organization
- Rules & Regulations
- Room Assignment
- Identify Group Leaders
- Facilitate Support Services (e.g. NGOs, GLAs)
Other Services
*Assistance to Orphans
*Stress Debriefing
*Livelihood Assistance
*Scholarships
*Food for Work
*Day Care Center Management
*Children's Feeding Program
DISASTER PREPAREDNESS & MANAGEMENT
Support to Disaster Preparedness
Support to Disaster Response/Management
ENVIRONMENT
Geo-Hazard Assessment
Mitigation Projects
*Vegetation Cover
*Reforestation
*Other Measures
WATER SUPPLY SYSTEMS
Identification of Sources
*Development of Sources
*Security of Water Systems
*Safety of Water Supply
Rehabilitation /Repair
*Wells/Springs
*Reservoir/Tanks


MAGBAGAKAY, ST. BERNARD, SOUTHERN LEYTE


LILOAN, SOUTHERN LEYTE

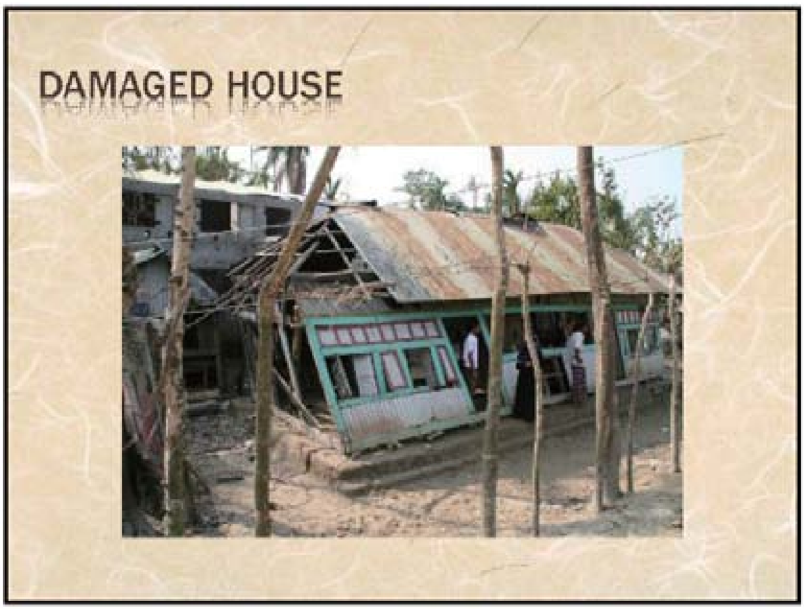

破壊された住宅の再建

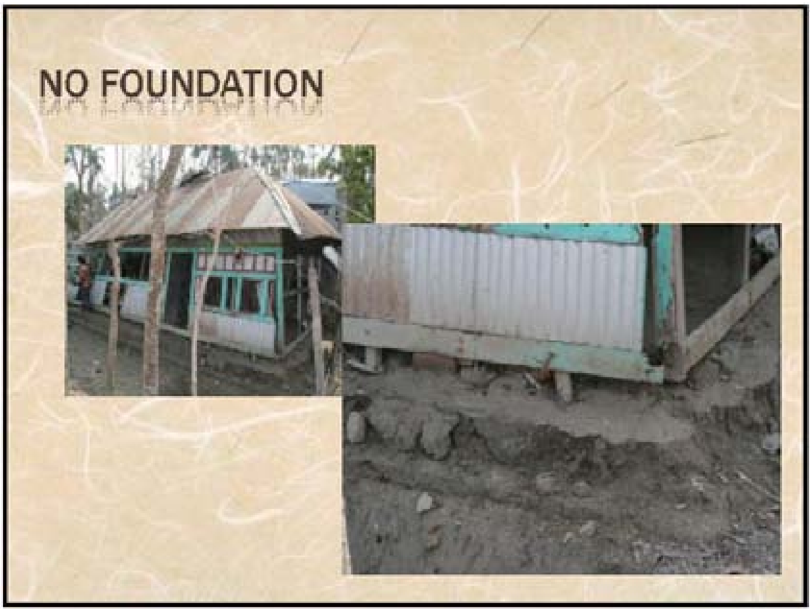


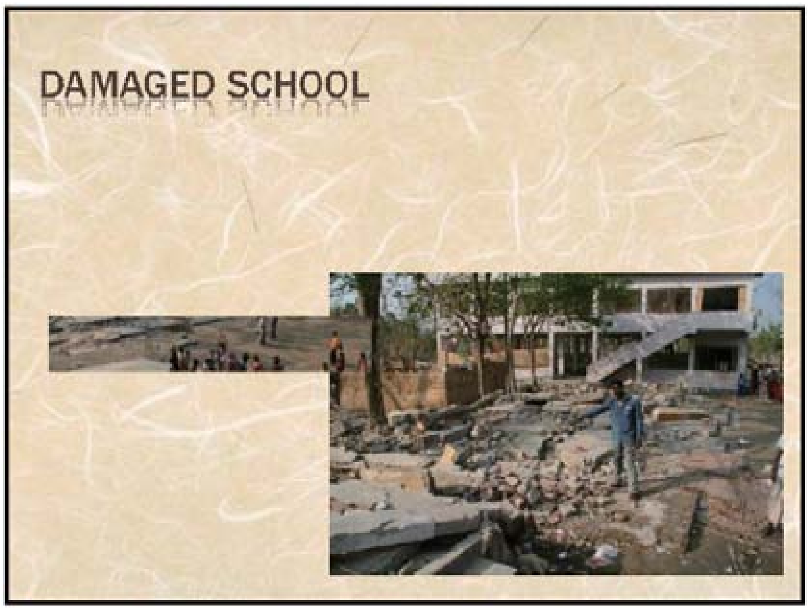
DESTRUCTIONS

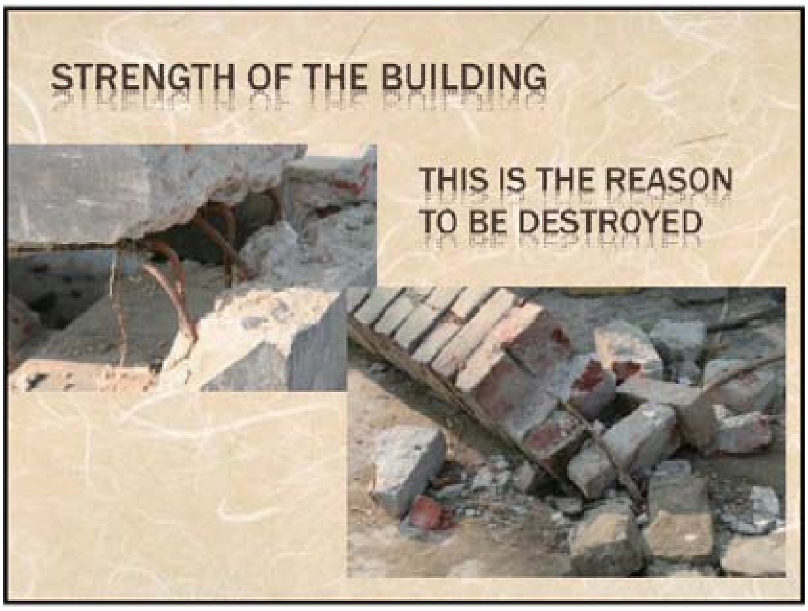
CYCLONE 1991 AND 2007

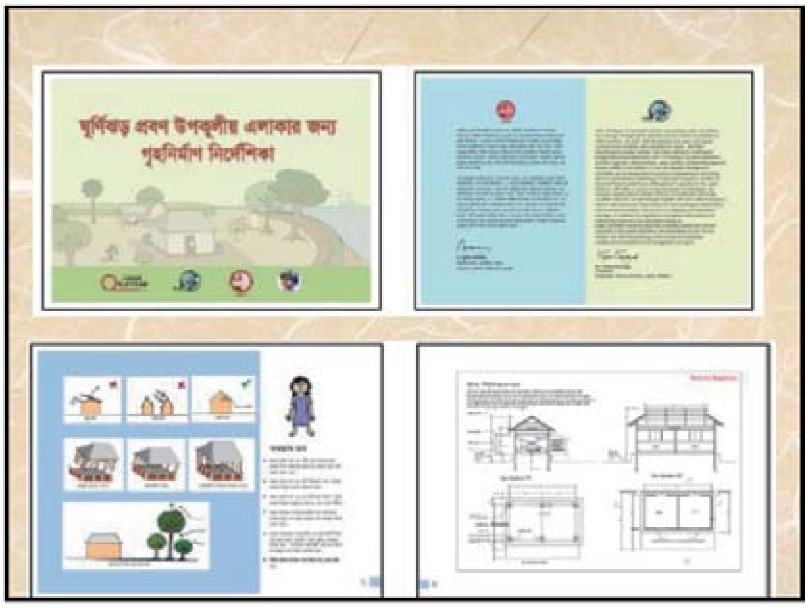
Ser	Event	1991	2007
1.	Death Toll	1,38,882	3363
2.	Missing	20,000	871
3.	Crops Damaged Area	3,50,000 Acres	2472942 Acres
4.	Areas Affected	15,000 Sq km	30 Districts

