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国際シンポジウム「巨大震災からの復興を考える」報告書

地震・津波防災対策に係る研究成果及び技術の普及に関する共同事業

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国際シンポジウム「巨大災害からの復興を考える」

2012年2月21日（火）13:00 - 17:00　於：政策研究大学院大学　想海楼ホール

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Ⅰ．はじめに

近年、地震・津波による巨大災害が世界的に頻発しており、地震・津波による被害の軽減が地球規模の課題となっています。防災に係る研究や技術において先進国であるわが国でも、2011年 3 月に発生した東日本大震災により甚大な被害が発生し、地震・津波防災対策の重要性を再認識することとなりました。このため、独立行政法人建築研究所と政策研究大学院大学は、世界の地震・津波災害の軽減に寄与し、防災に係る兵庫行動枠組 2005-2015 に対しても貢献するため、東日本大震災で得られた知見も踏まえ、地震・津波防災に関する研究成果や技術を、途上国を中心に積極的に普及することを目的とした共同事業を、2011 年度から実施しています。

この共同事業の一環として、2011 年東日本大震災の約 1 年後に当たる 2012 年 2 月に、地震・津波防災に係るわが国の知見や海外の経験等の共有と普及を図るため、国際シンポジウム、専門家会議、国際ビデオ会議を開催しました。2 月 21 日に政策研究大学院大学の想海楼ホールで開催した「国際シンポジウム―巨大震災からの復興を考える―」では、東日本大震災後に重要な課題となる復興に焦点を当て、ハードのまちづくり、住宅つくりに加えて、コミュニティ再生、災害弱者への配慮など、社会的な側面を含めた、地域の復興・再生についての議論を行いました。また、復興が進展しつつある、近年の世界の巨大震災との比較検討も行い、それぞれの国・地域の経済・社会状況による課題の違いとそれにあった対応の必要性や、普遍的な復興への教訓等についても議論を行いました。2 月 22 日には、復興に関する重要論点を掘り下げるための専門家会議を開催し、招聘有識者による報告を踏まえて、コミュニティの再生、災害弱者、防災技術の普及、国際的な支援などについて議論を深めました。

さらに、2 月 22 日の午後には、「国際ビデオ会議―復興を通じた安全な住宅つくりを考える―」を、世界銀行東京開発ラーニング・センター（TDLC）を中心に、9 カ国 12 会場をビデオ会議システムでつないで開催しました。災害時に死傷者発生の主要な原因となる建築・住宅の被害に焦点を当て、被害の実態と背景、被害軽減のための技術とその普及などについて、参加各国からの報告をもとに、国際社会における取組に寄与するため、知見の交換、今後の取り組みへの教訓について議論を行いました。なお、プレゼンテーション・スライドは講演者のご厚意により掲載させていただき、講演内容の要約は編集者の責任で行いました。

本報告書は、これらの活動の内容と成果を取りまとめたものです。大震災からの復興に関心のある皆様の今後の参考になれば、主催者として幸甚に存じます。

独立行政法人建築研究所国際地震工学センター長
安藤　尚一
政策研究大学院大学教授
岡崎　健二

Ⅱ．国際シンポジウム

１．国際シンポジウムの概要

（１）開催目的

近年、世界的規模において、大規模な地震・津波災害が頻発し、多数の犠牲者をもたらすとともに、地域社会が壊滅的な被害を被ってきている。このため、これらの災害の教訓を生かした災害に対して抵抗力のある地域の復興が大きな課題となっている。そこで、安全なまち・地域づくり、暮らしやすく、活力のある地域へ向けての復興再生を目指すという観点から、国際的なパースペクティブからの近年の地震・津波被害の復興過程の比較検討する。さらに、教訓の抽出、今後の取り組みの在り方の検討を行う。これら検討を通じて、日本において今後、議論が高まっていくことが予想される東日本大震災からの復興に向けての示唆を得る。この場合、復興過程は、より安全なまちづくりのチャンスであること、被災の経験が強く残り、被害軽減を実現するための防災関係技術の普及のための条件が優れていること、各国の経済・社会状況によって、効果的な普及の方法、実施主体等は異なることに留意する。国際シンポジウムの実施に当たっては、近年の巨大震災の復興に参画している有識者を招聘するとともに、阪神・淡路大震災等から得られた我が国の知見の活用を図る。

（２）実施概要

①日時：2012 年 2 月 21 日（火）　13:00～17:20

②場所：政策研究大学院大学　想海楼ホール

③プログラム：

・第１セッション　13:00～15:20

13:00　主催者挨拶

独立行政法人 建築研究所　理事　伊藤弘

政策研究大学院大学　政策研究センター長　森地茂

13:10　基調講演　東日本大震災からの復興

東京大学大学院　教授、日本学術会議　会長　大西隆

13:55　趣旨説明　近年の世界の巨大震災と復興の状況

独立行政法人 国際協力機構　国際協力専門員　楢府龍雄

14:10　巨大震災と復興についての各国からの報告

－2010 年　ハイチ地震災害

ハイチ公共事業・輸送・通信省　建物評価技術室技師　フリッツ・オプラン（ハイチ）

－2008 年　中国四川地震災害

北京師範大学　壹基金公益研究院　院長　ワン・ツェンヤオ（中国）

－2004 年　スマトラ沖地震・津波災害

インドネシア公共事業省　水道環境衛生訓練センター長　バンバン・スディアトモ(インドネシア)

15:10　地震の概要と特徴

独立行政法人 建築研究所　研究専門役　古川信雄

・第２セッション　15:40～17:20

15:40　パネルディスカッション

１．趣旨説明　復興・減災に関する論点提起

独立行政法人 建築研究所　国際地震工学センター長　安藤尚一

２．パネリストからの論点提起

－復興の実態：2005 年カシミール地震の事例にみる

建築家、災害リスク管理者　ガザラ・ナイーム（パキスタン）

－災害復興におけるジェンダー・社会包摂の視点

静岡大学　教授　池田恵子

－安全な建物づくり、まちづくり

独立行政法人 建築研究所　上席研究員　福山洋

－復旧・復興における防災対策の推進

国際防災戦略アジア太平洋事務所　上級地域コーディネーター　ジェリー・ヴェラスケス（タイ）

３．ディスカッション

４．質疑応答

17:15　閉会挨拶

政策研究大学院大学　教授　岡崎健二

２．第１セッションの概要

（１）主催者挨拶

１）独立行政法人 建築研究所　理事　伊藤弘

建築研究所は政策研究大学院大学と共同で本日の国際シンポジウムを開催している。東日本大震災で亡くなられた方々のご冥福、被災された方々の一日でも早い復興を祈念する。今回のシンポジウムも震災で犠牲となった方々や被災された方々の思いを、今後の世界各地での対策に生かすことをテーマとしている。

2004 年インド洋大津波、2005 年カシミール地震、2008 年四川大地震、2010 年ハイチ地震など大規模な津波、地震被害が毎年発生しており、何れの都市でも防災、建築、都市の専門家が様々な教訓を後世に伝える努力をしている。今回の国際シンポジウムがこれらの活動を拡げていく場になればと願っている。

建築研究所では住宅・都市の研究・開発や地震工学研修を総合的継続的に実施しており、防災政策プログラムを持つ政策研究大学院大学と共同して巨大災害に取り組むのはハード、ソフトの総合的視点から防災対策の構築に意義深いと確信している。

建築研究所、政策研究大学院大学はＪＩＣＡと協力して若手研究者、技術者を対象とした国際地震工学研修を実施している。建築研究所ではこれらのネットワークを活かし、ユネスコと連携し国際的な地震、津波防災情報のセンターとして機能する事を目指している。

本日招聘した基調講演者や世界的な第一線の学識者からの貴重な経験を学び、それぞれの立場で役立てていただきたい。最後に、被災地のより良い復興の一日も早い達成を祈念し挨拶といたします。

２）政策研究大学院大学　政策研究センター長　森地茂

仙台を含む東北被災地の復興はまだこれからの段階である、現在は地震、水害等大変な災害が多発する時期に入っており、財政や合意形成、将来を見据えた復興の将来像など多様な課題がある。

各国の第一線で復興に取り組んでおられた方々と共に学び、今後に生かすのが本会議の趣旨である。安全なまちづくり、コミュニティの再生、災害弱者への配慮など、経済的、社会的な面を含めてご議論賜れば幸いである。

GRIPS と政策研究センターを簡単に紹介すると、3月 11 日以降、本学の全教員が集合し復興について勉強し政策提言をしている。学校のホームページに日本語と英語でその内容が掲載されているのでご覧いただきたい。

昨年は「緊急事態における科学者の情報発信－福島からの教訓」国際シンポジウムを開催した。英国政府主席科学顧問ジョン・ベディントン氏を招聘しご議論いただいた。

センターではリサーチプロジェクト：教官、外部との共同研究の仕組みを持っており、政策決定や実施課程、漁業補償や農業基盤の研究を実施している。

防災政策プログラムを JICA、建築研究所、土木研究所と実施し、中南米、アジア、アフリカ、中近東から毎年約 40 名の学生が参加している。震災を機に工学、社会科学両面の研究を行うために、消防庁のＤｒ.や国交省の防災の教員を迎えて、2012 年４月から日本人用の防災政策、防災専門家養成プログラムを発足させる。

本日の議論で巨大震災から復興に役立つ成果が少しでも得られれば幸いである。

（２）基調講演　東日本大震災からの復興

（東京大学大学院教授、日本学術会議会長　大西隆）

今日の講演では（1）東日本大震災の簡単な整理、（2）中央政府、都道府県政府、市町村政府の復興に向けた活動の整理、（3）津波災害に対する教訓、復興の方向性、（4）過去の津波対策の検証と今後の復興の在り方、（5）経済活動、産業、雇用の復興についてお話しする。

今回の災害は３重の複合的な災害だと言われている。被害範囲が大きく 11 県で死者が出ている。特に、東北３県の 40 市町村で、死者、行方不明：19,000 人、全壊建物：12 万件、被害額：16.9 兆円と試算されている。この被害額は都市型の震災の阪神淡路の 1.7 倍であった。三陸地方ではハッキリ判るだけでも明治以降４回の津波被害があり、将来的にも津波被害の恐れが確信されている。

復興過程での安全な街、漁村集落の実現だけではなく、子孫の安全のために自らの選択が重要と考えている住民が多い。津波以前から三陸地域人口減少地域であるが、３月以降の 10 カ月で過去５年間を上回る人口減少に見舞われている。物理的な復興に合わせ、社会、経済活動の復興を含まなければいけない。

今回も地震によって津波が引き起こされているが、歴史的に見ると多様なケースがある。明治の津波でも２万人以上が亡くなっているが、震度自体は小さかったがその後の津波で被害が出ている。昭和の三陸津波は夜中に発生し、逃げ難い状態で到達している。チリ津波では日本は全く揺れを感じなかったが 24 時間後に津波が到達し 42 人が亡くなっている。東日本大震災は午後の活動時間中に発生し逃げ易いハズであったが、極めて大きな津波で多くの人命が失われた。津波は様々な時間帯、様々な揺れ方で到来し、人命を守るには居住、住宅が安全な場所にある事が極めて重要である。高齢化社会が進む我が国では住宅自体が安全な所に立地することが極めて重要になっている。

復興資金の供給、制度構築の重要な役割は中央政府にあり、実際の復興事業は現在の財政年度で行われており、2011 年度には合計で約 18 兆円、３回の補正予算が組まれている。この予算は来年も繰り越されて具体的な復興事業に充てられる。今月新たに、復興庁を設立し前線部隊を被災地に配置する政府の体制が整った。６月の復興基本法、復興特区法、津波防災地域づくり法が制定され被災地復興のための制度的枠組みが整えられた。津波被災地ではまちの再建が始まろうとしているが、特に、福島県では放射線被害のために帰れない場所もあり、その復興過程も複雑になると考えられている。

市町村が復興の現場の最前線に居る。岩手、宮城、福島では約 30 の被害の大きな市町村があり、そのほとんど市町村で 2011 年中に復興計画がつくられ、残りの市町村も 2012 年３月には復興計画が出揃う予定である。現状の復興計画は基本計画で具体的な手続き、合意やプランが示されていないが、具体的な復興の地域プランはこれから定められる。東日本大震災は想定を超える災害であり、防災計画から減災計画への発想の転換が必要になる。1933 年の津波を契機に政府が主導の組織的な高台移転が 100 箇所以上で進んだ。それに加え 60 年代以降の防潮堤、防波堤、避難施設等の防災施設を組み合わせた津波対策が行われて来た。

今回の災害を踏まえると、必ず想定を超える自然災害が起きるので、防災施設では防げないことを前提としている。命を守るために住宅を安全な場所に整備する。津波については高い場所に住宅を移すまちづくりによる対策が必要である。

防災施設、まちづくり、避難路確保の３点を組み合わせて減災に取り組むのが重要なポイントであり、被災地では３点を具体化する計画づくり、合意形成行われているが、中々簡単ではない。今回の被災地では、高台に移転して安全を確保したケースは少なく、防潮堤に頼った防災対策のため２万人弱の被害が出てしまっている。明治以降、適当な高台がある地域では、既に高台移転が進んでいたが、移転が出来ない地域では被害が出てしまったと言える。

被災地では住宅から港までの自動車による移動、ＩＣＴによるモニタリング、土木技術を組み合わせ、安全な内陸部への移転に取り組んでいる。街の再生と車の両輪に産業、雇用の再生が必要であり、産業再生のためのまちづくり会社が必要になる。これからはエネルギー供給、新しい中心市街地の活動、水産業の多角的な展開を行う産業・雇用創出が必要になる。

海外からの招聘の皆様にも貴重なご提言を頂ければ被災地の助けになると確信している。

（３）趣旨説明　近年の世界の巨大震災と復興の状況

（独立行政法人 国際協力機構　国際協力専門員　楢府龍雄）

自然災害の規模に加え、それぞれの地域の脆弱性、災害に対する対応力によって規定される。将来の安全な地域づくりには脆弱性の除去、防災能力の向上が必要になる。災害からの復興は将来の災害危険性の除去に貴重な契機になる。近年頻発する巨大災害の復興過程の比較により防災に関する深い考察を得る。

５つの巨大災害の比較の際は、コミュニティの視点からの復興の実態、社会奉仕の視点、建物・街づくりの観点、国際的な視野からの論点提起をいただきたい。これらによる有効な復興、安全な地域づくりの議論を期待している。

女川町では１年を過ぎても日常的に海水が浸水している状況にあり、高潮や台風についても危険な状況が続いている。災害復興の建築物もその後の地震で破壊される場合もある。途上国では災害復興は難しく、建設・供給セクターの生産能力、品質管理能力の低下や被災者の目先のリスク対応の問題が挙げられる。

取上げた５カ国では人口で 130 倍、ひとりあたりＧＮＩは 30 倍、途上国の高い低所得者比率、災害の種類などの面が異なっている。ハイチでは構造物の脆弱性、中国では建築基準の順守の問題、インドネシアでは広大な地域に津波被害が及んでいる。プラスの面として中国でのペアリングによる復興の実績やインドネシアの復興による反政府勢力との軋轢の緩和等が挙げられる。

阪神淡路では巨大災害への不十分な対応、土木構造物の不十分な耐震基準、旧建築基準の建築物の補強が重要になった。一方、災害弱者への配慮、コミュニティの重要性が認識された。

東日本大震災では津波警報発令方法を含む巨大災害対策の抜本的な見直しが議論されている。復興に時間がかかるもう一つの側面として、被災者の高齢化、住み慣れた復興住宅からの移転、借入による企業経営の悪化、地域経済、雇用の悪化などの課題がある。

緊急援助や応急対応と比べて災害予防の国際協力は十分ではない問題が残されている。このイベントが今後の安全な地域づくり、まちづくりの知見の国際的な共有に貢献できれば有意義である。

（４）巨大震災と復興についての各国からの報告

１）2010 年ハイチ地震災害（ハイチ公共事業・輸送・通信省　フリッツ・オプラン）

ハイチでは 1751 年首都崩壊被害、1770 年首都他２都市の破壊、1887 年ハイチ北西部大被害、1942 年北部被害、1971 年大震災の自然災害の歴史がある。特に、2010.1.12 には壊滅的な地震が発生している。地震発生は平日の午後４時 50 分。マグニチュード７。震度VIIIで 52 回の余震が発生した。負傷 30 万人、死者 23 万人。約 130 万人が住まいを失った。経済的には 80 億ドル相当の被害得を受けた。

被災の原因として、地震に関する活動の欠落、技術基準の未整備、人口密集の高さ、建築物の品質管理が劣る、設計上の欠陥、工法の欠陥などが挙げられている。緊急支援は地元による閉じ込められた市民の救出から始められ、その後外国の支援を受けている。政府によりメインストリートの整備、医療活動も地元が始め後から政府、国際社会が参加している。緊急支援の 25%は地元、民間、政府が参加しており、75%が国際社会の支援となっている。避難所の建設・整備の対応は非常に難しく、個人個人のバラバラの対応にならざるを得なかった。水は政府が配給し、食糧は人道団体が配給し、ＩＣＴについては国際的なメディアの支援を受けた。

復興については教育省が震災数ヵ月後に学校を再開している他、公共事業省もサイクロンに備えて河や運河の浚渫を実施している。また、日本等の手法を適用した損害建物の再開の査定法ＡＣＴ20 を作成し、健全な建物、損害はあるが構造に危険はない、危険の３段階で色分け表示をしている。防災面での課題はリスクの分散化、平等な成長、近代化へのコミットメント、ハイチ人で行う復興、国際的支援からの独立である。

復興に当たっての政策面の課題として統合的な災害管理、地方分権、零細企業育成が必要であり、復興基金は国際社会、ＮＧＯ、政府、民間部門が出し合っている。復興の教訓として自然災害に常に備える。ローカルコミュニティも政策的な対応により災害管理の計画を持っておくこと、分散的に実施することが重要である。

自然災害は世界のどこかに必ずあるので、忘れてはならない。このようなシンポジウムは自然災害の存在や危険性を忘れないためにも良い企画である。

２）四川地震災害（北京師範大学　壹基金公益研究院　院長　ワン・ツェンヤオ）

マグニチュードは８、沢山の町が影響を受けた。約 1,500 万人が直ぐに移住を迫られた。激甚地域の面積は 116,700 ㎢の広大な地域が影響を被った。死傷者も多く、経済損出は１兆元を超えている。

地震で映秀の町は全面的に崩壊した。1949 年以降山岳地帯が課題になっていたが、橋が破壊され救援活動が届かなかった町があった。幅 100Km、長さ 300Km が震災地域で地震２日後に１万人以上がスタジアムに集結し、食糧や水を待っていた。映秀－四川の道路が寸断し、約４か月は成都からは 800 ㎞の迂回あるいは雪山越えが必要であった。道路は 2010 年９月２日に復旧し、復興の主要な活動も９月末には終わっている。農村部の 200 万戸、都市部の 28 万戸、3,000 以上の学校、2,000 以上の病院、その他の医療施設のインフラの復興が四川、山西、甘粛では終わって

いた。

地元政府の被害が非常に大きかったので、復興に関しては中央政府が責任を負い、5 月 15 日に中央司令部を成都に設け、軍や警察の活動を調整して救援プログラムを作成した。国務院が 6 月 8 日に四川地震災害復興法を作り、中央政府が地震発生から４か月間で 1,000億 元を復興に充てる大きなプログラムを決定した。私は 10 年以上前から効率的な日本の体制を学んでおり、中国国務院の体制を変えこの様にコーディネートできるようにした。

２つ目の成果は中央政府が被災者に対して１万元の予算基準を発表し、この基準は以前に比べ倍増している。中央本部が地震発生後１週間で生活支援手当を提供している。住居や就労機会のない人に３か月間援助をする。中央政府が６月半ばに住宅再建基準を設定し、地方政府に対する約 400 億元の支出を決定し、被災世帯あたり２万元の助成金を担保している。地震後に仮設住宅とテントの２つが議論された。被災地には土地が無いのでテントを提供し、世帯あたり 2,000 人民元の助成金を提供し、市民自らの住宅再建意欲を刺激した。

中央政府がひとつの省がひとつの県を助ける特別なパートナーシップ政策を打ち出した。上海市や北京市がひとつ県を助ける政策であり、住宅再建に限らず、工場、マーケットなどの復興も手伝う。四川省では中央政府の予算や上海市、北京市等の県に対する支援により迅速な復興が進んでいる。大きな震災の場合、地方政府や中央政府だけでは十分ではないので、ＮＧＯのボランティアによる復興事業の協力を得た。

社会的な大規模な義捐金は意義が大きく、今回も 70 億人民元以上を受け取り多くの事業が実施出来た。ボランティアを奨励しサービスの受け入れ、国際協力を奨励した。18 省の首長をヨーロッパグループ、日本グループに分けたが、震災後は多くの人々は過去の経験に基づく日本から学ぶべきだと考えている。メディアを使った透明性の確保も地方政府の官僚主義を減らす良い取り組みになった。

復興には制度上のイノベーション、緊急性、自然発生性が重要な役割を担った。政府の意志決定もオープンに変り、様々なアドバイスも受け入れている。中国は機材、装備の面では国際社会や日本よりもかなり遅れており、まだまだ勉強する課題も多い。

３）スマトラ沖地震・津波被害

（インドネシア公共事業省　復興調整責任者　バンバン・スディアトモ）

2004 年 12 月のアチェの津波はリヒタースケールで 9.1、震源地はアチェ州から 250km 南西、短時間でアチェの全域の広範囲に被害が及んだ、特に西部の被災が大きかった。津波被害はマレーシア、タイ、遠くはアフリカまで及んだ。３日後の写真で大きな津波被害が伺われる。中程度の被害で済んだのは唯一モスクだけである。津波はスマトラ島北部を含む約 800km に亘る範囲に影響を与えている。

2005.3.28 にはニアスでも地震が発生、計22 万人以上の死者、行方不明者、63.5 万人以上が住居を失い、14 万戸の住居が倒壊し土地境界線などが判らなくなった。橋や学校など様々な施設が被害を受けている。

アチェはインドネシアの西の先端部で、最も貧しく復興能力が備わっていなかった、30 年間武力紛争に苦しんで来たので、震災当時も治安の問題があった。津波後の公平な資源配分が優先事項となり、生存者支援金による貧困への対応も要求されていた。被災者に対する一時使用施設の提供が喫緊の課題となった。テントは夜寒く、昼間は暑く、雨漏りもした。同時に復興バラックも建設さ

れ、住居をサポートするインフラ、公共事業、経済・社会施設の建設が復興の目的であった。生存者は住居の供給者により正式に確認され、集団のバラック住民として登録された。バラック以外に鉄骨フレームで木造壁の広さ 20 ㎡の仮設住宅を２万戸造った。

地域住民の参加によりコミュニティをまとめ、地図を形成、敷地割をして村落計画を作成した。全ての情報は土地所有者に署名され、村長にも情報が把握された。住居の提供者はデータ確認後に建設に着手しており、計画～実施～住宅引き渡しの通常のプロセスをたどった。

文化・社会・経済的なアプローチが復興過程では重要になり、コミュニティの参加が重要で地域住民のニーズを満たし、抵抗を防ぐためにコミュニティのミーティンング、コミュニティによる地図形成、コミュニティ・プランニングの３つが重要であった。

復興再建庁は土地問題等を回避するために法的な問題の解決を重視した。任務終了時には土地に関する紛争は殆んど無くなった。空間計画は災害ベースの空間計画、緩和、ミティゲーションが主なテーマで、コミュニティベースでは村レベルの地図形成、州、県、市レベルでの空間計画にあたった。コミュニティ中心の土地境界線の決定、標準化された、土地省の承認による地図形成、定住地は空間計画に準拠し、水や電気へのアクセスや洪水に対する脆弱性の除去の課題があった。

住居を建設する際には地震安全基準への適合など８項目の基準があった。コミュニティをまとめる意味では土地の紛争解決等の課題があった。被災者特定の課題や建設計画、資材調達の課題、建設会社の能力不足、支援データ不足、住宅やインフラ建設資材の不足、競合の課題、引き渡しの際の被災者からの苦情の課題があった。災害後 2008 年に復興再建庁はＧＩＳ、地理空間システムによるモニタリングシステムを構築した、それらにより住戸レベルの情報の透明性が確保できた。震災後の住居、住居に関する情報コーディネーターや敷地、家屋の写真などのデータも掲載されている。

災害直後の活動は被災地情報一覧表の作成、被災者と被災建物の一覧表作成、被災者登録が地元政府と共に実施される必要がある。沢山の住宅を速やかに整備するために、基礎部分だけを事業者が建設し仕上げは被災者自身が作業するアイディアもある。環境に悪影響を与えない被災地の再開発の実施は重要である。

（５）地震の概要と特徴（独立行政法人 建築研究所研究専門役　古川信雄）

モーメントマグニチュードMwはスマトラ・アンダーマン、東北地震では9.0～9.1、四川地震では 7.9、神戸、ハイチでは6.9～7.0だった。神戸と東北の地震エネルギーは 1,000 倍違う。

スマトラ地震の断層の長さは 1,300 ㎞、滑り量は 20mである。東北地震では断層は 500 ㎞、最大滑り量は 50mとなっている。マグニチュード 8 弱の四川地震は 250 ㎞、滑り量は 13m、神戸、ハイチでは断層は 50 ㎞、滑り量は 2～4mであった。長さで 20 倍、滑り量で 25～30 倍違う。スマトラ・アンダーマンと東北地震はプレートの沈み込みによるものなので、大きな津波を引き起こす。これ以外の３つは内陸で発生している。

内陸の地震では横ズレ断層や逆断層断層が生じ、海の沈み込み地震は逆断層地震になる。1990 年以降の 12 の震災を死者・行方不明者順に整理すると、ハイチ地震の 31 万人が最も大きく、スマトラ・アンダーマンの 22 万、四川の 8 万、東北２万、神戸５千の順になる。余震は断層面上で起こる。断層面の長さは、東北地震で 500 ㎞、ハイチ、神戸地震は 50 ㎞、四川は250㎞、スマトラは 1,300 ㎞と非常に大きい。

1960 年以降の地震を規模別に整理すると、1960 年チリ地震が最大でM9.5、1960 年のアラスカ

地震M9.2、スマトラ地震、東北地震の順になり、９位にインドネシア、ニアス地震M8.6 がある。スマトラ地震までは 1950、1960 年代に大地震が起きて、50 年間は静かだったが 2004 年以降大地震が頻発するようになっている。

大きな地震、M7.9 以上の地震は陸と海の境界、陸と島弧の境界で起こるプレートの沈み込みによる地震である。内陸で発生した四川地震だけが例外であり、津波は無いが被害は大きかった。M９の全ての地震は陸と海の境界で発生している。ハイチ地震はM6.9 で、M７クラスの地震は内陸でも多発している。神戸も含めて都市近郊であれば大きな被害を及ぼす。東北地震は太平洋プレートが北米プレートの下に沈み込んでいるため発生した。ハイチ地震は横ズレ断層で西側に被害が広がった。カリブ海では地震頻度は少ないが、北米、南米、ココスプレートの間に位置するため、プレート沈み込みや横ズレ断層の影響を受けている。四川地震は逆断層地震で多少横ズレ成分もある。スマトラでは年間５センチの速さで、インドプレートがユーラシアプレートの下に沈み込んでいる。神戸地震は横ズレ断層で、破壊が両側に伝播した。

３．第２セッションの概要

（１）パネラーの紹介・趣旨説明（独立行政法人 建築研究所国際地震工学センター長　安藤尚一）

パネラーはガザラ・ナイーム（パキスタン）、池田恵子（静岡大学教授）、福山洋（建築研究所上席研究員）、ジェリー・ヴェラスケス（UNISDR）である。

最初にそれぞれのパネリストから復興に当たるキーポイントのご説明をいただき、その後でディスカッションをする。

各地からのレポートを横割りの視点で見て行こうと考えている。社会的な視点、建築技術、まちづくり、国際活動の視点から説明していただく。

ここ 10 年で多くの震災がまとめて起こっており、急速な都市化、産業や人口の集中や拡大がリスクを増大させ、貧困層の問題、環境の悪化などが巨大災害の発生の原因になっている。倒壊建物 100 件あたりの死者数を見ると、四川や神戸、ペルー、ジャワ島の地震は建物被害の割には死傷者が少ないが津波被害の場合は死傷者が多い。簡易な建築物、軽量な建築物が多い地域では死傷者が比較的少なかった。サステナブルな復興とは物的な面に加えて、社会的、経済的、制度的に総合的に勘案するのが重要である。

本日のパネリストには社会的な視点、制度的な視点、物的な視点からの復興のポイントをお話しいただく。時間軸の問題は場合によるが、物的な復興は数年から５年以内、経済的復興には更に時間がかかり、神戸では社会的な復興に 10 年以上を要している。東日本大震災では人口減少期の復興が課題であり、皆様方の知見を反映させることが一つのテーマとなっている。

パネリストからいただいた教訓を国際社会や次の世代に伝えていくための議論もさせていただきたい。

パネルディスカッションの様子

（２）パネリストからの論点提起

１）復興の実態：2005 年カシミール地震の事例にみる

（建築家、災害リスク管理者　ガザラ・ナイーム）

パキスタンでは建築基準法不適合建物により 7.5 万人の死者、60 万世帯が居住を失った。パキスタンでは 95%の建物はロウ・ビルディングボード、石造で脆弱な建物が多く被害が拡大した。制度的な取り決めがパキスタンには無いので、誰が、どの様に復興するのかの課題が大きかった。

地震復興庁ＥＲＲＡの設立。土地所有の問題を解決する法律支援センターや銀行口座の開設。未亡人に対する金銭的支援や相続権、財産権の課題を扱う女性用委員会の発足。資材調達と訓練を行う建設ハブを全被災地に設置。耐震建築基準の議会承認。大規模なモニタリングの実施と苦情処理システムを導入した。

その結果、住居の復興状況は 92%、88%の住民が新しい復興住宅の安全性を評価し、65%以上が再建した保健医療施設を評価している。新設の学校が建設され、スタッフは不足しているものの小学校就学率が倍増。地震後に上水道整備率も向上している。

今後は、より安全なまちづくりの持続可能性の担保を目指している。

２）災害復興におけるジェンダー・社会包摂の視点（静岡大学　教授　池田恵子）

これまでの災害では女性、高齢者、貧困層に犠牲者が多い傾向があり、性別により被災経験や復興ニーズは違う。阪神淡路大震災、長崎豪雨災害、アチェやバングラディッシュでは女性死亡率が高かった。

東日本大震災の男女の経験の違い、○女性の方が家事の労働負担が大きい。○女性の就業機会が少なく、生活再建が遅れがち。○女性や子供の人権が守られ難い。○女性や弱者が復興議論に関わる機会が少ない。

ハザードと社会の脆弱性が重なって災害が起こる。健康、知識、人脈、時間、財産、政治力が偏っており、復興は平等に様々な資源や機会にアクセスできる必要がある。被災地の女性グループ、障害者支援のグループから、頼れるネットワークがあるので強いとも聞いた。災害の際は性別、年齢、国籍などが異なる集団が受けた影響を細かく理解する必要があり、復興に盛り込む工夫が必要である。そのためには、復興議論への様々な人々のバランスの良い参加、地域の様々な団体とのパートナーシップの構築、不平等が少ない社会への修正、復興が必要である。

３）安全な建物づくり、まちづくり（独立行政法人 建築研究所上席研究員　福山洋）

今回の主な震動被害はどの震災でも見られた柱のせん断破壊で、古い基準の建物に被害が集中している。一方、新基準や耐震改修は良好に機能しており、古い建物の改修の必要性が再認識された。耐震補強された建物でも非構造部材の部分的な損傷が見られ、継続利用するには問題が生じた建物もあった。今後は機能維持のための損傷を防ぐ事も考える必要がある。他にも大空間での天井落下の被害に関わる基準も検討されている。長周期地震動による共振現象も観測され大阪の超高層ビルも非構造部材が被害を受けた。

津波の教訓として多くの鉄筋コンクリート造建築物は津波に耐えることが出来たが、一部に倒壊、転倒、建物が流された例、漂流物による損傷もあった。

海岸等で活動する人々の安全性を確保するために津波避難ビルが必要になり、昨年度は津波避難ビルの構造設計法を検討した。構造被害が無くても浸水で機能が失われる場合もあり、昨日回復性の考え方も必要になる。

安全性は大原則であるが、災害からの回復性、機能の継続性の要求が強くなっており、人の感じ方、被害の程度、生活や活動への影響についてのシナリオの共有が重要である。神戸で地震の前に正しく補強されたビルは地震でほぼ無被害であり、今も使い続けられている。これは耐震技術を使った非常に良い例である。

4）災害後の復旧・復興における防災対策の推進

（国際防災戦略アジア太平洋事務所　上級コーディネーター　ジェリー・ヴェラスケス）

災害は様々な場所で発生するが、限られた国に被害を及ぼしている。地震、洪水、旱魃のリスクは中国、インド、バングラデシュ、インドネシアなど限られた国に死亡リスクがある。人口に対して相対的に見ると小さな国の影響が大きく、後発発展途上国や小島嶼途上国が上位に来る。相対的にはドミニカのリスクが高い。バヌアツも人口の大部分が災害の影響を受けてしまう。災害は一部の地域、一部の国に限られている。

世界的に災害は増えている。90－2007 までの死亡リスクは 13%増加し、経済損失リスクも 35%に増えている。発展・開発が進み、インフラ整備により脆弱性は減少しているが、危険に晒されている人口、資産が増えており脆弱性の改善が追い付いていない。テクノロジー、早期警報システムを早く改善しなければ危険に晒されている人口、資産に対応することが出来ない。

災害の影響は国によって異なり、サンタルシア、サモアの小国では災害発生に伴い 10～15 年も以前の経済状況に逆戻りしてしまう。インド、中国の大国は災害の経済に対する影響は少ない。貧困国での災害が多い訳ではなく、地震リスクが最も高いのは成長著しい中所得国である。開発、発展、経済成長によって災害が助長されている。手抜き工事の横行、危険な場所での居住などが新たな富裕国、中所得国に見られる。

サイクロン被害の危険は増しているが、脆弱性が改善され、死亡リスクは低下しているものの、経済損失リスクは上昇している。例えば、フィリピンでは 18 倍に増えている。フィリピンやタイ、ベトナムの復興関連予算は多額になっており、こうした趨勢はどれ程続くのか考える必要がある。

日本は津波に対する対策が整っていると言われていたが、危険に晒されている人口はインドネシアの 500 万人に次いで 420 万、津波に晒されているＧＤＰの金額は圧倒的に高い。高台移転がメインであったが、東電の事故により算出不能な経済損失が出ており、防潮堤整備も進んでいるが津波の高さ程高くはなくそれでは社会的な問題解決は出来ない。将来の災害は複雑性が増すと思われ、多くの人口が災害に晒されているので災害の影響の可能性は高い。

インドネシアの様なコミュニティ中心の復興、土地利用と建設の改善の例を紹介する。宮城では住民は安全な場所に移住し、沿岸には漁業加工処理施設が建設される。経済成長が進む日本は特に危険に晒されている人口が多いので、将来に必要な計画を自治体には検討してもらいたい。

（３）パネルディスカッション

１）それぞれの視点からの復興のポイント

想像を超える津波被害で安全な避難所や移住地を探せなかったと聞いた。出来る限り安全な場所を開発し、自然のセーフガードを出来る限り利用する。徒歩で移動できる山や丘への避難ルートを設定し実行する。仮設住宅を災害管理や社会学の訓練施設として利用する。（ガザラ）

災害は平素の延長で被害が拡大する。復興の際は地域問題を土台として考える必要がある。防災分野を孤立させない。教育、福祉、産業、雇用を含めて地域が災害に対して強くなるかが防災である。被災者や住民に女性や障害者、高齢者は含まれているのか。多様性を復興のうえで如何に担保するかが重要（池田）

ハードを如何に人の気持ちに繋げるかが重要で、そこに居る人々の思いを如何にエンジニアに繋げるかが課題である。目的を持ってみんなの力を集積すると、現在の技術では色々な事が可能になる。防災の戦略と方向性が大切だと思う。安全を進めて安心の観点が必要になる。（福山）

将来の復興はハードの部分だけでは満足できない。そのギャップは避難や教育等ソフトで埋めなければいけない。日本のソフト面を証明するのは難しいが、震災によってコミュニティ元年になるとの発言も聞いた。強力な社会活動が生まれ、必要な事が盛り込まれる様になる事を期待している。ソフトギャップを将来に繋げる。（ヴェラスケス）

２）ハードではカバーしきれない部分への対応

ソフト面の自主防災組織の活発化も聞こえて来る。地域の組織が災害復興、防災を如何に結び付けるのか、日常の延長が防災であり、地域活動組織の方がソフト面は知っている。地域の弱み、強みを知る人が、防災と結び付く必要がある。（池田）

シナリオの共有には沢山の議論が必要で時間がかかるが、先ずは、災害情報を共有し、それぞれの立場での行動を起こすことが大切だと思う。（福山）

津波の訓練経験を地方自治体、研究者、ＮＧＯ、マスコミ、コミュニティと共有し、脅威やリスクに対する認識を持たせる。次の段階は、専門家とコミュニティの絆を築くべきである。（ガザラ）

３）質疑・応答

Ｑ：タイの洪水被害に対するコミュニティ活動や事例などについてお教え願いたい。

Ａ：経済に対する影響が大きく、世界中の保険業界が日本の地震とタイの洪水で大きな痛手を被った。立地場所が危険に晒されているのではなく、ハードディスクのタイ、自動車産業の日本への集中、集積が危機を招いている。タイや日本の震災がシンガポールにも影響を及ぼしてしており世界中は繋がっている。

タイの再建復興担当大臣の話ではソフト面のアイディアは見つからない、コミュニティ、労働者への対応について逆に聞かれてしまった。金融リスクへの対応は分かるが、人への対応は分からないと言われてしまった。