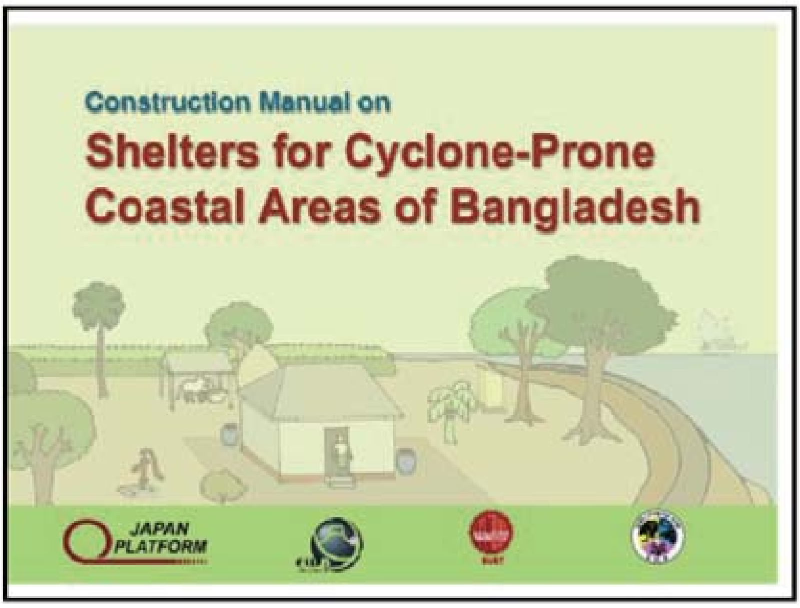

DAMAGED HOUSE

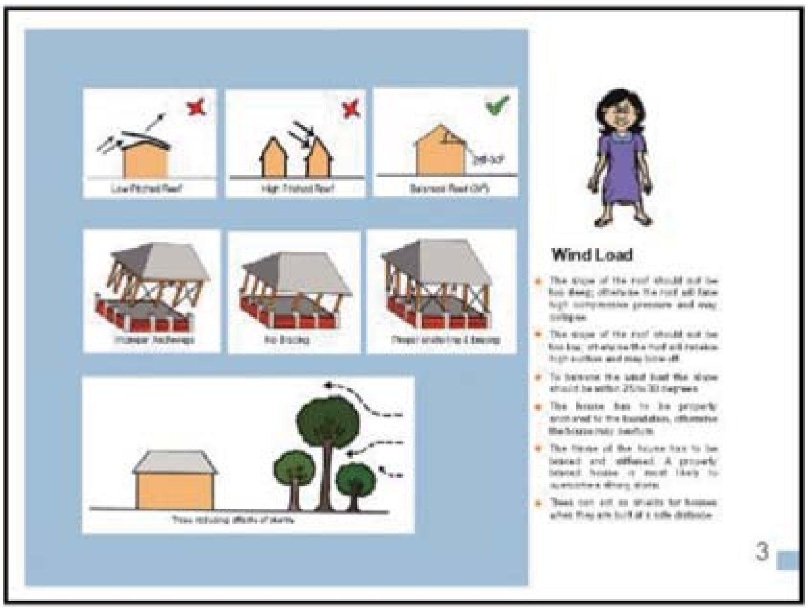

NO FOUNDATION

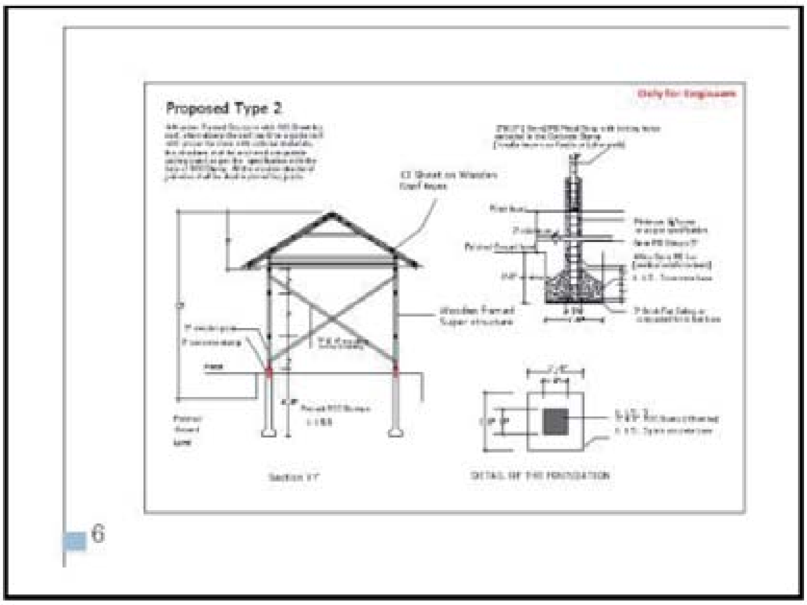

DAMAGED SCHOOL

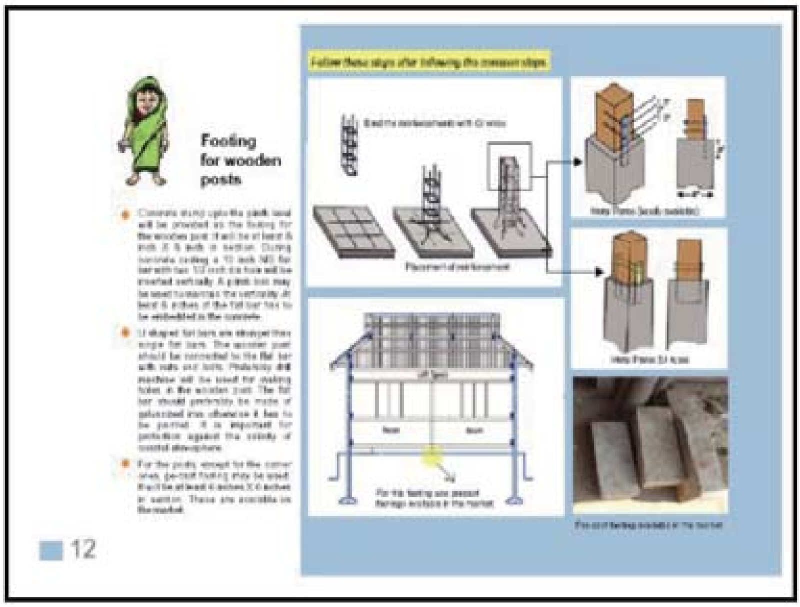

STRENGTH OF THE BUILDING
THIS IS THE REASON
TO BE DESTROYED

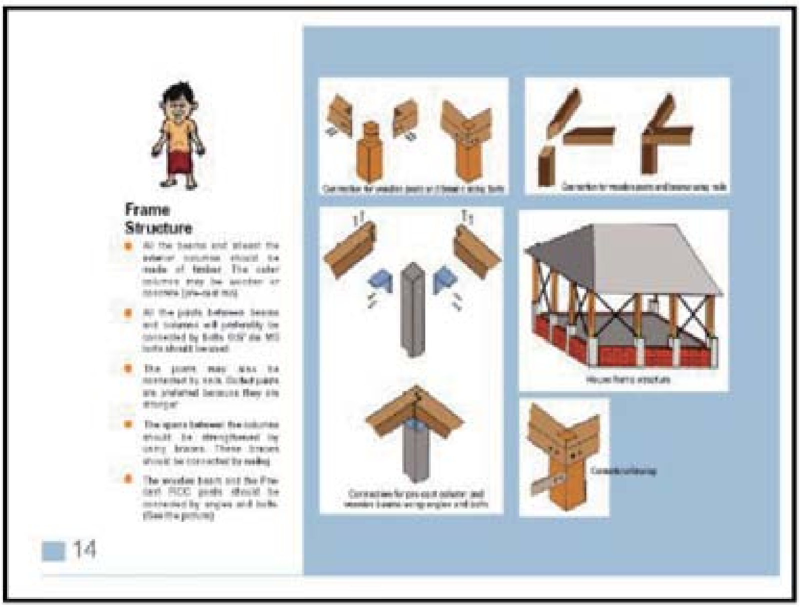



Construction Manual on
Shelters for Cyclone-Prone
Coastal Areas of Bangladesh
JAPAN
PLATFORM


Wind Load
3


Proposed Type 2
6


Footing for wooden posts
12


Frame
Structure
14


Thank you!

Findings from field monitoring of house reconstruction after Central Java Earthquake

- 中部ジャワ地震住宅再建事業モニタリング報告 -

2008年11月29日
International Symposium 2008 on Earthquake Safe Housing

NPO法人都市計画・建築関連OVの会（EVAA）
迫田　恵子

Summary: 復興による変化の概要
（Summary of Improvement through the reconstruction work）

Progress through the reconstruction
（今回の復興事業における進歩）

Reconstruction work action

住宅 (House) =

- 設計(工学論理) (Engineering theory) — 構造部材（柱梁）・図面の出現 / Appearance of structure parts (column, beam...) & drawings
  - ●Distribution of Working drawings
  - ●Disseminate Confined Masonry
  - ●Set Key requirements (Construction rule)

＋

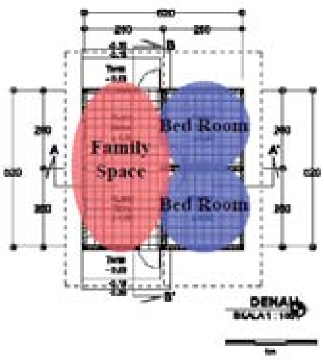
- 建築資材 (Materials) — 建築資材の規格化と使用 / Standardize of material
  - ●Set Key requirement (Material standard)
  - ●Material distribution (*By some donors)

＋

- 施工技術 (Workers' skill) — 労働者の施工技術や知識向上 / Improvement of const. Workers' skill & knowledge
  - ●Training for households & construction workers
  - ●Knowledge sharing through poster, booklet and etc

典型的な復興住宅事例
(Common style of the reconstruction house)

▲ 典型的な復興住宅事例
(Example of reconstructed house)



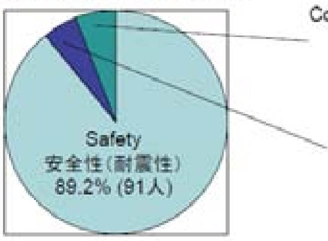
Source: Field survey

住民・労働者の意識 (Earthquake resistance awareness among inhabitants & workers)

＜住民の優先事項(地震後)＞
Priority for the house owners (Post-earthquake)

- The first priority for the house owners is "SAFETY".

⇒ Very natural



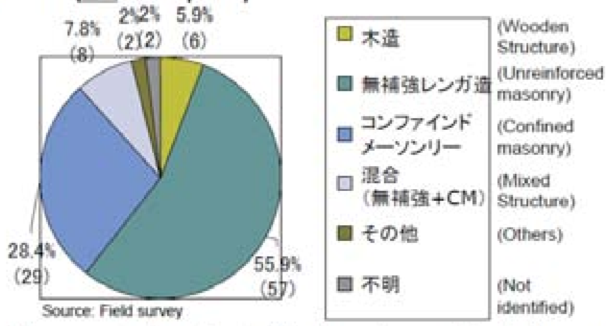
＜労働者の意識＞
Construction workers impression for the required skill level of the reconstruction work

- 85%* of construction workers didn't feel technical difficulty for the reconstruction work.

Source: Field survey

Progress①工学論理の導入 (1/2) Improve (Introduction of Engineering theory)

＜構造(地震前)＞
Construction (Pre-earthquake)



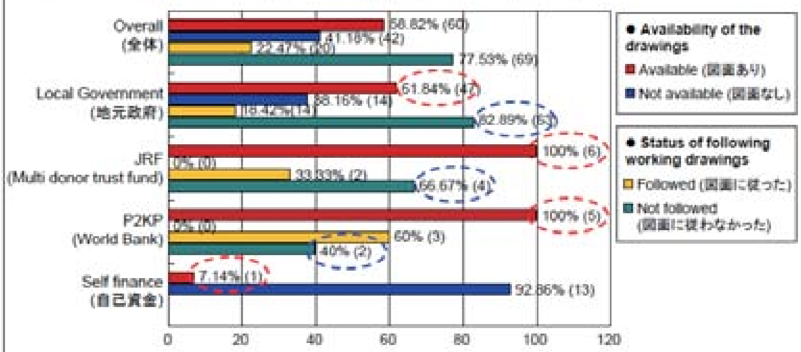
Source: Field survey

⇒Though the reconstruction, almost all the houses became Confined masonry.
地震後はほぼ全てがコンファインドメーソンリー(補強レンガ造)。

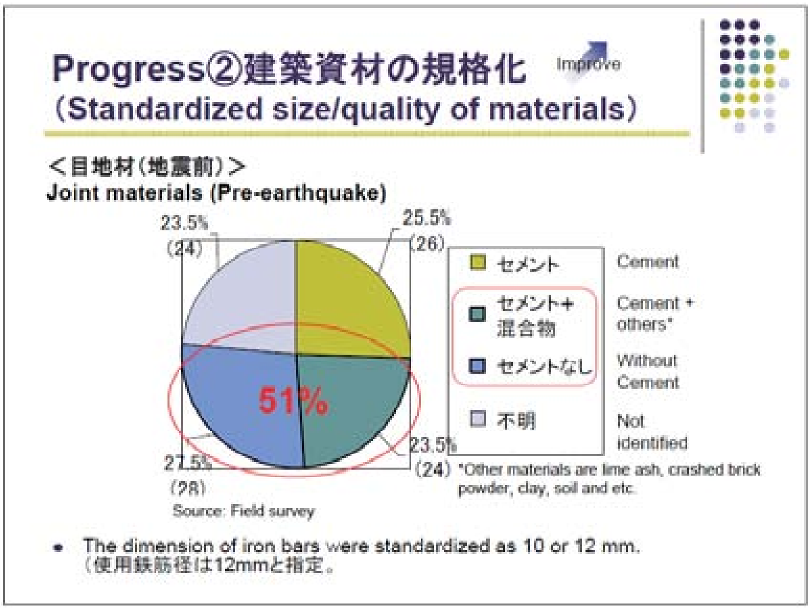
- Another improvement: Utilization of working drawings

Progress①工学論理の導入 (2/2) Improve (Introduction of Engineering theory)

＜図面の有無(地震後)＞
Availability of working drawings (Post-earthquake)



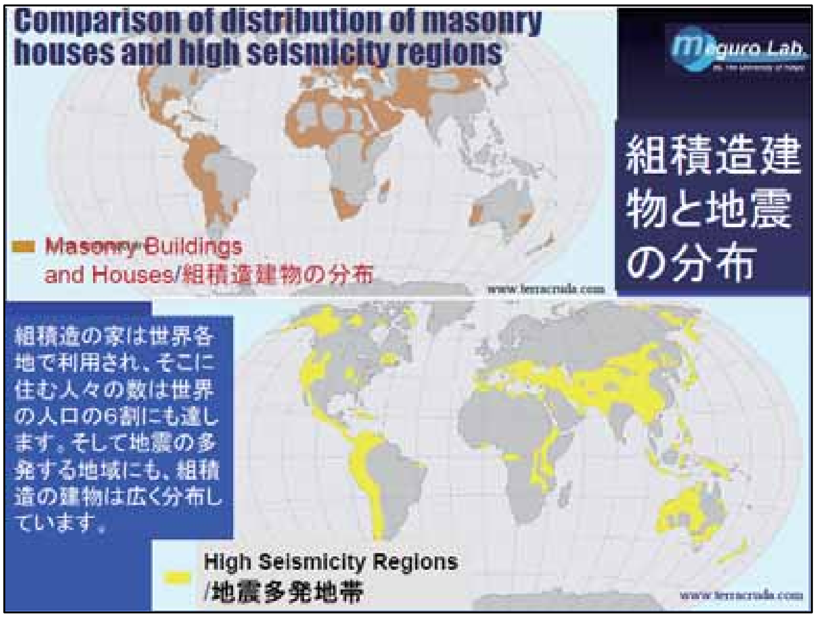
Source: Field survey

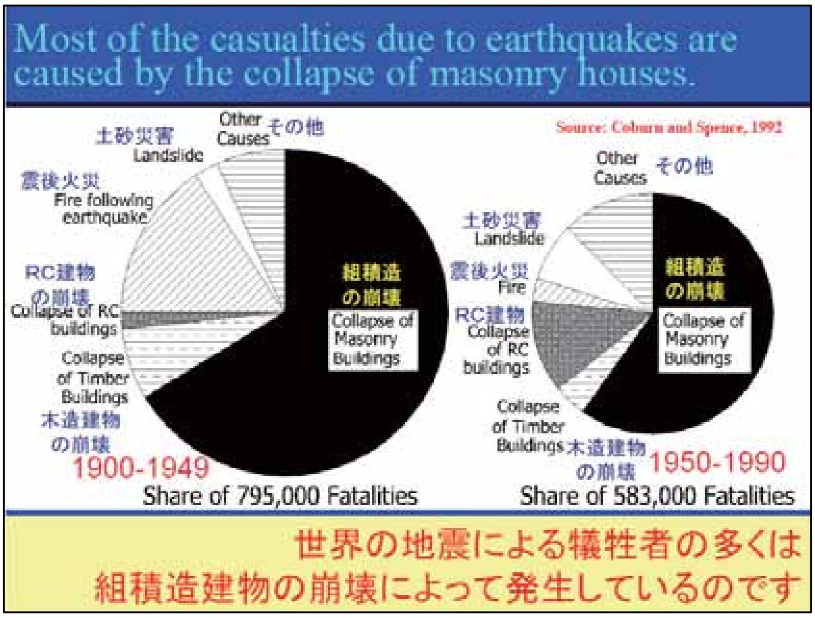

Progress②建築資材の規格化
Improve
(Standardized size/quality of materials)
<目地材(地震前)>
Joint materials (Pre-earthquake)
23.5%
(24)
25.5%
(26)
51%
23.5%
(24)
27.5%
(28)
セメント
Cement
セメント+混合物
Cement + others*
セメントなし
Without Cement
不明
Not identified
*Other materials are lime ash, crashed brick powder, clay, soil and etc.
Source: Field survey
The dimension of iron bars were standardized as 10 or 12 mm.
(使用鉄筋径は12mmと指定。


Progress③施工技術
Better?
(Construction workers' skills)
Exposed iron bars
Main structure parts with inadequate dimension
Not compacted concrete
Installment process is one of the big problem.
(ノン・エンジニアドに工学的側面を持ち込んだということで一定の成果が認められたが、施工技術の伸びは不明。)
Source: Field survey


Left Issues:労働者間の技術差
(Level gaps among construction workers)
Professionals
Amateur
Source: Field survey
Construction workers' skill vary a lot.
After renewing many houses, there would be only few chances of construction work.
⇒No chance utilize the trained knowledge & skill through reconstruction work.
⇒We need comprehensive solution.

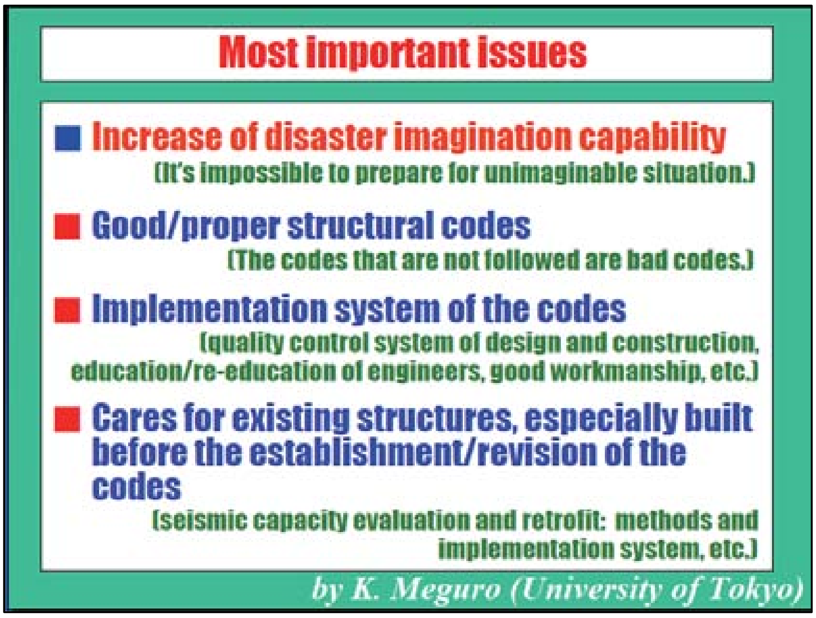

Implementation of earthquake safer housing through technological and social approaches
Kimiro MEGURO
Meguro Lab.
Director/Professor
International Center for Urban Safety Engineering
Institute of Industrial Science
The University of Tokyo


Comparison of distribution of masonry houses and high seismicity regions
Meguro Lab.
組積造建物と地震の分布
Masonry Buildings and Houses/組積造建物の分布
www.terracruda.com
組積造の家は世界各地で利用され、そこに住む人々の数は世界の人口の6割にも達します。そして地震の多発する地域にも、組積造の建物は広く分布しています。
High Seismicity Regions /地震多発地帯
www.terracruda.com

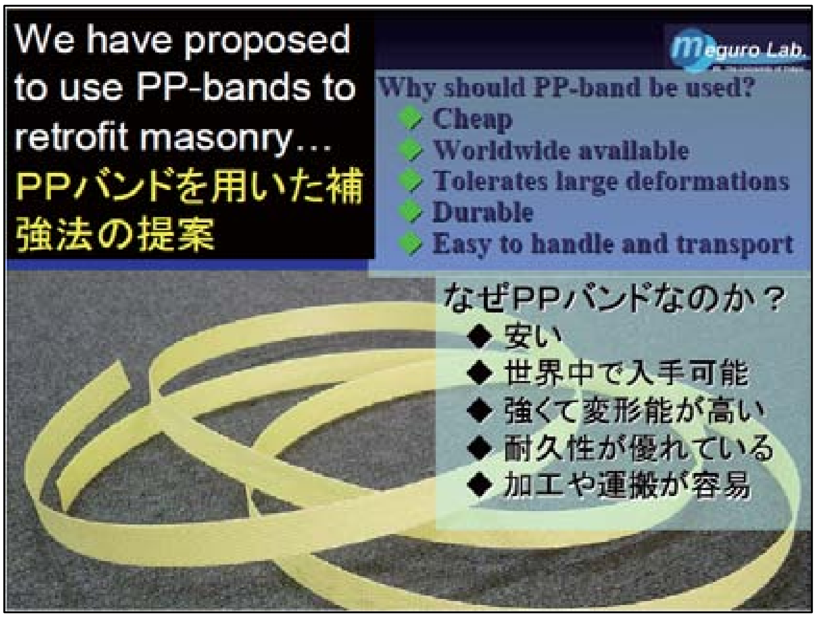

Most of the casualties due to earthquakes are caused by the collapse of masonry houses.
Source: Coburn and Spence, 1992
土砂災害 Landslide
Other Causes その他
震後火災 Fire following earthquake
RC建物の崩壊 Collapse of RC buildings
Collapse of Timber Buildings 木造建物の崩壊
組積造の崩壊 Collapse of Masonry Buildings
1900-1949
Share of 795,000 Fatalities
Other Causes その他
土砂災害 Landslide
震後火災 Fire
RC建物 Collapse of RC buildings
Collapse of Timber Buildings 木造建物の崩壊
組積造の崩壊 Collapse of Masonry Buildings
1950-1990
Share of 583,000 Fatalities
世界の地震による犠牲者の多くは組積造建物の崩壊によって発生しているのです


Promotion of disaster mitigation countermeasures
Researchers and engineers tend to use new and advanced technology without considering local condition and situation. However, ...
Key Words
◆Local Availability /Applicability
◆Local Acceptability