洪水は上流から来て貧困な地域が被災した。エンジニアは簡単に計算が出来るが、実際の社会面とはギャップが多くソフト面の計算はとても難しい。

Ｑ：安全な津波避難ビルとはどういうものか。

Ａ：耐震基準よりも柱や梁、壁を強化し、杭を充分に打つ等既存技術の応用で対応は可能。

４）まとめ（独立行政法人 建築研究所国際地震工学センター長　安藤尚一）

ハード、ソフトの両面を組み合わせた震災対応が必要であり、全ての関係者が防災に関係する

意識を持ち、多くの人々と広く関係を構築する必要がある。世界の巨大災害の教訓を学ぶと同時に世界やコミュニティとも共有していきたいと考えている。

（４）閉会挨拶（政策研究大学院大学　教授　岡崎健二）

日本の場合、広域的な災害には対応し難い。数年に一度の巨大災害に如何に対応するか、社会的な対策で補うがどのように対応するのかが難しい。

福山先生の被害シナリオの共有が効果的だと思われる。コミュニティの被害シナリオを共有し、想像力、対応力を涵養する事が出来るのではないか。被害シナリオの共有が社会的なギャップを埋めることに繋がるのではないか。復興の過程で格差を拡大しないまちづくりを組み込むことが大切である。

災害を契機にした家族やコミュニティ、国と国の絆がうまく復興に生かされるのを期待している。

Ⅲ．専門家会議

１．専門家会議の概要

（１）開催の趣旨

前日の「国際シンポジウム：巨大震災からの復興を考える」における報告者・パネリスト及び当該シンポジウムの主催機関（建築研究所、政策研究大学院大学）の研究者 10 名の参加により、以下をディスカッションの主テーマとする専門家会議を開催した。

①より災害復旧力に優れたコミュニティを構築する機会としての巨大災害からの復興

②復興を巡る主要な話題（コミュニティの再建、災害弱者と貧困削減の側面、より安全な建築物・住宅及び都市や町、国際活動）に係る議論

この会議は、上記のディスカッションを通じ、以下のアウトプットを得ることを共有することを目的とした。

①国際的視点（共通課題等）及び地域的視点・脈略（地域固有の課題等）の双方からの検討による、復興への教訓についての理解の深化

②日本の被災・復興経験を国際コミュニティにおいて共有するための方法及び戦略

③より災害復旧力のあるコミュニティの形成に寄与しうる、専門家、政府、NGO、コミュニティの今後の取り組みについての提案

（２）開催日時・場所

日時：2012 年 2 月 22 日（水）　10:00～12:00

場所：政策研究大学院大学会議室

（３）会議参加者

司会　楢府龍雄（国際協力機構JICA国際協力専門員）

ガザラ・ナイーム（パキスタン、建築家、災害リスク管理者）

ジェリー・ヴェラスケス（タイ、国際防災戦略アジア太平洋事務所上級地域コーディネーター）

バンバン・スディアトモ（インドネシア、公共事業省　水環境衛生訓練センター長）

フリッツ・オプラン（ハイチ、公共事業・輸送・通信省建物評価技術室技師）

ワン・ツェンヤオ（北京師範大学壺基金公益研究院院長）

池田恵子（静岡大学教授）

安藤尚一（建築研究所国際地震工学センター長）

斎藤大樹（建築研究所国際地震工学センター上席研究員）

岡崎健二（政策研究大学院大学教授）

２．参加者によるプレゼンテーション及び意見交換の概要

４名の会議参加者がプレゼンテーション（情報提供）を行い、各プレゼンテーショについて意見交換を行った。その概要は以下の通りである。

○プレゼンテーション１：池田恵子（静岡大学）「復興プロセスにおけるジェンダーと社会的包摂」

東日本大震災の復興プロセスにおいて、女性や、子供、障害者、高齢者等の災害弱者の安全とニーズにどのような対応がなされているか、所見された課題や、それらの対応に向けたコミュニティレベルでの自発的な動き（女性たちの主体的な取り組みを含む）について紹介し、コミュニティの構成員のみならず復興の担い手としての女性や災害弱者のニーズや参加に留意することの大切さが述べられた。

プレゼンテーション後は、①被災後の女性や災害弱者のニーズ把握は、日本でも新しい取り組みであること、②例えば避難所におけるパーティション設置といった女性のニーズの高いものへの取り組みについても、自治体の避難所運営マニュアルのちがいにより、日本国内でも地域ごとに対応の差があること、③地域の持続発展の担い手としての女性の重要な役割についてはすでに世界で広く認御識されることとなっており、災害復興プロセスにも意思決定や諸活動（ローカルビジネス、コミュニティケア等様々）に女性の参加を促進することが、世界どの地域でも重要であること――等について意見交換がなされた。

○プレゼンテーション２：ガザラ・ナイーム（パキスタン）「復興の実態：2005 年カシミール地震の脈略から」

カシミール地震がどのようなタイプの建築物に被害を及ぼしたかの報告に引き続き、新設されたパキスタン地震復興庁（ERRA）の任務とされた復興上の諸課題（住宅、保健施設、教育施設、水道・衛生施設の再建・復旧）とそれらの復興進捗状況と残された課題について報告された。また、最後に、津波対策としての、沿岸市街地の後背に屏風状に広がる断崖を利用した避難経路設置への取り組みについて、事例紹介された。

プレゼンテーション後は、①ERRA が専らに地震復興を対象とする組織であり、水害、サイクロン等他の自然災害に総合的に対応する組織でないことの課題、②ノンエンジニアド住宅の耐震性強化に関するトレーニングの実施の仕組み、③崖地の避難経路設置への取り組みにおけるコミュニティや NGO との協議・協調の方法――について、意見交換がなされた。

○プレゼンテーション３：斎藤大樹（建築研究所）「日本における近年の巨大地震災害の教訓」

発生時刻、マグニチュード、死者・行方不明者数、主な死因（火災、建物倒壊、津波）、地震断層の規模、地震動周期の比較により、関東大震災（1923 年）、阪神・淡路大震災（1995 年）、東日本大震災（2011 年）がそれぞれ特徴の異なる災害であったことが説明された後、関東大震災、阪神・淡路大震災の教訓が、日本の耐震設計基準の強化にどのように生かされたかが示された。次いで、東日本大震災を受け、建築物の耐津波設計基準づくりに向けた取り組みが、どのような観点から進められているか紹介された。

プレゼンテーション後、①津波で被害を受けた建物の種類、②RC 建築物の倒壊原因、③耐津波基準の適用対象（特定の地域や特定の建築物に限られるか）、④日本における津波危険地域での避難施設の設置基準の有無、⑤耐津波基準が導入された場合の建物建設コストの上昇程度（途上国にとりコストの問題は重要）、⑥耐津波基準による人命や財産の保護の効果（津波危険地域に住むこと自体を困難と考えるべきでないか）、⑤災害の種類別の避難場所の整備の要否（避難勧告が出せる台風に

は有効だが地震ではどうか、アチェでの整備状況はどうか）――等、活発な議論が行われた。

○プレゼンテーション４：ジェリー・ヴェラスケス（国際戦略アジア太平洋事務所、タイ）「国際協力、防災・減災、気候変動、復旧、復興」

甚大な災害のリスクへの財政モデルとして、①自然災害への政府の責任の削減（リスク削減）、②民間セクターへのリスクの移転（保険等）、③国家が負うべきリスクに対する資金手当て――の３種があるとの提示の後、途上国政府は概して①、②の重要性の認識が足りず、その結果として③に多くの費用を要することとなり、さらにその負担能力の問題から国際支援頼みになってしまう、という現状の構図が示された。続いて、ⅰ）このような構図は国際経済環境から見てもはや維持困難であり、低頻度の巨大災害は国ともかく、高頻度の比較的小規模な災害に対しては、①②を通じて自国で備える必要がある、ⅱ）ところが、途上国における客観的なリスクデータの不足の状況から、②に係るリスクを保険会社がとれないことが大きな問題である――との認識が示された。最後に、ⅱ）に関して、インドネシアで行われた災害後復旧ニーズ評価（PDNA）が、ユニークで先進的な取り組みであるとの評価が述べられた。

プレゼンテーション後、①国際協力により災害リスクデータ蓄積を進めるアイデアと課題、②保険の限界（人命まで守れない、人命を守るにはリスク削減が重要）、④個人の保険料負担低減による保険の成立性向上の工夫（個人・コミュニティ・自治体等複層的なレベルでの保険の適用）――などについて、意見交換が行われた。

専門家会議の様子

Ⅳ. 国際ビデオ会議

１．国際ビデオ会議の概要

（１）開催の趣旨

近年、地域コミュニティに壊滅的な打撃を与える巨大災害が頻発しており、東日本大震災に見舞われた日本も、被災地の復興に注力しているところである。そのような災害の後の復旧・復興段階は、より災害復旧力に優れたコミュニティを建設する重要な機会であり、住宅や建築物の安全性の向上は、災害による人的被害の低減にとって欠かせない要素である。

こうした問題意識を背景に、このビデオ会議は、巨大災害からの復興ならびにより安全なコミュニティづくりについて、近年巨大災害を経験した国々（ハイチ、中国、インドネシア）から日本に建築研究所・政策研究大学院大学が招聘した専門家と、地震多発国のビデオ会議参加者が、住宅及び建築物に焦点を当て議論することにより、各国の経験と教訓を共有するとともに、将来の大規模災害への備えへの示唆を得ることを目的として開催した。

（２）開催日時・場所

開催日：2012 年 2 月 22 日（水）

主会場：	世界銀行東京開発ラーニングセンター	16:00～19:55（日本）
サブ会場：	ビクトリア大学ウェリントン校	20:00～23:55（ニュージーランド）
	JICA 本部	16:00～19:55（日本）
	JICA 筑波国際センター	16:00～19:55（日本）
	JICA フィリピン事務所	15:00～18:55（フィリピン）
	JICA 中国事務所	15:00～18:55（中国）
	JICA インドネシア事務所	14:00～17:55（インドネシア）
	バンドン工科大学	14:00～17:55（インドネシア）
	JICA バングラディッシュ事務所	13:00～16:55（バングラディッシュ）
	ネパール地震工学協会	12:45～16:40（ネパール）
	JICA パキスタン事務所	12:00～15:55（パキスタン）
	ペシャワール工科大学	12:00～15:55（パキスタン）
	JICA トルコ事務所	09:00～12:55（トルコ）

（３）プログラム

１）開会挨拶（16:00～16:05）

岡崎健二（政策研究大学院大学教授）

２）住宅・建築物の被害と復興に関する海外招聘者によるプレゼンテーション（16:05～17:15）

－2010 年ハイチ地震

フリッツ・オプラン（ハイチ、公共事業・輸送・通信省建物評価技術室技師）

－2008 年四川地震：建築物の安全の問題

ワン・ツェンヤオ（中国、北京師範大学壺基金公益研究院院長）

－アチェとニアスにおける災害復旧・復興の調整・管理から得た教訓：住宅・居住部門に注目して

バンバン・スディアトモ（インドネシア、公共事業省水環境衛生訓練センター長）

－日本における近年の巨大地震災害の教訓

斎藤大樹（建築研究所国際地震工学センター上席研究員）

3）近年の地震による被害と復興についてのプレゼンテーション（17:15 ～17:55）

－2011 年トルコ・ヴァン地震（トルコ中継）

ナザン・キリク（トルコ、首相府災害緊急時対策庁）

－パダンにおける地震リスク認識：公務員、住宅所有者、建設業者の見解（インドネシア中継）

クリシュナ・S・プリバディ（インドネシア、バンドン工科大学准教授）

－大規模な住宅復興のための戦略：パキスタンの経験（パキスタン中継）

ナディーム・アモッド（パキスタン、元地震復興庁副長官）

4）より安全な復興あるいは地震被害軽減に向けた活動・イニシアチブの経験についてのプレゼンテーション（17:55 ～18:35 ）

－東ネパール地震の被害、復興のニーズ及び努力：ネパールの経験（ネパール中継）

アモッド・ディキシッド（ネパール、地震工学協会事務局長、緊急対応強化プログラム会長）

－フィリピンにおける実大振動台実験地震リスクの認識向上へのアプローチ（フィリピン中継）

ヘンレマグネ・C・ペナルビア（フィリピン、火山地震研究所）

－インドネシアにおけるノンエンジニアド住宅耐震設計基準の普及活動（インドネシア中継）

白川和司（インドネシア、公共事業省 JICA 長期専門家）

5）耐震住宅に係る教訓・知識・手法の共有に向けた国際協力に関するプレゼンテーション（18:35～19:35）

－ 耐震住宅供給に向けた努力：世界住宅百科（ニュージーランド中継）

アンドリュー・チャールソン（ニュージーランド、地震工学研究所世界住宅百科編集長）

－日本・世界銀行協力プログラム――巨大災害から学ぶ：知識共有・交流プログラム

相良純子（世界銀行コンサルタント）

－地震によるノンエンジニアド住宅の被害と国際地震工学会のガイドライン

石山祐二（北海道大学名誉教授）

－安全なノンエンジニアド建物へ向けた包括的アプローチの提案

楢府龍雄（国際協力機構国際協力専門員）

－安全な住宅の社会・経済的側面

池田恵子（静岡大学教授）

6）討議 （19:35 ～19:50）

7）閉会挨拶（19:50～19:55）

安藤尚一（建築研究所国際地震工学センター長）

２．プレゼンテーション・質疑応答・討議の概要

会議は、４つのセッション（上記 2)～5)）を骨格に進められた（セッション 5)と討議 6)は一体として行われた)。各セッションでは、全プレゼンテーション終了後、質疑応答・意見交換が行われた。各セッションにおいて行われた情報・意見交換の概要は以下の通りである。

○第１セッション：住宅・建築物の被害と復興に関する海外招聘者によるプレゼンテーション

４つのプレゼンテーションが行われた。

オプラン氏のプレゼンテーションでは、2010 年のハイチ地震によりどのような建物被害があり、それに対してどのような修復技術が用いられたかが示された。

ワン氏のプレゼンテーションでは、2008 年の四川地震の経験に基づいて、①建築基準を緩くしすぎないこと、②建築物の建設場所の慎重な選定、③建築物の１・２階部分の耐震性、④平時における避難訓練の実施、⑤仮設住宅やテントの供給に際しての被災者との対話――の重要性が指摘された。

スディアトモ氏のプレゼンテーションでは、2004 年のインド洋地震及び津波の復興プロセスにおける復旧・復興機関の設立、その役割や運営形態、復旧・復興プロジェクトの内容・事例・教訓等について情報提供された。

斎藤氏のプレゼンテーションでは、1923 年の関東大震災や 1995 年の阪神・淡路大震災の教訓が日本の耐震設計基準の強化にどのように生かされたか、また、昨年の東日本大震災を受け、建築物の耐津波設計基準づくりに向けた取り組みがどのような観点から進められているかが示された。

これらのプレゼンテーションを受け、①四川地震の経験は、国内他地域や他国の災害安全性向上（国際協力）に向けどのように生かされてきているか、②アチェの経験と日本の経験をつなぎ合わせて見えてくるものは何か、③更新した建築基準を運用するための人材育成や、市民による基準の遵守意識向上のポイントはどのようなものか――等について意見交換がなされた。

○第２セッション：近年の地震による被害と復興についてのプレゼンテーション

３つのプレゼンテーションが行われた。

キリク氏のプレゼンテーションでは、2011 年のトルコ・ヴァン地震による建物構造別の被災状況を概観した後、建物被害の主原因が、耐震基準の非遵守、建築材料・技術の質の低さ、施工状況の検査不足にあったと述べられた。

プリバディ氏のプレゼンテーションでは、国家公務員、地方公務員、住宅所有者、建設業者の計４グル―プの人々の地震リスク認識調査の結果から、グループ毎にリスク認識の違いがあることが示された。また、災害に安全な住宅の普及のためには、グループ毎の認識の違いに応じた働きかけが必要であり、そのためにはコンサルテーション・メカニズムの充実が鍵になる、との見解が述べられた。

アモッド氏のプレゼンテーションでは、2005 年のカシミール地震後の６つの住宅復興方針の説明の後、それらの方針に基づくプログラムの成功の鍵として、①オーナー主導と公共の監督・支援のバランス、②地域特性に合わせた設計、③計画・制度の遵守率向上の仕組み、④コミュニティ参加拡大、⑤不動産権利問題への対応、⑥災害弱者の住宅取得支援、⑦恒常的な住民との関わり、⑧建築材料の供給、⑨適時の方針見直し――と様々な事項が挙げられた。

これらのプレゼンテーションの後、①復興への取り組み経験を次の災害への備えにつなげる鍵（取り組み経験の安定的な組織・制度への組み込み)、②耐震材料・工法と地域の生活文化との調和、③国と地方政府双方の職員のリスク認識の違い、④政治家のリスク認識、④建築材料の安全性のモニタリングの大切さ（基準作成だけでは不十分）――について、意見交換がなされた。

○第３セッション：より安全な復興あるいは地震被害軽減に向けた活動・イニシアチブの経験についてのプレゼンテーション

３つのプレゼンテーションが行われた。

ディキシッド氏のプレゼンテーションでは、2011 年 9 月の東ネパール地震による建築物の被害の状況について建築構造別や施設用途別に述べられた後、復興に係る政府の取り組み及び NSET の取り組み（石工の研修、児童生徒への情報提供等）について紹介された。

ペナルビア氏のプレゼンテーションでは、2012 年 2 月 6 日に発生したネグロス島沖地震による建物被害の状況の報告の後、地震リスクに対する認識促進の目的で 2011 年 2 月に行われた建築基準適応住宅と非適応住宅の実大振動台実験の様子が紹介された。最後に、今後への教訓として、①建築基準とゾーニング規制の厳格な適用、②コミュニティ・施設向けの短・中・長期防災計画の策定、③積極的・現実的な災害への備え（避難訓練、キャンペーン、災害・緊急対応組織の強化など）の実施――の大切さが述べられた。

白川氏のプレゼンテーションでは、JICA 長期専門家として氏がインドネシアで取り組んでいる、地方政府の能力強化を目的としたノンエンジニアド住宅耐震設計基準の普及活動の内容について、情報提供が行われた。

これらのプレゼンテーションの後、①RC 造と木造の耐震性比較、②ネパールにおける建築基準の適用方法、③耐震建築物普及のための啓発活動と能力開発の方法、④安全な枠組組積造の構造上のポイント（部材のつなぎ方、枠組内の壁面積の最大値等）――について意見交換が行われた。

○第４セッション：耐震住宅に係る教訓・知識・手法の共有に向けた国際協力に関するプレゼンテーション

５つのプレゼンテーションが行われた。

チャールソン氏からは、地震工学研究所（EERA）と国際地震工学会（IAEE）の協力で 2000 年からホームページで公開されている「世界住宅百科」について、開設の目的やホームページの構成内容等が紹介された。

相良氏のプレゼンテーションでは、日本の東日本大震災からの復興の取り組み経験の教訓を共有する目的で日本政府と世界銀行が共同で進めるプログラムの内容及び期待される成果について、情報提供された。

石山氏のプレゼンテーションでは、まず、世界各地の様々なノンエンジニアド住宅やそれらの受ける地震被害の様相について大要が述べられた。その後、ノンエンジニアド住宅の耐震性強化を目指して国際地震工学会（IAEE）が 1986 年版に刊行したガイドラインが、四半世紀を経て 2012 年に改訂されたことが、新旧ガイドライン双方の執筆に携わった氏から紹介された。新ガイドラインの最大の特徴は、旧版になかった枠組組積造が加えられていることだ、と述べられた。

楢府氏のプレゼンテーションでは、①ノンエンジニアド住宅の被害削減は急務であるが、②それには、技術的側面のみならず社会経済的側面の課題が横たわっており、③各種イニシアチブや熱心な人々がその困難な課題に取り組んでいるものの、④それらの関係者の間での知識や教訓の共有が求められており、⑤それを進める総合的なアプローチの適用が強く推奨される――との見解が、楢府氏を含む 5 カ国 10 名の研究者の共著‘A Proposal for a Comprehensive Approach to Safer Non-Engineered Houses’ (2010 年、Journal of Asian Architecture and Building Engineering) を踏まえ、示された。

池田氏からは、住宅・コミュニティ復興を進める上では、社会・経済的側面に留意することが必要であり、コミュニティが多様なニーズや役割を持つステークホルダーで構成されることを認識し、①全てのステークホルダーの意思決定への参加促進、②異なるニーズに対応するための性別等によるデータ収集・分析（世帯を単位とする大括りのデータでは把握不可）、③居住に関係する性の違いによる役割分担の実状を考慮した、家族やコミュニティの世話をする人たちの労働負荷軽減、④建設関連就労への男女の公平な機会確保――に努めることが大事であると指摘された。

プレゼンテーション後、①国によっては大学で建設工学の教育を受けた女性が建設業界で働きたがらないという現実（就業機会の問題だけでない）、②災害弱者である外国人に対する支援に関する日本での取り組みの状況、③歴史的なモニュメント（構築物）を災害から守るための対策、④低所得層によるノンエンジニア住宅建設を抑制する手立て、⑤女性や災害弱者の被災時のニーズ把握や復興プロセスへの参加促進を検討する上で参考になるガイドライン（英語版等）の所在、⑥農村部のノンエンジニア住宅の設計基準――などを巡り、質疑や意見交換が行われた。

主会場（世界銀行東京開発ラーニングセンター）の様子

Ⅴ. 現地視察

１．現地視察概要・報告

（１）現地視察概要

① 日　　程 ： 2012 年 2 月 19(日) ～ 20 日(月) 1泊2日

② 場　　所 ： 東日本大震災(2011 年 3 月 11 日発生)の被害地域 （宮城県）
気仙沼市→南三陸町→女川町→仙台市

③ 参 加 者 ： 7 名 （国内参加者 1 名、海外参加者 3 名、GRIPS 2 名、BRI 1 名）

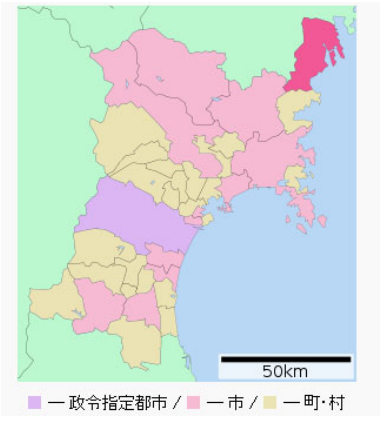
氏名	所属
池田恵子	静岡大学教育学部 教授
王振耀　ワン・ツェンヤオ	中国 ・ 北京師範大学 壹基金公益研究院 院長
Ghazala Naeem ガザラ・ナイーム	パキスタン ・ 建築家、災害リスク管理者
Jerry Velasquez ジェリーヴェラスケス	タイ ・ 国際防災戦略アジア太平洋事務所 上級地域コーディネーター
森田高市	建築研究所
岡崎健二	政策研究大学院大学 教授
李愛林	アシスタント

④スケジュール

時間		行動内容
2 月 19 日(日)		気仙沼市～南三陸町
	10:46 発	上野駅 （やまびこ 57 号盛岡行:2 時間 33 分）
13:13 着		一ノ関駅
移動		（マイクロバス:約 70 分）
14:30 ～ 15:00		気仙沼市周辺視察(車内)
移動		（マイクロバス:約 60 分）
16:00～17:00		南三陸町観光協会説明会
移動		（マイクロバス:約 10 分）
18:00 ～		宿舎:南三陸町ホテル観洋
2 月 20 日(月)		南三陸町～仙台市
9:00 ～ 10:00		南三陸町観光協会 現地視察
移動		（マイクロバス:約 80 分）
11:20 ～ 12:00		女川町周辺視察(車内) （女川町役場、女川町地域医療センター）
移動		（マイクロバス:約 30 分）
12:30 ～ 13:40		石巻市周辺視察(車内) （門脇小学校、石巻高校、日和山公園、石巻市役所）
移動		（マイクロバス:約 80 分）
15:00～16:30		東北地方整備局 説明会
移動		（マイクロバス）
	16:53 発	仙台駅 （Max やまびこ 150 号東京行:2 時間 5 分）
18:58 着		上野駅

（２）現地視察報告

１）気仙沼市



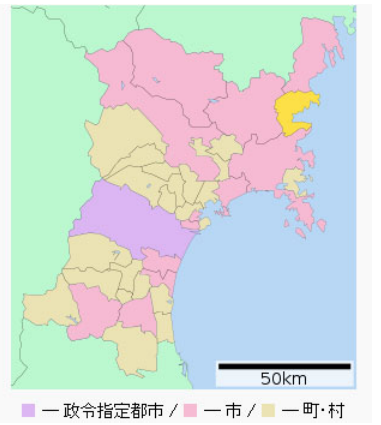
宮城県北東端の太平洋沿岸に位置する都市。2011 年（平成 23 年）3 月 11 日、マグニチュード 9.0 の東日本大震災が発生後、気仙沼市赤岩で震度 6 弱、本吉町および笹が陣で震度 5 強を記録した。大津波とそれによって流出した石油の引火による広域火災も発生し、被害は甚大。 国土地理院の調査の結果、岩手県・宮城県・福島県の広範な沿岸地域において、この地殻変動による著しい地盤沈下があったことが明らかとなった。

調査団は、被災した現地（火災による被災も含む）や、津波で流されて陸地の奥まで流されてきた漁船などを視察した。水産業が盛んだった漁市場も津波や地震で大きい影響を受けていた。

← 全焼した建物

津波で陸路まで流されてきた漁船 →

２）南三陸町



宮城県の北東部、本吉郡の南部に位置し、志津川湾、伊里前湾に面する町。

志津川湾では、ギンザケ、カキ、ホタテガイ、ホヤ、ワカメなどの海面養殖業が盛んに行われ、近年では、農漁業体験を含む滞在・体験型の観光にも力を入れていた。

東日本大震災が発生し、南三陸町は震度 6 弱（観測地点：歌津地区、志津川地区）を記録した。 さらにこの地震が引き起こした大津波は町内の 3 つの川を逆流し、1960 年のチリ地震による津波の到達地点を越えて内陸を襲った。この地殻変動により、志津川地区の地盤は大きくずれた。

①南三陸町観光協会説明会:

地域観光ガイド（震災前）として働いていた鴻巣氏（現在、震災の語り部）から、協会内で展示されていた南三陸の震災前と震災後の写真を説明をうけた。会議室に移動し、観光地としての南三陸町や震災による被害、災害後の対応、災害後の鴻巣氏の体験等のプレゼンテーションがあり、その後活発な質疑応答があった。

↓南三陸観光協会のビル

↓協会内部に展示されている大震災前後の写真

↓担当ガイドによるプレゼンテーション

②南三陸町観光協会の案内による現地視察:

- 公立志津川病院

南三陸町立志津川病院も、5 階建てビルの 4 階（高さ 15- 16m）までが津波に呑み込まれて医療機器、ベッド、カルテなどが損壊あるいは流失し、看護婦ら病院スタッフ 4 人・入院患者 67 人が死亡あるいは行方不明となった。向かい側の建物に多くの住民がいたが、責任者の機転で外に逃げるのではなく、建物内にとどまったため、多くの人が救われた。

- 防災対策庁舎: 天使の声

南三陸町防災対策庁舎の遠藤未希さんは、津波警報を無線で最後まで呼びかけていた。鉄筋三階建の建物は鉄骨だけ残して、津波に破壊された。３０名が屋上に逃げたが、その内町長を含む８名が助かったという。「命をかけた防災無線」のニュースを最後まで呼びかけた彼女の声は、「天使の声」と呼ばれている。また、遠藤さんが流された後、彼女の後を受け、最後まで防災無線マイクを握りしめていたのは、南三陸町危機管理課課長補佐の三浦さんだった。

３） 女川町

宮城県にあり、太平洋沿岸に位置する町。日本有数の漁港である女川漁港があるほか、女川原子力発電所が立地、東北地方に電力をもたらしている。

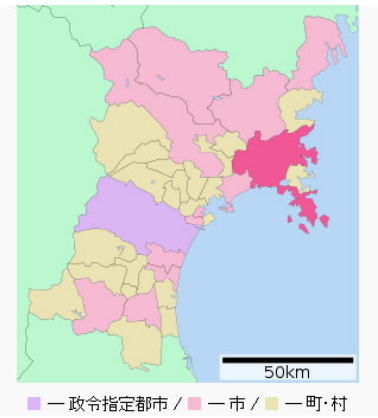
東日本大震災の際、女川町の女川原子力発電所の震度計が震度 6 弱を観測した（町内の検測所は津波で流失）。 さらにこの地震が引き起こした津波に襲われ、沿岸部は壊滅的被害を負った。港湾空港技術研究所の調査によれば、津波の最大波高は女川漁港の消防庁舎で海抜 14.8m を記録した。

鉄筋コンクリート製のビル 6 棟が基礎部分ごと地面から抜けて横倒しになる被害も発生した。液状化現象で基礎が浮き上がった所を津波になぎ倒された。世界的にも例の無い被害である事から、町では被害資料として保存する方針を固めている。調査団は、高台にある女川町地域医療センターから被害を受けた女川町全体を見た後、転倒した建物や後背地の高校敷地内に建設された仮設住宅を視察した。

←津波より転倒された建物

仮設住宅→

４）石巻市



宮城県東部に位置する、県内第二の人口を擁する市。石巻市の主要な産業は、水産業と県下第二の集積を見せる商業である。また、造船業、紙パルプ業なども盛んである。東日本大震災で最大の死者数を出した。

調査団は、瓦礫の山や廃棄された自動車を視察した後、日和山公園から市全体の被害状況を視察した。

（左）廃棄された自動車の山　→

（右）日和山公園から見える瓦礫の山

①東北地方整備局　説明会

- 発表者：　池口正晃氏（国土交通省　東北地方整備局　企画調整官）
- タイトル：「Actions taken after the Great East Japan Earthquake　Towards Rehabilitation and Restoration 」
- 内容：東日本大震災の概要、道路・港・空港の瓦礫撤去作業、国道、高速道路の緊急復旧、道路・川・沿岸部の復興

↓池口企画調査官のプレゼンの様子（通訳：岡崎）

↓災害危機管理室での説明

↓岩崎泰彦　東北地方整備局　副局長　表敬訪問

参　考　資　料

参考資料

１．各国災害事例資料、各国基礎情報

（１）各国災害事例資料

１）2010 年ハイチ地震災害

Item	Sub-item	Information	Data Source
Data on Hazard	Date and Time of Occurrence	4H53:10 PM, 12 January 2010.	USGS
	Magnitude (source)	M 7.0	USGS
	Epicenter	Leogane: 18.443°N, 72.571°W About 25 kilometers from southwest of P-A-P. Depth： From 10 to 13 kilometers	USGS
	Intensity of Shaking	" This earthquake produced violent shaking that can cause damage even to well-built buildings anywhere in the world"	USGS PDNA
	Ground Motion	A sliding movement of East-West has been observed, however local movements of subduction and a vertical movement about sixty centimeters have been recorded. It was a surface fault movement inducing landslides and soil liquefaction. Strong shake continued for 35 to 36 seconds.	USGS MCEER
	Tsunami (maximum height)	A tsunami about 3 meters has been observed on the south part of P.A.P	
Data on Damages	Major Affected Area	Three departments: West, Southeast, and Nippes were seriously affected. Particularly the metropolitan P-au-P area Was suffered enormous damage. 80% of the town Leogane where the epicenter is located was destroyed.	
	Human Damage	Dead: 230000 Injured: 100000 Homeless: 600000 Majority of the death is due to collapsed houses.	
	Damage of Buildings	Complete destruction : 105000 Damaged: 208000.	
	Infrastructure/Lifeline Damage	**Road:** - The Jacmel road was cut by landslides and damaged by soil liquefaction. Several streets through P-au-P were in the same situation. - The biggest commercial port was damaged. - All the Ministries and Public Administration have been destroyed. **Electricity:** The electric distribution lines completely destroyed within the Capital. **Telephone:** Only one of the four telephone companies worked after the earthquake.	
	Main Damage Cause	**Extreme vulnerability of constructions:** - Anchorage 90 degrees - 20 centimeters and more between the stirrups - Poor connection between the structural elements - Lack of ductility of the walls - Poor quality of concrete - High occupation density. - High instable soil.	

Item	Sub-item	Information	Data Source
	Characteristics of Damages (Physical/Social Aspects)	The earthquake destroyed completely and damaged a large number of buildings: schools, medical centers, all the government offices, residences. Almost all the old buildings with walls stone masonry around P-au-P were destroyed or severely damaged due to lack of ductility. Majority of the damages is due to the ground motion.	
	Direct Economic Loss	Total: 8 billion($US) Infrastructure, including housing: 57.2% Social: 19.4% Production sectors: 17% Education/culture: 6.1% Health: 6% Environment: 6.4% Water/Sanitation: 3% Food safety/nutrition: 4.2%	PDNA
	Lessons Learned	National government, local authorities should take their responsibilities. Every house must be built under a seismic code regulation.	
Emergency Response	Rescue activities	The first responders were local people, especially the marginalized, the unemployed usually lurking around public buildings. These unarmed saved what they could during the night. They removed several authorities under debris. But, the next day almost the whole world was at our bedside. In an indescribable mess, Dominicans, Americans, Canadians, French, Jamaicans, Cubans….came to our rescue. MTPTC began working to clear the most important streets to promote the rescue movement, evacuate the dead and remove people under debris.	
	Medical services	The Ministry of Public Health and the private health sector have responded quickly, saving what they could before we can get foreign aid. However, this national response has been very limited since the staff and the government facilities were seriously affected. So, 75% of Health services are delivered by the foreign staff. Medical attention was given everywhere, under tents and in some street corners. Many injured were transported to a US medical ship. The coordination between different staffs was very complicated. Thus it was very difficult to follow the Ministry of Public Health norms and guidelines.	
	Evacuation shelter	The issue of shelters looked like the more difficult. The earthquake made about six hundred thousands homeless increasing the number existed before. At the very beginning, almost everybody around the affected areas lived in open air. It was quite impossible to find enough plastics belts or tents to the relocated people. Therefore, some people built their shelters, using debris as wood, metal sheets and anything that they found. And two years later some people is still living in shelters made by them.	
	Food, water and other relief goods supply	**Food:** The issue of food was also very critical. After the earthquake, almost everyone was anxious for food. In first time humanitarian agencies tried to distribute food by helicopter. This experience was bad. Then they gave some cooking kit. And finally the food was distributed by the military. **Water:** Fortunately the infrastructure and staff of the national body in charge of water (DINEPA) were not affected. Therefore, they took action quickly asking to the private sector to join them in the distribution of water.	

Item	Sub-item	Information	Data Source
	Information and communication (Information to the disaster victims)	The Ministry of Communication has used the private medias to inform the public about the government decisions in response to the damages left by the earthquake. The government held regularly some press conferences. So, the population could know the organization of the humanitarian assistance and arrangements to support them at the critical period. The issue of Communication, was very complicated for the first days: - The main streets through the Capital have been cut with abandoned cars, debris of destroyed buildings and rubble from landslides. - Only one of the four telephone companies was available. The international medias contributions were very significant: they stimulated immediate action by the international community to the Haitian people.	
	Support from Private Companies		
	Support from abroad		
	Lessons Learned		
Recovery	Infrastructure/Lifeline	**Road and Streets:** - The road conducing to Jacmel was opened four days later and completely restored three months later. - The day after the earthquake, the main streets through P-a-P were partially cleaned to promote the rescue service. **Telephone:** **Electricity :**	
	Other services	- MENFP started with the scholar activities three month later. **MTPTC** - Has dredged rivers and drainage canals to cope the cyclonic season. - One week later, MTPTC began a vast campaign **Of assessment.** - 1862 builders worker are trained - 202 young engineers are trained to work in the field of quality control. - 17862 small and non- severely damaged houses have been repaired in the Leogane and P-a-P areas for the most vulnerable victims.	
	Temporary House	- This issue of temporary house was very complicated. At the very beginning, some people have obtained some plastics belts; others received some tents or built their shelters with anything that they could find. - By the assessment, the government via MTPTC encouraged some people to return to the non-damaged houses two months later.	
	Shelter		
	Disaster Waste	The total amount of the disaster waste is estimated at 10,000,000m^3.	MTPTC
	Finance	- International Community - Private sector - NGOs - Ministries	
	Support from Private Companies		
	Support from Abroad		

Item	Sub-item	Information	Data Source
	Lessons Learned		
Reconstruction	Principles	**Five priority principles**: - Leadership and mutual accountability - Decentralization and equal growth - Commitment to modernization - Haitian-led - Independence for international aid.	
	Key issues	- How to protect the people against natural disaster? - How to improve the quality of life in Haiti? - What we want to become	
	Organizations	- Interim Commission for the Reconstruction of Haiti (ICRH). - Development agency - Multi-Donor Trust Fund (HRF).	
	Finance	- International Community - Private sector - NGOs	
	Support from Private Companies		
	Support from abroad		
	Reconstruction Schedule	- Governance. - Reducing vulnerability of the people and basic service - Economic growth - Infrastructure programs	
	Key Target, featured strategies/approaches etc.	By this action plan, they aim to restart rapidly economic, governmental and social activities, reduce the vulnerability of the country, and put Haiti on the path of development by: - Including environmental aspects in all decisions and actions. - Integrating risk disaster management in all sectors and in all reconstruction activities. - Establishing an active employment policy: supporting micro-enterprises, strengthening vocational training, involving local firms and local labor and communities. - Undertaking the decentralization of the basic services. - Initiating a social safety net for the poorest.	
	Economic Recovery	- Recovery in domestic production - Cultural production - Economic and financial systems - Creation of jobs	
	Other Characteristics		
	Lessons Learned		
References	Reports	- http://www.cirh.ht/files/pdf/cirh_plan - http://housingworgs.org/i/blog/Haiti_PDNA - http://www.refoundation.ht - http://www.haitireconstruction.org - http://www.usgs.gov/natural_hazards/	
	Data/photos		

2）2008 年　中国四川地震災害

Item	Sub-item	Information	Data Source
Data on Hazard	Date and Time of Occurrence	2:28PM, May 12, 2008(Beijing Time),	USGS
	Magnitude Depth	Mw. 8.0, 33 km (China National Earthquake Bureau) M.7.9, 19 km (USGS)	CSB USGS
	Epicenter	N31.0, E103.4(Wenchuan County, Southwest Beijing, China) 79 km Off Northwest Chengdu of Sichuan Province, China	CSB
	Intensity of Shaking	Intensity scale:10,	CSB
	Ground Motion	The earthquake occurred as a result of motion on a northeast striking reverse fault or thrust fault on the northwestern margin of the Sichuan Basin. The earthquake's epicenter and focal-mechanism consistent with it have occurred as a result of movement on the Longmenshan fault or a tectonically related fault. The earthquake reflects tectonic stresses resulting from the convergence of crustal material slowly moving from the high Tibetan Plateau, to the west, against strong crust underlying the Sichuan Basin and southeastern China.	USGS
	Tsunami	N/A	
Data on Damages	Major Affected Area	More than 116,700 sq.km, including Sichuan, Gansu and Shannxi provinces	MCA
	Human Damage	Dead: 69,227 Missing: 17,824 Injured: 374,643	MCA, China (Sept.18, 2008)
	Damage of Buildings	Complete destruction: and Partial destruction: 4,140,000 houses	MCA, China (June, 2008)
	Infrastructure/Lifeline Damage	Road - Highway: 21 lines (seriously damaged) - Rural Road: 24,103 km (seriously damaged) Railway - Baoji to Chengdu: 669 km (Stop Operation more than 12 days) Airport: Shuangliu Airport at Chengdu Electricity: millions houses power outages (May 12) Water Supply: 391 reservoirs damaged differently, more than 5 million people need water supply (May13) Sewage System: 39 counties waste water treatment plants and pumping stations stop operation in 3 provinces. Telephone: - Land line 51 counties lines stop operation - Cell phone 2,500 base-station stop operation	China news
	Main Damage Cause	Most of human and physical damages were caused by the earthquake. More than 95% death and missing were killed by the earthquake. After earthquake, lots of mountains collapsed and also killed some people.	
	Characteristics of Damages (Physical/Social Aspects)	Majority of human casualties were caused by the earthquake. The majority of the building damages were also caused by the earthquake while many of collapsed houses were found and certain amount of damages are caused by earthquake. Many of damaged buildings were constructed because of lack of the enforcement of rural building codes . Factories in the disaster area were kept stop operation for a while and it affected the global "supply chain" (especially parts production to car industry), and eventually it affected the global industry and economy.	