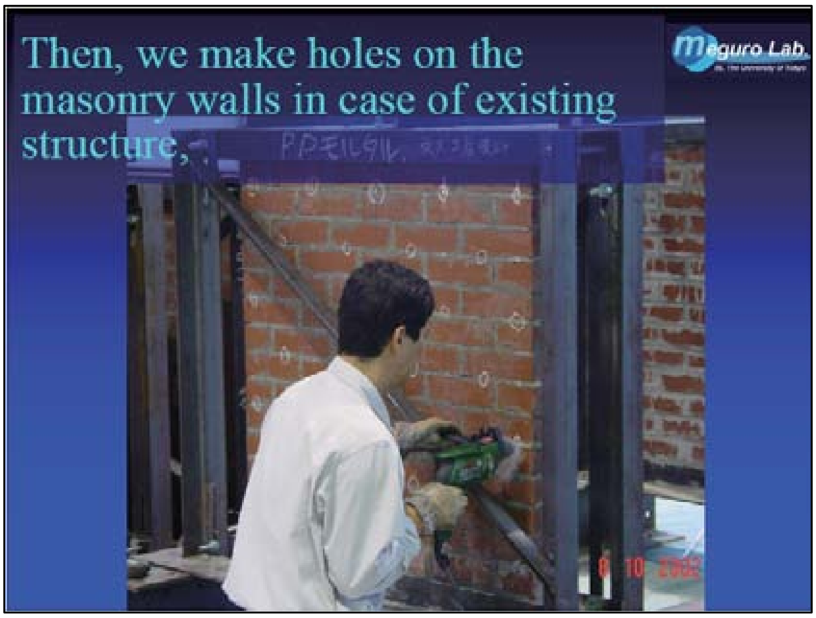

Local Availability/Acceptability
◆Technical Aspect
・method applicability
・material availability
◆Social Aspect
・cultural acceptability
・economical acceptability
・acceptable promotion system

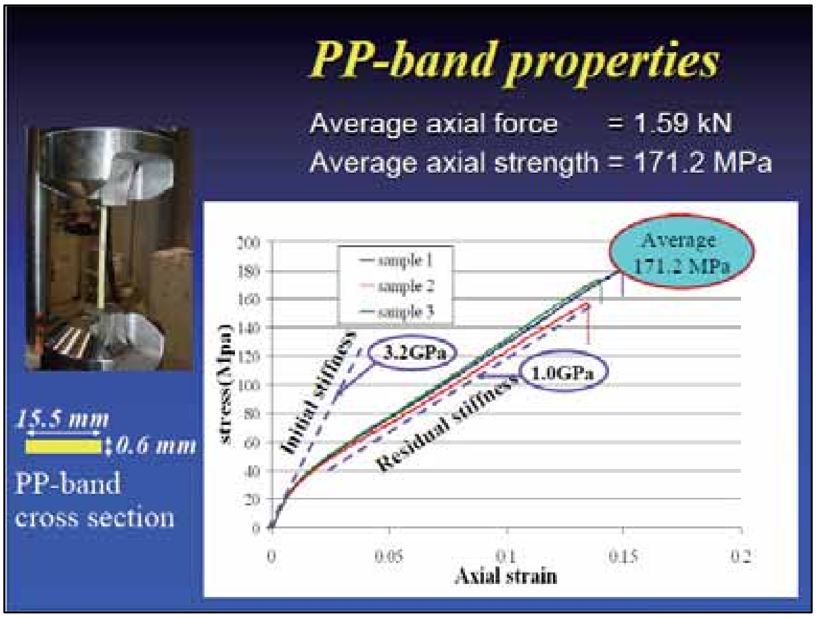

Most important issues
■ Increase of disaster imagination capability
(It's impossible to prepare for unimaginable situation.)
■ Good/proper structural codes
(The codes that are not followed are bad codes.)
■ Implementation system of the codes
(quality control system of design and construction, education/re-education of engineers, good workmanship, etc.)
■ Cares for existing structures, especially built before the establishment/revision of the codes
(seismic capacity evaluation and retrofit: methods and implementation system, etc.)
by K. Meguro (University of Tokyo)

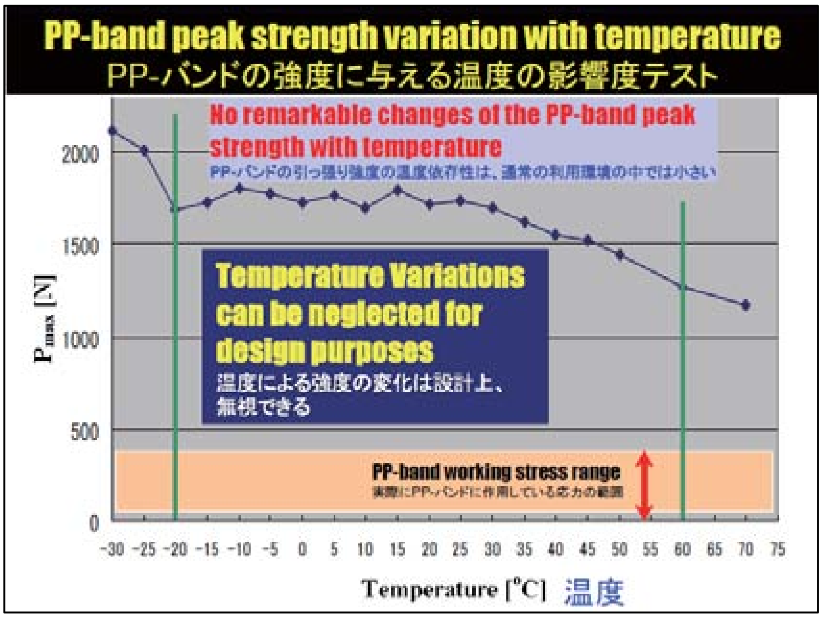

Promotion of disaster mitigation countermeasures
We should pay much attention to
◆Local Availability
◆Local Acceptability
also, to
◆Decision/Policy Makers


We have proposed to use PP-bands to retrofit masonry…
PPバンドを用いた補強法の提案
Meguro Lab.
Why should PP-band be used?
Cheap
Worldwide available
Tolerates large deformations
Durable
Easy to handle and transport
なぜPPバンドなのか？
◆ 安い
◆ 世界中で入手可能
◆ 強くて変形能が高い
◆ 耐久性が優れている
◆ 加工や運搬が容易


…and retrofitted them with PP-band meshes.
Meguro Lab.


Then, we make holes on the masonry walls in case of existing structure,
Meguro Lab.


PP-band properties
Average axial force = 1.59 kN
Average axial strength = 171.2 MPa
15.5 mm
0.6 mm
PP-band cross section
sample 1
sample 2
sample 3
Average 171.2 MPa
3.2GPa
1.0GPa
Initial stiffness
Residual stiffness
stress(Mpa)
Axial strain


PP-band peak strength variation with temperature
PP-バンドの強度に与える温度の影響度テスト
No remarkable changes of the PP-band peak strength with temperature
PP-バンドの引っ張り強度の温度依存性は、通常の利用環境の中では小さい
Temperature Variations can be neglected for design purposes
温度による強度の変化は設計上、無視できる
PP-band working stress range
Pmax [N]
Temperature [°C] 温度

Panelists

Dr. Iman Satyarno / Lecturer, Gadja Mada University, Indonesia
Dr. Marqueza Reyes /Assistant Professor, University of the Philippines
Dr. Kimiro MEGURO / Professor, Tokyo University
Dr. Kenji OKAZAKI / Professor, National Graduate Institute for Policy Studies
Mr. Toshiya Tsukamoto / Deputy Secretary General, NPO Engineers without Borders, Japan
Dr. Tatsuo NARAFU / General Coordinator of Collaborative Research and Development Project

パネリスト

インドネシア・ガジャマダ大学 講師	イマン・サティヤルノ
フィリピン大学 准教授	マルケサ・レイアス
東京大学 教授	目黒公朗
政策研究大学院大学 教授	岡崎健二
NPO 国境無き技師団 事務局次長	塚本俊也
コーディネーター：共同研究開発プロジェクト代表	楢府 龍雄

パネルディスカッション議事要旨

- 中部ジャワで学んだ事・ノンエンジニアに関することの補足（イマン）

・地震の被害軽減のために、まず、ガイドライン、2つめがソーシャライゼーション、3つめが実行＝インプリメンテーション。これらのステップを注意深くデザインする必要がある事を学んだ。

・第一に、実行出来ない様な難しいガイドラインは創らない。

・次に、収入の低い人達や教育の低い人達に、どのようにガイドラインを普及させていくかが問題である。ジョグジャカルタでは絵や図を使って理解の向上を図っている。

・次いで、実行の面では労働者自体の問題・建築資材の質の2点がある。コミュニティ・エンパワメント・プログラムにより、ファシリテーターの大学生の協力の下、約 20 万戸の住宅を自分達で造った。

・2、3千万個の新しいレンガを用意するのは時間が掛かりすぎるので、建築材料は中古或いはリサイクルしたレンガで、それらの使い方を学生が指導した。

➢バングラデシュでの経験（塚本）

・バングラディシュで、現地の実情を反映していない国際機関のマニュアルが政府承認を受けられなかったという経験がある。現地のレベルで、問題を自ら解決する方法が色々あるので、マニュアル作成の段階から現地の人達とのネットワークを強めていく必要があると考えている。

・国際機関は頭ごなしのマニュアルを提供してきたところが在るのではないかと考えている。現地の人達はかなりのキャパを持っているので、バングラディッシュ工科大学とのコラボレーションは非常に良かった。

➢地元の人達のポテンシャル（楢附）

・アチェ、中部ジャワ、ピスコなどの地震でも、現場でさまざまな工夫をしながら、試行錯誤を行っている。地元の人達はかなりのポテンシャルがあると今回の報告でも感じている。

➢バランガイのインフォーマルハウジング（マルケサ）

・マカティのジェシャルでは、地震に強い住宅づくりのために、地震が来る前のコミュニケーション・地震に強い住宅の技法をインフォーマルハウジングに導入する活動が問題となった。

・一軒、一軒をレトロフィットするのではなく、コミュニティ全体を再開発する手法を探った。都市の再開発やコミュニティのマスタープランが受け入れられるような状況になって来たので、広範囲に亘って様々な人々が参加するコミュニティの再開発のプロセスを採用した。

・インフォーマルなコミュニティ全体を扱うことで、一軒、一軒をレトロフィットする以上の成果が得られたのではないかと考えている。

➢地元の人々のポテンシャルを生かす・引き出す戦略についての補足（岡崎）

・ジョグジャカルタの復興は比較的上手くいっていると思う。また、グジャラート地震の復興はかなり上手くいっていると思う。当然、地震後であり意識が高まっているという要因があると思う。一方、アチェの場合は津波被害が大き過ぎて復興については上手くコーディネート出来なかった。

・インドネシアのバンドンの様に、今まで一度も地震の経験が無いところで人々の耐震意識を高めていくかが今後の課題ではないかと思う。

・コミュニティ防災や、震動台の実験も効果があるが、手間や限られた人にしか広がらない限界があり、無数にある既存住宅の耐震性向上には社会的仕組みの変革が求められる。

・目黒先生の指摘は非常に良いと思われるが、地震の被害を受けた人に扱いの差を付けるのは政治的にも難しいと思われる。本当に住宅を良くした人には報いる姿勢を明らかにしないと住宅の耐震補強を拡充するのは難しい。

➢ノンエンジニアード、インフォーマルの対策を考えるには工学技術より社会的システムの比重が大きいと感じている。（楢府）

➢工学を定着させる社会的システム（目黒）

・工学・社会システムの合わせ技と災害イマジネーションの教育が重要になる。地震の被害を受けてしまった時に自分の周りで何が起こるか、具体的に想像できる力が無いと対策を講ずることは出来ない。