Item	Sub-item	Information	Data Source
	Direct Economic Loss	Total: about 845.1 billion yuan Buildings (House, Shop, Office, Factory, etc.): 27.4% Lifelines and Infrastructures(Water, Gas, Electricity, Telephone, Road, River, etc.): 21.9% Others (School, Gov office, Hospital, etc.).: 20.4% (6.8 yuan = 1 USD)	Stat Council of China
	Lessons Learned	<Building codes and disaster reduction are very important> Because the earthquake differed from the assumptions, the earthquake degree height and more than 130,000,sq. km, and the disaster area exceeded expected districts. In China, there are no codes or standards about the rural buildings. Even in Sichuan, the protecting earthquake standard was still below 7 degree which actually can protecting earthquake below M. 5. There are short of the disaster management materials including hazard maps. The evacuation exercise program is not popular in schools and communities. In such situation, 5335 students died, only some school students evacuated to the safer place on their own decisions. The most famous case is Sangzao Middle School, and this shows a good example of disaster education and proper risk evacuation. <Damage to structures> Because the structure measures are not so good and also short of systematic procedures, after earthquake, a lot of conflicts happened between local governments and victims parents. The massive victims and colossal damages witnessed during this disaster exposed the limitations of disaster management measures of the ordinary building codes to an excessive degree. <Early warning system> In government, the China Earthquake Bureau is very strong, even at the county level, it also has associated with this organization. Chinese tradition believed that the scholars can resolve all problems, so if appointed experts as leaders,then they can do early warning. As a result, reports asked officials why they cannot do early warning. Changing this conception, maybe is very important, so should strengthening communities building including family activities. <Disaster Management Measures> Because damages caused by the earthquake greatly exceed the pre-disaster damage estimate, the former policies for disaster relief and reduction need to be fundamentally reviewed and the disaster management measures have to be rebuilt.	
Emergency Response	Rescue activities	Rescue activities were carried out mainly by local governments, army, police, firefighters, volunteers. As for the army case, about 157,000 personnel were dispatched for rescued and other emergency operation activities. As a result of the efforts, about 5,000,000 people were rescued.	MCA
	Medical services	DMAT (Disaster Medical Assistance Team): Total of 65,000 doctors and assistances were dispatched and provided medical service for about 3 months. Other Medical Team: Total of 14950 doctors from other provinces and medical associations, Red Cross, national hospitals, medical volunteers, etc. provided emergency medical services. In addition to the emergency medical care, 200 foreign doctors have being provided mental care for the disaster districts. Sichuan sent 10015 injurers to 340 hospitals in 20 provinces.	CDRC
	Evacuation shelter	Public facilities e.g. schools, community centers, public gymnasium were played as evacuation shelters and most of them were designated as shelters, especially in Mianyang city. 3 days after the disaster event, disaster people kept evacuated got the public buildings.after 30 days, 15,000 thousand people got more than 1,500 thousand tents and other 1,000 thousand shelters.	CDRC

Item	Sub-item	Information	Data Source
	Food, water and other relief goods supply	Foods and other relief goods were supplied by the central government, local government and others (NGO, other institutions, etc.) Central government provided 10 yuan and 0.5 kilo rice each day for evacuees during 3 months and after that reduce half, then into the normal assistance system.	CDRC
	Information and communication	To provide the information to the evacuee, the followings were conducted. 1. Handbook - Livelihood support - Livelihood and business reconstruction - Guide for temporary shelter life 2. Flyer 3. Broadcast 4. Each village at least one soldier Handbooks and flyers were distributed through not only official channel but also various channels e.g. volunteers (with explanation) and shops.	CDRC
	Support from Private Companies And NGO	Many private companies and NGO provided food and relief goods to the evacuated people in their areas of expertise. More than 3 millions volunteers to the disasters. Internet service providers, other website operators and private companies who had intention to contribute to assist disaster victims opened the site for donation, and donation through the Internet becomes one of the channels for donation.	Media
	Support from other provinces and cities	Central government arrange 21 provinces and cities such as Beijing, Shanghai, Tianjin and Jiangsu, Zhejiang, Guangdong, etc., support to disaster districts, the framework is one province or one city to one county. This policy established on May 22. In June, central government arrange this framework into recovery.	Media
	Support from abroad	171 countries and territories and 20 int'l agencies stated assistance. Received rescue team (incl. medical assistance team) from 6 counties, territories and agencies. Received relief goods and money totally more than 5 billion yuan. 273 foreign experts into disaster districts involved the rescue.	CDRC
	Lessons Learned	Based on the lessons learned previous large-scale disasters, mobilization of China State Council and other government institutions were rapid. A lot of new policies were created in the rescue process. Especially the policy "one provine to one county" made the relief action more efficient. Another policy is "open the door", government encouraged NGO participation, and welcome foreign rescue team into China. While many collaboration activities were made, supply of relief goods to the affected area was in time even the affected areas were so big and roads severely damaged by the earthquake.	
Recovery	Infrastructure/ Lifeline	Roads and highways were opened after earthquake except the section Yingxiu to Wenchuan town, about 80 km, that road was seriously damaged until after more than 3 months. The Highway from Dujiangyan city to Jiuzhaigou was destroyed. All railways were restored in 12 days. Electricity: Repaired the temporary line to the main towns or townships in about 1 week Water Supply: repaired 13649.6 km temporary pipeline to disaster district. Telephone: 100% was restored in 10 days at township. Note: Restoration of lifelines in the areas affected by the earthquake finished after the implementation of reconstruction plan in 2 years.	CDRC
	Other services	Under the framework of "one province to one county", each province established the office at the county, if they find some questions, they would be in charge of resolving them. So, a lot of food supply got from other provinces.	

Item	Sub-item	Information	Data Source
	Shelter	After 30 days, 15,000 thousand people got in more than 1,500 thousand tents and other 1,000 thousand shelters.	CDRC
	Disaster Waste/Debris	Because of the rehabilitation' s need, after 6 months, according the reconstruction plan, most disaster waste/debris already cleared.	Media
	Finance	Central government provided more than 50 billion yuan to supply the recovery. Tents and shelters all provided by central government.	Media
	Support from Private Companies and NGO	Whole donation is about 76 billion yuan. Some NGOs participated in the process of recovery.	CDRC
	Support from Abroad	N/A	
	Lessons Learned	After the Wenchuan Earthquake, Chinese central government believed that this national disaster must mobilize whole nation involved the relief and recovery. Different ministries made effort to do early recovery from earthquake damages, and another policy is "one province to one county", this made the risk to be reduced, the recovery is not only just central government's task, but also other provinces' task. Encouraging media to report the recovery process is also important. If the reporters found something was wrong, the government could resolve the problems.	
Reconstruction	Principles	June 8, 2008, The State Council made the regulation of reconstruction of Wenchuan Earthquake. The reconstruction principles include: (1) For disaster districts, the reconstruction should rely on local, especially encourage to do production, but must combine with central government support and the policy of "one province support one county". (2) Government should play the leading role but also encourage NGO's participation; (3) Reconstruction on the original place but combine with the project of moving other places. (4) Reconstruction quality must be ensured, but the efficient also should be combined. (5) The reality must be considered but combine with the designing future. (6) On the one hand, economic and social development should be ensured, on the other hand, must combine with the protection of the ecological environmental resources.	State Council
	Key issues	N/A	
	Organizations	National Level: Reconstruction Committee (established in June 2008) Province level: Reconstruction Committee of three provinces, governors were the director. City/Town Level: Implementing body for reconstruction	
	Finance	Since required amount of fund for reconstruction is too large to bear by the local governments. Therefore, central government allocated 302.6 billion yuan budget for recovery, other budget is provided by other provinces and cities.	State Council
	Support from Private Companies	Some of NGOs such as Wanke Compony established one township building.	
	Support from abroad	Some international companies did the donations about hospitals or schools, etc. Especially Hongkong and Taiwan gave a lot of support.	
	Reconstruction Schedule	As a result, till September, 2010,1908.5 thousand rural houses, 288.3 thousand urban houses, 3839 schools, 2169 hospitals, and more than 5000 projects of infrastructure were established in three provinces including Sichuan, Gansu, Shannxi .	State Council

Item	Sub-item	Information	Data Source
	Key Target, featured strategies/ approaches etc.	Because of the policy of "one province to one county", there was competition among different provinces. So the new policy is "3 years task will finish in 2years".	State Council
	Economic Recovery	Economic development recovery was strong. Sichuan, Gansu, and Shannxi provinces got lots of support,and that made the mountain poor district change a lot, and the buildings more modernized. Only in Sichuan, the reconstruction plan included 29692 projects and more than 800 billion yuan investment. Whole reconstruction investment is about 1000 billion yuan.	State Council
	Other Characteristics	Open policy is important, at the process of reconstruction, and the international experience were adopted by the government.	
	Lessons Learned	First the central government must provide the main budget to local government. This is the central government's responsibility. But secondly reconstruction can not be just centralized. It must be combined decentralized projects. Using the policy "one province to one county", it is a very important decision. Actually this is the big reform of the administration management of China. Thirdly reconstruction must combined the economic with social construction. This is the weak in the reconstruction process. Also, the reconstruction law and regulation, especially the overall plan is very important. Opening the process of policy making to the society, it is another experience in the reconstruction process. Some experts send a lot valuable suggestions to central and local governments.	
References	Reports	http://www.xinhuanet.com/xhwenchuan USGS: http://earthquake.usgs.gov/earthquakes/eqinthenews/ http://www.512.gov.cn/ http://www.cea.gov.cn/ http://www.ceic.ac.cn/ http://www.eq-igl.ac.cn/ http://www.mca.gov.cn http://www.jianzai.gov.cn/ http://www.sdpc.gov.cn/ Http://www.scio.gov.cn http://www.audit.gov.cn/n1057/n1072/n258889/ www.sc.gov.cn/10462/10929/11076/11077 Richard A. Kerr. Chinese Quake Likely a Mega-Catastrophe. Daily News. ScienceNow. 2008-05-12	
	Data/photos	UNDP-China Project: Working Report about Relief and Reconstruction of Wenchuan Earthquake, by CDRC.	

3）2004 年　スマトラ沖地震・津波災害

Item	Sub-item	Information	Data Source
Data on Hazard	Date and Time of Occurrence	Aceh : 07:58AM, December 26, 2004 Nias : 11:09PM, March 28, 2005	USGS
	Magnitude (source)	Aceh : M 9.1 Nias : M 8.6	USGS
	Epicenter	Aceh : 250 km South west of ACEH (3.316°N, 95.854°E) Nias : 2.074°N, 97.013°E	USGS

Item	Sub-item	Information	Data Source
	Intensity of Shaking	Aceh : Intensity scale : 4.0 (Soloview-Imamura scale) Nias : Intensity scale : 0.5 (Soloview-Imamura scale)	ISET Journal
	Ground Motion		
	Tsunami (maximum height)	Aceh : 45 m (150 ft) around Lhok Nga area of Aceh Besar District and 24 m (80 ft) according NOAA Nias : 4 m	NOAA/ NESDIS
Data on Damages	Major Affected Area	Aceh : Banda Aceh, Meulaboh (2 cities, 11 districts) Other countries : Thailand, Srilanka, India, Maldives, Malaysia, Myanmar, Seychelles, Eastern Africa Nias : 80 percent of whole area	USGS
	Human Damage	Dead : 127,720 in Aceh, around 250,000 in total 678 in Nias Missing : 93,285 (Aceh)	
	Damage of Buildings	House : 139.195 units Social- Economic Facilities : 93.285 units School : 3.415 units Health Infrastructure : 517 units Government Building : 669 units	
	Infrastructure/Life line Damage	Agriculture : 73.869 Ha Roads : 2.618 Km Bridges : 119 units Ports : 22 units Airport/Airstrip : 8 units	
	Main Damage Cause	The distances between the epicenter and the coast line is very near (90 km in the perpendicular position from the epicenter) Large population of people living in the area along the coast Lack of facilities and infrastructure to support / protect to face the danger of tsunami Lack of access to information and education on awareness of the tsunami Tsunami wave hydrodynamic forces contributed to most damages and losses incurred by the event. Earthquake cause less damages to the area due to the typical structures in the area were not more than double storeys building. Early warning systems installed in the Pacific Ocean, but not installed in the Indian Ocean, whereas 85 percent historically recorded tsunami events occurred here. Some sophisticated tools owned by developed countries already detect symptoms of the tsunami, they've released a tsunami warning to countries in the Pacific Ocean region, but can not provide information to countries in the Indian Ocean before there was a wave of attacks tsunami	

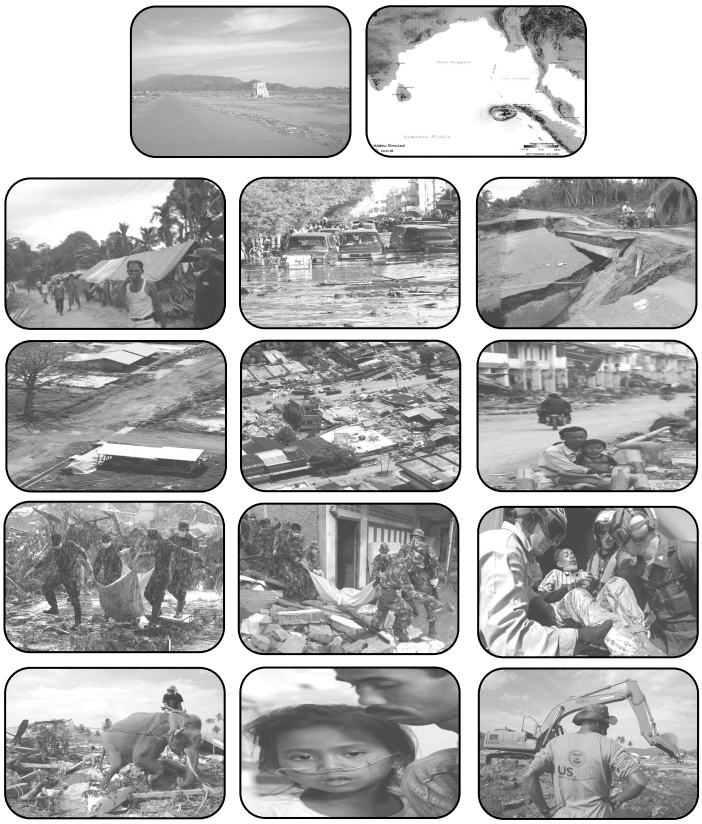
Item	Sub-item	Information	Data Source
	Characteristics of Damages (Physical/Social Aspects)	Physical Aspects: Public Utilities (school, community health center). Infrastructure (electricity, sanitation, drainage, roads & bridges, clean water). Social-Cultural Facilities (village hall, mosque/church). One storey buildings that were located closely to coastal impacted area were flattened and left only their foundation. Social Aspects: 104.500 small bussiness were collapsed 15.000 household need to be relocated 60.000 farmers were displaced 1.927 teachers died 13.828 coastal fishing boats destroyed/lost	
	Direct Economic Loss	• Total Loss (Aceh-Nias) : Rp. 46.56 Trillion • Approximately Aceh's GDP loss : up to US$ 4.5 Billion, estimated decrease of Aceh's economic growth : 5% • Decrease rate of per capita income : 32% • Inflation rate : 4.45% (April 2005), 3.24% (Agustus 2005) • Impact of national economic growth : 0.1-0.4 % (2005)	
	Lessons Learned	• Pre event knowledge of coastal community to tsunami is important to make them aware and ready for emergency evacuation soon after major sea earthquakes. • High structures are potential to be used for escape buildings should higher ground are difficult to find at reachable distance for evacuation. • Government should move quickly to clarify which agency will coordinate the post-disaster reconstruction program, what is empowered to do, and when its mandate begins and ends • A strong, experienced leadership team should be appointed to gain the full support of other government agencies amd the donor agency • A crisis mindset should be maintained throughout the reconstruction effort, adapting usual internal procedures and structures to a crisis situation • Strong implementation capability should be built early on so that the coordinating agency can meet its overall reconstruction targets by directing resources for meeting emerging needs • reconstruction to ensure funding flows meet actual needs	
Emergency Response	Rescue activities	• Evacuation and searching of victim's bodies Done by collaborative work by Indonesian National Force (TNI), police, Indonesian Red Cross (PMI), Indonesia Search and Rescue (Basarnas), community, volunteers from inside and outside the country.	
	Medical services	• Handling of victims who were injured done in all hospitals and health care units which still functioning in that particular area coordinated by Ministry of Health of RI • Some of the seriously injured victims who need special treatment were brought out to Medan and Jakarta • Build emergency health care unit • Re-functionilize the damaged hospital/health care units	
	Evacuation shelter	• 562.149 people live in houses/tents (July 1, 2005) • 33.458 people live in barracks/transitional shelter (July 1, 2005)	

Item	Sub-item	Information	Data Source
	Food, water and other relief goods supply	• 5.000 tonnes rice and foods are delivered (January 9, 2005) by National Logistic Agency (*BULOG*) • Fixation of clean water supply and sanitation treatment/piping units by *PDAM* with 435 l/s production capacity and 250 l/s distribution capacity • Aids from other county and university such as portable water purification • Clean water and electricity supply was cut off and being rehabilitized in January 2005 except for Meulaboh and west-coast area	
	Information and communication (Information to the disaster victims)	• All communication was cut off the day disaster happened. Begin to functional again in January 2005 except for Meulaboh and west-coast area • Communication was being installed in January 2005. IBM installed 250 computer units being to cover Aceh, Medan and jakarta Area • Radio installation also begin to installed in January 2005 by *ORARI* and *Kodim* • PT Telkom Indonesia provided 1 month free for call for Cellular phone registered under Aceh regional codes	
	Support from Private Companies	A national-private tv station provided foods for the emergency	
	Support from abroad	• Total involved country : 34 • Personnel : 16.000 • Medical team : 117 • Mothership/carrier : 9 • Float hospital : 1 • Aircraft : 31 • Helicopter : 82	
	Lessons Learned	• During emergency period, critical decisions such as who should lead rescue process and which area should be focused are urgent. Slow process on this will delay rescue process and save the survivors and consequently will increase restive • Overseas support during emergency could be minimum during the emergency period. Therefore, local and national capacities to respond quickly are important to prevent further crisis in the disaster area • Government at the impacted area was mostly paralyzed due to staggering number of victims and losses. Therefore, neighbourhood provincial government support is crucial to restore rules and official engagements • Emergency activities to save the survivors should be prioritized. Top priorities include meeting basic needs, filing supply chain gaps, building a coordination room, and involving affected communities in emergency • Efforts should be made to “build back better” at every opportunity, with disaster-resistant construction, improved quality and sustainable institutional capability • Key donors and multi-donor funds should be requested to play coordinating roles	

Item	Sub-item	Information	Data Source
Recovery	Infrastructure/Life line	• During 2005-2009, done under coordination of Aceh-Nias Rehabilitation and Reconstruction Agency (BRR Aceh-Nias) supported by other national and international agencies, such as Ministry of National Development Planning (Bappenas), Ministry of Finance, US AID, JICA/JICS, Japan Red Cross, American Red Cross, IOM, UNDP, World Bank , etc • Communication line, clean water supply line, electricity are starting to restored in January 2005 • Transportations line also started being restored in January 2005 • 3.696 km of roads are built after 4 years • 363 bridges are built after 4 years • 23 ports are built after 4 years • 13 airport or airstrips are built after 4 years • 97% households have electricity supply (des 2008) • Cellular/mobile phone access reach 35 % household needs	
	Other services		
	Temporary House	The number of victim lived in barrack/transitional shelter : • 106.320 (2005) • 14.280 (2006) • 3.698 (2007) • 871 (2008) • 344 (2009) Government of RI built barracks/transitional shelter in 24 locations. 977 barracks were built. Each barracks consist of 12-20 transitional shelter with 4x5 m size for each family	
	Disaster Waste	5.765.000 m3 of waste were being cleaned and recycled 2.5 millions wood waste are being recycled. UNEP, UNDP, and several agencies were involved in removing tsunami waste	
	Finance	Total Rp. 21.728.136.110 was being used for ACEH rehabilitation and reconstruction Total of Rp. 2.826.115.886 was being used for Nias rehabilitation and reconstruction. Supported by Government of Indonesia, UN Bodies, Multi Donor Fund (MDF), EU Community, Governement of Japan and others	
	Support from Private Companies	Astra International, Several Indonesia National Companies, PT Telkom, Indosat, Media Indonesia Corp, PT Coca Cola, and others were involved during the recovery process	
	Support from Abroad	In housing and settlement area : High-Level NGO/IA : 24 NGO/International Agencies : 57.914 units Mid-Level NGO/IA : 72 NGO/International Agencies : 38.898 units	
	Lessons Learned	• Shelter and basic needs of the survivors are top priorities • Accurate survivors data determine how livelihoods supports can be delivered effectively and efficiently • Traumatized victims may receive less attention and care if carefull survivors treatment is not conducted involving phsyciatry observation • Women and children are the most vulnerable community groups that need serious care during recovery	

Item	Sub-item	Information	Data Source
Reconstruction	Principles	• Implementing islamic law in all aspects of life (especially in Aceh) • Improve the quality of human resources • Strengthening provincial and districts government • Develop and manage natural resources wisely and in accordance to its capacity • Re-built houses and settlement compeleted with its basic insfrastructure • Built eficient and reliable infrastructure • Develop an excellence, fair and competitive regional economic • Developing and preserving cultural values and customs that support sustainable development • Increasing the capacity of local bureaucracy that professional, authoritative, and trustworthy • Strengthen public understanding of national and state insight • Strenghten the implementation of appropriate local government	
	Key issues	• Religion, social and cultural rights • Education, health and gender • Monitoring • Economy • Planning and Finance • Housing and settlement • Infrastructure • Government operation • Restoring Rules and Law • Institutional and human resources development	
	Organizations	Executing Agency BRR, other goverment bodies, local/international NGO/foundation, United Nation, Other nations such as Japan, German, Australia, Netherland and many more	
	Finance	Budgeting composition for Aceh-Nias Rehabilitation and Reconstruction : on-treasury and on-budget : Government : 21 trillion rupiahs Donor : 8 trillion rupiahs off-treasury and on-budget : Donor : 3 trillion rupiahs Off-treasury and off-budget : Donor : 35 trillion rupiahs	
	Support from Private Companies		
	Support from abroad	Multi Donor Fund, UN Bodies (such as UNDP, UNICEF, IOM,), World Bank, EU Community, JICA-JICS of Japan, Government of Japan, US AID, Saudi Arabian Government, Turkey, Singapore, and others supported the reconstruction process	
	Reconstruction Schedule	April 2005 – April 2009	

Item	Sub-item	Information	Data Source
	Key Target, featured strategies/approaches etc.	• The development of spritual and social life of the people of Aceh and Nias • Social, economic and cultural community is in a better state • Improving the quality of educational services, health and women's roles • Rehabilitation and reconstruction in Aceh and Nias • New structures and institutions to support sustainable economic growth • Develop key potential for economic growth in a sustainable Aceh and Nias • The rise of of agriculture fisheries and forestry • The presence of holistic-infrastructure development plan • Reconstruction and rehabilitation of housing and settlement than comply to minimum standard • Availability of access to a healthy and clean water to all citiens • Restoration of public roads and highways in Aceh and Nias • Restoration of docks, terminals and airports which are needed to support economic growth • Restoration of drainage system and flood control • Revitalization of government building and insfrastructure • Strenghten the capacity of civil servant	
	Economic Recovery	• 60% of small bussinesses have access to credit. About 60.000 micro-credits to 4% of households in ACEH and 1.5% of households in Nias • Fisheries production reached 25% above the production level before the tsunami in 2004 • Fish production reached 350.000 tonnes • In 2007, rice production reached 1.535.375 tonnes exceed the pra-tsunami production • In 2007, coffee production reached 42.308 tonnes exceed the pra-tsunami production • In 2007, the poverty level is become 27% from 30% in 2003	
	Other Characteristics		
	Lessons Learned	• Key donors and multi-donor funds should be requested to play coordinating roles • Constant communication among partners should be maintained to manage beneficiary and donor expectations about the pace and progress of reconstruction • The coordinating agency should ensure integrity and accountability of funds to gain donor coinfidence and support • A range of influence skills including diplomacy, authority, and flexibility may be used throughout the course of reconstruction • Quality of reconstruction process as well as to ensure the works done efficiently and effectively in achieving the reconstruction goals should be kept as top priority. Due to heavy and large number of reconstruction agencies during the time, coordination and control of the process will be difficult if frameworks and rule among the agencies do not conform at the first place • Data of the victims as well as data of land status are difficult to verify. This will slow the reconstruction process or else will put the reconstruction process in legal status obstacle that may not be easy to resolve • Restoring digital data of land status at remote and save area will help reconstruction agencies to validate legal status of landowners	

Item	Sub-item	Information	Data Source
References	Reports	Accountability Report of BRR 2008, USGS (United States Geological Survey), ISET (Institute for Social and Environmental Transition) Journal, Execution of Emergency Response Audit Report of DPR 2005, Semester Report of BRR, Progress Report of BRR 2005, Progress Report of BRR 2006, NOAA (National Oceanic and Atmospheric Administration, NESDIS (National Environmental Sattelite, Data and Information Service)	
	Data/photos	D-Day + Emergency Response : 	

Item	Sub-item	Information	Data Source
		Recovery, Rehabilitation and Reconstruction: 	

4）2011 年　東日本大震災

Item	Sub-item	Information	Data Source
Data on Hazard	Date and Time of Occurrence	2:46PM, March 11, 2011(JST), 05:46 (UTC)	JMA
	Magnitude Depth	Mw. 9.0, Mj 8.4, 24 km (JMA) M.9.0 (USGS) Mw 8.8, 23.7 km (Univ. of Tokyo)	JMA USGS ERI-UT
	Epicenter	N38.1, E142.9 (130km ESE off Oshika Peninsula) Off Pacific Coast of Tohoku (North East) Region, Japan	JMA
	Intensity of Shaking	JMA Intensity scale:7, Max. Ground Acceleration: 2933gal	JMA K-NET

Item	Sub-item	Information	Data Source
	Ground Motion	A strong ground acceleration of over 2933 cm/s/s was observed in K-NET Tsukidate observation station (Miyagi pref.) near the hypocenter, and the strong ground acceleration propagated in broad area. According to the distribution of ground displacement, there was a major ground motion of maximum above 50cm from Tohoku to Kanto area. Especially in Sendai plain there was a huge ground displacement of more than 100cm.	ERI-UT
	Tsunami (maximum height)	average / max Northern part of Tohoku (Sanriku): about 15m / more than 30 m Southern part of Tohoku (South of Sendai, Ibaraki, Chiba): about 5m / about 10m	Joint Survey Group
Data on Damages	Major Affected Area	Pacific coast of the Tohoku area - Boso Peninsula (Near Tokyo)	-
	Human Damage	Dead: 15,845 Missing: 3,380 Injured: 5,894	NPA (Jan.20, 2012)
	Damage of Buildings	Complete destruction: 128,471 houses Partial destruction: 242,309 houses Partial damage: 662,514 houses Fully/partial burned: 281 houses	NPA (Jan.20, 2012)
	Infrastructure/Lifeline Damage	Road - Highway: 979 km (closed to traffic) - National Road: 1,119 km (closed to traffic) Railway - Shinkansen: 990 km (Stop Operation) - Main lines: 1,012 km (Stop Operation) Major Port: 15 Port Airport: 13 Airport Electricity: 2.6 million houses power outages (Mar. 12) Water Supply: 1.8 million houses out of water supply (Mar. 16) in 19 Prefectures Sewage System: 48 waste water treatment plants and 78 pumping stations stop operation in 7 prefectures. Gas - piped: 420,000 houses out of supply - supply by cylinders: 1,660,000 houses out of supply Telephone: - Land line 1 million lines stop operation - Cell phone 14,800 base-station stop operation	CAO1
	Main Damage Cause	Most of human and physical damages were caused by the tsunami. More than 90% death and missing were killed by the tsunami (drowning). It is difficult to identify or distinguish the damages by the earthquake in the tsunami affected area, however according to the surveys conducted by the some research team (e.g. Architectural Association), not many buildings were severely damaged by the earthquake.	SC

Item	Sub-item	Information	Data Source
	Characteristics of Damages (Physical/Social Aspects)	Majority of human casualties were caused by the tsunami. Though death and missing were reached almost 20 thousands, amount of injured people of 3,300 was very small, and it would be a typical characteristic of the tsunami disaster. The majority of the building damages were also caused by the tsunami while many of collapsed houses were found and certain amount of damages by earthquake was recognized in some inland areas. Many of damaged building were constructed before the enforcement of new building codes which was enforced in 1981. Damaged to the infrastructures were also limited. Effects of the retrofitting were observed. Factories in the disaster area were kept stop operation for a while and it affected the global "supply chain" (especially parts production to car industry), and eventually it affected to the global industry and economy. Nuclear power plant located on the pacific coast was damaged by the tsunami and totally lost power supply. Due to this power failure, reactors were uncontrolled and damaged. A radiation leaked to the atmosphere and it caused nuclear disaster. Negative impact to the nation's economy by shortage of electricity due to power plant failure. Wide range and complexity damage characteristics	SC Sangiin
	Direct Economic Loss	Total: about 16.9 trillion yen Buildings (House, Shop, Office, Factory, etc.): about 10.4 trillion yen Lifelines (Water, Gas, Electricity, Telephone, etc.): about 4.3 trillion yen Infrastructures (Road, River, Port, Airport, etc.): about 2.2 trillion yen Agriculture, Forest and Fishery about 1.9 trillion yen Others (School, Gov office, Hospital, etc.).: about 2.5 trillion yen (1 trillion yen = 12.5 billion USD)	CAO2

Item	Sub-item	Information	Data Source
	Lessons Learned	<Gap between pre-disaster assumption and the actual hazards> Because the actual earthquake and tsunami differed from the assumptions, the tsunami height and extent, and the inundation area exceeded expected levels. The estimated inundation area was used for disaster management material including hazard maps. It is possible that the hazard maps that were prepared based on the pre-disaster hazard assumptions lead to providing false sense of security to people, and that the tsunami that exceeded these assumptions led to an expansion of the damage. In such situation, some school students evacuated to the safer place than that of designated place on their own decision, and this shows the good example of disaster education and proper risk communication. <Damage to structures> Looking at the structure measures, while these are effective against tsunamis with tsunami heights within the scope of their design, the massive tsunami and colossal damage witnessed during this disaster exposed the limitations of disaster management measures that rely on coastal protection facilities to an excessive degree. <Under-estimation of the first tsunami warning and its effects> The estimation of earthquake magnitude and the tsunami height by JMA immediately after the earthquake vastly underestimated, and the size of the earthquake and the tsunami warnings were subsequently repeatedly revised upwards over time. It is considered that the impact of the initial tsunami height prediction was particularly great, and it is possible that the evacuation actions of residents and volunteer fire fighters were blunted by the initial tsunami warning, leading to expansion of damage incurred. <Disaster Management Measures> As damages by the disaster greatly exceeding the damage estimate, the former principles for hazard assumption need to be fundamentally reviewed and the disaster management measures have to be rebuilt.	SC
Emergency Response	Rescue activities	Rescue activities were carried out mainly by police, firefighter, coast guard and Self Defense Force (SDF). As for the SDF case, about 107,000 personnel were dispatched for SAR and other emergency operation activities. As a result of the efforts, about 27,000 people were rescued.	CAO2
	Medical services	DMAT (Disaster Medical Assistance Team): Total of 193 teams were dispatched and provided medical service for about 2 weeks. Other Medical Team: Total of 2,656 teams (12,264 members) from medical association, Red Cross, national hospitals, medical volunteers, etc. provided emergency medical services. In addition to the emergency medical care, some teams have being provided mental care for the disaster victims. Also received medical teams from four countries.	CAO2
	Evacuation shelter	Public facilities e.g. schools, community centers, public gymnasium were played as evacuation shelter and most of them were designated as shelters. 3 days after the disaster event, about 470 thousand people were kept evacuate in more than 2,100 shelters.	CAS recon1
	Food, water and other relief goods supply	Foods and other relief goods were supplied by the central government, local government and others (NGO, other institutions, etc.) Central government provided 26.2 million meals and 7.9 million water bottles for evacuees during 2 months and a half from the disaster.	CAO2

Item	Sub-item	Information	Data Source
	Information and communication	To provide the information to the evacuee, the followings were conducted. 1. Handbook - Livelihood support - Livelihood and business reconstruction - Guide for temporary shelter life 2. Flyer 3. Special TV and Radio program for evacuees 4. Newsletter through electric media (Internet) Handbooks and flyers were distributed through not only official channel but also various channels e.g. volunteers (with explanation) and shops.	CAS
	Support from Private Companies	Many private companies provided food and relief goods to the evacuated people in their areas of expertise. Logistics for relief goods were also supported by private companies. Private companies donated money for disaster victims. Internet service providers, other website operators and private companies who had intention to contribute to assist disaster victims opened the special site for donation to the public, and donation through the Internet becomes one of the channels for donation.	wiki
	Support from abroad	163 countries and territories and 43 int'l agencies stated assistance. Received rescue team (incl. medical assistance team) from 29 counties, territories and agencies. Received relief goods from 63 counties, territories and agencies. Received donation (money) from 93 counties, territories and agencies and total amount of donation was more than 17.5 billion yen (USD219 million). US military forces provided special support called "Tomodachi Operation" with more than 20,000 military personnel.	CAO2
	Lessons Learned	Based on the lessons learned previous large-scale disasters, mobilization of SDF, DMAT, Tech-Force and other government institutions were rapidly conducted. A principle for emergency road recovery called "Kushinoha sakusen" was contributed to start the early relief activities, and it was effective to supply relief goods to the affected areas. While many collaboration activities were made, supply of relief goods to the affected area was in trouble because the affected areas were too big and roads along the coast were severely damaged by the tsunami.	SC MILT1
Recovery	Infrastructure/ Lifeline	Roads and highways were re-opened in two weeks except the sections that bridges were washed away. 50% of railways were restored in one month. About 1.5 months after the disaster, Shinkansen was return to the full operation while some main railway lines were still under restoration because some segments were completely washed away and new alignments of the railways have not been decided yet. Electricity: Restored in about 1 week Water Supply: 50% was restored in 1 week and mostly restored in one month Gas: 50% was restored in 3 weeks and mostly restored in 1.5 months Telephone: 50% was restored in 3 days and 90% restored in 2 weeks Note: Lifelines were restored only the areas where not affected by the tsunami. Restoration of lifelines in the areas affected by the tsunami will be done in accordance with the implementation of reconstruction plan.	SC JSCE1
	Other services	N/A	

Item	Sub-item	Information	Data Source
	Temporary House	Provided by prefecture government (Subsidized by the central gov.) Required number of temporary houses: 53,013 (Completed: 52,182 as of end of Dec. 2011) Iwate: Required: 13,984, Completed: 13,984 Miyagi: Required: 22,095, Completed: 22,095 Fukushima: Required: 16,619, Completed: 16,226 Start construction: 2 week after disaster 50% completion: middle of June More than 90%: middle of Aug.	CAO2 MLIT kasetu
	Disaster Waste/Debris	The tsunami produced huge amount (about 23 million tons) of disaster waste. The amount of waste is the equivalent to 19 years' waste amount (15.7 million tons) for Miyagi and 11 years' waste amount (4.8 million tons) for Iwate. As of Nov. 2011, about 62% of waste was removed, however, due to limitation of the processing and disposal capacity, progress of waste disposal was not sufficiently progressed. As capacity of waste dumping sites in the disaster affected area is limited, wide area collaboration for waste disposal is being conducted.	CAS debris
	Finance	Since the scale of damage was huge, local governments could not bear the cost for recovery. Therefore, central government allocate contingent budget for recovery by supplementary budget arrangement, and almost all recovery costs will be bared by the central government.	MIC news1
	Support from Private Companies	N/A	
	Support from Abroad	N/A	
	Lessons Learned	As the measures had been taken in the various sectors such as road, railways and lifeline service providers etc. based on the lessons learned from the past disasters, rapid recovery was made possible. On the other hand, the scale of disaster was huge and affected wide area and sectors including provision of electricity and supply chains, necessity of BCP (Business Continuity Plan) has been strongly emphasized.	MILT2 news2 ntt

Item	Sub-item	Information	Data Source
Reconstruction	Principles	The Reconstruction Design Council in response to the Great East Japan Earthquake prepared the report and seven principles for reconstruction were proposed. (1) For us, the surviving, there is no other starting point for the path to recovery than to remember and honor the many lives that have been lost. Accordingly, we shall record the disaster for eternity, including through the creation of memorial forests and monuments, and we shall have the disaster scientifically analyzed by a broad range of scholars to draw lessons that will be shared with the world and passed down to posterity. (2) Given the vastness and diversity of the disaster region, we shall make community-focused reconstruction the foundation of efforts towards recovery. The national government shall support that reconstruction through general guidelines and institutional design. (3) In order to revive disaster-afflicted Tohoku, we shall pursue forms of recovery and reconstruction that tap into the region's latent strengths and lead to technological innovation. We shall strive to develop this region's socioeconomic potential to lead Japan in the future. (4) While preserving the strong bonds of local residents, we shall construct disaster resilient safe and secure communities and natural energy-powered region. (5) Japan's economy cannot be restored unless the disaster areas are rebuilt. The disaster areas cannot be truly rebuilt unless Japan's economy is restored. Recognizing these facts, we shall simultaneously pursue reconstruction of the afflicted areas and revitalization of the nation. (6) We shall seek an early resolution of the nuclear accidents, and shall devote closer attention to support and recovery efforts for the areas affected by the accidents. (7) All of us living now shall view the disaster as affecting our own lives, and shall pursue reconstruction with a spirit of solidarity and mutual understanding that permeates the entire nation.	recon
	Key issues	N/A	
	Organizations	National Level: Reconstruction Agency (established in Feb. 2012) Prefecture level: Branch office of Reconstruction Agency Reconstruction Headquarters of prefectural government City/Town Level: Implementing body for reconstruction esp. land use planning	recon1
	Finance	Since required amount of fund for reconstruction is too large to bear by the local governments. Therefore, central government will directly provide fund to the local governments as well as subsidy to the activities done by local governments. To secure the fund for reconstruction, central government established "Special Tax for Reconstruction" and will raise a "Special Bond for Reconstruction". Reconstruction funds in prefectural level will be prepared and some of reconstruction works will be done using the funds.	MOF recon3
	Support from Private Companies	N/A	
	Support from abroad	N/A	

Item	Sub-item	Information	Data Source
	Reconstruction Schedule	Reconstruction of major infrastructures e.g. roads, rivers, transport facilities are being implemented and it planned to be completed in a few years. 33 out of 43 cities/towns have already prepared their reconstruction plans. Many of the reconstruction plans have target period of reconstruction with the range of 7 to 10 years, and also set phases of reconstruction e.g. years for recovery, rehabilitation and reconstruction with development.	recon1 miyagi kesen rikuzen
	Key Target, featured strategies/ approaches etc.	Key target, strategies and approaches for reconstruction are varied depending on the existing situation of the cities/towns. Some approaches, i.e. “creating a safe city for disasters”, “creating a vibrant city”, are common in many cases. To create a safe city, especially for avoiding any human land use plans have been prepared by restricting the residents in tsunami affected areas and relocation of village to the high land.	recon1 miyagi kesen rikuzen
	Economic Recovery	N/A (Reconstruction is on progress.)	
	Other Characteristics	N/A	
	Lessons Learned	N/A (Reconstruction is on progress.)	

Item	Sub-item	Information	Data Source
References	Reports	JMA: http://www.jma.go.jp/jma/en/2011_Earthquake.html USGS: http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/ ERI-UT: http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103_tohoku/eng K-NET: http://www.kyoshin.bosai.go.jp/kyoshin/topics/html20110311144626/main_20110311144626.html Joint Survey Group: http://www.coastal.jp/tsunami2011/ NPA: http://www.npa.go.jp/archive/keibi/biki/index.htm CAO1: http://www.cao.go.jp/shien/2-shien/1-infra.html CAO2: http://www.bousai.go.jp/ Sangiin: http://www.sangiin.go.jp/japanese/annai/chousa/keizai_prism/backnumber/h23pdf/20119201.pdf CAS: http://www.cas.go.jp/jp/fukkou/ MIC: http://www.soumu.go.jp/main_content/000117828.pdf MILT2: http://www.thr.mlit.go.jp/road/jisinkannrenjouhou_110311/kushinohasakusen.html MILT2: http://www.thr.mlit.go.jp/road/jishinkanrenjouhou_110311/fukkyuuriyuu.pdf MOF: www.mof.go.jp/public_relations/finance/201112e.pdf recon1: http://www.reconstruction.go.jp/ recon2: http://www.cas.go.jp/jp/fukkou/english/index.html recon3: www.reconstruction.go.jp/topics/doc/20110729houshin.pdf debris: http://kouikishori.env.go.jp/material/ SC: http://www.bousai.go.jp/jishin/chubou/higashinihon/index_higashi.html JSCE1: http://committees.jsce.or.jp/2011quake/node/86 news1: http://sankei.jp.msn.com/affairs/news/110327/dst11032712020031-n1.htm news2: http://sankei.jp.msn.com/economy/news/110605/biz11060523270007-n1.htm rekuzen: http://www.city.rikuzentakata.iwate.jp/kategorie/fukkou/fukkou-keikaku/fukkou-keikaku.html kesen: http://www.city.kesennuma.lg.jp/www/contents/1318004527115/index.html miyagi: http://www.pref.miyagi.jp/seisaku/sinsaihukkou/keikaku/index.htm ntt; http://www.keieiken.co.jp/monthly/2011/1109-04/index.html wiki: ja.wikipedia.org/wiki/東日本大震災に対する支援活動	
	Data/photos	<Photo> http://www.mod.go.jp/j/approach/defense/saigai/tohokuoki/photo_001.html http://www.pref.miyagi.jp/snd-doboku/ http://mainichi.jp/select/weathernews/20110311/etc/photo.html http://www.asahi.com/photonews/gallery/tsunami/ http://archive.shinsai.yahoo.co.jp/	

５）1995 年　阪神・淡路大震災

Item	Sub-item	Information	Data Source
Data on Hazard	Date and Time of Occurrence	5:46AM, January 17, 1995 (UTC: 20:46, Jan. 16, 1995)	CAO1
	Magnitude(source)	M 7.3 (JMA) M 6.9 (USGS)	CAO1 USGS
	Epicenter	The northern part of Awaji Island N34.36, E135.02, Depth: 16km (JMA) N34.58, E135.01, Depth: 22km (USGS)	CAO1 USGS
	Intensity of Shaking	JMA Intensity scale: 7 (Identified by the post-earthquake survey) Ground shaking were felt wide area of Japan	CAO1
	Ground Motion	Max. peak ground acceleration of 818gal was recorded at Kobe. Vertical and horizontal shaking occurred simultaneously. Strong shake continued 10 to 15 sec, and very strong shake (maximum shake) continued about 3 sec.	CAO1 CAO2
	Tsunami (maximum height)	No Tsunamis	
Data on Damages	Major Affected Area	Wide areas of Kinki not only Hyogo pref. but also Osaka and Kyoto were affected.　Especially, Kobe urban area along the fault line was severely affected.	CAO1
	Human Damage	Dead:　6,434 Missing:　3 Injured:　43,792 65years and more occupied half the number of the dead. Most of death: Crushing death, about 7 % of the death by fires Estimated time of death of more than 90% of deaths was before 6:00am which is just 15 min after the earthquake.	CAO1 Hyogo1
	Damage of Buildings	Complete destruction:　104,906 houses (186,175 households) Partial destruction:　144,274 houses (274,182 households) Partial damage:　390,506 houses Fully burned:　7,036 houses Partial burned:　96 houses	FDMA1
	Infrastructure/Lifeline Damage	Road - Highway:　Elevated Hanshin Expressway was collapsed. Most of highways and urban express ways were closed for traffic. - Road:　7,245 sections closed to traffic - Bridges:　330 bridges damaged - Rivers:　774 places (dykes and other facilities) damaged - Slope failure:　347 places Railway - Shinkansen:　Kyoto–Himeji (max.130km, Jan.17, Stop Operation) - Main lines:　88km (Stop Operation) - Urban commuters:　157km (Stop Operation) Major Port:　Kobe Port and Amagasaki-Nishinomiya-Ashiya Port stopped operation. Electricity:　2.6 million houses power outages (Jan. 17) Water Supply:　1.3 million houses out of water supply Gas:　860,000 houses out of supply Telephone:　more than 300,000 lines stop operation	FDMA1 CAO2 Hyogo2

Item	Sub-item	Information	Data Source
	Main Damage Cause	A lot of people were sleeping as the earthquake occurred in the early morning. Many people (70 to 80% of dead) were crushed by the old timbered houses or by furniture. On the other hand, not many people were outside and roads and railways were not clouded, this may be causes of decreasing damages outside houses.	Hyogo1
	Characteristics of Damages (Physical/Social Aspects)	Large-scale destructions by earthquake and fires were happened in the areas where old wooden houses were densely constructed. Severe damages on wooden buildings were found in the range of 6 to 7km form the fault line while fewer damages were found more than 10km away from the fault line. Damage on the public buildings was also remarkable, and 15 % of damaged non-residential buildings were public buildings. As many of public buildings were used for evacuation shelters, some damaged public buildings were used as emergency evacuation shelters without confirmation of safety. Significant damages on buildings that were constructed before 1981 were found and it was pointed out that there was a big difference in the earthquake resistance before and after enforcement of new building code in 1981. It was pointed out that severe damages concentrated to the "Inner-City" area. Meanwhile, severe damages also found in the areas where high income people lived. Many fires occurred in the area where earthquake intensity scale was more than 6, especially scale 7, and it was proportionate to the housing damage.	Hyogo3 CAO1
	Direct Economic Loss	Total: 9,927 trillion yen Buildings: 5,800 trillion yen Lifelines: 1,488 trillion yen Ports: 1,000 trillion yen Industry: 630 trillion yen Education/Culture 335 trillion yen Agriculture/Fishery/Forestry 118 trillion yen Medical and Social Services: 173 trillion yen Other Public Facilities 382 trillion yen	hyogo4
	Lessons Learned	In general, preparedness for super-scale earthquake was not enough. Revised building code enforced in 1981 worked. Revision of seismic design code for infrastructure is necessary.	NP

Item	Sub-item	Information	Data Source
Emergency Response	Rescue activities	Police: 4,500 police officers working for helping people per day (Jan.20 to Feb.28) 5,500 police officers were dispatched to the disaster area from other areas and total of 16,000 police officers were allocated to the disaster relief. Helicopters, mobile units and other cars and equipment were put in relief activities. Self Defense Force (SDF): About 4,500 SDF (GSDF and MSDF) were dispatched the disaster area on Jan.17 which included cars, ships, airplanes/helicopters and operation equipment. Max. 21,760 SDF/day worked not only for rescue but also removal of rubbles and disaster wastes. Fire and Disaster Management Agency: Total of 32,400 fire department officers were dispatched by the end of march for helping rescue and relief activities. Community Level firefighting organization: Members for the community level firefighting organization ware deployed for search and rescue, firefighting, guide for evacuation and patrol the area. Collaborative search and rescue activities with several organizations such as prefectural government, police, SDF and fire department were remarkable as this kind of collaboration have never happened in the previous disasters. Communities played very effective role in rescuing people especially in More than 70% of rescued people were rescued by community people.	CAO4
	Medical services	Medical service points were established by the Ministry of Welfare (161, currently Ministry of Health, Labour and Welfare), SDF (15), Red Cross (12), and other organizations. Public and private hospitals, universities, medical doctors association and other organizations dispatched doctors and medical staffs to the disaster area. On Feb.7, 1,730 doctors and medical staffs from outside of the disaster area worked for taking care of the pacients, and total of 75,000 medical staffs worked by the end of April. Travelling clinics were also operated by those medical staffs and volunteers.	CAO4
	Evacuation shelter	About 317,000 people (at the peak on Jan 23) were displaced in 1,153 evacuation shelters. Though, regional disaster contingency plans designated certain schools as evacuation centers but many residents went to schools or public facilities that nearest to their homes. Foods, water and other emergency relief goods were supplied, however despite to the government officials' effort, those goods were not smoothly provided to the emergency shelters due to lack of proper information on the shelters especially immediately after the disaster. Shelters were mainly operated by the On Aug. 20, 1995, all shelters were officially closed however even one year after the disaster, about 800 victims could not move to temporary house or other places and kept displaced in shelters.	CAO4

Item	Sub-item	Information	Data Source
	Food, water and other relief goods supply	Supply of foods, water and relief goods were mainly done by the local government with help of the line ministries of central government, SDF and other local governments. Even though securing water, foods and other relief goods was the local government responsibility, the local government could not secure required amount of supplies because the scale of disaster was extensive. Therefore, the central government played great role to secure it. Water supply at temporary water supply point was made by more than 800 water tender deployed from outside the disaster area and it was continued till April. Foods and relief goods for displaced people secured by local government were delivered through various channels including private companies and volunteers. Shops of the major retail industry re-opened relatively early and this greatly supported the victims' life because official supply of foods and goods were not so sufficient.	CAO4
	Information and communication (Information to the disaster victims)	Information for the disaster victims were mainly provided by the local government through various medias. Local governments opened "information centers" for handling numerous inquiries from the residents immediately after the disaster. The information centers opened around the clock and deployed staffs who can speak foreign language to address inquiries from the foreigners. Local government also continuously provided the information on damage, current situation of shelters, etc. through mass media such as newspaper, TV and Radio by holding periodical press conference and having regular programs. That information was also provided in several languages. To improve the accessibility to the information, local governments provided 15,000 portable radios to the disaster victims. Paper based information dissemination was also done by the local governments. These paper based information that covers all necessary information for the disaster victims were distributed to the evacuation shelters, public facilities, stations and shops. To provide area specific information, community FM Radio played big role and the disaster victims highly depend on it to get the information. Information for volunteers were provided through the office of prefectural government's volunteer promotion section and social welfare council. The office also acted as a center for volunteer registration, coordination and guidance.	CAO4
	Support from Private Companies	Not sufficient information on this item was found because at the time of the Great Hanshin-Awaji Earthquake, supports from private companies were made in ad hoc and voluntary basis and not systematically provide. After Great Hanshin-Awaji Earthquake, many discussions on cooperation between public and private company have been made.	-
	Support from abroad	70 countries and territories and 3 international agencies offered support and received the supports from 44 countries and territories by Feb. 9. Rescue teams from Switzerland, France and England (NGO) were worked on rescue and recovery of body. 8 medical teams from abroad were also worked in Kobe under exceptional treatment in case of emergency. It was pointed out that receiving assistances from abroad forced additional work to the people in affected area and there were some mismatch between actual needs at the affected area and support from abroad.	CAO4

Item	Sub-item	Information	Data Source
	Lessons Learned	◆ Importance of establishment of coordination mechanism between the agencies related to disaster relief before disasters. ◆ Necessity of strong coordination and collaboration during disaster relief ◆ Government staffs and governments' facilities also affected by the disaster and faced difficulties for emergency response. ◆ Importance of ensuring the means of communication and keep functioning of information systems. ◆ Necessity of designation of evacuation shelters and keep it functioning and sufficient stockpile of emergency relief goods ◆ Necessity of special attention and care to the vulnerable person to disaster and foreigners ◆ Necessity of mechanism to receive assistance (rescue, relief, medical) ◆ Importance of information dissemination both disaster area and outside of the affected areas that including abroad.	IRP CAO4
Recovery	Infrastructure/ Lifeline	Road - Highways and express ways were mostly restored in one to 8 month. Collapsed express way sections were fully restored one year and 8 months after the disaster. - Major parts of national roads were restored in a few days. Railway - Damaged section of Shinkansen (130km) was restored about 3 months after the disaster. - Main lines were also restored in 3 months after the disaster. - Urban commuters were gradually restored and fully restored in 7 months after the disaster. Electricity: 5 days after the disaster (except collapsed house) Water Supply: 40 days after the disaster (temporary restored) 3 month after the disaster (fully restored) Gas: 3 month after the disaster Telephone: Switching equipment - one day after the disaster Telephone line – 2 weeks after the disaster	Hyogo4
	Other services	No sufficient information	
	Temporary House	The temporary houses are provided to all the victims who lost their houses by the earthquake. Construction of the temporary houses was started about one month after the disaster, and total number of temporary houses constructed was 48,300 (46,617 ware occupied in Nov. 1995) in Hyogo pref. All residents of temporary house left in Jan. 2000, and all the temporary houses were broke down by the end of Mar. 2000. Some of the temporary houses that can be re-used were sent to other countries such as Turkey and Taiwan as temporary houses for the disaster victims.	hyogo4
	Disaster Waste/Debris	Total amount of the disaster waste produced by the disaster was estimated at the 20 billion tons (21.1 billion m^3) which was equivalent to the 9-years waste production of Hyogo pref. Those disaster wastes were transferred to Osaka Bay reclamation area and Awajishima reclamation area.	hyogo5
	Finance	Central gov. formed a supplementary budget of 1,022 trillion yen for construction of temporary houses, recovery for lifelines, roads, etc. and support of victim's daily life about one month after the earthquake.	CAO2
	Support from Private Companies	N/A	
	Support from Abroad	N/A	

Item	Sub-item	Information	Data Source
	Lessons Learned	Temporary housing Policies ◆ In temporary housing, community members and residents of the facilities should cooperate with one another and live autonomously. Coordination of various individuals, including volunteers, specialists and the government is indispensable to achieving this. ◆ Project has been undertaken for supporting the day-to-day lives of those living in emergency housing for disaster reconstruction. The underlying aims of the project is looking after the community and promoting social interaction. Various problems, however, have been pointed out, including the weakening of community ties. ◆ Securing emergency housing is an important first step in rebuilding housing for victims, but rebuilding their daily lives is essential to proceeding with full-fledged reconstruction of housing. ◆ It is therefore important to progress with securing and rebuilding housing in a way that value the ties among people. ◆ Some of the emergency housing units constructed after the earthquake that were capable of being reused were provided to Turkey and Taiwan as temporary housing for victims of disasters.	IRP
Reconstruction	Principles	Reconstruction principles of the Great Hanshin Awaji Earthquake and Law for reconstruction 1) Promote prompt recovery of livelihood, economy and building safe community by proper role allocation and collaborative work of central and national government with respecting the wishes of local residents 2) Through the abovementioned activities, re-create dynamic Kansai Area.	CAO2
	Key issues	(1) Support normalization of peoples' life in affected area (2) Disposal of disaster waste/debris (3) Measures for preventing secondary disaster (4) Rehabilitation of port function (5) Early recovery of infrastructure (6) Upgrade of earthquake resistance (7) Measures for housing (8) Urban development/improvement (9) Ensuring employment, preventing of unemployment (10) Enhancement of medical/health services and welfare (11) Early recovery of education facilities (12) Reconstruction of agriculture and fishery related facilities (13) Economic recovery (14) Cross-cutting measures for smooth recovery and reconstruction (15) Ensuring of safety and smooth traffic (16) Measures for disaster prevention/mitigation	CAO2
	Organizations	Headquarters for reconstruction of the Great Hanshin Awaji Earthquake Chairman: Prime Minister Members: Ministers Secretariat: Secretary of National Land Agency and Central government officers from related ministries. Other members: Hyogo Pref. gov., Kobe City gov., Economic Association, Chamber of commerce, etc. Reconstruction committee of the Great Hanshin Awaji Earthquake	CAO2

Item	Sub-item	Information	Data Source
	Finance	Central gov. formed a supplementary budget about 1,429 trillion yen for initial reconstruction activities after 3 month of the earthquake. (780 trillion yen spent directly by central gov. and remaining were spent as subsidy to the local gov. project) Central gov. continuously allocate budget for reconstruction activities. Central gov. directly spent 37 % of total amount for reconstruction of 16,300 trillion yen, but the central gov. also provides money for reconstruction as subsidy to the local gov., and as a result about 95% of reconstruction budget spent by the central gov. In addition, followings were made for promoting the reconstruction. - Establishment of special foundation for reconstruction - Issuance of local bonds - Special grants of the "local allocation tax"	CAO2 ESRI
	Support from Private Companies	N/A	
	Support from abroad	N/A	
	Reconstruction Schedule	Hyogo Prefecture Strategic project for reconstruction: 3 years ◆ Housing reconstruction Public: 80,500 houses, Private: 44,500 houses ◆ Industry recovery Recover to the same economy/industry production level before the earthquake ◆ Urgent infrastructure rehabilitation 5,700 trillion yen Project for reconstruction promotion: 10 years	CAO4
	Key Target, featured strategies/approaches etc.	Basic Issue for Reconstruction ◆ Livelihood recovery - Measures for making stable for the peoples' life - Create cultural environment ◆ Economic recovery - Ensure employment - Recover economy - Create more vital economic environment ◆ Create safe and attractive community - Create a base for disaster resistance, comfort and convenient area - Create environmental friendly and barrier free community for older and disability people	CAO4
	Economic Recovery	Economic indicators, such as population, industrial production index, number of tourists, job-offers-to-seekers ratio etc. were generally recovered to the level before the earthquake in ten years. For example, census at Nov 2001, population of the affected area exceed the one before the disaster	hyogo4
	Other Characteristics	N/A	

Item	Sub-item	Information	Data Source
	Lessons Learned	◆ Importance of community leaded and government assisted community/urban reconstruction for creating safer communities against disasters, which includes keeping community tie and community revitalization, ◆ Importance of continuous mental health care for disaster victims ◆ Necessity of continuous take care of elders and other vulnerable people ◆ Necessity of revision of design standard of facilities. (Revision of design seismic intensity for buildings and full-scale revision of design concept for civil engineering structures) ◆ Necessity of mechanisms that help individual/household level revitalization including funding for victims and employment measures. ◆ Necessity of establishment of mechanisms that promote the reconstruction such as establishment of a special foundation, enforcement of laws and regulations for economic revitalization, and measures for small and medium sized industry recovery, etc. ◆ Necessity of promotion of disaster education based on the lessons learned from the disaster and keep memorize the disaster. ◆ Necessity of laws and/or regulations that promote activities and participation of volunteers, NGOs/NPOs who would be indispensable to post disaster recovery activities.	Hyogo6
References	Reports	CAO1: http://www.bousai.go.jp/1info/kyoukun/hanshin_awaji/earthquake/index.html CAO2: http://www.bousai.go.jp/4fukkyu_fukkou/hanshin_awaji.html CAO3: http://www.bousai.go.jp/1info/kyoukun/hanshin_awaji/download/index.html CAO4: http://www.bousai.go.jp/kensho-hanshinawaji/chosa/index.htm USGS: http://earthquake.usgs.gov/earthquakes/world/events/1995_01_16.php hyogo1: http://web.pref.hyogo.jp/pa20/pa20_000000016.html hyogo2: http://web.pref.hyogo.jp/pa17/pa17_000000002.html hyogo3: http://web.pref.hyogo.jp/pa17/pa17_000000001.html hyogo4: http://web.pref.hyogo.jp/wd33/wd33_000000010.html hyogo5: http://www.lib.kobe-u.ac.jp/directory/eqb/book/4-367/index.html hyogo6: Hyogo Prefecture (2005) The Great Hanshin-Awaji Earthquake. The Report of the 10-Year Reconstruction hayashi: www.taiwan921.lib.ntu.edu.tw FDMA1: http://www.fdma.go.jp/detail/672.html NP : Special issue on report of Hanshin-Awaji Earthquake by the Kobe Shimbun (Newspaper) recon: Reconstruction principles of the Great Hanshin Awaji Earthquake and Law for reconstruction ESRI: www.esri.go.jp/jp/archive/hou/hou050/hou44-6-2.pdf IRP: http://www.recoveryplatform.org/assets/file/irp_casestudies/irp-cs-8-jpn.pdf	
	Data/photos	<Photos> http://www.city.kobe.lg.jp/safety/disaster/earthquake/earthquake03.html http://momo.nishi.or.jp/GIS/AppRoot/hisai_Phot/index.asp http://www.lib.kobe-u.ac.jp/eqb/dlib/eqbdlib-photo.html http://www.lib.kobe-u.ac.jp/directory/eqb/photo/maeda/index.html	

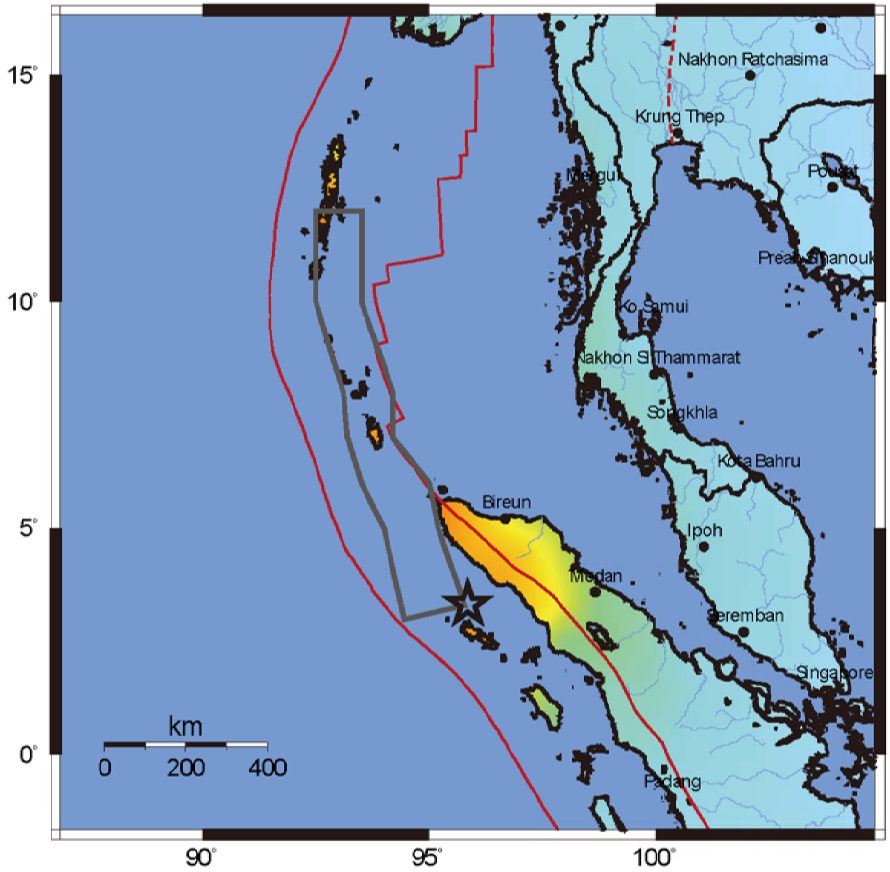
各国基礎情報　Basic Intelligence

国名		ハイチ共和国	中華人民共和国	インドネシア共和国	日本国
首都		ポルトープランス	北京	ジャカルタ	東京
人口		10.2 百万人（2011）	1,347.6 百万人（2011）	242.3 百万人（2011）	126.5 百万人（2011）
国土面積		27.6 千 km2	9,327.5 千 km^2	1,811.6 千 km^2	364.5 千 km^2
一人あたり GNI（PPP）		1,180（2009）	7,640 ドル（2010）	4,200 ドル（2010）	34,640 ドル（2010）
経済成長率（%、GDP、年率）		-5.1%（2010）	10.4%（2010）	6.1%（2010）	4.0%(2010)
産業構造（%、GDP）	第一次産業	N.A.	10%（2010）	15%（2010）	1%（2009）
	第二次産業	N.A.	47%（2010）	47%（2010）	27%（2009）
	第三次産業	N.A.	43%（2010）	38%（2010）	72%（2009）
失業率		N.A.	4.3%（2010）	7.9%（2010）	5.0%（2010）
貧困人口割合（1 日あたり 1.25＄（PPP）以下）		54.9%	15.9%（2005）	18.7%（2009）	N.A.
平均寿命		61 歳（2010）	73 歳（2010）	68 歳（2010）	83 歳（2010）
乳幼児死亡率（5 歳以下）		165‰（2010）	18‰（2010）	35‰（2010）	3‰（2010）
中等教育男女比率（女性／男性）		0.619（2010）	0.778（2010）	0.778（2010）	0.972（2010）
政治・経済の経緯		1804：フランスから独立（ラテンアメリカ初） 1915：アメリカによる占領（1934 撤退） 1990：初の民主選挙実施 2004：国連ハイチ安定化ミッション 2006：新政権発足	1949：中国共産党により建国 1978：鄧小平による改革開放 1997：香港返還 2010：GDP 世界第 2 位	1945：日本から独立 1949：オランダから独立承認 1967：ASEAN 発足・加盟 1999：G20 開催・加盟 東ティモール独立	1868：新政権設立、近代着手 1945：第 2 次世界大戦敗戦 1968：GNP 世界第 2 位 1995：バブル崩壊、経済低迷
現在の主要課題		・厳しい貧困状態 ・農業生産性が低く、食糧需要を輸入と援助に依存 ・依然として政権が不安定	・都市・農村の格差拡大 ・国内の分離・独立運動 ・金融、エネルギー、環境、社会保障等における不安	・民族・宗教による分離・独立問題 ・イスラム過激派によるテロ活動	・巨額の財政赤字 ・年金、医療費支出の増大 ・少子高齢化の進展 ・製造業の競争力の低下
自然災害の状況	概要	2010 年の震災被害以外では、ほとんどが台風、洪水により被害を受けている。	地震、極端な気候変化、洪水、暴風、高潮、森林火災、干ばつ、虫害、地滑り・斜面崩壊 など多種多様な災害が起きている。とりわけ、地震、干ばつ、台風により大きな被害が出ている。	洪水、地すべり、旱魃、津波、地震、火山活動、山火事が主な脅威である。特に洪水、地震が頻発している。	毎年、台風に見舞われる他、多くの火山を有し、噴火現象や火山性地震等による火山災害が発生する。4 枚のプレートが入り組む地形となっているため、地震が多い。
自然災害の状況	地震	2010 年の地震以前には、主に 1842 年キャプ・ハイチェン地震（死者 5000 人以上）、1946 年ドミニカ共和国地震の被害を受けた他、ほとんど大規模な地震は発生しておらず、被害を受けていなかった。	1920 年海原大地震で死者 20～24 万人、1976 年唐山地震で死者 24～78 万人の被害を受けている。2008 年四川大地震は唐山地震以来の大規模地震被害であり死者約 6.8 万人の被害を受けた。	2000 年代まで死者 100～1,000 名程度の地震被害を受けてきたが、2004 年スマトラ地震（死者 1,001 名）以降巨大地震が頻発し、2005 年スマトラ地震（死者 1,303 名）、2006 年ジャワ地震・津波（死者 5,749 名）、2009 年スマトラ地震（死者 1,117 名）と大きな被害を受けている。	1923 年関東大震災により甚大な被害。以降、耐震建築などに取り組む。毎年、M7 クラスの地震が発生。1945 年南海地震、1946 年東南海地震以降は、毎年死者数 0～100 名程度。1995 年阪神･淡路大震災により犠牲者 6,434 名。

国名		ハイチ共和国	中華人民共和国	インドネシア共和国	日本国
	津波	1842 年キャプ・ハイチェン地震による津波（死者約 300 名）、1946 年ドミニカ共和国地震による津波（死者 1,790 名）の他にはほとんど被害を受けていない。		2004 年スマトラ地震では（死者 22 万人以上）と非常に大規模な被害を受けた他、1979 年レンバタ島津波（死者 1,465 名）、1992 年フローレス島地震・津波（死者 1,169 名）、2006 年ジャワ島地震・津波（死者 802 名）と地震に伴う大きな津波被害を受けている。	明治三陸津波、昭和三陸津波など甚大な被害を受けた。1960 年チリ地震の際には三陸地方で 142 名が死亡した。最近では 1993 年、北海道南西沖津波により犠牲者 109 名。
	火山噴火			150 の火山が活動。近年の火山被害は、2010 年ムラピ山（死者 322 名）、2007 年ケルート火山（避難者 30,000 名）など。	108 の火山が活動。近年の火山被害は、1989～1995 年雲仙普賢岳（死者 44 名）、2000 年有珠山（避難者 16,000 名）など。
	風水害	2004 年ジーンにより 5000 人以上が犠牲となった他、2008 年にはフェイ、グスタフ、ハンナ、アイクが推定 9 億ドルの被害を出した。	2006 年ビリスにより死者・行方不明者 820 名、被災者 2,962 万人の被害を受けた他、例年百～千数百人の死者、数百万人以上の被災者を出している。		毎年、台風が襲来。被害は、伊勢湾台風（1964 年、死者 4,697 名）、狩野川台風（1958 年、犠牲者 1,269 名）以降は、毎年犠牲者数名～数十名程度。
	洪水	1960 年に死者 500 人、2004 年に死者 2665 名の被害を受けた他、例年死者十～数十人の被害を出している。	1887 年黄河洪水で死者 90～200 万名、 1931 年中国洪水で死者 100～250 万名、1938 年黄河洪水で死者 50～70 万名と大きな被害を受けている。	2006 年に死者 645 名の被害を出した他、例年 100～数百名の被害を出している。	
自然災害の死者数（100 万人あたりの年平均人数（1960-2010 年））		485.2 人 地震：436.7 人、洪水：9.8 人、風水害：38.7 人、干ばつ：0 人	8.4 人 地震：7.4 人、洪水：0.7 人、風水害：0.2 人、干ばつ：0.1 人	19.2 人 地震：16.1 人、火山：0.6 人、洪水：0.7 人、風水害：0.3 人、干ばつ：1.6 人	2.1 人 地震：1.0 人、火山 0.0 人、洪水：0.4 人、風水害：0.7 人
自然災害の被災者数（100 万人あたりの年平均人数（1960-2010 年））		29,367.7 人 地震：7,259.8 人、洪水：1,591.6 人、風水害：12,914.2 人、干ばつ：7,602.1 人	24,671.4 人 地震：1,043.0 人、洪水：10,028.2 人、風水害：6,759.8 人、干ばつ：6,840.4 人	2,613.8 人 地震：807.7 人、火山：153.3 人、洪水：956.0 人、風水害：2.3 人、干ばつ：694.5 人	1,469.0 人 地震：128.8 人、火山：16.0 人、洪水：983.1 人、風水害：341.1 人
防災関係法令			1998：中華人民共和国防震減災法 1994：地震監視施設と地震観測環境の保護条例 1995：破壊的地震に対する緊急対策条例 1998：地震予報管理条例 1999：地震行政法執行規定	2007：防災法第 24 号（Disaster Management Law No. 24）	1961：災害対策基本法（防災対策の基本的枠組み） 1897：砂防法（土砂災害対策） 1950：建築基準法（建築確認、建築基準など） 1964：河川法（治水対策、利水） 1978：大規模地震対策特別措置法（地震観測の強化、警戒宣言の発令）
建築許可制度の有無				建築法（2002 年）及び地方税・手数料法（1997 年）	・建築基準法（建築確認）
建築物の耐震基準の有無			・Code for Seismic Design of Buildings GB50011-2001（2008 年更新）	・The Indonesian Seismic Code (SNI-03-1726-2002)（2002 年更新） ・公共事業大臣令 2006-19（2006 年）	・建築基準法（耐震基準については 2000 年更新）

2011 Great East Japan, 2010 Haiti, 2008 Wenchuan(Sichuan), 2004 Sumatra, 1995 Great Hanshin-Awaji Intensity Map (USGS)

2004 Sumatra
Dec.26.2004 07:58:01 UTC+7
M 9.1



2008 Wenchuan (Sichuan)
May.12.2008 14:28:01 UTC+8
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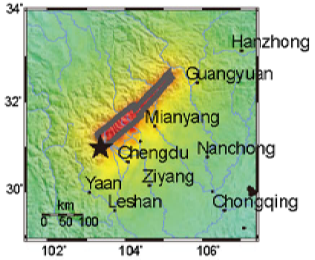

2011 Great East Japan
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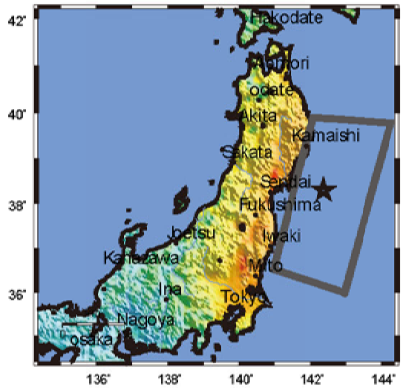
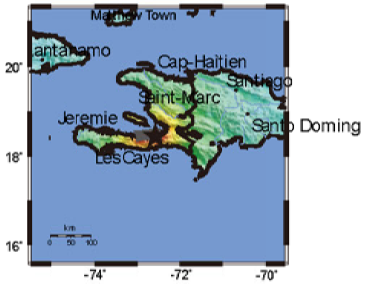
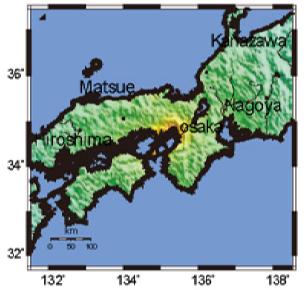
M 9.0



2010 Haiti
Jan.12.2010 16:53:10 UTC-5
M 7.0

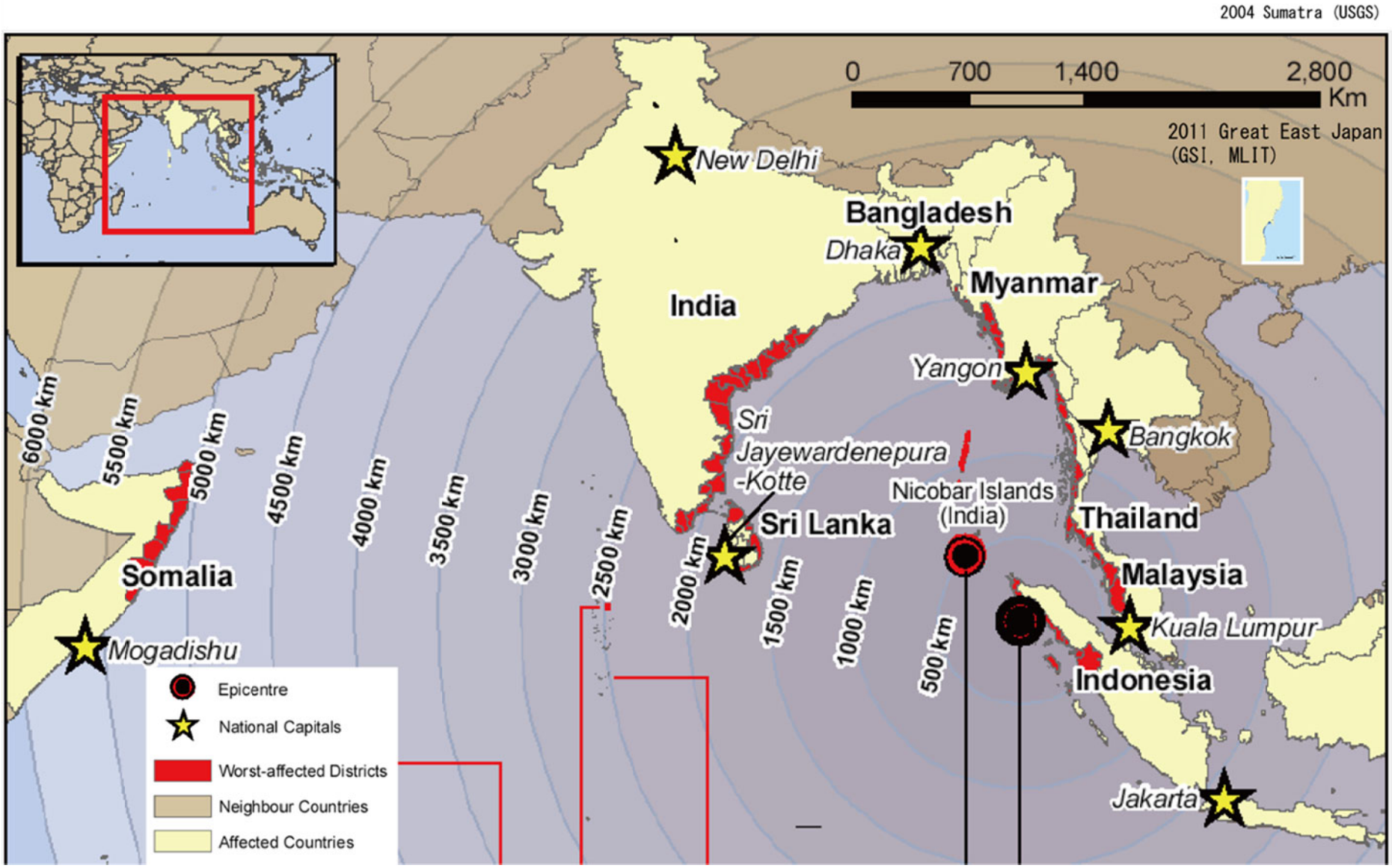


1995 Great Hanshn-Awaji
Jan.17.1995 05:46:52 UTC+9
M 6.9



INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy

2004 Sumatra, 2011 Great East Japan Tsunami Affected Area



２．国際シンポジウム発表資料

（１）趣旨説明　近年の世界の巨大震災と復興の状況

（独立行政法人 国際協力機構　国際協力専門員　楢府龍雄）

International Symposium on
Sustainable Reconstruction from Super Disasters

Explanatory Introduction
趣旨説明：近年の世界の巨大震災と復興の状況

February 22, 2012
At Sokairo-Hall,
National Graduate Institute for Policy Studies (GRIPS),
Minato-ku, Tokyo, Japan