・政治家・研究者・行政・マスコミ・一般市民がそれぞれのレベルで災害イマジネーションが不足している。災害イマジネーションを高めるとともに、防災に尽力した人々の努力を明らかにし、報われる状況を早く作ることが重要。

・地震が起こりやすい国の、地震が起こりやすい場所で住宅を建てて、地震に際して、きちんとした耐震住宅とそうでない物の差を明確にして普及に繋げるといったことも国に要請している。

➢インドのグッドプラクティス（アリア）

・震災の経験を基に、耐震化の方法を村人達に訴えたうえで、住宅の再建・建築を行っている。

・グジャラート地震では、防災当局が再建後もサポートを行っており、現在、州全体の学校の耐震補強を行っている。また、政府の防災管理の役人と共にこれらを行っている。

・被災地で制度的な形をつくって今後の啓発活動につなげているのが重要である。

・現在、他の州に対しても教育を行おうとしており、震災はあったが自分自身は地震体験は無かった地域でも減災の措置を採り始めている。これらの州省でも防災省などを設立する動きが出始めている。

・防災省のトップは地域の首長なので、被災後も様々な政策や戦略を採り続けることが出来る。

・インドでは津波の早期警戒システムの配備を準備している。サイクロンや高波に対してもアンテナを用意している。

・日本にも学びながら、インドでは登録・軽減・教育・トレーニングの各分野に取り組んでいる。これは、どの国も見習うべきである。

会場からの質疑

佐々波

・途上国の低所得階層の耐震補強に向けて、NGOがどの程度参加できるかに深い興味を持っている。

・NGOのポイントとして大学等との連携が挙げられる。住宅問題と関連して、市政府・中央政府の協力、企業の支援などが可能性として考えられるのではないか。

斉藤

・ 日本でも耐震補強が必要な既存の建物が多く問題となっている。子供の教育を通じて耐震補強の大切さや地震の悲惨さを訴えると、親は子供のために耐震補強をしたいと思うという、教育に地震防災の意識を啓蒙する試みがあり、これらは非常に有効だと考えている。

ファイナルコメント

イマン

・国際機関、NGO、様々な政府や大学、コミュニティ、企業がが一緒にワーク・トゥギャザーし、お互いに助け合いながら住宅の耐震化を進める必要がある。

・それは大学やコミュニティ、NGO、政府単独では出来ない。一つの地域、国、全世界でレッツ・ワーク・トゥギャザーが必要。

マルケサ

・メトロマニラのインフォーマルハウジングの防災についてはジレンマがある。1．インフォーマルハウジングは地震による被害が大きい。2．メトロマニラの人口の35%がインフォーマルハウジングに住んでいる。

・このような人々に地震に強い住宅を供給するオプションとして都市の再開発、補強、レトロフィットの3つがある。

・これらが参加型で、コミュニティーベースのアプローチが無ければ成功しないので、それだけでは不十分だと考えている。

岡崎

・地震対策の第一歩は自分の地震リスクを理解すること。しかし、地震のリスクはわかりにくい。自分の住宅の耐震性もわかりにくい。地震の発生時期もわからない。家族構成やライフスタイルによっても異なるので、地震リスクに関しては個人個人の差が非常に大きい。

・専門家の力を借りたリスクコミュニケーションが必要で、そういった面を助ける専門家の育成と、各人がコミュニケーションする事で自分のリスクについて理解していく事が重要。

・読むよりも聞く、聞くよりも見る方がわかりやすい。見るよりも体験する事の方がわかりやすいので、体験型・ビジュアル方で自らのリスクが実感できる教育方法が大切だと思われる。

塚本

・住宅の支援を通じてコミュニティ開発に繋げて行かなげればならないので、アリア先生のホーリスティックなアプローチが非常に重要だと思われる。

・住宅を通して住民の人達が広がる世界がある。それはホーリスティックな、コンプレヘンシブなアプローチだと思う。

・住宅のテクニックの中でそういう社会的な広がりを覚えていく必要があり、イマン先生のように、色々な主体が協力して取り組まなければならない分野だと思う。

目黒

・防災は政治的な論争のポイントにならないので上手くいかない。現在、防災士の組織代に取り組んでおり、現在、全国に 25,000 人の防災士が存在している。5,000 人くらいから政治家の対応が変わるので政治的なパワー・プレッシャー・グループをそれぞれに持つことも重要ではないか。

・損得勘定に直結する情報の出し方が必要。自動車の任意保険のような、耐震補強ビジネスが必要。

・自然災害大国の子供たちに、きちんと防災を教えなければいけない。受験科目に防災を組み込んで、有名私立学校が受験に問題に出題するようになると変わるかもしれない。

・良い言葉を付けて、ブランドイメージに直結するワーデディング、ブランディングが重要。上手くブランディングをして、そういう活動がみんなの為になっているということをお互いに共有するような社会システムをつくる事も重要。

楢府

・4 年前に始めた頃は、ノンエンジニアード・低所得者層の地震防災対策は「非常に良い事だが、問題が大変なので止めた方が良い」「こういった研究をしている人は、世の中には多くない」という声が多かった。

・しかし、本日も世界各国から様々な方に来ていただき、共通の問題意識を持ってやっていただける方が沢山居るということがこの4年間でわかった。

・非常に多岐に亘る分野で難しい問題だと思うが、今後も繋がりの輪を維持しながら、少しでも安全な地域づくり、住宅づくりに貢献できればと思う。

パネルディスカッション会場風景

パネリスト

会場からの質問、コメント

Ⅲ. ANNEX
参考資料

「地震に強い住宅」に関する国際シンポジウム

世界共通の課題を一緒に考える

数々の大地震を受けて、今、世界では、地震災害を減らすことが強く望まれています。地震による死因の多くは、自分の家の倒壊によるものです。しかし、世界ではまだ多くの人がノンエンジニアド（技術者が関わらない）で造られた、レンガ、石や木材など材料を使った地震に弱い住宅に住んでいます。緊急対応や救助が効率的に行われれても、亡くなった人は戻りません。どんなに効果のある耐震技術が開発されても、人々がそれを使わなければ安全な住宅はできません。

そこで「地震に強い住宅」に関する国際シンポジウムでは、耐震コミュニティ作りに向けて、いかに住宅の安全性を向上させることができるかについて、関心を持つ幅広い分野の方々で議論を行います。

開催日：2008年11月28日（金）－29日（土）

会場：政策研究大学院大学（GRIPS）内、想海楼ホール

〒106-8677　東京都港区六本木7-22-1
大江戸線六本木駅下車出口7より徒歩5分
日比谷線六本木駅下車出口4Aより徒歩10分
千代田線乃木坂駅下車出口5より徒歩6分

参加費：無料　（事前登録必要）

使用言語：英語および日本語（同時通訳あり）

主催：建築研究所（BRI）、　政策研究大学院大学（GRIPS）
国連地域開発センター（UNCRD）

後援：国連防災戦略（UN/ISDR）、ユネスコ（UNESCO）、
内閣府、国土交通省、国際協力機構　＊予定含む

http://www.grips.ac.jp/jp/about/access.html

独立行政法人 建築研究所　GRIPS 政策研究大学院大学　UNCRD 国連地域開発センター

プログラム

2008年11月28日（金）

9:00-9:30　受　付

第一部　地震リスク認知と防災政策

9:30-9:40　オープニング　開会挨拶　政策研究大学院大学学長　八田達夫
来賓挨拶　国土交通省住宅局長（政策研究大学院大学客員教授）　和泉洋人

9:40-12:30　パネルディスカッション
「地震リスク認知の理解と防災政策への示唆」

地震リスク認知調査の概要　政策研究大学院大学　岡崎健二
[インドネシア]　バンドン工科大学　ワヤン・センガラ
[パキスタン]　プレストン大学　ナジブ・アーメド
[フィジー]　鉱物資源省　ラサルサ・ヴェティバウ
[フィリピン]　フィリピン大学　マルケサ・レイアス
[ネパール]　ネパール地震工学協会（NSET）　アモッド・ディキシット
[トルコ]　イスタンブール工科大学　イルマ・カラツナ
[インド]　インド工科大学ボンベイ校　ラヴィ・シンハ
[日本]　筑波大学　梅本通孝

第二部　基準から現場へ－建築基準普及への挑戦－

13:30-13:40　オープニング　UNCRD所長　小野川和延
13:40-15:00　【　セッション1　】　地震にまけない住宅　：　これまでとこれから

基調講演：　地震と在来建築　インド内務省国家地震顧問　アナンド・アリヤ教授　(インド)
震災復興から学ぶ　テディ・ブーン　(インドネシア)
報告：　建築基準の創設－ネパールの経験　都市・建築局長　スルヤ・サンガチェ　（ネパール）
工学と建設のギャップを埋める　建築研究所　楢府龍雄

15:00-15:20　休　憩
15:20-16:35　【　セッション2　】　建築基準の実施

基調講演：　もうひとつの課題：既存建築物の地震対策　東京大学名誉教授　小谷俊介
報告：　近年の震災からの経験　UNCRD兵庫事務所所長　安藤尚一
ネパールにおける建築基準の実施　NSET　アモッド・ディキシット　（ネパール）
建築基準実施の枠組み―HESIの経験から　UNCRD兵庫事務所　ジシュヌ・スベディ

16:35-16:50　討　論
16:50-17:00　まとめ・閉会のことば

2008年11月29日（土）

第三部　地震による死傷者を少なくする方策を考える　－ノン・エンジニアドを中心に－

協力：防災科学技術研究所、三重大学
＊第三部の実施運営にあたっては文部科学省（MEXT）の助成を受けています。

13:00-14:40　【　セッション1　】　ファシリテータ：　三重大学　花里利一

開会挨拶：　建築研究所理事長　村上周三
基調講演：　四川地震の被害と教訓(仮題)　中国地震局地質研究所　何永年客員教授　(中国)
ノン・エンジニアド構造の耐震性向上の取り組み(仮題)　インド内務省国家地震顧問　アナンド・アリヤ教授　(インド)
報告：　近年の地震被害の教訓とアジア諸国との共同研究開発の取り組み　建築研究所　楢府龍雄
ポスター展示のインデキシングセッション

14:40-15:00　休　憩　・　ポスターセッション
15:00-17:00　【　セッション2　】　パネルディスカッション　ファシリテータ：　建築研究所　楢府龍雄

パネリスト：　フィリピン大学　マルケサ・レイアス　（フィリピン）、　ガジャマダ大学　イマン・サティヤルノ　（インドネシア）
政策研究大学院大学　岡崎健二　（日本）
東京外国語大学客員教授/NPO国境なき技師団事務局次長　塚本俊也　（日本）
まとめ：　共同研究開発プロジェクト研究運営委員長/北海道大学名誉教授　石山祐二

17:00　閉　会

17:15-18:15　意見交換会
基調講演者、パネリストを交えてリラックスした雰囲気での意見交換会を開催します。（別途申し込み要：参加費1000円）

参加申し込み・問い合わせ
建築研究所　岡倉・今井　宛
Tel: 029-864-6641
Fax：029-864-2989
EM: sympo-2008@kenken.go.jp

International Symposium 2008 on Earthquake Safe Housing

- Discuss together on the keen and common issue -

Reduction of earthquake disasters is one of the keenest issues common in earthquake prone areas in the world. In most of deaths caused by earthquakes, people are killed by their own houses. Most of the world's population lives in vernacular houses that are built of adobe, brick, stone, and wood, and are non-engineered and thus vulnerable to earthquakes. No matter how effectively emergency management and relief activities are conducted, the lost lives can never be regained. No matter what effective technologies are developed, the non-engineered houses will not be safer unless these technologies are applied.

This International Symposium on "Earthquake Safe Housing" therefore aims to discuss among the interested experts how we can improve the safety of houses, newly built and existing, towards safer communities against earthquakes.

<u>Date: November 28th-29th, 2008 (Friday-Saturday)</u>

Venue: Sokairo Hall, National Graduate Institute for Policy Studies (GRIPS), Tokyo

7-22-1 Roppongi, Minato-ku, Tokyo

http://www.grips.ac.jp/about/access.html

Admission Free (Pre-registration required)

Language: English and Japanese

(simultaneous translation is available)

Organized by

- Building Research Institute (BRI)
- National Graduate Institute for Policy Studies (GRIPS)
- UN Centre for Regional Development (UNCRD)

Supported by (tentative)

- UN International Strategy for Disaster Reduction (UN/ISDR)
- UNESCO
- Cabinet Office, Government of Japan
- Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan
- Japan International Cooperation Agency (JICA)

BUILDING RESEARCH INSTITUTE

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UNCRD United Nations Centre for Regional Development

Program

Registration/ Inquiry
Attn: Okakura Ms. / Imai Mr. (BRI)
Tel: +81-29-864-6641
Fax:+81-29-864-2989
E-M: sympo-2008@kenken.go.jp

Friday, November 28, 2008

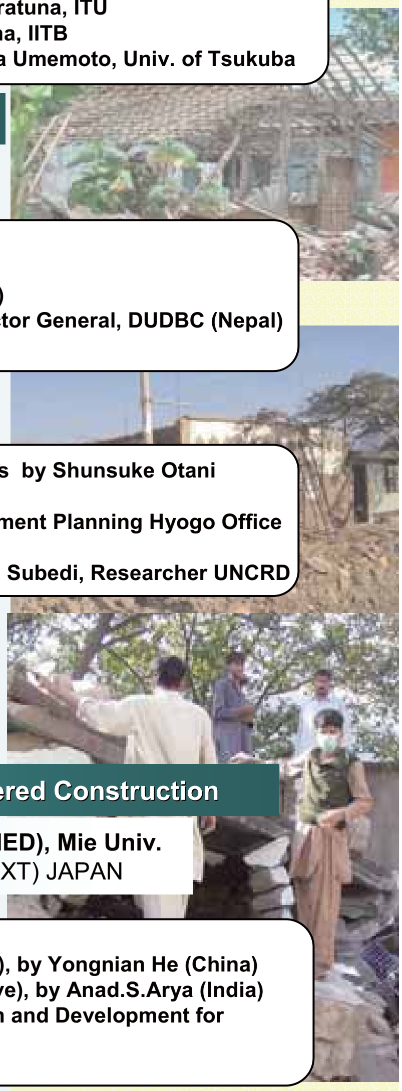
9:00-9:30 Registration

Part 1 Earthquake Risk Perception and Disaster Reduction Policies

9:30-9:40 Opening: Tatsuo Hatta, President, GRIPS,
Hiroto Izumi, Director General, Housing Bureau, MLIT (Visiting Prof. of GRIPS)

9:40-12:30 Panel Discussion
"Understanding Earthquake Risk Perception and Its Implication for Development of Disaster Reduction Policies"

Outline of the Survey on earthquake risk perception: Kenji Okazaki, GRIPS
[Indonesia] Wayan Sengara, ITB
[Pakistan] Najib Ahmad, Preston Univ.
[FIJI] Lasarusa Vuetibau, Mineral Resources Dept.
[Philippines] Marqueza Reyes, Univ. of the Philippines
[Nepal] Amod Dixit, NSET-Nepal
[Turkey] Yilma Karatuna, ITU
[India] Ravi Sinha, IITB
[Japan] Michitaka Umemoto, Univ. of Tsukuba



Part 2 From Code to Practice: Challenges in Building Code Implementation

13:30-13:40 Welcome Address: Kazunobu Onogawa, Director, UNCRD
13:40-15:00 【Session 1】 Housing Earthquake Safety: Lessons and Challenges

Key note Speech:
Earthquake and Non-engineered buildings by Anad. S. Arya (India)
Lessons from re-construction after earthquakes by Teddy Boen (Indonesia)
Development of Building Code- Experience of Nepal by S.B.Sangachhe, Director General, DUDBC (Nepal)
Bridging gap between engineering and construction by Tatsuo Narafu

15:00-15:20 Break
15:20-16:35 【Session 2】 Building Code Implementation

Key note Speech: Another Problem: Seismic Protection of Existing Buildings by Shunsuke Otani
Experience of damages in recent earthquakes,
by Shoichi Ando, UNCRD Disaster Management Planning Hyogo Office
Building Code Implementation in Nepal, by Amod Dixit, NSET (Nepal)
Framework for Building code Implementation: Experience of HESI, by Jishnu Subedi, Researcher UNCRD

16:35-16:50 Discussion
16:50-17:00 Closing remarks

Saturday, November 29, 2008

Part 3 Strategies to Mitigate Casualties by Earthquakes focusing on Non-engineered Construction

Supported by National Research Institute for Earth Science and Disaster Prevention (NIED), Mie Univ.
＊This session is supported financially by Ministry of Education, Culture, Sports, Science and Tech. (MEXT) JAPAN

13:00-14:40 【Session 1】 Facilitator: Toshikazu Hanazato, Mie Univ.

Opening Address: Shuzo Murakami, Chief Executive of BRI
Key note Speech: Damages and Lessons from Sichuan Earthquake (tentative), by Yongnian He (China)
Challenges for Safer Non-engineered Construction (tentative), by Anad.S.Arya (India)
Report: Lessons from Recent Earthquakes and Brief Introduction of Research and Development for Safer Non-engineered Construction, by Tatsuo Narafu, BRI
Indexing Session for Poster Presentation

14:40-15:00 Break ・ Poster Session
15:00-17:00 【Session 2】 Panel Discussion: Facilitator: Tatsuo Narafu, BRI

Panelists: Marqueza Reyes, Univ. of the Philippines (Philippines), Iman Satyarno, Gadja Mada Univ. (Indonesia)
Kenji Okazaki, GRIPS (Japan)
Toshiya Tsukamoto, Visiting Professor, TUFS/ Deputy Secretary General of Engineers without Borders
Concluding Remarks: Yuji Ishiyama, Chairperson of Management Committee for R&D Project

17:00 Closing

17:15-18:15 **Casual Talking**
Organizers cordially invite all the participants to join "Casual Talking" in which you can enjoy talking with Key note speakers, panelists and participants in friendly atmosphere (fee: 1,000 JPY: registration needed)

「地震に強い住宅」に関する国際シンポジウム　－世界共通の課題を一緒に考える－

2008 年 11 月 28 日（金）、29 日（土）
政策研究大学院大学、想海楼ホール、東京

主催：
- 建築研究所（BRI）
- 政策研究大学院大学（GRIPS）
- 国際連合地域開発センター（UNCRD）

後援：
- 国連防災戦略（UN/ISDR）
- ユネスコ（UNESCO）
- 内閣府
- 国土交通省
- 国際協力機構（JICA）

1. 背景と目的

世界の地震地域では共通して、地震災害の軽減が喫緊の課題となっている。近年では、2008 年の中国・四川省大地震、2007 の年ペルー・ピスコ地震、2006 の年インドネシア・ジャワ島中部地震、2005 年のパキスタン北部地震が、社会に甚大な被害を及ぼした。日本でも 1995 年の阪神・淡路大震災で大きな被害が生じた。

地震による犠牲者の多くは、自分が住んでいる住宅が倒壊することによって亡くなる。世界の大部分の人は、伝統的な工法であるアドベ、レンガ、石や木材などによる、ノンエンジニアド住宅に住んでおり、耐震構造に関する工学的配慮に欠けているため地震に対して脆弱な構造となっている。最新の科学技術によっても地震を正確に予知することはできないことから、今後発生する地震による死者数や甚大な被害を減らすためには、これらの住宅を安全なものにすることが最も重要である。既存の住宅の耐震性を高めることができれば、地震による犠牲者を減らし、被災地の経済や社会活動の停滞を軽減することができる。いかに緊急事態の対応や救助活動が効率的に行われようとも、亡くなった人は戻らない。いかに効果のある耐震技術が開発されても、それが適用されなければノンエンジニアド住宅は安全にはならない。そこで「地震に強い住宅」に関する国際シンポジウム（3 部構成）では、地震に強いコミュニティづくりに向けて、ノンエンジニアド住宅の耐震安全性の向上策について、専門家の間で議論することを目的としている。

2. 会場

政策研究大学院大学（GRIPS）内、想海楼（そうかいろう）ホール
〒106-8677 東京都港区六本木 7ー22ー1、代表 Tel：03-6439-6000
会場案内：別紙参照

3. 使用言語

英語および日本語（同時通訳使用）

第一部： 地震リスク認知と減災政策

2008 年 11 月 28 日(金) 9：30–12:30

1. 目的

ノンエンジニアド住宅は一般に耐震性が低いが、普通の人が使える適切で実用的な技術を用いて建設すれば、一定の耐震性を確保することができる。そしかしながら、問題は、耐震性の低い住宅の所有者が耐震性を高めるために投資する（特に耐震改修）動機が働かないことにある。住宅の耐震改修を進めることができるのは、政府ではなく住宅所所有者である。住宅の所有者が自分の家の耐震安全性に関心を持たないために、建設業者や石工も耐震性に関心を持たない。そこで人々に対して、住宅の耐震安全性に投資することは価値のあることだと納得してもらうことが重要である。政策研究大学院大学(GRIPS)と建築研究所(BRI)は、文部科学省（MEXT）の支援による「アジアの地震地域におけるネットワーク型防災共同研究」の一環として（自主研究も含む）、耐震技術の普及を進めるための地震リスク認知に関する共同研究を実施した。

2007 年から 2008 年にかけて、住民、政府職員、石工・住宅建設業を対象とした地震リスク認知に関する調査を、インドネシア、ネパール、パキスタン、トルコ、フィジー、インド、フィリピン、日本を対象として実施した。また耐震技術の普及のためのパイロット事業も、インドネシア、ネパール、パキスタンとトルコで 2008 年に実施した。第一部は、これらの最新の成果を参加者の間で共有し、それを防災政策の開発につなげるよう議論することが目的である。