Dr. Tatsuo Narafu
Senior Advisor,
Japan International Cooperation Agency (JICA)

Devastating damages by the Great East Japan Earthquake （東日本大震災による甚大な被害）

写真：国際協力機構

Disaster risk （災害危険性）

- Disaster risk is defined by Hazard, Vulnerability and Management capacity （災害危険性は、自然災害、脆弱性、対応力によって変化する）
- Vulnerability which led to devastating damage by the Great East Japan EQ are not only the huge hazard but also;
  - large population living the tsunami prone area
  - properties and industries accumulated
  （東日本大震災による甚大な被害の要因の一つ：津波危険地域への人、物、業務の蓄積）
- Vulnerability and management capacity differs from country to country

Reduction of future disaster risk
将来の災害危険性の低減の取り組み

- We can reduce future risk by
  - increasing management capacity
  - reducing vulnerability
  （将来の災害危険性は、脆弱性の減少と防災能力の向上により実現する）
- Reconstruction phase provides critical opportunity to build up more resilient society (build back better) with lessons learned from latest experiences （災害復興は、将来の災害危険性低減の極めて貴重な機会）
- Vulnerability, management capacity and possibility of reduction of future disaster risk is different from country to country reflecting its social and economical conditions (脆弱性、防災能力、将来の災害危険性低減は、各国の経済社会条件により異なる)
- Comparison of super-disasters in different socio-economical conditions allows us to understand better （近年の巨大災害を比較することにより、災害、将来の防災についての深い理解が期待できる）

Comparison of recent super-disasters
本シンポジウムの趣旨：近年の巨大災害とその復興状況についての比較

- Reports on recent super-disasters and reconstruction （近年の世界の巨大災害についての報告）
  - 2011 Great East Japan Earthquake
  - 2010 Haiti Earthquake
  - 2008 Wenchuan
  - 2004 Indian Ocean EQ and tsunami
  - 1995 Great Hanshin-Awaji EQ
- Presentation on viewpoints/issues for comparison （比較を行う場合の視点/側面についての提起）
  - reality of reconstruction from viewpoint of people and community （コミュニティの視点から見た実態）
  - Gender and social inclusion （ジェンダー、社会包摂）
  - building and urban development （建物、まちづくり）
  - international viewpoint （国際的な視点）
- Discussion based on comparison will clarify factors which influence vulnerability and management capacity, and constraints for reconstruction （比較に基づく議論による検討の深化を期待）

Difficulties of reconstruction
Dilemma on safety and convenience of daily life
（復興の難しさ：安全性と利便性のジレンマなど）

- Many people work in fishery and harbor （多くが漁業、港湾業務に従事）
- High construction cost for new area of elevated level （高台移転のコスト）
- Increasing risk of high tide caused by destruction of dykes and subsidence （地盤沈下、堤防の崩壊による危険性）

2012. 2 Onagawa, Miyagi (宮城県女川2012年2月)

Difficulties of reconstruction "Build back Better" is not an easy job （"より安全なまちづくり"は、簡単ではない）

- Urgent needs of affected people （被災者の緊急のニーズ）
- Local housing supply sectors usually damaged by disasters （住宅供給セクターの被災）
- Serious risks other than future earthquakes like loss of income, hunger, epidemic diseases etc. （被災者を悩ます他の深刻なリスク）

Collapsed reconstruction project houses

Handout to audience （本日の配布資料）

- **Table of brief information of four countries** (Haiti, China, Indonesia, and Japan) （各国基礎情報）
- **Table of brief information on each of super disasters** (2010 Haiti, 2008 Wenchuan, 2004 Indian Ocean EQ and tsunami, 2011 Great East Japan EQ and 1995 Hanshin-Awaji EQ) complied from reports by invited speakers （巨大災害の一覧表）
- **Maps of super-disasters on same scale** （巨大災害の地図：同一スケール）(distribution of shaking motion intensity and tsunami attack)
- **Presentation materials of each of presentations** （プレゼンテーションのスライド）

A bit from the handout（配布資料（各国基礎情報）より）

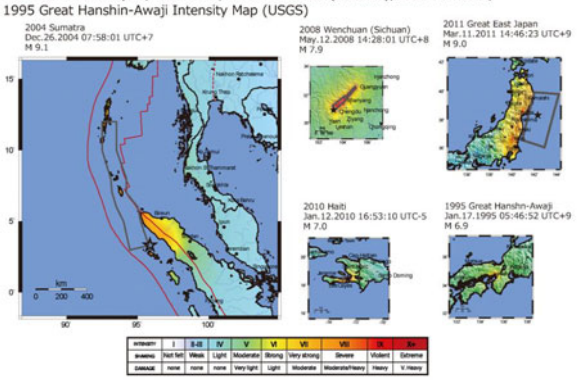
- **Population:**（人口）
  Haiti 10 million – China 1.3 billion (130 times)
- **GNI per capita:**（一人当たりのGNI）
  Haiti 1.2 thousand US$ - Japan 35 thousand US$ (30 times)
- **Poverty factor** (income less than $1.25) :（貧困指標）
  Haiti 55% - China 16% - Japan NA

- **Major disasters:**（各国の主要な自然災害）
  - China, Indonesia and Japan:
various disasters like earthquakes, tsunami, flood, volcanoes, land slides
  - Haiti:
hurricanes, floods. Earthquakes occur less frequent

Earthquakes for recent 30 years (1977-2007)

Earthquake Research Institute, University of Tokyo

2011 Great East Japan, 2010 Haiti, 2008 Wenchuan(Sichuan), 2004 Sumatra, 1995 Great Hanshin-Awaji Intensity Map (USGS)



Data: USGS

A bit from the handout（配布資料（各国基礎情報）より）

Super-disasters	2010 Haiti	2008 China	2004 Indonesia	2011 East Japan	1995 Hanshin
Magnitude	7.0	7.9	9.1	9.0	6.9
Intensity of shaking motion	Extremely strong (10)	Extremely strong (10)	Severe (Soloview: 4)	Extremely strong (JMA:7)	Extremely strong (JMA:7)
Major cause of damage	Ground shaking	Ground shaking	Tsunami	Tsunami	Ground shaking
Dead/missing Injured (thousand)	230 100	88 375	221 -	19 6	6 44
Buildings(thousand) Complete Partial	105 208	Total 4,140	237	128 705	112 535
Economical loss (billion US$)	8	124	5	211	124

Remarkable respects/aspects of each super-disasters
各巨大災害の特徴的な事項

- **2010 Haiti**
  - Extreme vulnerability of construction – poor materials and workmanship, very long return period of earthquakes etc.（ハイチ：構造物の際立った脆弱性）
- **2008 China**
  - Vulnerability of structures attains to poor enforcement of building codes especially for rural buildings and low level of expected scale of earthquake
  - The framework of ""one province to one county" works well
（中国：基準の執行と低めの想定災害による構造物の脆弱性、"非被災の省が、被災県を支援"が有効に機能）
- **2004 Indonesia**
  - Far reaching damage by the tsunami to Thailand, Sri Lanka, India and even far to eastern Africa
  - No early warning system of tsunami in Indian Ocean caused serious
  - Friction with anti-central government group eased
（インドネシア：広大な地域への津波被害、津波警報システムンの未整備、反政府勢力との融和）

Remarkable respects/aspects of each super-disasters各巨大災害の特徴的な事項

- **1995 Hanshin-Awaji earthquake**（阪神淡路大震災）
  - Preparedness for super-disasters was not enough（巨大災害への対策が不十分）
  - Revision of seismic design code for infrastructures was require（土木構造物の耐震基準の見直し）
  - Retrofitting-reinforcing of old sub-standard buildings/houses was recognized urgent（旧基準の古い建物の補強の必要性）
  - Special attention and care is recognized necessary to vulnerable people such as disabled, sick persons, elderly, foreigners etc.（災害弱者への配慮）
  - Keeping ties/human relations of communities is important in reconstruction（コミュニティの維持）
  - Psychological care/trauma is found important（こころのケア）
- **2011 East Japan Earthquake**（東日本大震災）
  - Gap between pre-disaster assumption and the actual hazard emerged（想定された以上の災害の発生）
  - The way/system of tsunami warning should be improved（津波警報の発令方法の改善）
  - Disaster management for super-disasters needs to be reviewed fundamentally（巨大災害への対策の抜本的な見直し）

Different Aspects of Reconstruction
復興に関する側面（今回の企画、準備を通じて認識したこと）

- **Aspects which could be reconstructed in short period**
  - buildings, infrastructures, etc.
（比較的確実に実行できるハード施設の復興）
- **Aspects which need longer period in case of the Hanshin-Awaji Earthquake**
（長期間を要する復興：阪神淡路大震災の事例から）
  - people who lost their families become old and have difficulties to live without support
（家族を失った被災者の高齢化、要介護化）
  - contract of rental houses for reconstruction project will terminate in several years, which will result affected people live there will have to leave for new houses
（借り上げ復興住宅の期限の終了）
  - local manufacturers still suffer from large debts which they borrow to reconstruct their factories after the disaster
（被災時の借入金による企業経営の圧迫）
  - Kobe harbor lost its customers during reconstruction period and could not recover until now, which result less job opportunities of harbor workers
（神戸港のシェア低迷による経済、雇用への影響）

International cooperation　国際協力

- International cooperation in emergency response and recovery becomes usual
（緊急援助、応急対応についての国際協力は一般化）
- International cooperation in prevention/reduction of future risks is expected
（今後、災害予防についての国際協力が期待される）

"Prevention is better than cure"(予防は治療にまさる)

（２）2010 年ハイチ地震災害（ハイチ公共事業・輸送・通信省　フィリッツ・オプラン）

HAÏTI

International Symposium on Sustainable Reconstruction from Super Earthquake Disasters at JAPAN

Mr. Fritz Auplan

Ministry of Public Works, Transportation, and Communication Haiti
Technical Office of Building Rating Direction of Public Works

1

Contents

2

HAÏTI

LOCATION

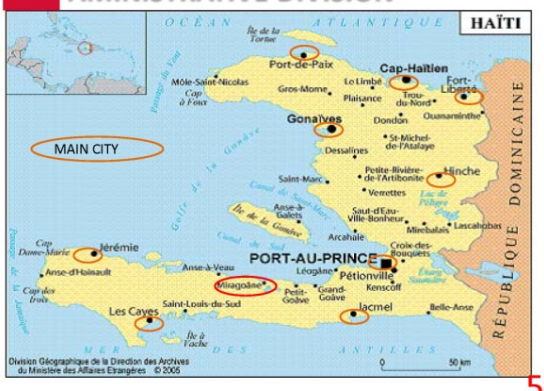
3

HAITI AT A GLANCE

CAPITAL	Port-au-Prince
SURFACE AREA	27 750 km²
CLIMATE	CITIES: 25° < T <30° MOUNTAINS: 15° < T <20°
POPULATION	10 000 000 (363/km2)
LANGUAGES	CREOLE - FRENCH
RELIGION	- CATHOLICISM -VODOU -PROTESTANTISM

4

AMINISTRATIVE DIVISION



5

HISTORICAL OVERVIEW

- NATIVES PEOPLE < 1492
- 1492 → ARRIVAL OF THE SPANISH
- 50 YEARS LATER → The natives disappeared
- 1697 → FRENCH ARRIVAL
- 1791 → SLAVES REVOLT
- 14 YEARS LATER → FREEDOM AFTER A BLOODY WAR.

6

MAIN INDUSTRY

- THE TOURISME
  - GOOD CLIMATE
  - BEAUTIFUL BEACHES
  - BEAUTIFUL PLANTS
  - MANY CULTURES

7

BEACH (AT JACMEL)

8

BEACH (AT PETIT GOAVE)

9

BEAUTIFUL PLANT (AT PORT-SALUT)

10

BEACH

11

HAÏTI AND EARTHQUAKE DISASTER

21/ 11/ 1751	Port –au-Prince WAS DESTROYED
19 YEARS LATER	
3 / 06/ 1770	Port –au-Prince AND TWO OTHERS CITIES DESTROYED
117 YEARS LATER	
23 /09/ 1887	THE NORDWEST WAS SEVERLY AFFECTED
55 YEARS LATER	
7/ 06/ 1942	THE NORTH OF HAITI WAS SEVERLY AFFECTED
29 YEARS LATER	
21 /08 /1971	ALL THE COUNTRY WAS SHAKEN

12

12 JANUARY 2010 EVENT

DATE AND TIME	16:50 on Tuesday
MAGNITUDE	7.0
INTENSITY(MMI)	VIII
AFTERSHOCKS	52 (4.2 < M < 5.9)
CASUALITY	230 000
INJURING	300 000

13

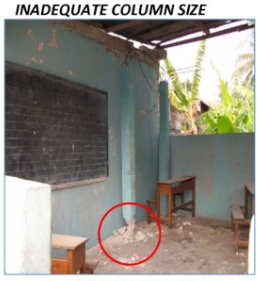
12 JANUARY 2010 EVENT

HOMELESS	1.3 MILLION

14

DESIGN DEFECTS

INADEQUATE COLUMN SIZE



FLEXURAL FAILLURE

SHORT COLUMN

SHEAR FAILLURE

15

MAIN DAMAGE CAUSE

- LACK OF SIGNIFICANT SEISMIC ACTIVITY
- LACK OF SEISMIC ENGINEERING CODE
- LACK OF A PROPER QUALITYY CONTROL
- HIGH DENSITY OF POPULATION AROUND THE CAPITAL

16

DESIGN DEFECTS

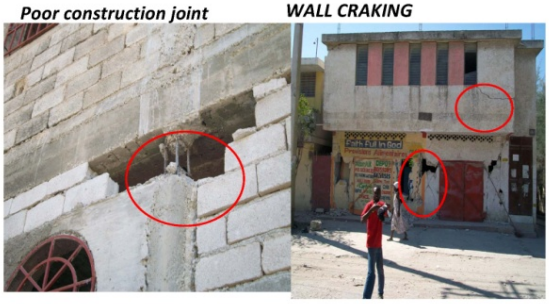
CAPTIVE COLUMN

SHEAR FAILLURE

17

CONSTRUCTION DEFECTS

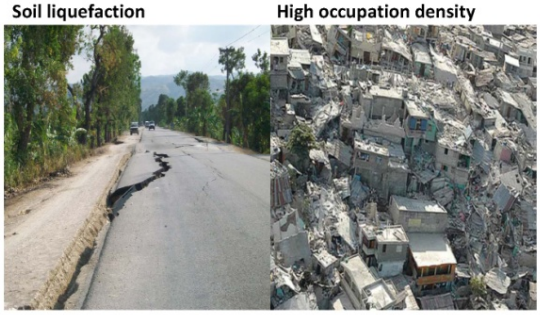
Poor construction joint ***WALL CRAKING***



18

MAIN DAMAGE CAUSE

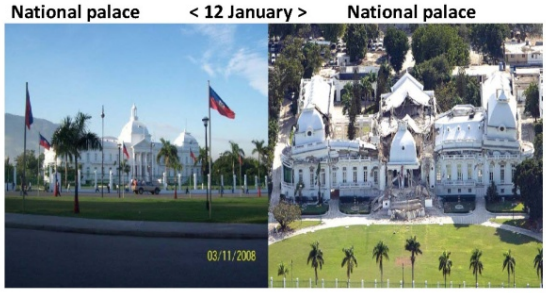
Soil liquefaction **High occupation density**



19

12 JANUARY 2010 EVENT

National palace **< 12 January >** **National palace**



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ECONOMIC LOSS

TOTAL	$US 8 BILLIONS
Infrastructure, including housing	57.2 %
Social	19.4%
Production sectors	17%
Education/culture	6.1%
Health	6%
Environment	6.4%
Water/Sanitation	3%
Food safety/nutrition	4.2%

21

EMERGENCY RESPONSE

- **Rescue of people trapped under debris** started by local community helped after by the foreign staff.
- **Promote the rescue movement** : cleaning the main streets headed by the government.
- **Medical care** started by Local community and Private sector, headed after by Government and International Community.

Local Community, Private sector, Government	25%
International Community	75%

22

EMERGENCY RESPONSE

- **Evacuation shelter**: this issue was very difficult for all sectors. Some people built their shelter with what they could find.
- **Food** was distributed by the humanitarian agencies
- **Water** was distributed by the Government (DINEPA fortunately not affected)
- **Information and Communication**: ***Private medias*** shared the government decisions in response to the event. ***International medias*** stimulated immediate action by the international community.

23

RECOVERY

- MENFP started with the scholar activities three months later
- MTPTC dredged rivers and drainage canals to cope the cyclonic season and protect the people in the campsites.
- MTPTC created BETEB a dedicated agency charged to assess damage to all buildings in earthquake-affected areas, develop criteria for repair and reconstruction, provide reconstruction quality control with the procedure follows:

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RECOVERY

DAMAGE ASSESSEMENT METHODOLOGY:

➢ ***Evaluation methodology ATC-20 adapted to Haitian practices***:

- Examine the exterior of the building
- Check the movement of soil
- Back to the interior if possible
- Discuss the comments
- Signpost the building:

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RECOVERY

Signpost the building:

- The healthy building received a green label(the building is structurally undamaged)
- One that deserved some-unfriendly, receives a yellow label (restricted entry)
- One that presented serious plastic damage and can collapse at any time received a red . (unsafe, not can be used)
- Explained the phenomenon to the occupants and tell them how to behave.

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EMERGENCY RESPONSE

Map of Port-au-Prince area showing green-, yellow- , red-tagged building.

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EMERGENCY RESPONSE

SECOND STEP : ***Detailed engineering assessments***

➢ This step aimed to assess the yellow houses once again

➢ Every damage is measured and classified.

➢ The house received a label blue.

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RECONSTRUCTION PRINCIPLES

- ➢ Leadership and mutual accountability
- ➢ Decentralization and equal growth
- ➢ Commitment to modernization
- ➢ Haitian- led
- ➢ Independence from international aid.

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RECONSTRUCTION KEY ISSUES

- ➢ How to protect Haiti against natural disaster?
- ➢ How to improve the quality of live in Haiti?
- ➢ What we want to become?

30

STRATEGIES/APPROACHES

- ➢ INCLUDING ENVIRONMENTAL ASPECTS IN ALL DECISIONS
- ➢ INTEGRATING RISK DISASTER MANAGEMENT IN ALL SECTORS AND IN ALL RECONSTRUCTION ACTIVITIES
- ➢ UNDERTAKING THE DECENTRALIZATION OF THE BASIC SERVICE
- ➢ ESTABLISHING AN ACTIVE POLICY SUPPORTING MICRO-ENTREPRISES
- ➢ INITIATING SOCIALSAFETY FOR THE POOREST

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HAITI RECONSTRUCTION FUND

- ➢ INTERNATIONAL COMMUNITY
- ➢ NGOs
- ➢ GOVERNMENT
- ➢ PRIVATE SECTOR

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LESSONS LEARNED

- WE SHOULD ALWAYS IMAGINE AND DEVELOP STRATEGIES AGAINST NATURAL DISASTERS.
- IN DISASTER MANAGEMENT POLICY LOCAL COMMUNITY IS VERY IMPORTANT.
- UNREINFORCED MASONERY WALL AND NONDUCTILTE CONCRETE CONSTRUCTION ARE VERY VULNERABLE TO EARTQUAKE DAMAGE.
- DECENTRALIZATION IS VERY IMPORTANT FOR THE DEVELOPING COUNTRIES.

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COCLUSION

- NATURAL HAZARDS ARE ALWAYS SOMEHERE ALL OVER THE WORLD. WE CAN NOT FORGET THEM.
- I THINK THAT THIS KIND OF MEETING , THIS SYMPOSIUM CAN HELP THE COUNTRIES NOT TO FORGET NATURAL HAZARDS AND NATURAL DISASTER.

THANK YOU

34

（３）四川地震災害（北京師範大学　壹基金公益研究院　院長　ワン・ツエンヤオ）

China Philanthropy Research Institute

Lessons of Reconstruction from Sichuan Earthquake Disaster

Dr. Wang Zhenyao
Dean, Philanthropy Research Institute,
Beijing Normal University, China
February 21, 2012 Tokyo, Japan

Feb. 21, 2012 1

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I. The serious situations of Sichuan Earthquake

Feb. 21, 2012 2

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Aerial photograph: Yingxiu Town of Wenchuan County on May 14

Feb. 21, 2012 3

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The terrain of the vast affected area is complex, limiting the efficiency of rescue efforts

A collapsed bridge on the way to Wenchuan on May 16

Collapsed buildings

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Quake-afflicted people were removed

A bird's-eye view of the affected area

the quake-afflicted people were facing great difficulties

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5.12 Wenchuan Earthquake

- The Great Wenchuan Earthquake that measured at 8 Ms occurred at 14:28 on May 12, 2008,with its tremors extending to 48810 villages, 4667 towns, 417 counties and cities in 10 provinces including Sichuan, Gansu, Shaanxi, Chongqing, Yunnan, Henan, Hubei, Guizhou, Hunan and Shanxi.
- 15.1 million people were forced to relocate immediately. The severely quake-strickenarea exceeds 116,700 square kilometers.

Feb. 21, 2012 6

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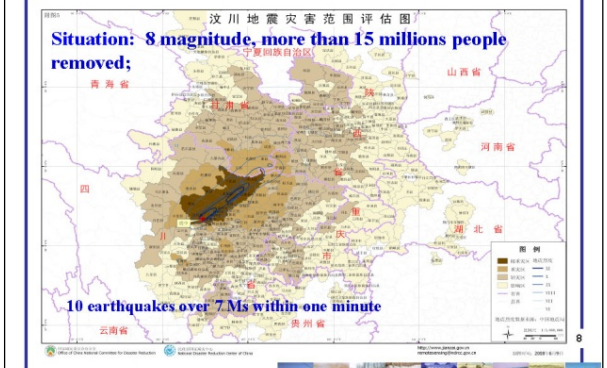
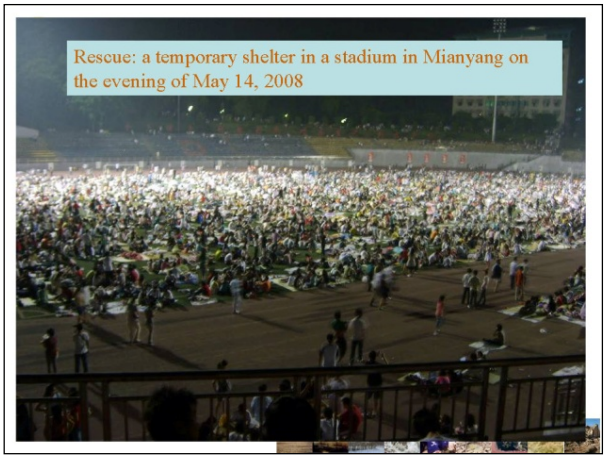
Big Challenge to China

- 69,227 people are reported dead and 17,923 people are listed as missing. The economic loss run higher than 1 trillion yuan.
- Western district is very poor. The local governments could not reconstruct independently;
- The situation is dangerous because too many people were waiting!

Feb. 21, 2012



Feb. 21, 2012


Rescue: a temporary shelter in a stadium in Mianyang on the evening of May 14, 2008

China Philanthropy Research Institute

Roads at northwest were blocked for 3 months and 20 days!!!

- The Yingxiu-Wenchuan Road was finally cleared on Sept. 2, which was already 3 months and 20 days after the Earthquake.
- Before Sept.2, people had to make a **800-km detour** and climb over snow-capped mountains to reach Wenchuan from Chengdu.

10

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But as a result, at the end of September, 2010, the main task of rehabiliyation already finished.

1908.5 thousand rural households and 288.3 thousand urban households, 3839 schools, 2169 hospitals and other medical buildings, and 5000 different infrustructures alredy finished in Sichuan, Shaanxi and Gansu.

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Why so fast?

Six lessons

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Lesson one, central government were responsible for the reconstruction.

- In the emergence response, the Central government decided to form a general headquarter of earthquake relief .
- The headquarter decided to set up a frontline general command office in Chengdu on May 15th to coordinate frontline relief efforts.

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"Act of Disaster Management and Reconstruction of Sichuan Earthquake" was announced earlier by State Council, systematizing and standardizing post-disaster reconstruction

- The Act published on June 8 plays a positive effect on the systematization of the post-disaster reconstruction.
- It's the first time in China to publish the Act of Reconstruction.

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Lesson two, earlier announced the central budget standard to disaster people.

one household ten thousand yuan, and it is double than before.

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Formulating new policy for three-month temporary aid

- On May 20th , the general headquarters decided to issue temporary life assistance to people in straitened circumstances who had no room to live in, no capital goods and no source of income for 3 months.
- The standard was 10-yuan grants and 0.5kg processed grain per person per day; in this way the affected people in straitened circumstances would get a little more than the one-dollar international minimum standard of relief;

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The high standard for rural housing reconstruction

- In the middle of June, it was decided that the central government should spend 40 billion yuan, including 35 billion yuan in Sichuan, 3.8 billion yuan in Gansu,1 billion yuan in Shanxi, and 100 million yuan in Chongqing and Yunnan each.
- **Local governments should ensure that disaster-afflicted people can get a subsidy of 20,000 yuan per household.**

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The mechanism of urgently starting to construct the temporary shelter

- On May 20th, the headquarters decided to purchase 900,000 tents and tarpaulins and thousands of tons of awning cloth urgently and required it to be done by June 20; the headquarters decided to purchase 1 million mobile rooms and each province should start to help the rebuilding efforts in certain counties that they supported,in order to fully guarantee the temporary shelter for the victims
- Sichuan Province was also determined to issue 2000 RMB subsidies to every farmer household who built temporary shelters for themselves to encourage farmers to build temporary shelters for themselves.

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Lesson three, established the special partnership

"big help small"

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"one province to help a severely affected county "

- In the process of emergency rescue, the Ministry of Civil Affairs set up an emergency support system on May 21st: one province supporting a county, playing a very positive role in stabilizing the situation in disaster areas.
- On June 11th, the central government decided to set up a comprehensive "one province to help a severely affected county " reconstruction counterpart support system. The central government required that the support provinces' corresponding support relief work load should not be less than 1% of the local fiscal revenue of the year before. Henceforth the mechanism of 18 provinces and cities supporting 18 counties in Sichuan province, Tianjin supporting Shanxi Province, Shenzhen supporting Gansu province.

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18 provinces to severely affected counties in Sichuan province

广东—汶川 山东—北川 浙江—青川 江苏—绵竹
上海—都江堰 北京—什邡 河南—江油 河北—平武 辽宁—安县
福建—彭州 山西—茂县 湖南—理县 吉林—黑水 安徽—松潘
江西—小金 湖北—汉源 重庆—崇州 黑龙江—剑阁

Guangdong province (mainly Shenzhen)---severely affected areas of Gansu province

Tianjin--- severely affected areas of Shaanxi province

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Lesson four, encouraging NGO participation

donation, volunteers, and do some projects for reconstruction

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Motivate social donation on a large scale

- According to The Ministry of Civil Affairs's announcement on Mar 9, 2009, they have received accumulative donations worth 76.022 billion RMB.
- In comparison with the situation in 1998: During the combating Flood period in 1998, donations receiced was 7.259 billion RMB.
- The amount of the donation has exceeded all the previous annual historical donation records.

23

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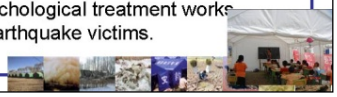
encouraging volunteer services

- It is estimated that there were 3 million volunteers having reached the disaster-striken area. They created a new mode of voluntary work.
- Due to the less-developed volunteer organization in China, the volunteers were self-motivated. They organize by themselves and integrate with the local management team, forming different service networks.
- The volunteers were also involved in the order maintenance and psychological treatment works in the settlement of earthquake victims.



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Lesson five, encouraging international cooperation

Learn from Japan

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International emergency rescue and reconstruction

- The government invited the international rescue team for the first time to participate in emergency relief, and it also called on all other countries to support. The rescue efforts made by neighboring countries and regions showed the power of the international cooperation;
- All countries and regions which have diplomatic relations with China provided various support for us. On May 15th, international relief teams started to arrive!
- Followed that, a lot of international experts arrived disaster district.

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Lesson six, open policy for media to the process of reconstruction

transparency to society

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Opening media to disaster districts after that it is still.

- Media from home and abroad can interview freely in the disaster-striken area. Feature programs from CCTV and other media have become important information platforms for reporting disaster-relief and reconstruction.
- All the influencial media gave more concerns about reconstruction.

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The urgency and spontaneity of innovation

- As a whole, adjustment, innovation of many policies based on the institutional innovation played an important role in the reconstruction of Sichuan Earthquake.
- The administrative work of the government has made great adjustment since the decision making process was open and all the sigificant decisions were open to the public for advices.

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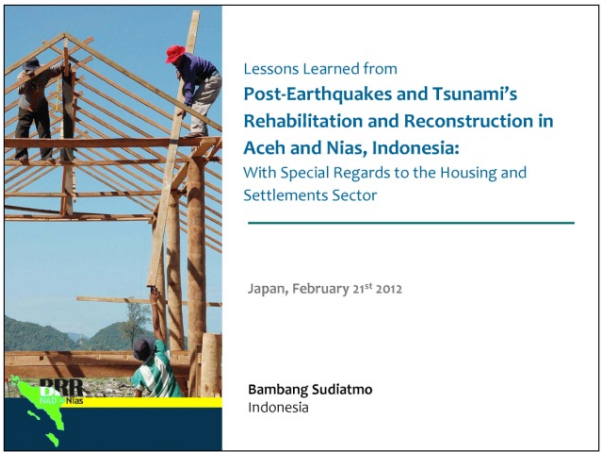
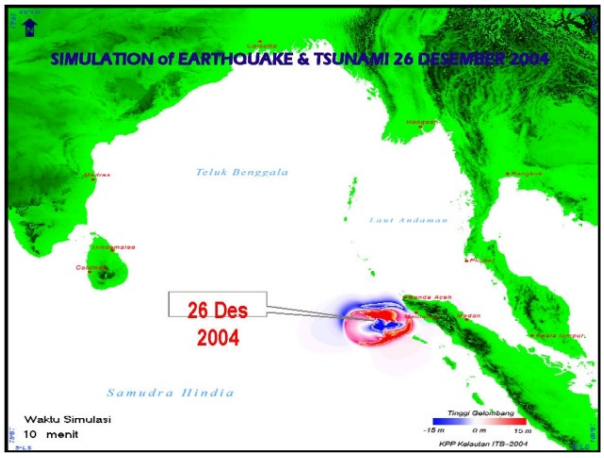
The recognized shortcomings:equip ment, regulations!

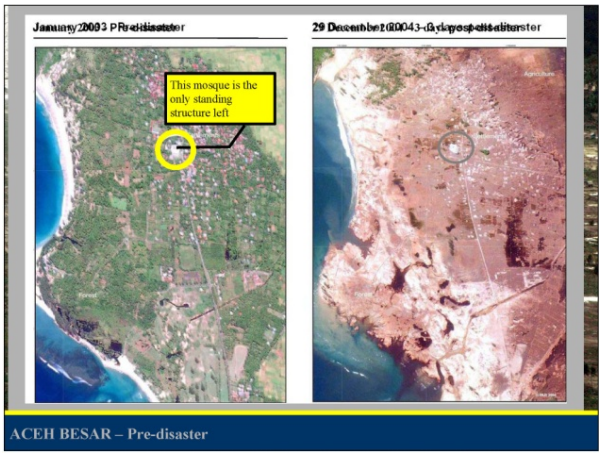
- **We are far behind in equipment: compare our equipment with MIG-26 helicopter.**

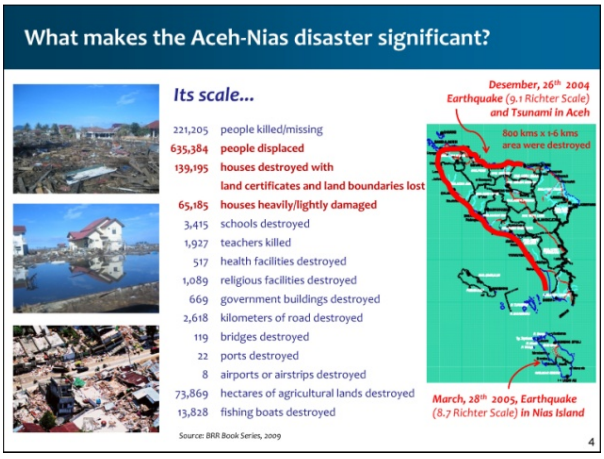
30

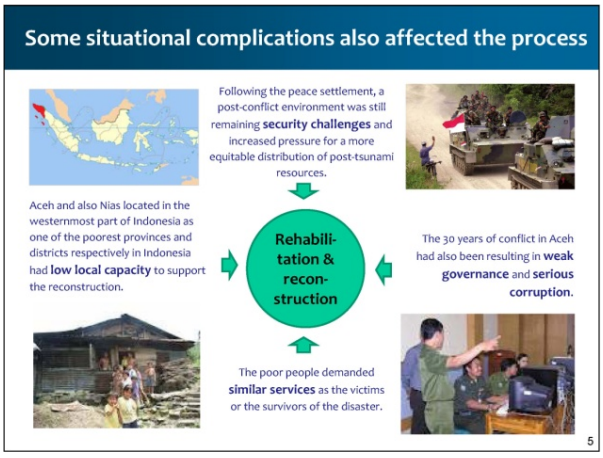
（４）スマトラ沖地震・津波被害（インドネシア公共事業省　復興調整責任者　バンバン・スディアトモ）



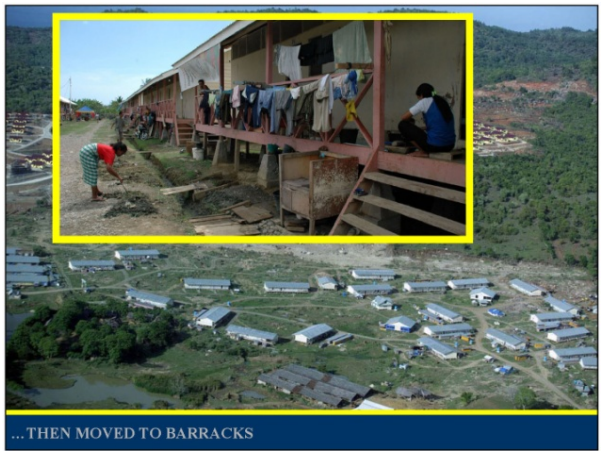




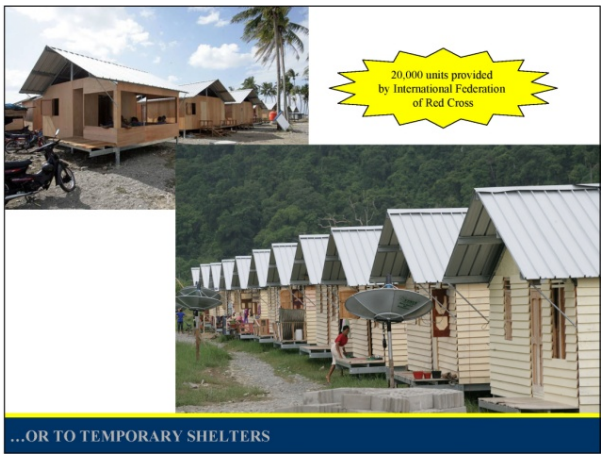




DURING EARLY RECOVERY, THEY LIVED IN TENTS...



...THEN MOVED TO BARRACKS



...OR TO TEMPORARY SHELTERS

Housing reconstruction process: from community to community

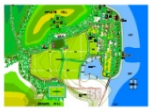
10

COMMUNITY BASED APPROACH ON RECONSTRUCTION

Village Meetings (consensus building), Village Mapping, Village Planning, and Housing Devt Meetings as community based approach reconstruction

11

The programs...



PRE-CONSTRUCTION PROGRAM:

1. Village planning *(bottom-up)* & spatial planning *(top-down)*
2. Land procurement and land certification
3. Beneficiary identification and data collection

MAIN PROGRAM (CONSTRUCTION):

1. **Construction of new houses:**
   a. Reconstruction (new construction in the previous site)
   b. Relocation/resettlement (new location/site)
   c. Housing aids for renters ('BSBT')
2. **Rehabilitation of damaged houses**
3. **Neigborhood basic infrastructure and facilities:**
   a. Reconstruction; b. Rehabilitation, c. Relocation

POST-CONSTRUCTION PROGRAM:

1. Policing of housing aid abuse
2. Hand over of houses to community
3. Hand over of basic infrastructurs to local government

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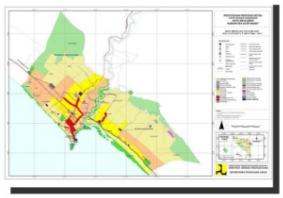
Spatial planning principles

- **Disaster-based spatial planning** (take mitigation of disaster into account)
- **Community-based planning** (start from 'village level' planning: creating a map being agreed and signed by all relevant inhabitants)
- Formulating more macro **spatial plan** at district/city and provincial level



- Using spatial plan as a **disaster mitigation tool** to improve disaster preparedness

13

Land certification and management principles

Land certification:

- Community-driven adjudication or community-based arbitration
- Surveying the land boundaries and creating land map which standardized and approved by the National Land Agency (BPN)
- BPN issued land ownership certificate which stated not only the head of family (men) but also the wives (so-called Joint Land Titling – previously uncommon in traditional or national law)

Land acquisition for resettlement

- Compliance with spatial planning: accessible to clean water and electricity, not prone to flooding
- Relatively easy to build settlement

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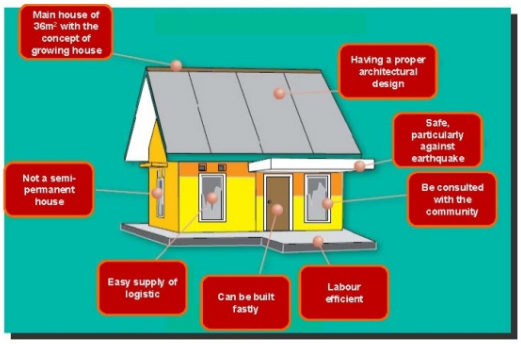
Building new house: core house principle



15

Some challenges...

1 Community development, land mapping and village planning

- **Land boundaries** and land certificates (incl. the archives in the land administration offices) were lost or damaged.
- **Difficulties in indentification** of land tenure since the land owners were dead, missing, moving out, or the heirs were underage.
- **Land dispute took very long time**, and reclaiming the land after the reconstruction almost end, it was impossible to get housing aid

2 Identification and verification of beneficiaries

- **Weak disaster preparedness:** no (spatial) data indicating identity and place of inhabitants; during the survey there were no people in place
- Eligible beneficiaries were **underage** (no parents)
- Beneficiary got married with other beneficiary, **potential to get double aid** (supposedly household-basis aid)
- Beneficiaries asked **grants from more than donors/NGOs**
- Remote areas **difficult to reach**

3 Construction planning and procurement

- Facing the **dilemma** between involving qualified contractors from outside or incapable local contractors but insisted to involve
- Rapid procurements were very required , though the **data about the fields very limited.** It brought high risk of improper implementation.

6 Hand over of the houses and neighborhood facilities

- In the end of BRR mandat, it was quite common getting and responding **complaints from the community** on the result of housing aids (due to hundreds development partners, thousands beneficiaries, varied situation on the field, limited time)

5 Construction and revitalization of basic infrastructure and facilities

- Difficult to bring the logistic due to road/bridges damaged or in islands
- Need heavy engineering design (landslide, land submerged)
- Shortage of materials or local people offered substandard materials
- Contractors could not work, hold up by local communities
- Rivalry among the contractors (opposed by local contractors)
- No workers available
- Improper subcontracting practices

4 Construction execution/ House construction

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The Houses

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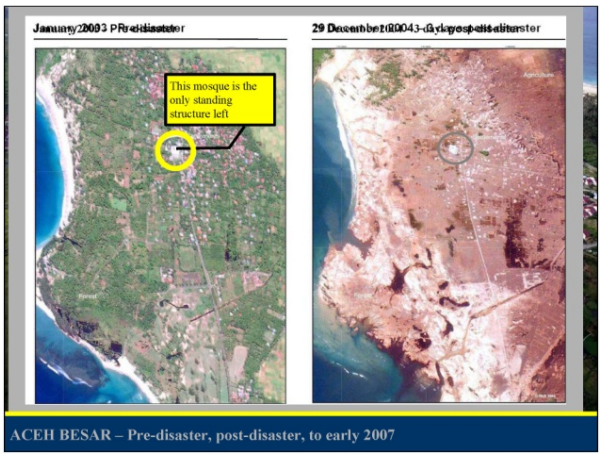

ACEH BESAR – Pre-disaster, post-disaster, to early 2007

BARRACK AND RELOCATION COMPLEX

(Another 859 HH will soon get their houses)

DAILY LIFE IN RELOCATION COMPLEX

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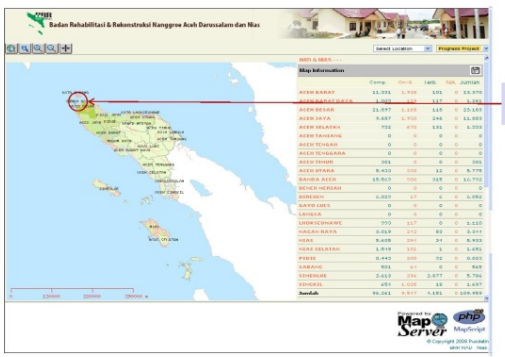
Housing GIS (on line)



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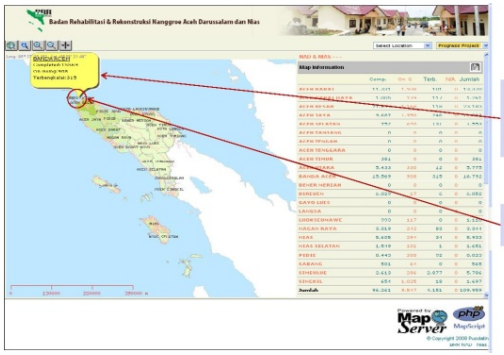
Housing GIS (on line)



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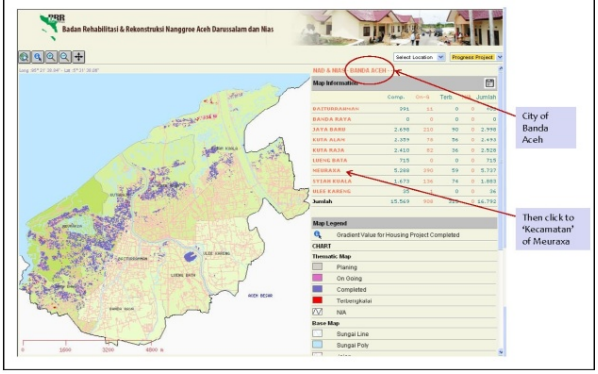

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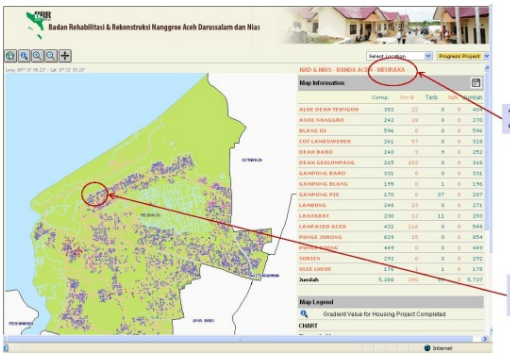

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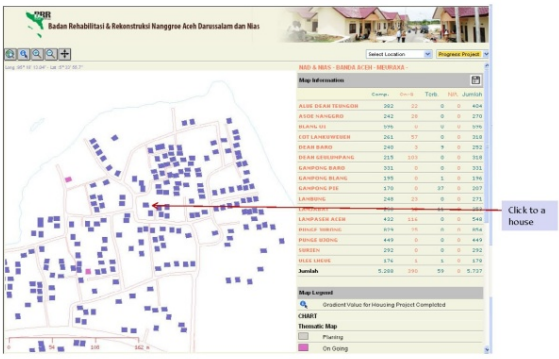
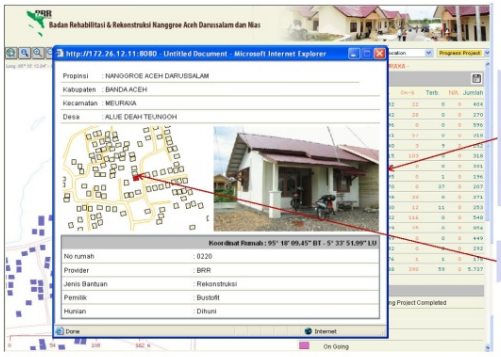


Housing GIS (on line)



Lessons Learned

The works that should be done immediately after the disaster take places includes

1.Inventory the impact area

2.Inventory the survivor and house destroyed and damaged.

All of the activities above should be done together local government and lock the data.

3.It is not required to provide completed house construction to the survivor. We can provide them with the house with main construction such as foundation, pillar and roof. The others finishing construction like floor and wall can be given to the survivor.

4.Do the house inventory using geospatial methods

5.Always using environmental and health friendly material

6.Re-develop impacted area without causing environmental damages

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Thank You

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（５）地震の概要と特徴（独立行政法人 建築研究所研究専門役　古川信雄）

Overview and Features on Each Earthquake

Nobuo Hurukawa
(Building Research Institute, Japan)

International Symposium on Sustainable Reconstruction from Super Earthquake Disasters, 2012/2/21, Tokyo

Target Earthquakes

- Great East Japan Earthquake 2011
- Haiti Earthquake 2010
- Wenchuan Earthquake 2008
- Indian Ocean Earthquake and Tsunami 2004
- Great Hanshin-Awaji Earthquake 1995

Seismic Information

Date (UT)	Name	Mw	Length of Fault	Maximum Displacement	Type	Mechanism
1995/01/16	Great Hanshin-Awaji (Kobe, Japan)	6.9	50 km	2 m	Inland 内陸	Strike Slip 横ずれ
2004/12/26	Indian Ocean (Sumatra -Andaman)	9.1	1300 km	19 m	Subduction → Tsunami	Thrust 逆断層
2008/05/12	Wenchuan (Sichuan, China)	7.9	250 km	13 m	Inland 内陸	Thrust 逆断層
2010/01/12	Haiti	7.0	50 km	4 m	Inland 内陸	Strike Slip 横ずれ
2011/03/11	Great East Japan (Tohoku)	9.0	500 km	50 m	Subduction → Tsunami	Thrust 逆断層

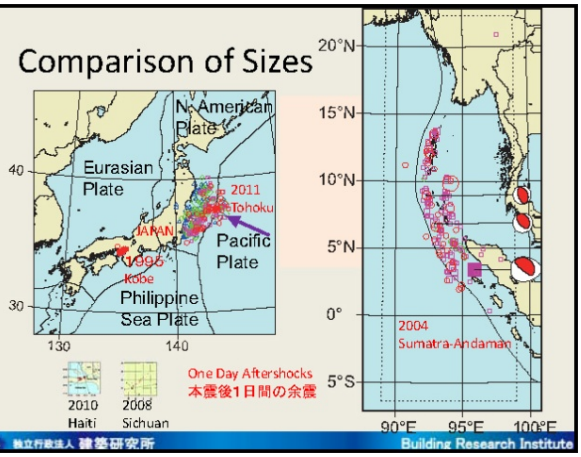
*Mw: Moment Magnitude

Deadliest Earthquakes since 1990

	Date (UTC)	M	Region	Fatalities	Type
1	2010/01/12	7.0	Haiti	316,000	Inland
2	2004/12/26	9.1	Sumatra - Andaman	227,898	Subduction
3	2008/05/12	7.9	Sichuan, China	87,587	Inland
4	2005/10/08	7.6	Pakistan	80,361	Inland
5	1990/06/20	7.4	Iran	50,000	Inland
6	2003/12/26	6.6	Southeastern Iran	31,000	Inland
7	2011/03/11	9.0	Tohoku, Japan	20,896	Subduction
8	2001/01/26	7.7	India	20,023	Inland
9	1999/08/17	7.6	Turkey	17,118	Inland
10	1993/09/29	6.2	India	9,748	Inland
11	2006/05/26	6.3	Java, Indonesia	5,749	Inland
12	1995/01/16	6.9	Kobe, Japan	5,530	Inland

US Geological Survey

Comparison of Sizes

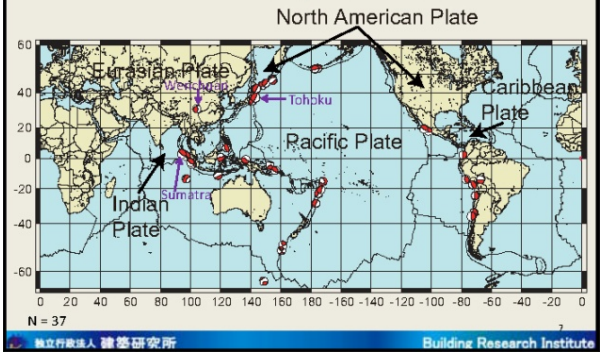


Greatest Earthquakes since 1900

	Date (UTC)	M	Region
1	1960/05/22	9.5	Chile
2	1964/03/28	9.2	Prince William Sound, Alaska
3	2004/12/26	9.1	off the west coast of northern Sumatra
4	1952/11/04	9.0	Kamchatka, Russia
4	2011/03/11	9.0	Near the East Coast of Honshu, Japan
6	1906/01/31	8.8	Colombia-Ecuador
6	2010/02/27	8.8	Offshore Maule, Chile
8	1965/02/04	8.7	Rat Islands, Alaska
9	1950/08/15	8.6	Assam-Tibet
9	1957/03/09	8.6	Andreanof Islands, Alaska
9	2005/03/28	8.6	Northern Sumatra, Indonesia

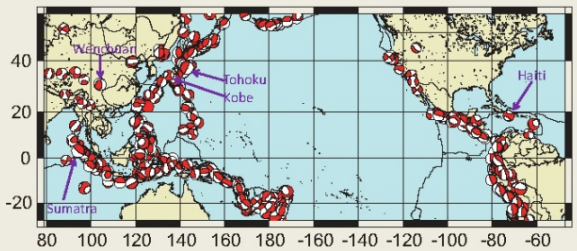
US Geological Survey

Large Earthquakes in the World 1976-2011, Mw ≥ 7.9



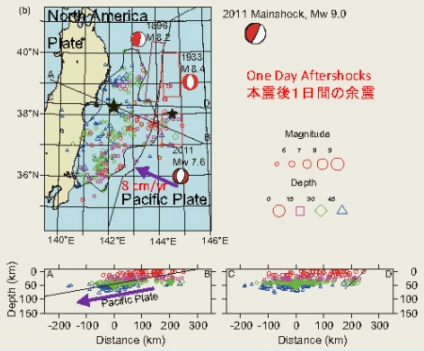
N = 37

Large Earthquakes in the World 1976-2011, Mw ≥ 6.9



N = 603

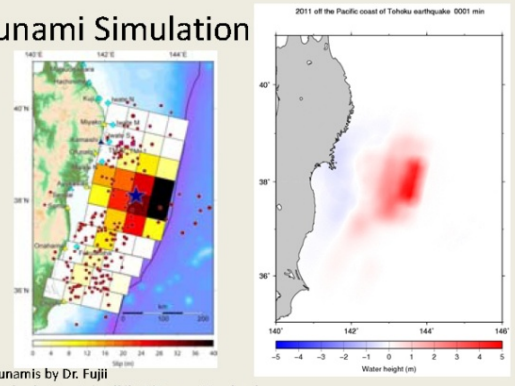
1. Tohoku Earthquake 2011



Building Research Institute

1. Tohoku Earthquake

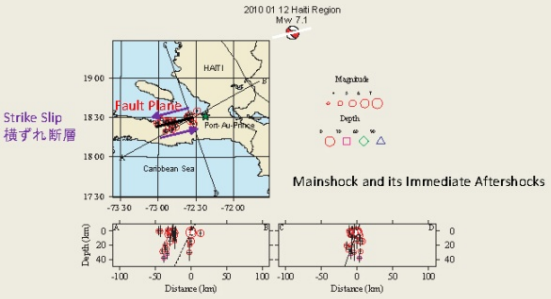
Tsunami Simulation



Recent Tsunamis by Dr. Fujii
http://iisee.kenken.go.jp/staff/fujii/TsunamiTop.html

Building Research Institute

2. Haiti Earthquake 2010

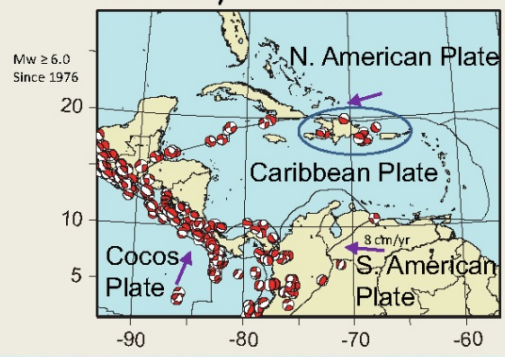


IISEE Quick Report on Earthquakes
http://iisee.kenken.go.jp/special2/20100112haiti/20100112Haiti-MJHD.pdf

Building Research Institute

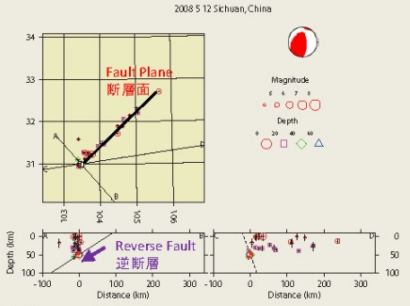
2. Haiti Earthquake

Seismicity in Caribbean Sea



Building Research Institute

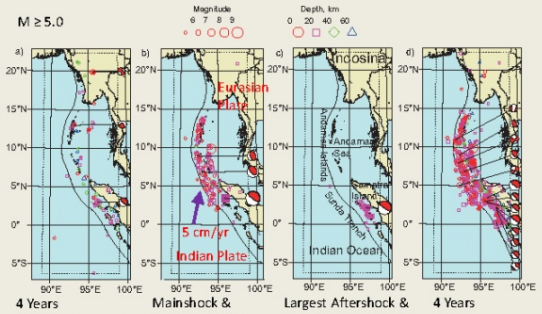
3. Sichuan Earthquake 2008



IISEE Quick Report on Earthquakes
http://iisee.kenken.go.jp/special2/20080512china-MJHD.pdf

Building Research Institute

4. Sumatra-Andaman Earthquake 2004

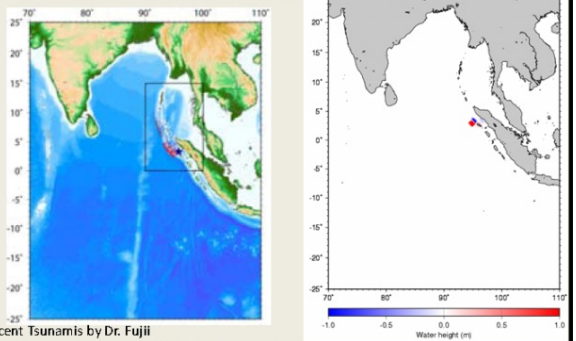


4 Years Before Mainshock | Mainshock & 24 Hours Aftershocks | Largest Aftershock & 24 Hours Aftershocks | 4 Years After Mainshock

Building Research Institute

4. Sumatra-Andaman Earthquake

Tsunami Simulation



Recent Tsunamis by Dr. Fujii
http://iisee.kenken.go.jp/staff/fujii/TsunamiTop.html

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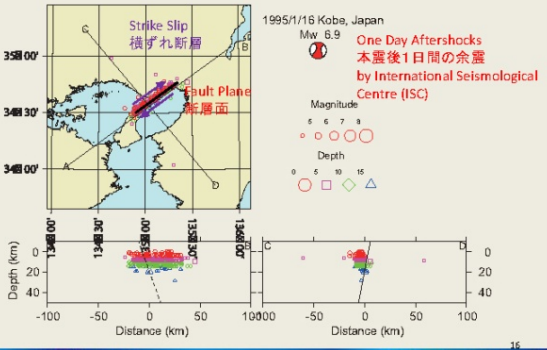
5. Kobe Earthquake 1995



Building Research Institute

Session 2: Panel Discussion

"Sustainable Reconstruction from Super Earthquake Disasters"
巨大震災からの復興を考える

Issus on reconstruction and disaster mitigation

(Viewpoints: Community, Gender, Building technology, Urban development, International activities etc.)
地域社会、ジェンダー、建築技術、
まちづくり、国際活動などの視点から

Super Earthquake Disasters in the World
最近50年間の世界的な巨大地震災害

Earthquake Disasters with over 15,000 casualties (1960-2011) 犠牲者15,000人以上の地震

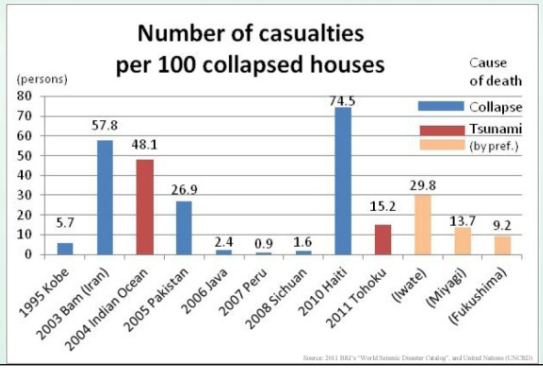
	Country: Earthquake	Year	Mg	Casualty (A) = Dead +missing	Collapse (B)	Casualty ratio A/B x 100
1	China: Hebei (Tangshan Earthquake)	1976	7.8	242800		
2	Indian Ocean Tsunami	2004	9.0	226408	470000	48.1
3	Haiti Earthquake	2010	7.0	222576	(300000)	(74.5)
4	China: Sichuan (Wenchuan Earthquake)	2008	8.1	87576	5461900	1.6
5	Pakistan Kashmir Earthquake	2005	7.6	73328	272000	26.9
6	Peru: Chimbote, Huaras	1970	7.8	66794	(>15000)	
7	Iran: Manjil Earthquake, Rudbar	1990	7.7	35000		
8	Iran: Kerman, Bam Earthquake	2003	6.7	31830	55000	57.8
9	Armenia: Spitak Earthquake	1988	6.8	25000		
10	Guatemala Earthquake	1976	7.5	22870		
11	India: Bhuj Earthquake (Gujarat)	2001	8.0	20023	(339000)	(5.9)
12	Japan: Great East Japan Earthquake	2011	9.0	19295	127185	15.2
13	Iran: Tabas Earthquake	1978	7.4	18220		
14	Turkey: Kocaeli Earthquake	1999	7.8	17118	(60000)	(28.5)
15	China: Yunnan Earthquake	1970	7.8	15621		
ref.	Japan: Great Hanshin-Awaji Earthquake	1995	7.3	6434	111123	5.7

東日本大震災

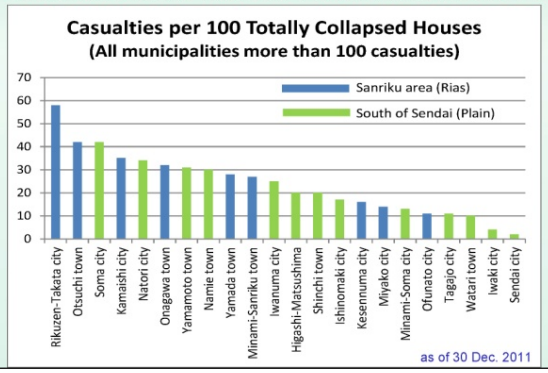
Why many Super Disasters happens?
なぜ多くの巨大災害が発生しているのか

1. **Constant occurrence of natural hazards**
   自然現象は常に生じている。
2. **Increasing risks by expansion of rapid urbanization, city, industry and population**
   急速な都市化、産業や人口の拡大がリスクを増加させ、
3. **Trends of heavier damages to the poor** (some earthquake cases to middle income)
   貧困層が被害を受けやすい（地震では中間層の場合もある）。
4. **Environment degradation, climate change**
   環境の悪化や気候変動。

International Comparison of "number of casualties per 100 collapsed houses" of recent world huge disasters
「全壊100戸当たりの死者行方不明者数」による災害国際比較

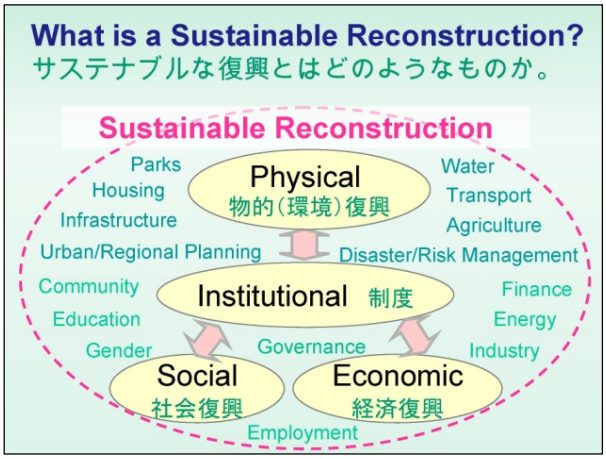


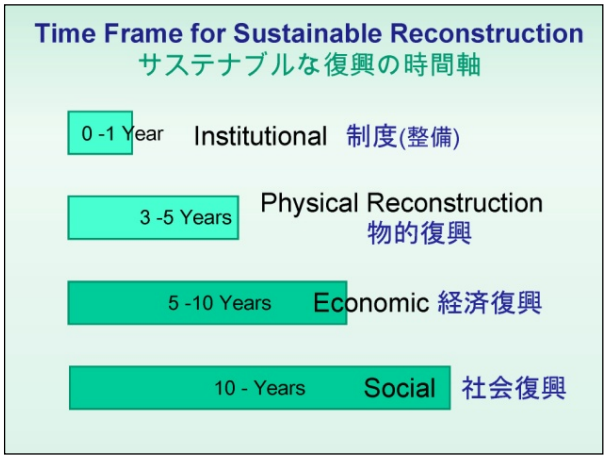
Municipal Comparison of "number of casualties per 100 collapsed houses" of the Great East Japan Earthquake
東日本大震災の市別「全壊100戸当たりの死者行方不明者数」



Heavily damaged areas in Onagawa, Minami-Sanriku & Otsuchi Town by the Great East Japan Earthquake, photo by BRI

東日本大震災の激甚被災地
女川町、南三陸、大槌町の例





1) What should we prepare before disaster for a better reconstruction?

1）復興のため地震が来る前から備えるべきことは何か。

2) How can we transfer the lessons to other areas, other countries, and next generations?

2）復興の教訓を他の地域や国際社会、さらに次の世代にどのように伝えるべきか。

（７）復興の実態：2005 年カシミール地震の事例にみる（建築家、災害リスク管理者　ガザラ・ナイーム）

Reconstruction Realities
Kashmir EQ 2005

Ghazala Naeem, Pakistan

Earthquake 2005, Pakistan

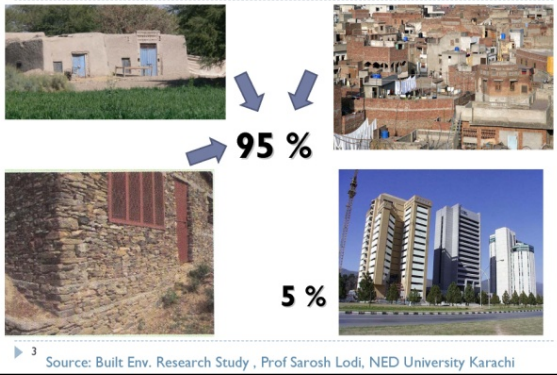
"Earthquakes do not kill people, it is the unsafe buildings which do"

- Highly fragile built environment when shaken by the M 7.6 EQ,
  - Devastated 30,000 square kilometers of the area.
  - Killed more than 73,000 people including 18000 school children.
  - About 600,000 families were made homeless
  - Affecting livelihood and infrastructure in nine districts

Above: Aerial view of devastation caused by EQ 2005- Balakot City, KPK

2

Built Environment- Current Scenario



3 Source: Built Env. Research Study , Prof Sarosh Lodi, NED University Karachi

Reconstruction Target

- 600,000 houses, 6298 educational facilities ,796 health units
- 6440 km of road network ,50-70 % of the infrastructure

- Challenge
  - Who & How .....
  - No Institutional Arrangement
- Response
  - Earthquake Reconstruction and Rehabilitation Authority" (ERRA) was constituted on 24th Oct 2005

4

Housing- Challenges

- Unreliable Data Base (No Updated Documentation Record Individuals & Land)
  - Legal Aid Centers
- Bank Account for Cash Grant
  - Special Arrangement for Banking System
- Male Dominant Society
  - Established Women Committees

5

Housing- Challenges

- Many fold increase in Construction
  - Construction Hub in affected Districts
  - Training of Costruction Workers
- Building Design/standards
  - Non-engineered Structures- Developing Guidelines
  - Dissemination among self buiders and contractors
  - Seismic Buiding Code
- Monitoring & Evaluation
  - Field AI Teams (Assistance and Inspection Teams)
  - Grievances redress system for house ownerships, land availability and relocation issues.

6

Housing (updates & Impacts)

- **Updates**
  - Progress so far 92 %
  - Over 250,000 trained human resources for seismically safe non-engineered construction.
- **Social Impact:**
  - Promotion of safer reconstruction methods and new technologies
  - Established Culture of Compliance
  - Enhanced level of confidence in reconstructed houses. During a survey in 2008; 88 %consider their new house safer.

7

Housing with Owner Driven Approach

8

Health

- **306 health facilities** (267 were pledged by donors but later 92 facilities were dropped)
- **Challenges:**
- **Integration** of Smaller Units into Primary Health Care Centre
- **Sustainability**

First dialysis center at AJ& K, Abbass Institute of medical sciences Muzzaffarabad

9

Health

Updates:

- 84 % progress
- very few health facilities are fully operational, primarily due to the lack of government's capacity to maintain and manage.

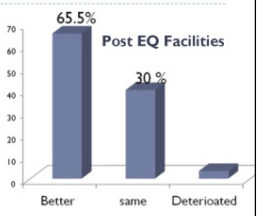
Instead of pre EQ smaller health unit an improved Rural Health Center with modern facilities of minor OT other diagnostic facilities was constructed at Chokothi-AJK

10

Health

Social Impact

- A great proportion of patients felt donor/ NGO provided health facilities are better than the facilities managed by the government.



2008 ERRA Social Impact Report 2008

11

Education

Challenges:

- Land availability
- Capacity limitations of Government

Instead of three to ten rooms Pre-EQ facility more than 20 rooms school are built with all allied facilities

12

Education

Updates

- 75 % progress
- Operation and maintenance of completed facilities is the basic challenge for concerned provincial and state government

Social Impact

- The new enrolment in primary schools has increased 90 % as compared to pre EQ enrolment.
- Community has a trust in new construction.

13

Water Supply & Sanitation

Challenges

- The scattered water sources in the rugged terrain and inadequate supply system

Updates

- 84% completed

Social Impact

Improved behavioural changes on hygiene and sanitation in the community.

14

Way Forward

- Sustainability of all the "build back better" facilities by improving capacities of line departments
- Preparedness for future disaster risks for optimum utilization of country's scarce resources. NERRA
- Integrating disaster risk reduction into development. (e.g. B.C. implementation)
- 2010 and 2011 mega floods reconstruction demands
  - Integration of lessons learnt by ERRA
  - Measures to reduce carbon footprint & climate change adaptation strategy

15

What we have achieved so far.....

16

（８）災害復興におけるジェンダー・社会包摂の視点（静岡大学　教授　池田恵子）

復興にジェンダーと社会包摂の視点を

池田恵子(静岡大学)

International Symposium on Sustainable Reconstruction from Super Earthquake Disasters

Integrating Gender and Social Inclusion in Reconstruction

Keiko Ikeda (Shizuoka Univ.)

2012/02/21

E−mail ekikeda@ipc.shizuoka.ac.jp

1

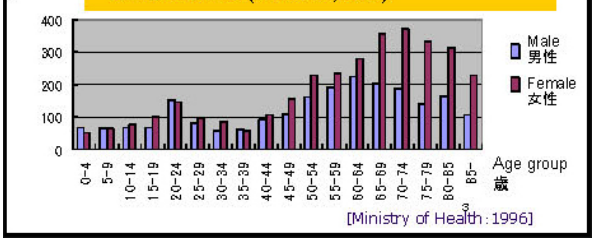
なぜジェンダーと社会包摂の視点か？ Why gender and social inclusion?

1. 女性、高齢者、障がい者、貧困層の犠牲者が多い
   Disproportionate impact on women, aged, handicapped and the poor
2. 男性と女性の被災・復興の経験とニーズは異なる
   His and her experiences during and after disaster are different

2

阪神淡路大震災(1995年)における性別年齢階層別犠牲者数
Sex and age-group disaggregated number of victims in the Hanshin-Awaji Great Earthquake (1995)

- Male 2,713 Female 3,680 Unknown 9 (Total 6,402)



[Ministry of Health : 1996]

3

世界的な傾向として Global Trend [Neumayer and Plu¨mper 2007]

- 4605件の災害(141カ国、1981-2002年)の分析
  a sample of 4605 disaster events in 141 countries over the period 1981–2002.

①災害により女性が男性より多く死亡
Natural disasters lower the life expectancy of women more than that of men

②大災害ほど、犠牲者数の男女差が大きい
The stronger the disaster, the stronger this effect on the gender gap of life expectancy

③女性の社会経済的地位が高い国ほど、災害の犠牲者数の男女差は小さい
The higher women's socioeconomic status, the weaker is this effect on the gender gap of life expectancy

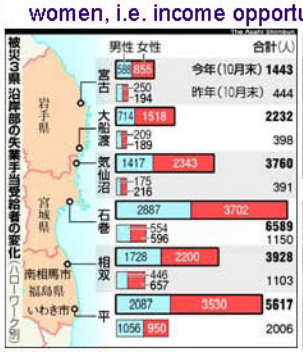
4

Miyagi 2011/05

女性の労働負担(家庭責任)が増える
much increased workload (care works) for women
⇒家庭や地域の復興に関する議論への参加が減少
⇒Less opportunity for women to participate in community reconstruction

---

女性の生活再建は遅れがち(雇用、住居)
less access to resources for recovery for women, i.e. income opportunity and housing



朝日新聞2011年12月10日

Miyagi 2011/05

Iwate 2011/06

女性や子どもの人権が守られにくくなる(暴力)
Increase of gender-based violence

Miyagi 2011/07

宮城県警に2011年に寄せられたドメスティックバイオレンス(DV)の相談は1397件で、前年に比べて49件増えたことが同県警のまとめで分かった。そのうち東日本大震災に被災したことが原因と考えられるケースは99件にも上り、全体の相談件数を引き上げた要因となった。

河北新報 2012年2月4日

復興の議論に十分に参加できない
Insufficient participation to decision-making about reconstruction

Miyagi 2011/05

復興関連委員会の女性委員の数
Number of women in reconstruction committees

Recovery committee	Women among committee members
Iwate Pref. 岩手県	2人 (18人中)
Miyagi Pref. 宮城県	1人 (12人中)
Sendai City 仙台市	3人 (16人中)
National committee 復興推進委員会(国)	3人(15人中)

仮設/復興住宅コミュニティ、町・地区、生産協同組合では?
In Temporary/Permanent housing community, town/village, fishers/farmers co-op?

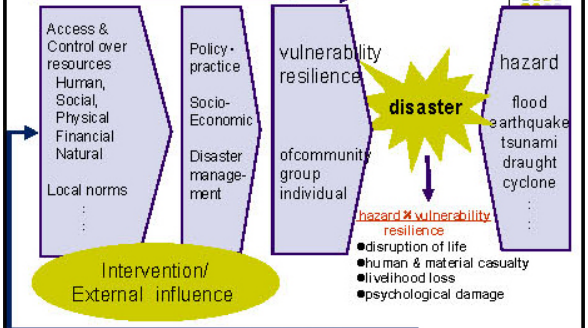
災害とは何か [Wisnerほか2004より作成]

災害への脆弱性と回復力の変化

Disaster

Modified from Wisner Ben et al 2004

Progression of vulnerability/resilience at local level



復興におけるジェンダー・社会包摂
Gender and Social Inclusion in Reconstruction

性別、年齢、障がいの有無、家族関係、就労状態、性的指向・性別自認、国籍・・・・・
gender, age, disability, household type, employment status, sexuality, ethnicity, citizenship・・・..