2. プログラム

9:00–9:30 受付

時間： 9:30–12:30 （11 月 28 日）

部 ／ 時間	発表	司会/発表者	組織、役職
9:30–9:40	開会挨拶	八田達夫	政策研究大学院大学学長
	来賓挨拶	和泉洋人	国土交通省住宅局長
			（政策研究大学院大学客員教授）
9:40–12:30	**パネルディスカッション**		
	「地震リスク認知の理解と防災政策への示唆」		
9:40–10:00	地震リスク認知調査の概要	岡崎健二	政策研究大学院大学
10:00–10:10	インドネシア	ワヤン・センガラ	バンドンエ科大学
10:10-10:20	ネパール	アモッド・ディキシッド	ネパール地震工学協会事務局長
10:20-10:30	パキスタン	ナジブ・アーメッド	プレストン大学
10:30-10:40	トルコ	イルマ・カラツナ	イスタンブールエ科大学
10:40-10:50	フィジー	ラサルサ・ヴェティバウ	鉱物資源省
10:50-11:00	インド	ラヴィ・シンハ	インドエ科大学ボンベイ校
11:00-11:10	フィリピン	マルケサ・レイアス	フィリピン大学
11:10-11:20	日本	梅本通考	筑波大学
11:20-11:30	休憩（参加者からの質問票回収）		
11:30-12:30	討論、質疑応答		

第二部: 基準から現場へー建築基準普及への挑戦ー　　2008 年 11 月 28 日(金) 13:30–17:00

1. 目的

地震災害は、人間が制御できない自然現象と、災害に対する社会の弱さの相互作用によって生じる。耐震性のある建物や建築基準の普及、地盤状況を考慮した計画案や危険回避のための訓練や教育によって、社会の脆弱さとそれによる生活への地震の影響は減少できる。しかし、途上国における都市化により危機的な状況は悪化の一途を辿っている。多くの途上国では、地震から人命や財産の損失を軽減するために建築規制システムを設けている。しかし、そのシステムが効果的に機能することはあまりない。その理由は、地域の防災意識不足、実施機関の実行力不足そして効果的な実施、監視、検査の法的な仕組みの不足があげられる。

2007 年に UNCRD は、住宅の構造安全性の改善を目標とした「地震にまけない住宅計画」(HESI)を開始した。その活動には、住宅の安全性を高めるための政策の助言、効果的な建築基準適用のための能力開発などがある。全世界的なネットワーク、情報交換、知識や地震リスクの軽減方法に関する共有の場を作ることは、HESI の最も重要な活動の一つである。第二部は、本事業を通じた途上国での地震災害、復興および建築基準の実施の経験を共有することを目的としている。

2. プログラム

時間: 13:30–17:00 (11 月 28 日)

部 / 時間	発表	司会/発表者	組織、役職
13:30–13:40	歓迎の言葉	小野川和延	UNCRD 所長
セッション1:	**地震にまけない住宅:これまでとこれから**		
13:40-14:05	基調講演 1:地震と在来建築	アナンド・アリヤ	インド内務省　国家地震顧問
14:05–14:30	基調講演 2:震災復興から学ぶ	テディ・ブーン	インドネシア
14:30–14:45	建築基準の創設:ネパールの経験	スルヤ・サンガチェ	都市・建築局長(ネパール)
14:45-15:00	工学と建設のギャップと埋める	楢府龍雄	建築研究所　国際協力審議役
15:00-15:20	休憩		
セッション2:	**建築基準の実施**		
15:20-15:50	基調講演 3:もうひとつの課題:既存建築物の地震対策	小谷俊介	東京大学名誉教授
15:50-16:05	近年の震災からの経験	安藤尚一	UNCRD 兵庫事務所所長
16:05-16:20	ネパールにおける建築基準の実施	アモッド・ディキシッド	ネパール地震工学協会事務局長
16:20-16:35	建築基準実施の枠組み—HESI の経験から	ジシュヌ・スベディ	UNCRD 兵庫事務所
16:35-16:50	討論		
16:50-17:00	まとめ・閉会の言葉		

2008 年 11 月 29 日（土） 13：00–17:00

第三部： 地震による死傷者を減らす方策を考える －ノン・エンジニアドを中心に－

協力： 防災科学研究所 (NIED)、三重大学 （＊第三部の実施について文部科学省(MEXT)の助成を受けています。）

1. 目的

第三部は、人命被害の元凶となっている、地震に対して脆弱な庶民住宅や同様の工法による小規模の建物に焦点を当てて、死傷者を減らす方策について議論する。これらの建物は、耐震設計や材料の品質管理などの技術関与が不十分で、ノンエンジニアドとよばれることが多いもので、工学技術を持った人たちが建設するエンジニアド建築とは異なり、耐震技術も、それぞれの現場で調達できる材料、その地域の職人で実施できる技術でなければ実際に使われることは期待できない。また、そうした耐震技術を十分な工学知識を持っていない職人達に理解してもらうことにも工夫が必要である。

ここでは、甚大な被害をもたらした今年 5 月の中国・四川省大地震の被害の実態を地元の専門家から報告いただき、長年この問題に取り組んでこられた専門家からその概要の説明をいただくこととしている。それを受けて、ノンエンジニアドという安全性の向上が難しい建物について、建築構造、地震防災、国際協力などの専門家や、開発途上国での経験の豊富な実務家の方に、死傷者を減らす方策について議論していただく。

2. プログラム　時間： 13:00 – 17:00 （11 月 29 日）

部 / 時間	発表	司会/発表者	組織、役職
13:00–13:10	開会挨拶	村上周三	建築研究所 理事長
セッション1：	ファシリテーター	花里利一	三重大学 教授
13:10–13:40	基調講演 1： 四川地震の被害と教訓(仮題)	何永年	中国地震局地質研究所客員教授
13:40–14:10	基調講演2： ノンエンジニアド構造の耐震性向上の取り組み(仮題)	アナンド・アリヤ	インド内務省 国家地震顧問
14:10–14:25	近年の地震被害の教訓とアジア諸国との共同研究開発の取り組み	楢府龍雄	建築研究所 国際協力審議役（共同研究開発代表者）
14:25–14:40	ポスター展示のインデキシングセッション	ポスター展示者	
14:40–15:00	休憩、ポスターセッション		
セッション2：	ファシリテーター	楢府龍雄	建築研究所 国際協力審議役
15:00–16:50	パネリスト	マルケサ・レイアス	フィリピン大学教授
		イマン・サティヤルノ	インドネシア・ガジャマダ大学講師
		岡崎健二	政策研究大学院大学 教授
		塚本俊也	東京外国語大学客員教授 /NPO 国境なき技師段事務局次長
16:50–17:00	まとめ	石山祐二	共同研究開発研究運営委員長/北海道大学名誉教授
17:00	閉会		

意見交換会 （17：15－18：15）

基調講演者、パネリストを交えて、気楽な雰囲気での意見交換会を開催します。(参加費 1000 円)

会場案内

「地震に強い住宅に関する国際シンポジウム」<世界共通の課題を一緒に考える>

2008（平成 20）年 11 月 28 日(金)午前・午後、 29 日（土）午後

開催場所： 政策研究大学院大学　講堂（想海楼ホール）

住所：〒106-8677　東京都港区六本木 7-22-1

電話：03-6439-6000

HP: http://www.grips.ac.jp/jp/about/access.html

交通：東京メトロ千代田線乃木坂駅、都営大江戸線六本木駅、東京メトロ日比谷線六本木駅より、
いずれも徒歩 10 分程度です。

周辺地図：

参加登録票 Registration Form

「地震に強い住宅に関する国際シンポジウム」＜世界共通の課題を一緒に考える＞

International Symposium 2008 on Earthquake Safe Housing

–Discuss together on the keen and common issue

1. **称号(title)** Dr. Mr. Ms. Others ( )

2. **苗字（英語併記）(family name)**

3. **名（英語併記）(first name)**

4. **所属機関（英語併記）(organization/institute)**

5. **所属部署／役職（英語併記）(position)**

6. **メールアドレス(email address）**

7. **住所（postal address）**

8. **電話、ファックス番号（tel, fax number）**

9. **参加希望パート（check the part/parts you would like to attend）**
   - ( )11 月 28 日(金) 9:00－12:30 第 1 部 (Part1 November 28)
   - ( )11 月 28 日(金) 13:30－17:30 第2部 (Part2 November 28)
   - ( )11 月 29 日(金) 13:00－17:00 第 3 部 (Part3 November 29)
   - ( )11 月 29 日(金) 17:15－18:15 意見交換会(Casual Taling November 29)

10. **同時通訳レシーバー** 必要 不要

    Do you need a receiver for simultaneous translation? Yes No

11. **意見交換会**(会費 1000 円) **参加 不参加**

    Do you participate Casual Talking? Yes No

E-mail address: sympo-2008@kenken.go.jp ファックス: 029-864-2989

問い合わせ(電話): 029-864-6641 (建築研究所：岡倉、今井)

International Symposium 2008 on Earthquake Safe Housing

- Discuss together the keen and common issues -

28 – 29 November, 2008

Sokairo Hall, National Graduate Institute for Policy Studies, Tokyo

Organized by

-Building Research Institute (BRI)

-National Graduate Institute for Policy Studies (GRIPS)

-UN Centre for Regional Development (UNCRD)

Supported by

-UN International Strategy for Disaster Reduction (UN/ISDR)

-UNESCO

-Cabinet Office, Government of Japan

-Ministry of Land, Infrastructure, Transport and Tourism (MILT), Japan

-Japan International Cooperation Agency (JICA)

1. Background and Objectives

Reduction of earthquake disasters is one of the keenest issues common in earthquake prone areas in the world. In recent years, our societies have been severely damaged by Sichuan Earthquake 2008 in China, Pisco Earthquake 2007 in Peru, Central Java Earthquake 2006 in Indonesia, and Northern Pakistan Earthquake 2005. Japan also suffered severe damages from 1995 Hanshin-Awaji Earthquake.

In most of deaths caused by earthquakes, people are killed by their own houses. Most of the world's population lives in vernacular houses that are built of adobe, brick, stone, and wood, and are non-engineered and thus vulnerable to earthquakes. Because earthquakes cannot be predicted precisely even by applying the most advanced science and technology, it is essential to make these houses safer in order to reduce the number of victims and the amount of severe damage caused by future earthquakes. The more resilient the existing houses are against earthquakes, the lower the death rate will be in the event of an earthquake, and the less drastic will be the disruptions to economic and social activities in the affected areas. No matter how effectively emergency management and relief activities are conducted, the lost lives can never be regained. No matter what effective technologies are developed, the non-engineered houses will not be safer unless these technologies are applied. This International Symposium on "Earthquake Safe Housing" therefore aims to discuss among the interested experts how we can improve the safety of houses, newly built and existing, towards safer communities against earthquakes.