特定の属性を備えた人が必ずしも脆弱とは限らない
No one is vulnerable just because he/she belongs to certain social/economic category
脆弱な人は、能力や回復力も持っている
Vulnerable people also have their resilience
ジェンダーはすべての脆弱性要因の横断的要因である
Gender is a cross-cutting issue

男女、多様な集団への災害の異なる影響を理解
Understand and address different impacts of disaster on men/women of all ages and various group of people

＋

男女の復興ニーズに対応した復興計画
Identify gender and specific recovery needs and plan reconstruction based on them

＋

復興の議論へバランスのとれた参加を確保
Balanced participation by men/women to decision-making

＋

女性団体や地域の様々な団体との協働
Engage local women's/ aged/ handicapped organizations in reconstruction initiatives

⇒

災害前より「脆弱な存在を作り出さない社会」へ
Building back better = reduced vulnerability= enhanced social inclusion and equity

（９）安全な建物づくり、まちづくり（独立行政法人 建築研究所上席研究員　福山洋）

Safer Building and Urban Development
（安全な建物づくり･まちづくり）

Contents（内容）

1）Lessons from building damage by earthquake motions and/or tsunami
（振動被害または津波被害からの教訓）

2）Way of thinking for reconstruction
（復興に向けての考え方）

Hiroshi FUKUYAMA, BRI, Japan

1

Outline of Building Damage by E.Q. Motions
（振動被害の概要）

Shear failure of short columns
（腰壁･垂れ壁が取り付く柱（短柱）のせん断破壊）

2

Outline of Building Damage by E.Q. Motions
（振動被害の概要）

Collapse of middle story
（中間階の層崩壊）

3

Outline of Building Damage by E.Q. Motions
（振動被害の概要）

Tilting of a building
（建築物の傾斜）

Settlement of a building
（建築物の沈下）

4

Outline of Building Damage by E.Q. Motions
（振動被害の概要）

Collapse and falling of a penthouse
（塔屋の崩壊･落下）

5

Lessons from Building Damage by E.Q. Motions -1
（振動被害による教訓 – (1) ）

✓ Severe damage observed in buildings designed according to the old code
（旧耐震基準で設計された建築物に大きな被害が集中）

✓ Buildings designed due to current code, which developed as a measure to previous E.Q. damage, and retrofitted buildings performed well
（既往の地震被害対策として開発された現行基準により設計された建築物と、耐震補強された建築物は良く機能した）

（従来の対策が有効に機能）

Promote seismic retrofit for structural safety
（耐震改修を推進すべき）

6

Outline of Building Damage by E.Q. Motions
（振動被害の概要）

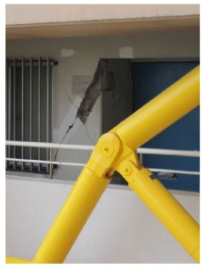
Buildings designed according to the current seismic codes
（新耐震基準で設計された建築物）

Damage of non-structural wall
（非構造壁の損傷）

Damage of door
（ドアの損傷）

7

Outline of Building Damage by E.Q. Motions
（振動被害の概要）



Damage of non-structural walls of a building retrofitted with oil dampers（オイルダンパーで補強された建築物の非構造壁の損傷）

8

Lessons from Building Damage by E.Q. Motions -2
（振動被害による教訓 – (2) ）

✓ Damage to non-structural elements was observed in many buildings including new buildings and retrofitted buildings（非構造部材の損傷が新耐震基準で設計された建築物や、補強された建築物等で見られた）

✓ Some buildings lost its function due to damage to non -structural elements as well as structural members
（構造部材だけでなく非構造部材の損傷によって使用できなくなった建築物があった）

⇩

Be a disaster resilient building
（損傷回復性の高い建築物を目指すべき）

9

Demand of 1981 Japanese Seismic Code
（1981年改正（現行）耐震基準の要求）

- No Damage is required for Functional Continuity against medium scale E.Q.
（中地震に対して損傷せず、建物の継続使用が可能）

Buildings will meet with several times during their lifetime
（建物使用期間中に数回遭遇する程度の地震）

- No Collapse is required for Life Safety against large scale E.Q.
（大地震に対して倒壊・崩壊せず、人命を守る）

Buildings may meet with one times during their lifetime
（建物使用機暗中に一度遭遇するかも知れない程度の大地震）

10

Structural Damage to New Buildings (1995 Kobe E.Q.)
（新耐震建築物の構造被害（1995年兵庫県南部地震））

Fall of Suspended Ceiling in Symphony Hall
（音楽ホールでの天井落下）

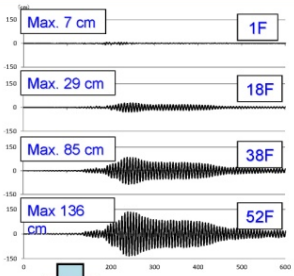
⇩

Review of the building regulations
（建築基準の再評価）

12

Building Response by Long-period E.Q. Motions
（長周期地震動による超高層建築物の応答）

Sakishima governmental office of Osaka



⇩

Review of the building regulations
（建築基準の再評価）

13

Outline of Building Damage by Tsunami
（津波被害の概要）

Most of RC buildings survived structurally
（ほとんどの鉄筋コンクリート造建築物は津波荷重に耐えた）

14

Outline of Building Damage by Tsunami
（津波被害の概要）

Collapse
（倒壊）

15

Outline of Building Damage by Tsunami
（津波被害の概要）

Overturning
（転倒）

16

Outline of Building Damage by Tsunami
（津波被害の概要）

Sliding
（滑動）

17

Outline of Building Damage by Tsunami
（津波被害の概要）

Debris impact
（漂流物の衝突）

18

Lessons from Building Damage by Tsunami -1
（津波被害による教訓 – (1) ）

- ✓ Most of wooden houses washed away
  （ほとんどの木造住宅は流失した）
- ✓ Collapse or overturned steel/RC buildings were found
  （鉄骨造やRC造にも倒壊や転倒の被害が見られた）
- ✓ Tsunami evacuation building should be prepared for quick evacuation in seaside area
  （海岸地域での迅速な避難のために、津波避難ビルの整備が必要）

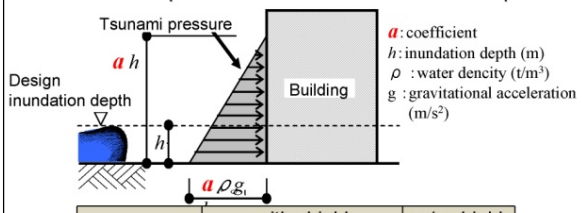
⇩

Structural design method for tsunami evacuation buildings was proposed （津波避難ビルの構造設計法が検討された）

19

Calculation of Tsunami Pressure
（津波波圧の算定）

= static water pressure with a times of inundation depth



	with shield		w/o shield
Distance from sea or river	≧ 500m	< 500m	any case
Coefficient a	1.5	2	3

遮蔽物の有無と海岸等からの距離とによるaの分類

20

Lessons from Building Damage by Tsunami -2
（津波被害による教訓 – (2) ）

- ✓ Most of building functions were lost due to tsunami inundation even in case the building suffered no structural damage
  （構造被害が無くても、津波の浸水によりほとんどの建物機能が失われた）

⇩

Disaster resilience should be held if business continuity is required
（事業継続性が求められる場合は高い損傷回復性を保有すべき）

- ✓ Important facilities, emergency power supply or computer systems etc., should be placed at higher level than maximum tsunami inundation depth
  （重要な設備（非常用電源やコンピュータシステムなど）は、津波浸水深よりも高い位置に設置すべきである）

21

Damage to Hospital Rooms by Tsunami
（津波による病院室内の被害）

22

Way of Thinking for Safer Building and Urban Development（安全な建物づくり・まちづくりの考え方）

- Safety
  （安全性）
- Disaster Resiliency, Function Continuity
  （災害からの早期回復性、機能継続性）

⇩

Holding damaging scenario in common
（災害シナリオ（被害イメージ）の共有）

23

Kobe Yusen Bldg.
1918 RC&SC+4

Low for Urban Development under concept of Tsunami Disaster Prevention
（津波防災まちづくり法）

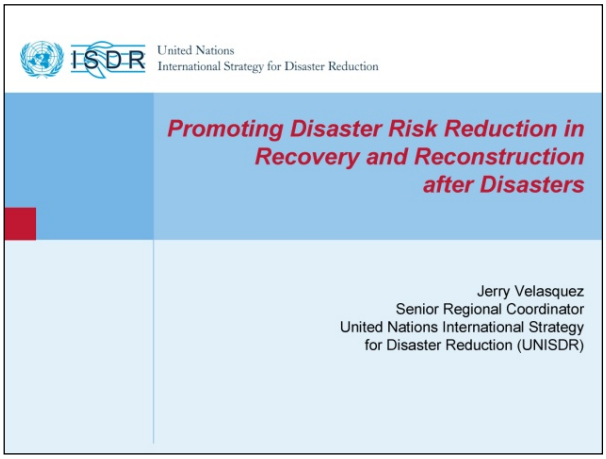
Basic concept

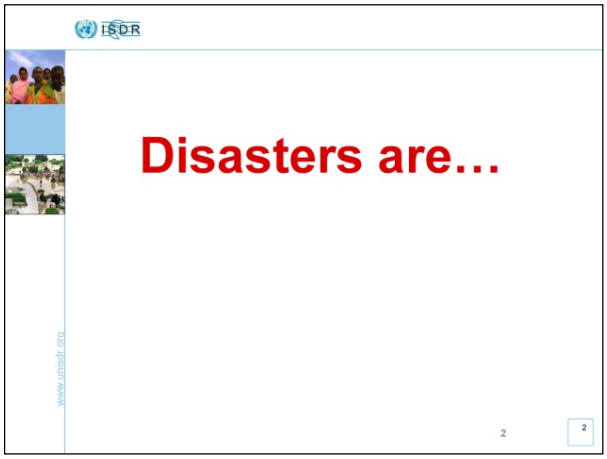
- ✓ Measure with disaster experiences and governmental policy for promoting countermeasures against tsunami
  （東日本大震災の経験や津波対策推進法を踏まえた対応）
- ✓ Secure human lives under maximum event of tsunami
  （最大クラスの津波が発生した際も「なんとしても人命を守る」）
- ✓ Adopt multiple policies with every aspects for disaster prevention
  （ハード・ソフトの施策を総動員させる「多重防御」）
- ✓ Promote disaster prevention effectively in the comprehensive plan of urban development including regional activation
  （地域活性化も含めた総合的な地域づくりの中で効果的に推進）
- ✓ Maintain human consciousness of tsunami disaster prevention
  （津波に対する住民等の意識を常に高く保つよう努力）

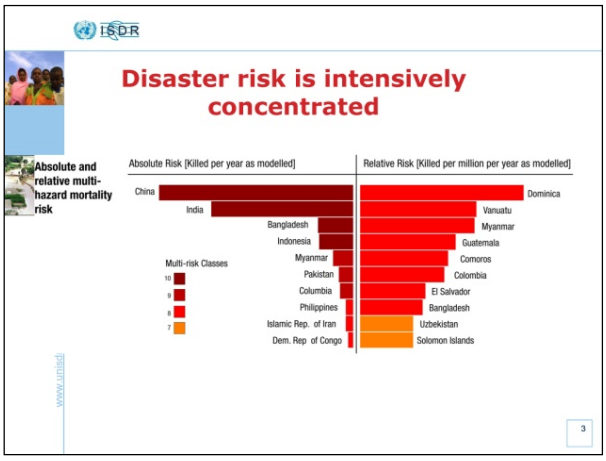
25

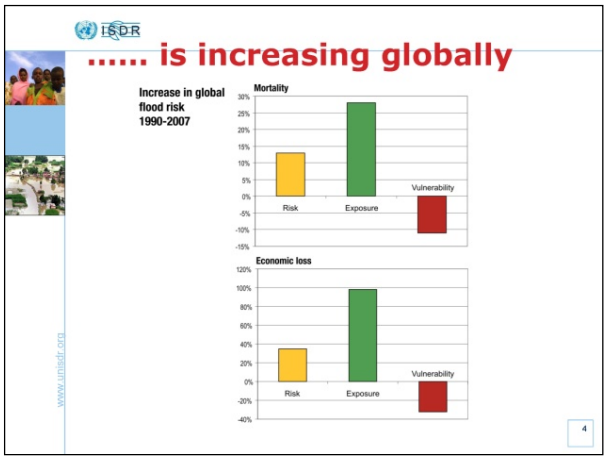
（１０）災害後の復旧・復興における防災対策の推進

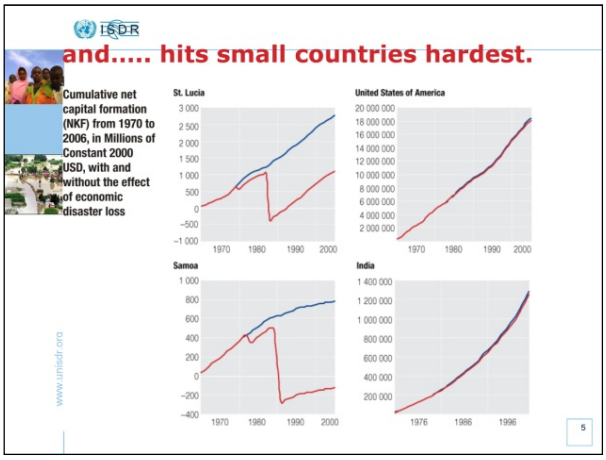
（国際戦略アジア太平洋事務所　上級地域コーディネーター　ジェリー・ベラスケス）

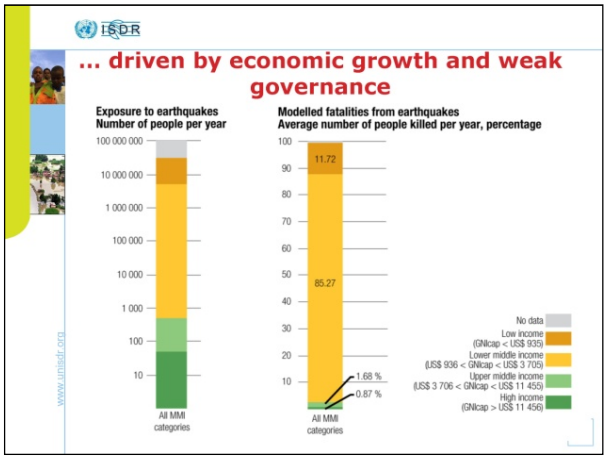




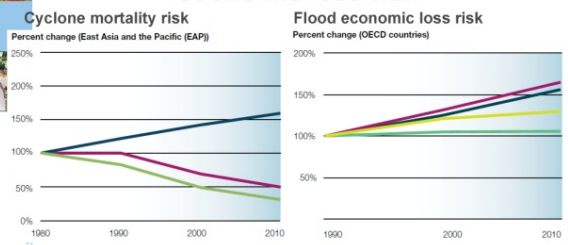




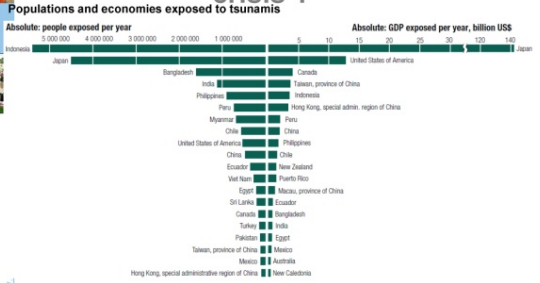




… leading to falling mortality – but rising economic loss risk



Risk – the future.
Synchronic failures and sequential crisis ?



Strategies to Reduce Exposure

- Land use planning, urban planning, spatial planning
- Engaging private sector
- Post-disaster recovery and reconstruction

9

Post Disaster Recovery

- Community focused recovery
- Proper resourcing
- Considering Social, Cultural Capital and Heritage
- Improve Post Disaster Land Use and Construction Practices

10

COMMUNITY PARTICIPATION LET THE PEOPLE INVOLVED DIRECTLY IN THE RECONSTRUCTION. BY DOING THIS, TRANPARENCY AND ACCOUNTABILITY WILL BE IMPROVED.

Disaster risk reduction is everybody's business!

http://www.unisdr.org

14

３．専門家会議レポート

（１）池田恵子（静岡大学）「Mainstreaming gender in disaster reconstruction」

Mainstreaming gender in disaster reconstruction

Keiko Ikeda (Shizuoka University)

Why mainstreaming gender?

Men and women have different experiences and concerns – gender concerns – during disasters. All dimensions of disaster vulnerability – such as susceptibility to hazards, the potential to suffer damage, and the capacity for recovery – are affected by gendered patterns of access and control over resources, as well as by gender roles, responsibilities, and norms (Adger 2006; Wisner et al. 2004; Enarson and Morrow eds 1998). People's experiences and concerns during disasters also depend on factors like class, ethnicity, age, family composition, and individual experience. Gender is a cross-cutting factor, and disaster vulnerability changes as other social categories lie on top. Men and women, and boys and girls are differently affected in terms of health, livelihood, security, and life itself, as is being repeatedly reported and revealed to us from the field (Enerson and Chakrabarti eds. 2009). Neumayer and Plumper (2007) analyzed the effect of disaster strength and its interaction with the socio-economic status of women on the gender gap in life expectancy in a sample of 141 countries over the period 1981–2002. They found that 1) disasters and their subsequent impact, on average, kill more women than men; 2) the stronger the disaster, the stronger this effect on the gender gap of life expectancy; 3) the higher women's socioeconomic status, the weaker is this effect on the gender gap of life expectancy.

Every aspect of disaster recovery and reconstruction are related with gender issues. What type of employment creation schemes is introduced in which economic sectors; how the temporary and permanent housings are designed and located; how the local welfare institutions are rebuilt; all affect women and men differently. It is crucial to understand and address how disaster impacted differently to men and women, The reconstruction, otherwise, will reproduce and fix the gender gap of vulnerability and inequity, which in turn bring same suffering in the next disaster.

Recovery from 3.11 Earthquake and Tsunami

As a member of a research team for Risetogether (an organization for promoting mainstreaming gender and diversity issues in recovery from the Great East Japan Earthquake) , I with three other colleagues (Dr. Azumi Tsuge, Dr. Mieko Yoshihama, and Ms Tomoko Unomae) had interview with 29 reconstruction planners and operators who worked mostly in Miyagi and Iwate prefectures (June 2011- Jan 2012). In Fukushima prefecture, interview is still going on. The research aims to understand how people assisting reconstruction tried to understand various needs of women/vulnerable groups, and to address them in reconstruction programs. Staff members of rescue and reconstruction related institutions and organizations, women's organizations working for women and local government bodies and so on, and individuals in the local

community were interviewed.

Gender-sensitive and vulnerability-reduction-focused disaster recovery policies are already in place in Japan. The Government newly enacted Basic Reconstruction Law last June. In the guideline for recovery issued by the headquarter for reconstruction from the Great East Japan Earthquake, it is emphasized that responding to women's/men's and vulnerable people's needs especially in 1) rebuilding resilient community, 2) recovery of life, and 3) farming sector, and to ensure participation of women as well as men in all reconstruction process. Disaster Management Basic Plan (amended in Dec. 2011) clearly mentions that opinion of women's and various group of people should be incorporated when managing temporary housing community. While, practicing these basic principles seemed difficult as I understood from interviews, as follows.

1) How gender and specific needs were identified in reconstruction process

Gathering and sharing gender-specific and socio-economically disaggregated data were not practiced much in programs of reconstruction – from planning to monitoring and evaluation. Instead, usually, only the household head and community leaders, mostly male, were consulted to provide ideas on the needs of every affected member in the household or community on their behalf. Women, in front of men and unfamiliar person, often did not want to speak out their needs. Some local women's groups held women-only-meetings, or used enveloped questionnaire to protect privacy. Only then, they could somehow know what were the women's needs. It was further difficult to reach families with the aged/ the disabled or single-mothers with small babies who were too sick/week to stay long at emergency shelters, as they are invisible, scattered in their own house, or moved to house for rent, though they are among most vulnerable. The social workers who were assigned to temporary housing communities were given gender sensitivity training and were expected to gather gender disaggregated data on recovery needs.

2) gender specific needs addressed in reconstruction programs

Women's workload for family care greatly increased, which made it difficult for women to have wide choice of jobs. Unemployment among women increased more than among men, as certain newly created jobs after the Disaster and Tsunami were mostly meant for men, such as clearing debris and construction works. The government held vocational training courses and entrepreneurship seminars for women.

Consulting facilities including telephone hotlines were established to respond to anticipated increase of violence against women and children, especially domestic violence. Psychological counselors were given special training in affected prefectures. On the other hand, very few programs targeting single-father families and mental health care for men are planned and practiced, though many interviewees pointed out that they are very necessity.

Many of the reconstruction programs are still designed based on 'household model', not 'individual model.' In some cases, allocation of temporary houses and distribution of 'recovery donation money' to the household head excluded women accessing resources for recovery.

3) Increasing the representation of women and vulnerable groups in post-disaster decision-making

Women/Vulnerable people are not sufficiently participating in decision-making of recovery planning, and women's leadership was not very commonly accepted. Number of women in formal reconstruction related committees of local bodies and central Government are very small. Interviews with some women leaders in community reconstruction related institutions revealed women's leaderships were challenged and women leaders face hardship accessing information necessary for recovery. Women's initiatives were displayed when preparing meals for other affected people. Local women's organizations are actively engaged in reconstruction. Although their activities may not be very important for mainstream reconstruction programs, they are contributing to raise and promote affected women's leadership. Most of the women's groups are small and financially week, and should be supported in terms of acquiring skills and capacity for financial and organizational sustainability.

4) Assisting those who assist reconstruction

Many of the reconstruction planner and operators were themselves affected by the Earthquake and Tsunami. Improving work environment of female reconstruction planners and operators, e.g. daycare service for their dependent family, would contribute to better reconstruction programs. Reconstruction planner and operators should be informed with how to identify gender needs of reconstruction.

Need to learn from international practice

The Japanese experiences mentioned above in tentative research findings contrasts strikingly with progress achieved in some Asian countries. For example, Bangladesh has mainstreamed gender and social inclusion in disaster risk reduction process and long-term development goals in both policy and community levels. Since 2005 when Comprehensive Disaster Management Program was launched, about one third of members of Union (lowest unit of local autonomy) Disaster Management Committee members are women (50% are women in case of NGO assisted disaster management committees). Thus participation of women in decision-making and agenda-setting was made secure. Community-based disaster risk reduction planning process was standardized, in which discussion sessions only among the poor, the disabled and women separately. Gender disaggregated vulnerability and capacity analysis was also a part of the process. Number of women in rescue and recovery organizations also increased. Cyclone Prepared Programs that convey cyclone warning messages to community people and assist their evacuation in coastal areas, initially consisted of only male volunteers, but now one third of them were women (Ikeda 2011).

Bangladesh and other Asian countries have institutionalized this series of improvement after late 1990s, adopting frameworks prepared at two World Conferences for Disaster Reduction both hosted by Japan. It is our turn now to learn how to identify various needs of men/women and address them in reconstruction operations, and how to promote equal participation of men and women into reconstruction, from international practices.

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（２）ガザラ・ナイーム（パキスタン）「Reconstruction Realities　In Context of Kashmir Earthquake 2005」

Reconstruction Realities

In Context of Kashmir Earthquake 2005

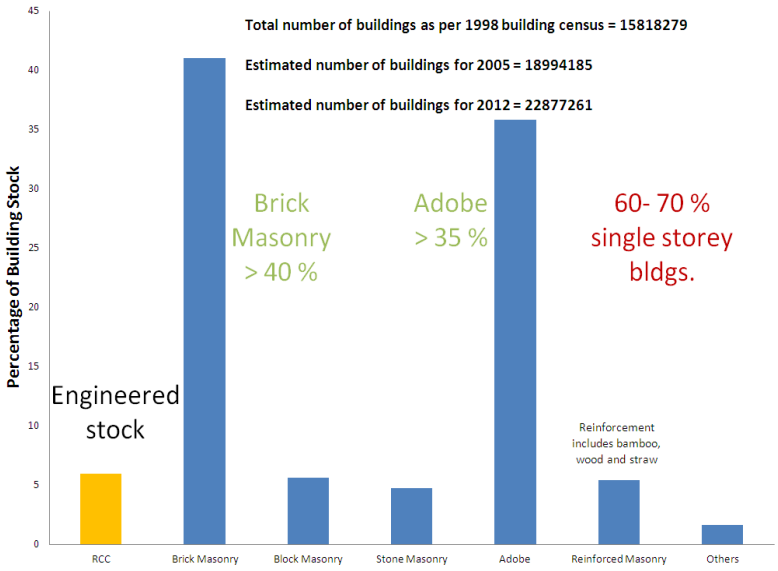
1. Background

The phrase “earthquakes do not kill people, it is the unsafe buildings which do” was found to be true during the 2005 Kashmir Earthquake.

Highly fragile built environment when shaken by the magnitude 7.6 EQ on the Richter scale, devastated 30,000 square kilometers of the area. It killed more than 73,000 people including 18000 school children. About 600,000 families were made homeless also affecting livelihood and infrastructure in nine districts of Khyber Pakhtunkhwa (KPK) and Azad Jammu and Kashmir (AJK).

Above: Aerial view of devastation caused by EQ 2005- Balakot City, KPK

Severity of the damage is attributed to the earthquake’s upthrust coupled with poor construction; built mostly as non-engineered structures without following any building code. Following chart can help understanding the typology of built environment of Pakistan.



Right: Graph shows only 5% engineered buildings whereas more than 75 % structures of load bearing brick masonry and Adobe.

Source, Pakistan Built Environment Research Project, Prof. Sarosh Lodi, NED University Karachi

Unprecedented efforts and cooperation of national and international community culminated in successful completion of relief and recovery phase, which was followed by reconstruction and rehabilitation activities.

2. Reconstruction Targets:

Apart from the huge death toll and the unprecedented number of people injured and displaced, the earthquake destroyed all essential facilities in the entire nine districts.
This mega disaster created a mammoth task to reconstruct 600,000 houses, 6298 educational facilities, 796 health units, 6440 km of road network and 50-70 % of the infrastructure (telecom, power, water and sanitation) completely destroyed.

Prior to Kashmir Earthquake 2005, no dedicated organization in the country existed to deal with the mega disasters like this one, therefore ensuing huge volume of the reconstruction challenge, an "Earthquake Reconstruction and Rehabilitation Authority" (ERRA) was constituted on 24th Oct 2005, soon after the earthquake. Although it was not an easy take off for such an infant organization with hardly any previous established mechanism and procedures in force and any human resource capacity developed to deal with such mega disasters.

After six months of the earthquake, the relief phase was declared closed, having created enabling environment for the affected population to start participating in the reconstruction and rehabilitation of their houses and physical infrastructure.

3. Sectoral Challenges and Updates:

ERRA intervened in twelve different sectors grouped under four clusters:

1. Direct Outreach to Households and Individuals[1],
2. Social Services[2],
3. Public Infrastructure[3],
4. Cross Cutting Programmes[4].

I. Housing

ERRA provided financial and technical assistance to the owners of damaged or destroyed houses for reconstructing or retrofitting, following an owner-driven approach but assisted and inspected by the construction regime.

- Mobilized Assistance and Inspection (AI) Teams for house to house outreach.
  Partner organizations were involved to constitute AI teams trained in assessments comprising of a government representative, an engineer and a social organizer.
- Provided cash grants of US $ 1667 for reconstruction of a core house of 250-400 square feet and US $ 833 for retrofitting and repair of structurally damaged house. Cash grants installments were are linked to three stages of construction and adoption of seismic safety design standards.
- Established building standards and earthquake resilient designs for non-engineered and adobe construction by improving and modification of indigenous and prevailing construction techniques.
- Technical assistance targeted at local authorities, partner organizations, contractors, masons, and home- owners covering; hazard mapping, damage and eligibility assessments, earthquake resilient construction solutions, facilitating building material markets as well as land and property related issues.
- Developed grievances redress system for house ownerships, land availability and relocation issues.

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1 Rural Housing, Livelihood and Social Protection
2 Education Health, Water and Sanitation
3 Governance, Transport, Power and Telecommunication
4 Disaster Risk Reduction, Environmental Safeguards and Gender Equality

Challenges:

- In the absence of updated ownership records/ data base of family properties, finalizing the lists of beneficiaries as per eligibility criteria and damage assessment was a huge challenge.
  Legal Aid Centers were established at district level to resolve the property ownership disputes.
- Exclusive Women Committees were established to help and support the female heads of the families to receive financial and technical assistance for reconstruction e.g. widows of the victims faced family resistance for taking cash grants.
- To meet the demand of many fold increase in construction activity in the affected area, large number of trained workers/ masons were needed; about 80% of the force required was untrained and hence trained from the scratch. To support aggregated demand and continued supply/availability of good quality construction material, material hubs were established at district level.
- Financial assistance was planned to be disbursed through banks whereas most of the people did not have any bank account. Special arrangements were made for opening of the new bank accounts and re-issuance of necessary documents to affected population.
- Relocation of the individual house to an alternate site was comparatively easy but relocating a town or a settlement posed difficulties in terms of finding alternate site as well communities' acceptance to be relocated.
- The massive reconstruction in the area resulted in tremendous pressure on the natural resources and hence deforestation was monitored and controlled with the help of satellite images.

Updates: 462546 units of rural housing were completely destroyed and 1010,091 were partially damaged. At the end of 2011, rural housing programme is near successful completion. By the end of June 2012, 92 % of the destroyed houses will be reconstructed as per ERRA guidelines leaving over 250,000 trained human resources for seismically safe non-engineered construction. Put this information in box

Master plans of urban development projects for the cities of Muzaffarabad, Bagh, Rawalakot and Balakot have been approved and Chinese firms are conducting field surveys.

Social Impact: During a survey in 2008; 88 percent responded enhanced level of confidence in their reconstructed houses. The awareness raising campaigns further enhanced the community's capacity. This prompted safer reconstruction methods and new technologies with wide inclination towards ERRA guidelines.

II. Health

Health care network was rendered paralyzed and 796 health facilities needed reconstructed or retrofitting. The required health services were being provided in makeshift arrangements

Challenges: The smaller Units were integrated into primary health care facilities out of which initially 267 were pledged by donors but later 92 facilities were dropped. Sustainability of interventions is a major challenge which needs to be addressed by the government.

Updates: 173 health facilities have been completed, 86 are under construction and 47 are at designing/ tendering stage as of Jan 2012.
However, very few health facilities are fully operational, primarily due to the lack of government's capacity to maintain and manage.

First dialysis center at AJ& K, Abbass Institute of medical sciences

Social Impact: patient's survey showed 65.5 % found the post earthquake health facilities better than before; whereas only 3.5 % of the facilities had deteriorated. A great proportion of patients felt donor/ NGO provided health facilities are better than the facilities managed by the government. 50 % were of the view that the new facilities are performing better because of the new equipment and better supply of medicine whereas 35 % considered improved construction as the reason of better health facilities.

III. Education

The Kashmir earthquake destroyed 6298 educational institutions killing more than 18000 students. Surviving teachers and students were traumatized and the objective was to bring them back to normalcy within the shortest possible time, hence tent schools were established to ensure minimum disruption of academic activities.

Challenges: Land availability was a big issue, many institution were to be relocated for reconstruction for improved facility. Government department have serious capacity limitations to operate and manage such a large number of projects spread over a vast area.

Updates: 38 % educational institutions have been reconstructed, whereas 36 % are near completion. The reconstructed universities are provided with modern state-of-the-art equipment, libraries and laboratories. The standard of seismically safe educational buildings along with modern day facilities has been an incentive to attract high enrolment and improve the standard of education. Provision of staff, operation and maintenance of completed facilities is the basic responsibility of the concerned provincial and state government which are finding it hard to cope with sustainability issues.

Social Impact: Students enrolment in schools has been significantly improved. The new enrolment in primary schools has risen to 385,00 as compared to the 200,000 . The increase in the number of students going to school reflects the restored confidence of the parents to send their children to educational institutions. 85 % students consider their institutions well equipped and safe.

IV. **Water Supply and Sanitation**

The objective is to improve community's quality of living standards with improved drinking water supply, sanitation and solid waste management.

Challenges: the scattered water sources in the rugged terrain and inadequate supply system was envisaged as a futuristic problem. However, the strategy of participatory approach, was implemented to overcome the impeding tasks i.e. reconstruction and rehabilitation of 4001 Water Supply Schemes (WSS) and 623 sanitation projects.

Updates: So far, over 84% of the physical work has been completed; whereas remaining ongoing works are at advanced stages of completion.

Social Impact: As a result of installation of water supply schemes (WSS) within the proximity of a radius of 75m compared to pre-earthquake situation, on average, a household resulted in saving one hour daily. Improved access to WSS has helped to bring the behavioral changes on hygiene and sanitation in the community.

4. Way forward

A glimpse of reconstruction and rehabilitation process and progress so far reveals unprecedented achievements by ERRA for a newly established organization with no background experience of handling disaster of this magnitude.

However, the experience also reveals that incompatible capacities of other line departments need a lot of improvement to ensure sustainability of all the "build back better" facilities and infrastructure.

The nation was caught unprepared by the Kashmir Earthquake in 2005; but the increased frequency of natural and manmade disasters within the past decades has revealed the importance of preparedness and mitigation for optimum utilization of country's scarce resources.

Diverse topographic climatic and cultural features of Pakistan coupled with varied disaster threats ranging from hydro-met to geological, demand extra ordinary care for integrating disaster risk reduction into development.

The subsequent reconstruction scenario, of 2010 and 2011 mega floods demands integration of lessons learnt from the reconstruction of EQ 2005 in addition to adapt measures to reduce carbon footprint and keeping in mind climate change adaptation strategy.

References:

1. *ERRA Annual Review 2009-10*
2. *Summary report on MZD Earthquake destruction by Ali, UET Peshawar*
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4. *ERRA Monitoring and Evaluation Report 2010-June 2011*
5. *ERRA Social Impact Survey report 2008*

（３）斎藤大樹（独立行政法人 建築研究所）「LESSONS OF RECENT GIGANTIC EARTHQUAKE DISASTERS IN JAPAN」

LESSONS OF RECENT GIGANTIC EARTHQUAKE DISASTERS IN JAPAN

Taiki SAITO[1]

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1. Introduction

In the last 100 years, there are three gigantic earthquake disasters in Japan which caused tremendous loss of human life: the 1923 Great Kanto Earthquake Disaster (hereinafter referred to as **1923 Kanto Earthquake**), the 1995 Great Hanshin-Awaji Earthquake Disaster (hereinafter referred to as **1995 Kobe Earthquake**) and the 2011 Great East Japan Earthquake Disaster (hereinafter referred to as **2011 Tohoku Earthquake**). Figures 1 shows the epicenters and Table 1 summarizes the disasters.

1923 Kanto Earthquake　　1995 Kobe Earthquake　　2011 Tohoku Earthquake

Figure 1 Epicenters of earthquakes (figures are cited from Wikipedia)

Table 1 Three gigantic earthquake disasters in Japan after 1900

	1923 Great Kanto Earthquake	1995 Great Hanshin Awaji Earthquake	2011 Great East Japan Earthquake
Date	1923.09.01	1995.01.17	2011.3.11
Time	11:58	05:46	14:46
Magnitude	7.9	7.2	9.0
Death & missing	Around 105,000	6,434	19,312 (*2)
Main cause of death	Fire 85%	Building Collapse 75% Fire 12% (*1)	Tsunami 92% (*2)
Major building damage	- Wooden houses - Brick buildings adopting western style	- Old type buildings designed before 1981 - RC buildings with Soft first story	- Minor damage for shaking - Tsunami damage

*1 from statistics of Kobe city
*2 from Japanese National Police Agency (as of 22 Dec. 2011)

The cause of loss is different in each disaster. Roughly, it can be categorized as “Fire (1923 Kanto Earthquake)”, “Shaking (1995 Kobe Earthquake)” and “Tsunami (2011 Tohoku Earthquake)”. Even Japan has learnt severe lessons from earthquake disasters and has improved knowledge and technology for countermeasures, the 2011 Tohoku Earthquake reveals the fact that our effort is not still enough. This paper summarizes lessons of each disaster and efforts which have been taken, especially focusing on the structural design of buildings.

2. Earthquake intensity

Figure 2 shows the sizes of earthquake fault including the 1960 Chile Earthquake which is known as the largest earthquake in the world.

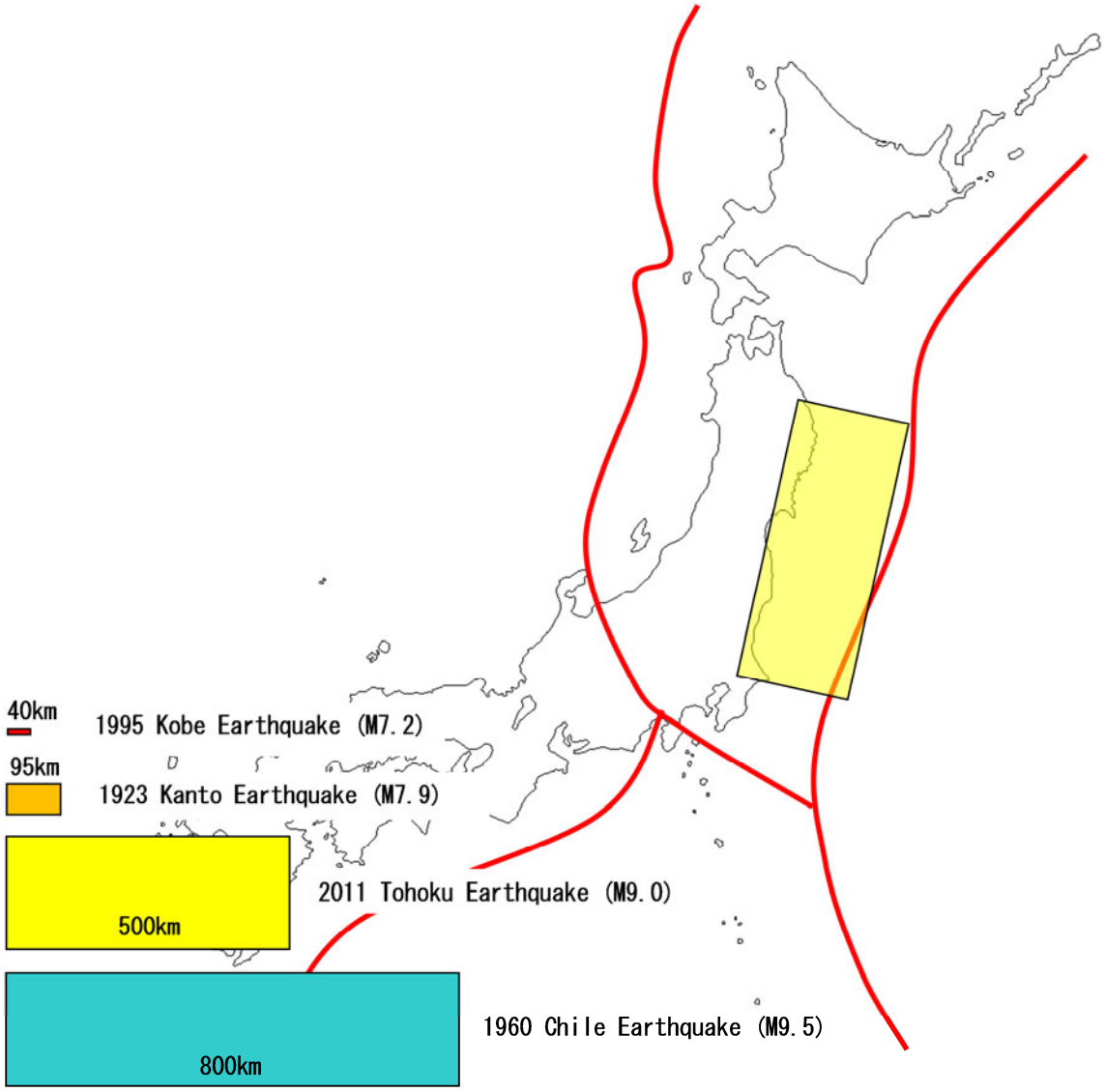


Figure 2 Size of earthquake fault

The 2011 Tohoku Earthquake is known at the largest earthquake in the history of Japan from the size of magnitude. However, comparing other two earthquakes, the epicenter was relatively far from the land. In general, intensity of earthquake ground shaking is getting

reduced as the distance from the epicenter increases (as shown in Figure 3). This could be the reason that building damage due to the 2011 Tohoku Earthquake was relatively minor. However, the maximum accelerations of earthquake ground motions recorded at the 2011 Tohoku Earthquake are quite large as shown in Figure 4. Question still remains why the building damage was minor even earthquake ground motion has such a high acceleration value.