2. Venue

Sokairo Hall, National Graduate Institute for Policy Studies (GRIPS)

3. Program

November 28

9:30 - 12:30 Part1: Earthquake Risk Perception and Disaster Reduction Policies

13:30 - 17:00 Part2: From Code to Practice: Challenges in Building Code Implementation

November 29

13:00 - 17:00 Part3: Strategies to Mitigate Casualties by Earthquakes focusing on Non-engineered Constructions

17:15 - 18:15 Casual Talking

Posters are presented at the lounge of the venue for 28-29, November

4. Language

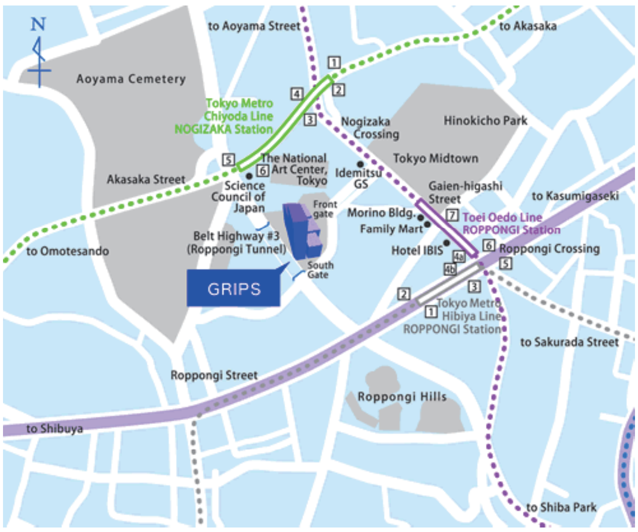
English and Japanese (simultaneous translation is available)

5. Registration for participation

Registration for participation to Symposium should be made by sending Registration Form by e-mail or facsimile to Building Research Institute (BRI) at following address before November 21, 2008.
Confirmation will be delivered several days before the workshop.

E-mail address: sympo-2008@kenken.go.jp
Facsimile: +81-29-864-2989
Telephone: +81-29-864-6641
(Ms. Okakura or Mr. Imai)

Access to National Graduate Institute for Policy Studies (GRIPS)
Address: 7-22-1 Roppongi, Minato-ku, Tokyo, Japan



http://www.grips.ac.jp/jp/about/access.html

Part 1: Earthquake Risk Perception and Disaster Reduction Policies

9:30-12:30 on 28 November,2008

1. Objective

Non-engineered houses can be quite strong when they are constructed with appropriate and practical techniques that are affordable to ordinary people. A big challenge, however, is that the house owners lack the motivation to invest to secure the safety of their houses, particularly to retrofit them, even though the houses are quite vulnerable to earthquakes. The vulnerable houses can be retrofitted only by the homeowners themselves, not by the authorities. The house builders and masons lack interest in securing sufficient safety mainly because house owners are not concerned with the structural safety of the houses. It is thus crucial to convince people that the investment in safer housing will eventually prove to be worthwhile.

National Graduate Institute for Policy Studies (GRIPS) and Building Research Institute (BRI) have carried out joint researches on earthquake risk perception to promote dissemination of technologies for safer housing partially under the "Collaborative Research and Development Project for Disaster Mitigation on Network of Research Institutes in Earthquake Prone Areas in Asia" with financial support of Ministry of Education, Culture, Sports, Science and Technology (MEXT).

The survey on the earthquake risk perception of residents, government officers, and masons/house builders, was conducted in Indonesia, Nepal, Pakistan, Turkey, Fiji, India, the Philippines, and Japan in 2007- 2008. A pilot project for dissemination of technologies for safer housing is also conducted in Indonesia, Nepal, Pakistan, and Turkey in 2008. Part 1 aims to share the latest outcome of these surveys among the participants and discuss its implications to policy development for disaster reduction.

2. Agenda

Time: 9:30-12:30 (Fri, 28th November, 2008)

9:00 - 9:30 **Registration**

9:30 - 9:40 **<u>Opening</u>**

Tatsuo Hatta, President, GRIPS,

Hiroto Izumi, Director General, Housing Bureau, MLIT (Visiting Prof. of GRIPS)

9:40 - 12:30 **<u>Panel Discussion</u>**

"Understanding Earthquake Risk Perception and Its Implication for Development of Disaster Reduction Policies"

- 9:40 - 10:00 Outline of the Survey on earthquake risk perception / Kenji Okazaki, GRIPS
- 10:00 - 10:10 [Indonesia] Wahan Sengara, ITB
- 10:10 - 10:20 [Nepal] Amod Dixit, NSET-Nepal

-10:20 - 10:30 [Pakistan] Najib Ahmad, Preston University
-10:30 - 10:40 [Turkey] Yilma Karatuna, ITU
-10:40 - 10:50 [FIJI] Lasarusa Vuetibau, Mineral Resources Department
-10:50 - 11:00 [India] Ravi Sinha, IITB
-11:00 - 11:10 [Philippines] Marqueza Reyes, Univ. of the Philippines
-11:10 - 11:20 [Japan] Michitaka Umemoto, Univ. of Tsukuba

-11:20 - 11:30 Break (collect questions from the floor)

-11:30 - 12:30 Discussions, Q and A

Part 2: From Code to Practice: Challenges in Building Code Implementation

13：30-17:00 on 28 November,2008

1. Objective

Earthquake disaster is interplay of natural hazard, which is beyond human control, and vulnerability, which is created by people. The vulnerability and hence impact of earthquakes on livelihood of people can be reduced by measures such as adherence to earthquake resistant building design and construction standards, proper land use planning and education and training for risk evasion. However, the risk is ever increasing as rapid urbanization in developing countries is adding extra pressure on building construction and measures to reduce earthquake risks often get low priority. Although developed countries also face risk from earthquakes, the problems in developed countries and developing countries are different in their scope and magnitude. Most of developing countries have established a building control system, aiming to prevent loss of lives and property in earthquakes. However, the system seldom functions effectively because of lack of awareness among communities, lack of capacity of implementing authorities and lack of regulatory mechanism for effective implementation, monitoring and reviewing.

In 2007, UNCRD launched the Housing Earthquake Safety Initiative (HESI) with goal to improve structural safety of houses to prevent damage and safeguard people's lives, property and livelihood from earthquakes through effective implementation of building safety regulations. The activities included perception and implementation gap analysis of target countries, awareness raising among the stakeholders, developing policy recommendations on improving safety of houses and developing capacity of national and local officials to implement building safety regulations effectively.

One of the major activities envisaged in HESI is creation of platform for networking, information exchange, sharing of knowledge and sharing of good practices in mitigating earthquake risk throughout the world. Part 2 aims to share experiences of earthquake disasters, reconstruction and building code implementation in developing countries through this project.

2. Agenda

Time: 13:30-17:00 (Fri, 28th November, 2008)

Opening Session

13:30 - 13:40	Welcome address by Kazunobu Onogawa, Director, UNCRD

Session 1: Housing Earthquake Safety: Lessons and Challenges

13:40 - 14:30	Key-note speech: Earthquake and Non-engineered buildings by Prof. Anand S. Arya, India Lessons from re-construction after earthquakes by Teddy Boen, Indonesia
14:30 - 14:45	Development of Building Code: Experience of Nepal by Surya B. Sangachhe, Director General, Department of Urban, Nepal
14:45 - 15:00	Bridging gap between engineering and construction practice by Tatsuo Narafu
15:00 - 15:20	Break

Session 2: Building Code Implementation

15:20 - 15:50	Key-note speech: Another Problem: Seismic Protection of Existing Buildings by Shunsuke Otani
15:50 - 16:05	Experience of damages in recent earthquakes by Shoichi Ando, UNCRD Disaster Management Planning Hyogo Office
16:05 - 16:20	Building code Implementation in Nepal by Amod Dixit, NSET, Nepal
16:20 - 16:35	Framework for Building code Implementation: Experience of HESI by Jishnu Subedi, Researcher UNCRD
16:35 - 16:50	Discussion
16:50 - 17:00	Closing remarks

Part 3: Strategies to Mitigate Casualties by Earthquakes focusing on Non-engineered Construction

13：00-17:00 on 29 November,2008

Supported by:

National Research Institute for Earth Science and Disaster Prevention (NIED)

Mie University

With financial support of Ministry of Education, Culture, Sports, Science and Technology (MEXT)

1. Objective

Part 3 is organized to discuss on strategies to mitigate casualties by earthquakes focusing on peoples' houses and community buildings, which are vulnerable and the main cause of human casualties. Those are often called non-engineered as those have no/little technical intervention such as seismic design and quality control of materials. Those need an approach different from engineered constructions as those are constructed with local materials by local non/semi skilled workers. Only feasible and affordable technologies would be accepted by people and communities.

Part 3 presents a report on tragic damages by Sichuan Earthquake May, 2008 and a summary on efforts to develop seismic technologies for non-engineered constructions. Then experts and practitioner in structural engineering, disaster management and international cooperation discuss on practical strategies for mitigation of disasters.

2. Agenda

Time: 13:00 – 17:00 (29 November)

17:15 – 18:15 Casual Talking

Session 1: Facilitator: Toshikazu Hanazato, Mie Univ

13:00 - 13:10	Opening Address by Shuzo Murakami, Chief Executive of BRI
13:10 - 13:40	Keynote Speech1: Damages and Lessons from Sichuan Earthquake (tentative) by Yongnian He (China)
13:40 - 14:10	Keynote Speech2: Challenges for Safer Non-engineered Construction (tentative) by Anad.S.Arya (India)
14:10 - 14:25	Lessons from Recent Earthquakes and Brief Introduction of Research and Development for Safer Non-engineered Construction by Tatsuo Narafu, BRI
14:25 - 14:40	Indexing Session for Poster Presentation
14:40 – 15:00	Break

Session 2: Facilitator: Tatsuo Narafu, BRI

15:00 - 16:50 **Panel Discussion**

-Marqueza Reyes, Univ. of the Philippines (Philippines),
-Iman Satyarno, Gadja Mada Univ. (Indonesia)
-Kenji Okazaki, GRIPS (Japan)
-Toshiya Tsukamoto, Visiting Professor, TUFS/ Deputy Secretary General of Engineers without Borders

16:50 - 17:00 Closing remarks by Yuji Ishiyama, Chair person, Management committee for Research and Development Project

Casual Talking

17:15 – 18:15 on 29 November, 2008

Organizers cordially invite all the participants to join "Casual Talking" in which you can enjoy talking with key note speakers, panellists, presenters and participants in friendly atmosphere (fee:1,000Yen).

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参加登録票 Registration Form

「地震に強い住宅に関する国際シンポジウム」＜世界共通の課題を一緒に考える＞

International Symposium 2008 on Earthquake Safe Housing

–Discuss together on the keen and common issue

1. **称号(title)** Dr. Mr. Ms. Others ( )

2. **苗字（英語併記）(family name)**

3. **名（英語併記）(first name)**

4. **所属機関（英語併記）(organization/institute)**

5. **所属部署／役職（英語併記）(position)**

6. **メールアドレス(email address）**

7. **住所（postal address）**

8. **電話、ファックス番号（tel, fax number）**

9. **参加希望パート（check the part/parts you would like to attend）**
   ( )11 月 28 日(金) 9:00－12:30 第 1 部 (Part1 November 28)
   ( )11 月 28 日(金) 13:30－17:30 第2部 (Part2 November 28)
   ( )11 月 29 日(金) 13:00－17:00 第 3 部 (Part3 November 29)
   ( )11 月 29 日(金) 17:15－18:15 意見交換会(Casual Taling November 29)

10. **同時通訳レシーバー** 必要 不要
    Do you need a receiver for simultaneous translation? Yes No

11. **意見交換会**(会費 1000 円) 参加 不参加
    Do you participate Casual Talking? Yes No

E-mail address: sympo-2008@kenken.go.jp ファックス: 029-864-2989

問い合わせ(電話): 029-864-6641 (建築研究所：岡倉、今井)