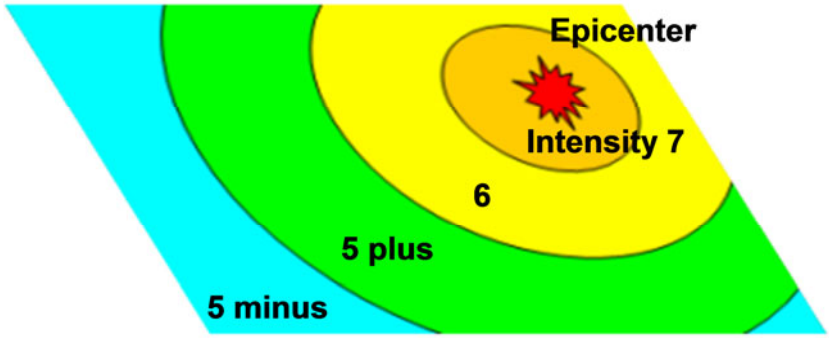
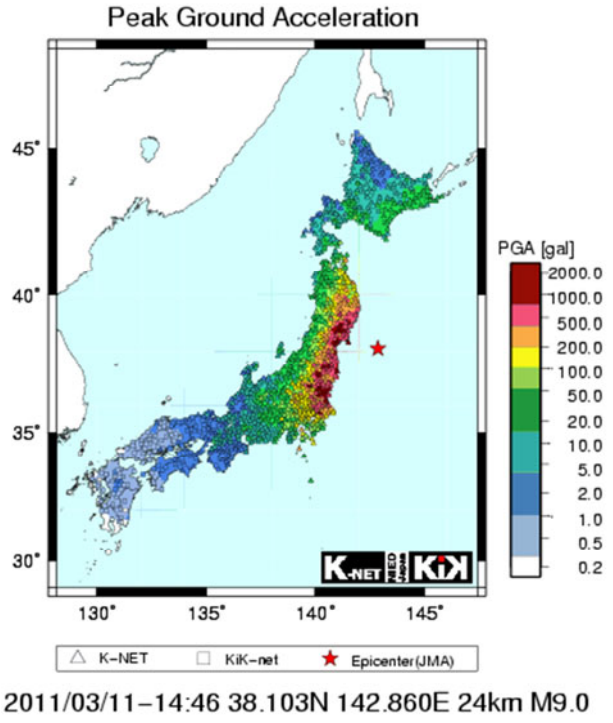


Figure 3 Intensity of earthquake



No	Name of station	The maximum acceleration
1	K-NET筑馆(MYG004)	2933gal
2	K-NET盐灶(MYG012)	2019gal
3	K-NET日立(IBR003)	1845gal
4	K-NET仙台(MYG013)	1808gal
5	K-NET鉾田(IBR013)	1762gal
6	K-NET今市(TCG009)	1444gal
7	K-NET白河(FKS016)	1425gal
8	KiK-net西乡(FKSH10)	1335gal
9	K-NET大宮(IBR004)	1312gal
10	KiK-net芳贺(TCGH16)	1305gal

(data from National Research Institute for Earth Science and Disaster Prevention)

Figure 4 List of large earthquake ground motions at the 2011 Tohoku Earthquake

Figure 5 shows the comparison of pseudo velocity spectrums between the 1995 Kobe Earthquake and the 2011 Tohoku Earthquake. The 1995 Kobe Earthquake occurred just beneath the city of Kobe and produced intensive shaking with high frequency around 1 to 2 Hz as shown in the spectrum. On the other hand, it is seen that the power of the 2011 Tohoku Earthquake in this frequency range is relatively small. Generally wooden houses and low rise reinforced concrete buildings are affected by the shaking with the frequency component

around 1 to 2 Hz; this could be the explanation of minor building damage at the 2011 Tohoku Earthquake.

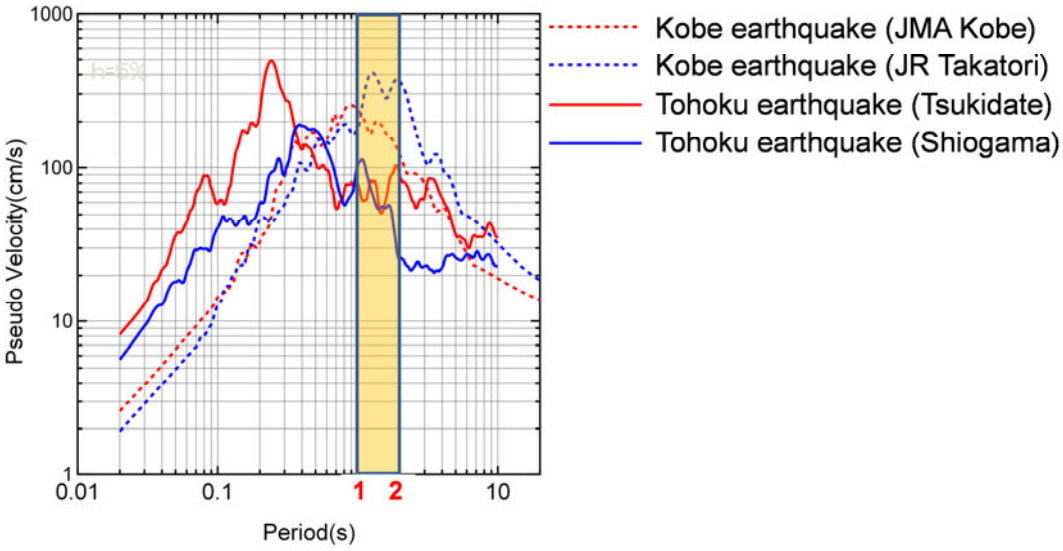


Figure 5 Pseudo velocity spectrums with 5% damping

3. Seismic capacity of buildings

3-1. 1923 Kanto Earthquake --- from brick to reinforced concrete

There was no seismic design code in Japan before the 1923 Kanto Earthquake. As that time, Japanese Government decided to introduce Western culture and technology to catch up Western countries. Fire resistance was the main concern in urban areas since the most buildings were constructed by wood. Therefore, Government recommended buildings made of brick instead of wood.

At the 1923 Kanto Earthquake, brick buildings were severely damaged. The Ginza Brick Street, the symbol of Western style town, destroyed completely. Ryou-unkaku, the highest brick tower in Japan with 12 stories, also the landmark of Asakusa district, has collapsed. On the other hand, reinforced concrete buildings showed excellent performance both against fire and earthquake shaking. Reinforced concrete has jumped to the leading role in building the city of Japan. The first seismic design code was enacted next year of the 1923 Kanto Earthquake.

There are unique structures became popular after the 1923 Kanto Earthquake. One is the steel encased concrete structures (so called SRC) and another one is the reinforced concrete shear walls.

3-2. 1995 Kobe Earthquake --- start promotion of seismic retrofit

Japanese seismic design code has been revised many times based on the lessons of earthquake disasters. The 1968 Tokachi Earthquake caused severe damage to reinforced

concrete buildings. The Architectural Institute of Japan (AIJ) revised design guideline of reinforced concrete buildings in 1971, requiring more stirrups to increase shear resistance and ductility of buildings.

The biggest revision of seismic design code was made in 1981 after the 1978 Off Miyagi Earthquake. The code adopted two level design procedures as shown in Figure 6; one is the serviceability limit design for moderate earthquakes with a base shear capacity of 20 percent of total weight of a building, another one is the safety limit design for strong earthquake with a base shear capacity of 100 percent of total weight of a building.

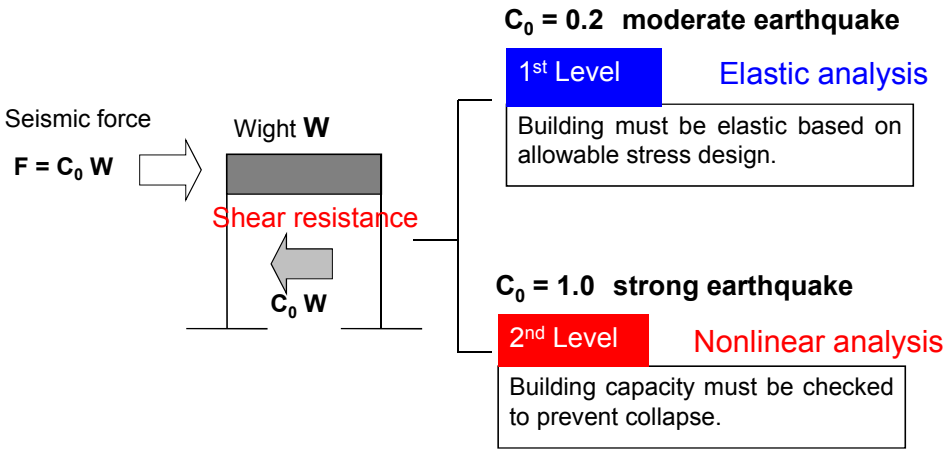


Figure 6 Concept of the two level design procedure at 1981 revision

The effect of this revision was proved at the 1995 Kobe Earthquake. As shown in Figure 7, the ratio of collapse buildings designed after 1981 was very small. The minor revision was made after the earthquake to prevent collapse of soft first story buildings. After the earthquake, Japanese Government issued a law to promote seismic retrofit of existing buildings design before 1981, providing subsidy and other benefits.

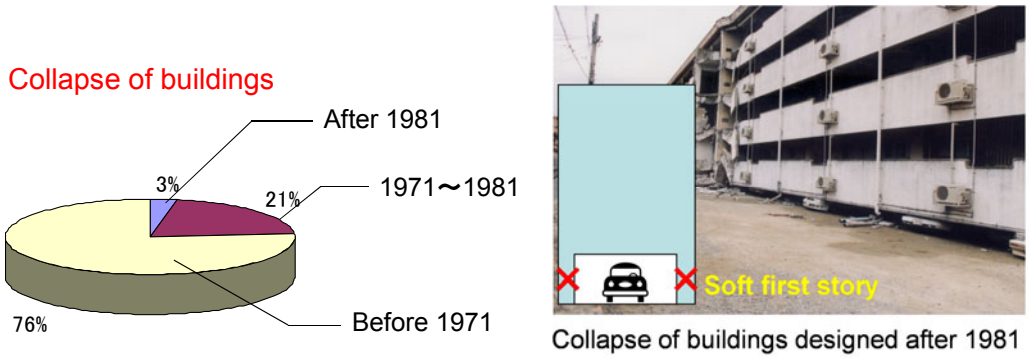


Figure 7 Building damage at the 1995 Kobe Earthquake

3-3. 2011 Tohoku Earthquake --- need to consider Tsunami force in building design

Tsunami induced by the 2011 Tohoku Earthquake struck the Pacific coast of eastern Japan including prefectures of Iwate, Miyagi, Fukushima, Ibaraki and Chiba. In some areas, tsunami height reached over 10 m and washed away the houses and buildings in the areas.

The earthquake shaking was also strong in wide area of Japan; however, the damage of buildings due to shaking was limited. Extensive liquefaction of sandy soil occurred in Kanto area.

In tsunami disaster site, overturning was observed in 4-story or lower reinforced concrete buildings with relatively small size of openings as shown in Figure 8. In all overturned buildings, the maximum inundation depth exceeded their height. Most of the overturned buildings are of mat foundation. In some overturned buildings on pile foundation, piles were pulled out from the ground.

Figure 8 Overturning of a reinforced concrete warehouse in Onagawa city

Consideration of the tsunami effect on buildings is not mandatory for the structural design and there is no regulation to define the tsunami force in the Building Standard Law in Japan. However, the Cabinet office, government of Japan released official guideline on the structural design of buildings for vertical evacuation from tsunamis in 2005. This guideline provides the simplified method to calculate tsunami wave pressure affecting a building using design water depth (see Figure 9). The guideline was revised in 2011 to change the run-up height of tsunami using the parameter α which ranges from 1.5 to 3.0 depending on the distance from the coast and the existence of shielding fence of tsunami.

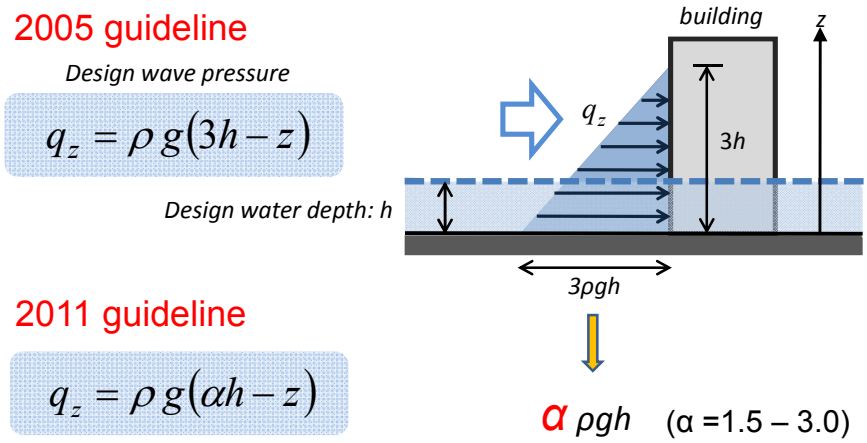


Figure 9 Guideline on the structural design of tsunami evacuation buildings

4. Conclusions

Tsunami has attacked Tohoku regions repeatedly. However, people forgot such lessons and started living again in dangerous areas near the ocean. A gigantic earthquake like the 2011 Tohoku Earthquake is supposed to occur every 1,000 years. The 1995 Kobe Earthquake is also expected to occur every 2,000 years. The return period of the gigantic earthquake is too large for human to keep awareness of disaster prevention. Therefore, it is important to change regulations or make the new ones reflecting the lessons as soon as possible. Also, sharing such experience with other countries is important.

Acknowledgement

The author would like to express his deepest condolences to those who lost their families and those who are suffering from the disaster. Alos, he would like to express his heartfelt appreciation to people from around the world for their warm support.

（４）ジェリー・ヴェラスケス（国際戦略アジア太平洋事務所、タイ）「Promoting Disaster Risk Reduction in Recovery and Reconstruction」

Promoting Disaster Risk Reduction in Recovery and Reconstruction

Jerry Velasquez, D.Eng.
Senior Regional Coordinator, UNISDR Asia Pacific

Introduction

The Asia-Pacific region has witnessed remarkable economic growth and development in recent decades. Since 1990, its aggregate GDP grew three fold – to $17.7 trillion and the share of people living in poverty fell from 49% to 25%. Even at the height of 2008-09 global economic crisis, Asia and Pacific was still the fastest-growing region in the world, supported in large part by fiscal stimulus packages adopted by the region's biggest economies. Further, the outlook for 2010 has improved significantly, with Asia-Pacific region developing economies forecast to grow by 7 per cent, led by China (9.5) and India (8.3).

The Asia-Pacific region is home of 61% of the world's population and 29% of world's GDP and from 1980 to 2009 absorbed an average of 58% of global mortality and 42% of global economic damages caused by disasters. This means that the region has performed better in protecting its human assets than its economic assets, and that despite the commendable economic performance of the region, the region still has a lot to do to improve the resilience of its economies to disasters as compared to the rest of the world.

Between 2002 and 2011, there were 4130 disasters recorded, resulting from natural hazards around the world where 1,117,527 people perished and a minimum of US$1,195 billion was recorded in losses. In the year 2011 alone, 302 disasters claimed 29,782 lives; affected 206 million people and inflicted damages worth a minimum of estimated US$366 billion.

Increasing Disaster Exposure

If there is one thing that we managed to achieve over the many years of prevention is the reduction of the number of deaths due to disasters despite the rise in the number of events. However, what is alarming is the tremendous increase in economic damage due to these same disasters. It is observed that these increases are caused by increased exposure coupled with economic development.

More people and assets are located in areas of high risk. The proportion of world population living in flood-prone river basins has increased by 114%, while those living on cyclone-exposed coastlines have grown by 192% over the past 30 years. Over half of the world's large cities, with populations ranging from 2 to 15 million, are currently located in areas highly vulnerable to seismic activity. Rapid urbanization will further increase exposure to disaster risk.

As a background, the recent Global Assessment Report for Disaster Risk Reduction (GAR) notes the increasing trend for disaster impacts worldwide, is measured in terms of fatalities and economic effects (mostly losses). This trend is driven, according to GAR, by the rapid increase in exposure, both human and economic. The GAR also tells us that vulnerability has improved considerably in the last few decades.

Almost 85% of mortality risk to earthquakes is concentrated in lower-middle income countries, which highlights that while wealthy countries tend to be less risk-prone than poorer countries; most of the recent risks to earthquakes have accumulated in countries, which are rapidly expanding their economies. This means that disaster risk increases if the exposure of people and assets to natural hazards increases faster than countries can strengthen their risk-reducing capacities, including the strengthening of governance capacities, such as the quality of institutions, transparency and accountability.

In the case of floods, mortality risk increased by 13% from 1990 to 2007, but over the same period flood economic loss risk increased by 35%. These increases were found to be due to rapid growth in the people and economic assets concentrated in hazard prone areas. Globally, the number of people exposed to floods increased by 28% in this period, while exposed GDP increased by 98%. Most flood risk is concentrated in countries, such as China, India, and Thailand, which had increased their GDP by 550%, 285% and 218% respectively (based on constant 2000 USD) in the same period.

Also vulnerability declined by 11% in the case of deaths and by 32% in the case of economic loss, reflecting improved development conditions. This means that we are really doing well in our preparedness, early warning, etc. But this decline was insufficient to compensate for the increase in exposure - we simply put more people and economic activities in harms way.

In the case of the recent floods in Thailand, the Chao Phraya basin where all of the floods came from and which drains in Bangkok, covers 30% of Thailand's land area and is where 40% of the population live. However, it is also where 66% of the total GDP is generated and where 78% of the people work. There are projections that the basin will slowly get more urbanized in the coming decade.

In another example, in India, growing cities exposes more assets and people to hazards, with an about 200 million city dwellers likely to be exposed to earthquakes and cyclones by 2050, which is three times more than the 70 million people exposed today.

A new global ranking by Maplecroft, calculating the vulnerability of 170 countries to the impacts of climate change over the next 30 years, identifies some of the world's largest and fastest-growing economies, as facing the greatest risks to their populations, ecosystems and business environments. In this ranking 16 countries are rated with 'extreme risk,' to future climate effects largely due to significant forecasted growth. Bangladesh (1), India (2), Philippines (6), Vietnam (13) and Pakistan (16) all feature in the highest risk category and are of particular importance as they are major contributors to the ongoing global economic recovery and are vital to the future expansion of Western businesses in particular.

And exposure does not necessarily mean physical location. For example, in assessing the implications for the Asia-Pacific region of a slowdown in Japan due to last years tsunami disaster, a recent economics report by ESCAP found that a 1.0 percentage point shrink by from the baseline growth in 2011 of the Japanese economy would have a 0.1 to 0.21 percent impact on growth to China, Malaysia, India, Singapore, and Philippines, including a 0.2 to 0.5 % impact on export growth of these same countries due to disruption in inputs from Japan as part of regional production chains.

Finally, the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, whose executive summary was released last November 2011, and the full report this February 2012, notes that "settlement patterns, urbanization, and changes in socioeconomic conditions have all influenced observed trends in exposure and vulnerability to climate extremes (high confidence)."

Strategies for Reducing Disaster Exposure

What are practical strategies to reduce exposure from disasters? Exposure to future disasters has the greatest potential to be reduced if disaster risk management approach is incorporated in land use, urban and spatial planning, and in post-disaster reconstruction planning.

The latest worldwide data shows that only 15% of low-income countries report success in using land-use planning and urban development to reduce risk. Land use changes exacerbate the impacts of disasters. Locating large numbers of vulnerable communities or economic assets in flood prone riverbanks, extensive deforestation and mining, and conversion of farmlands into urban development increases the risks of damages due to floods.

The recent floods in Pakistan, Thailand and the Philippines have put focus on the urban development, watershed management and community preparedness systems. There is also some anecdotal data that private investments create new risk through new economic areas and zones, which lead to concentration of population and assets in coastal areas and flood plains.

The private sector, largely accountable for economic growth and financing infrastructure, should share in the responsibility for the risks they create, rather than having the public sector solely paying for them. There has been greater exposure to disasters, yet there is no apparent link between growth and disaster risk reduction.

The following section looks more in depth at the opportunities for reducing disaster exposure during recovery and reconstruction.

Reducing Disaster Risks During Recovery and Reconstruction

The Hyogo Framework for Action highlights the importance of mainstreaming disaster risk reduction efforts within urban planning and reconstruction of building and infrastructure projects.

Post-disaster reconstruction is often seen as a chance to rebuild better, reduce future disaster risk, and improve the quality of life of the affected communities. However, the haste to "recreate the familiar" & "return to normal" tends to skip the concept of "building back better" in the post-disaster reconstruction.

A typical barrier to the adoption of more DRR in recovery and reconstruction include barriers to fundamental land use change (cost, prior investments, property ownership, and commercial interests), lack of community involvement in the recovery and reconstruction planning, and the haste to reconstruct, which in turn results in less reduction of exposure during reconstruction.

Community Focused Recovery

One important aspect of incorporation of risk reduction during reconstruction is community-based approaches in reducing risks. For example, considering cultural dimensions and livelihood patterns of affected communities will ensure that policies and technologies used during reconstruction will cater to the needs of the communities.

Importantly a disaster may offer an opportunity for communities to change the way they think. By involving communities in the very early in the recovery process, it provides an opportunity to build on community's cultural and social resilience. For this to happen, however, communities need to be involved in the planning and execution of the activities in the recovery. Governments can therefore develop standards and strategies for community participation and input, based on an understanding of community strengths and weaknesses.

Proper Resourcing and DRR During Recovery

The International Recovery Platform has found that one of the most important requirements for a resilient recovery is to allocate sufficient time and resources. If the time frame is too short the danger is that the recovery processes may build back vulnerabilities or even increase them, while risk reduction will amount to little more than a series of add-on training programmes.

In addition to sufficient time, the scale of financial resources available for recovery, especially from non-governmental sources, is also an important aspect of the success of the recovery and the success of the inclusion of disaster risk reduction. Resources can come from national, local and community sources within Governments, and through pairing of economically strong and less developed local governments.

Linking loans from donor communities and private sector to risk reduction efforts can also be a means of ensuring that these investments are sustainable and does not create new risks. Donor aid and post disaster loans are a source of cheap funding to help recovery and reconstruction in the aftermath of a disaster, and should be encouraged to also be the source of mitigation and resilience building within recovery and reconstruction period.

Consider Social, Cultural and Natural Heritage in Recovery

The post-disaster recovery reconstruction processes usually focus primarily on providing the essential needs for the local communities and on rehabilitating basic infrastructure. Because of this, the attention paid to the damage caused by this disaster to the cultural and natural heritage becomes limited. However, the reality is much more complex, and social fabric often requires rebuilding of other social structures, including cultural heritage and places for worship.

Improve Post Disaster Land Use and Construction Practice

It is often said that post disaster recovery and reconstruction should not rebuild back risks. However, in the haste to rebuild, sometimes un-intentional risks are re-created both in terms of location and in the structures that are rebuilt.

For example, in 1954 an earthquake caused massive damage in a town in Algeria. Then, just 26 years later following a building boom, an earthquake again devastated the same town. Eighty-five schools were destroyed caused by unsafe reconstruction following the previous earthquake. This means that the rush to rebuild can often result in lower safety standards being adopted during recovery.

In another example, after the destructive cyclone in Bangladesh in the 1970s cyclone shelters were built in areas adjacent to the Bay of Bengal. However, the shelters were poorly designed, ill sited and often located beyond a reasonable distance for people to access in times of need. Twenty years later, after a major cyclone in 1991, Bangladesh redesigned the cyclone shelters, and enlarged, and relocated them in closer proximity to current population centers.

In another example, after the 2004 Indian Ocean Tsunami, many affected countries created “red zones” along the coast moving entire populations out of the way of possible future tsunami. However, displaced communities often need the proximity to the sea because of their livelihood, and thus in the case of Indonesia, lifted the “red zone” area not long after the disaster. It is therefore important to find a balance between relocation and reducing exposure and creating weak communities due to lack of livelihoods.

Need for More Coherent Approaches for Reducing Risks During Recovery

Most governments have not fully developed coordinated and coherent action on disaster risk reduction across different sectors and between central and local governments, and between the phases of the disaster risk management cycle. Institutional arrangements, legislation, policy for disaster risk reduction, and capacities tend to be anchored, when in place, in disaster response which may not have the authority or capacity to influence decisions related to national development planning and investment.

Some of the lessons that need to be considered to ensure that recovery and reconstruction incorporate DRR thus:

- Promote a community-focused recovery

- Proper resourcing and DRR during recovery
- Consider social, cultural and natural heritage in recovery
- Improve post disaster land use and construction practice

In addition to the issues identified above, some lessons from literature on how risk reduction can be incorporated into disaster recovery

- Integrating disaster risk reduction into any prior planning of recovery
- Prior assessment of risks
- Incorporation of risk reduction approaches into the implementation of emergency preparedness and response
- The development or strengthening of institutions, legal mechanisms and capacities
- Building risk reduction values and approaches into the human dimensions of recovery.
- Ensuring the more tangible aspects of risk reduction are applied in the physical reconstruction of new buildings and infrastructure.

Gender and social inclusion in reconstruction process

Experiences of people engaged in planning and operation of reconstruction since March 11

2012 /02/22

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Research on experience of reconstruction planners and operators

This presentation is based on the interim report compiled by the research team of Risetogether (2012/01/29) http://risetogetherjp.org/?p=492

Objective: To record the gender differentiated impact of Earthquake and Tsunami and recovery process and use the data for policy recommendations

- Risetogether http://risetogetherjp.org/ (Research Team: Ms. T. Yunomae, Dr. A. Tsuge, Dr. M. Yoshihama and K. Ikeda) funded by Oxfam Japan
- June 2011 ~May 2012

Questions

- Type of reconstruction activities?
- How to understand needs of women/vulnerable groups ?
- How to address them in reconstruction programs?
- Lessons learned and problems faced?

29 Organizations / individuals engaged in reconstruction activities in Miyagi and Iwate Prefectures. (as of Jan.5)

A. Women's group working for women, Gender equity section of local government
B. Rescue and reconstruction organization
C. Local government (other than A)
D. Medical institution
E. Educational institution
F. Local assembly
G. Local leaders (neighborhood association etc)

Gender-sensitive and vulnerability-reduction -focused disaster recovery policies/programs

Basic Reconstruction Law (June 24, 2011)

... incorporate opinion of various group of people including women, children, the disabled....

Reconstruction Guidelines (July 29, 2011)

Programs:
1)Building resilient community
2)Rebuilding life: counseling, employment, entrepreneurship development
3)Rebuilding economy: farming, tourism, welfare

Disaster Management Basic Plan (Dec. 2011)

Safety / participation in management of temporary housing community

1. Identifying gender and specific needs on reconstruction

1) Both those affected and assisting them with reconstruction are aware that women and men have different reconstruction needs, but were not always able to understand and address the diverse needs
2) Difficulty of reaching families with the aged/ the disabled or single-mother HH who did/could not stay at emergency shelters.

Consultation with the vulnerable / women ? - Space use of evacuation shelters

Consultation with the vulnerable / women ? - Space use of evacuation shelters

Consultation with the vulnerable / women ? Design and equipments of temporary houses

Meaning of 'We are OK'

登米えがおネットHPよりhttp://www.tome-egaonet.jp/katudou.html

- **Women-only discussion session with female social worker**
- **Local government's undersign**
- **Local women's group work with the local government**
- **Simple check sheet (easy to fill in, privacy is kept)**

1. Identifying gender and specific needs on reconstruction

- The need for gender-specific and socio-economically disaggregated data
- Women's and vulnerable group's engagement in defining what are reconstruction needs
  workload, violence,.... Seriously lacking
- Needs assessment team (both sex)

Needs assessment with head of household and community leaders is still common

1. Identifying gender and specific needs on reconstruction

- Developing mechanisms to share gender-sensitive information
  - Employment of reconstruction social workers assigned to temporary housing community
  - training on gender/vulnerable people's needs
- Use of gender analysis tools

Seriously lacking

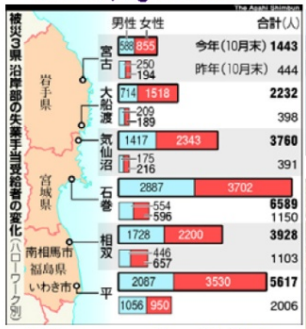
- Community-based participatory process
- Recovery early assessment by planners
- Who does what for recovery?
  Who has access and control of what?
  What hampers meaningful participation?

2. Addressing gender and specific needs in reconstruction programs

1) **Increased workload (family care) for women**
2) **Recovery related work for men, overwork of men ⇔ large unemployment of women**
3) **Increased violence against women, DV**
4) **Very few programs targeting single-father family, and relaxation and social networking for men (especially aged men)**

Addressed, but with no systematic gender disaggregated data

Responding to income insecurity of women, aged and other vulnerable people



Asahi Newspaper, Dec. 10, 2011

Miyagi 2011/05

Iwate 2011/06

Responding to violence against women after disaster

Fukushima 2011/06

Message card with hotline numbers
'Seeking privacy and personal security is no selfish even during disaster'

- Counseling services for women
- Gender balanced paid reconstruction job
  - ●Most reconstruction jobs in the market are "for men"
  - ○Entrepreneurship training for women
  - ○Handicrafts making (NGOs)
  - ○Emergency Employment Creation Scheme (MoHW)
    "delivery care project" "social work" "community café"
  - ●poverty of single mother family
- Gender equitable housing and financial services
  - ●household-based distribution of recovery donation and temporary houses

3.Increasing the representation of women and vulnerable groups in post-disaster decision-making

1) **Women/vulnerable people were not sufficiently participating in decision-making of recovery planning**
2) **Women's leadership was not common**

- Increasing the representation of women and vulnerable groups in decision-making
  - ○Gender equity group in "Reconstruction Agency"
  - ●Only 3.4% of prefecture disaster management committee members are women [Zenkoku Chijikai 2008]

Recovery committee	Women among committee
Iwate Pref.	2人 (18人中)
Miyagi Pref.	1人 (12人中)
Sendai City	3人 (16人中)
National committee	3人(15人中)

- Working with local women's organizations
  - ○Counseling, childcare, sexual minority, community business, tourism,
  - ○Retired community nurses and day nursery teachers, community social workers
- Developing the capacity of local women leaders
  - ○Story of some local women leaders who volunteered managing shelters

Many local women's groups joined reconstruction

Fukushima Gender Equity Center, 2012, http://www.f-miraikan.or.jp/pub/topics/svTopiDtl.aspx?servno=1202

Women's Room was opened
Three local women's group managed the room
- chatting with women, coordination with groups from outside, refer to government service

The prefectural govt's gender equity secton supported

4. Need of assisting those who assist reconstruction

1) Work environment of female reconstruction planners and operators
2) Remunerations and secure employment status (local women's groups)
3) Affected and working for reconstruction, while caring for family

（２）ガザラ・ナイーム（パキスタン）「復興の実態：2005 年カシミール地震の脈略から」

Reconstruction Realities
Kashmir EQ 2005

Ghazala Naeem, Pakistan

Earthquake 2005, Pakistan

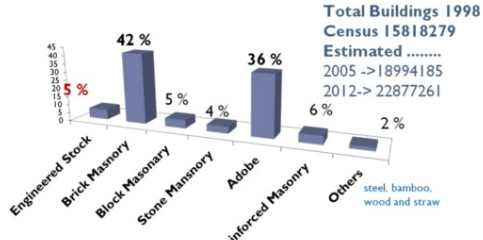
"Earthquakes do not kill people, it is the unsafe buildings which do"

- Highly fragile built environment when shaken by the M 7.6 EQ,
  - Devastated 30,000 square kilometers of the area.
  - Killed more than 73,000 people including 18000 school children.
  - About 600,000 families were made homeless
  - Affecting livelihood and infrastructure in nine districts

Above: Aerial view of devastation caused by EQ 2005- Balakot City, KPK

2

Building Types in Pakistan



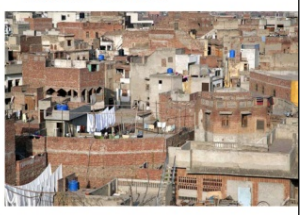
only 5% engineered buildings whereas more than 75 % structures of load bearing brick masonry and adobe.

Source: Built Env. Research Study , Prof Sarosh Lodi, NED University Karachi

3

Built Environment- Current Scenario

- 5 % Engineered Building Stock- Islamabad
- 42 % Brick Masonry- Interior Lahore



4

Built Environment- Current Scenario

- 4 % Stone Masonry Northern Area- AJK
- 36 % Adobe

5

Built Environment- Current Scenario

- 6 % reinforced Masonry
- 2 % Others

6

Reconstruction Target

- 600,000 houses
- 6298 educational facilities
- 796 health units
- 6440 km of road network
- 50-70 % of the infrastructure (telecom, power, water etc)
- Challenge
  - Who & How .....
  - No Institutional Arrangement
- Response
  - Earthquake Reconstruction and Rehabilitation Authority" (ERRA) was constituted on 24th Oct 2005

7

Sectoral Challenges

- ERRA intervened in twelve different sectors grouped under four clusters:
  - Direct Outreach to Households and Individuals,
    - Rural Housing, Livelihood and Social Protection
  - Social Services,
    - Education Health, Water and Sanitation
  - Public Infrastructure,
    - Governance, Transport, Power and Telecommunication
  - Cross Cutting Programmes
    - Disaster Risk Reduction, Environmental Safeguards and Gender Equality

8

Housing- Challenges

- Unreliable Data Base (No Updated Documentation Record Individuals & Land)
  - Legal Aid Centers
- Bank Account for Cash Grant
  - Special Arrangement for Banking System
- Male Dominant Society
  - Established Women Committees

9

Housing- Challenges

- Relocation
  - Individual- Comparatively Easier
  - Town- Alternate Site, Community resistance
- Many fold increase in Construction Activity - Aggregated Demand of Building Material and Trained Workers
  - Construction Hub in affected Districts
  - Training of Costruction Workers
- Deforestation -Tremendous pressure on Natural Resources

10

Housing- Challenges

- Building Design/standards
  - Non-engineered Structures- Developing Guidelines
  - Dissemination among self buiders and contractors
  - Seismic Buiding Code
- Monitoring & Evaluation
  - Field AI Teams (Assistance and Inspection Teams)
  - Grievances redress system for house ownerships, land availability and relocation issues.

11

Housing (updates & Impacts)

- **Updates**
  - Progress so far 92 %
  - Over 250,000 trained human resources for seismically safe non-engineered construction.
- **Social Impact:**
  - Promotion of safer reconstruction methods and new technologies
  - Established Culture of Compliance
  - Enhanced level of confidence in reconstructed houses. During a survey in 2008; 88 %consider their new house safer.

12

Housing with Owner Driven Approach

13

Health

- **306 health facilities** (267 were pledged by donors but later 92 facilities were dropped)
- **Challenges:**
- **Integration** of Smaller Units into Primary Health Care Centre
- **Sustainability**

First dialysis center at AJ& K, Abbass Institute of medical sciences Muzzaffarabad

14

Health

- **Updates:**
- 173 health completed, 86 are under construction and 47 are at designing/ tendering stage. Overall 84 % Progress.
- very few health facilities are fully operational, primarily due to the lack of government's capacity to maintain and manage.

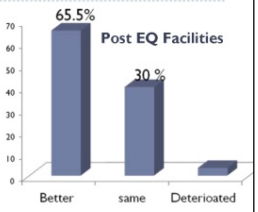
Instead of pre EQ smaller health unit an improved Rural Health Center with modern facilities of minor OT other diagnostic facilities was constructed at Chokothi-AJK

15

Health

Social Impact

- A great proportion of patients felt donor/ NGO provided health facilities are better than the facilities managed by the government.



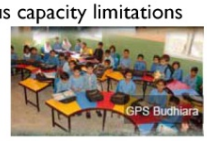
2008 ERRA Social Impact Report 2008

16

Education

Challenges:

- Land availability was a big issue, many institution were to be relocated for improved facility.
- Government department have serious capacity limitations



Instead of three to ten rooms Pre-EQ facility more than 20 rooms school are built with all allied facilities

17

Education

Updates

- 38 % completed whereas 36 % are near completion. (75%)
- Operation and maintenance of completed facilities is the basic challenge for concerned provincial and state government

Social Impact

- The new enrolment in primary schools has increased by 90 % as compared to pre-EQ enrolment.

18

Water Supply & Sanitation

Challenges

- The scattered water sources in the rugged terrain and inadequate supply system
- 4001 Water Supply Schemes (WSS) and 623 sanitation projects.

19

Water Supply & Sanitation

Updates

- 84% completed

Social Impact

- Installation of water supply schemes (WSS) within the proximity 75m radius compared to pre-earthquake situation, on average, a household resulted in saving one hour daily.
- Improved behavioural changes on hygiene and sanitation in the community.

20

Way Forward

- Sustainability of all the "build back better" facilities by improving capacities of line departments
- Preparedness for future disaster risks for optimum utilization of country's scarce resources.
- Integrating disaster risk reduction into development. (e.g. B.C. implementation)
- 2010 and 2011 mega floods reconstruction demands
  - Integration of lessons learnt by ERRA
  - Measures to reduce carbon footprint & climate change adaptation strategy

21

Using the natural safeguards .....

- Evacuation Route
  - Pedestrian Access to DRM Park
  - 800 steps, with 5 rest area

（３）斎藤大樹（（独）建築研究所）「日本における近年の巨大地震災害の教訓」

1

LESSONS OF RECENT GIGANTIC EARTHQUAKE DISASTERS IN JAPAN

Taiki SAITO

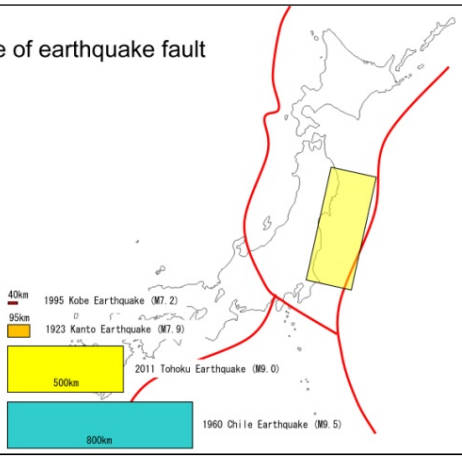
Chief Research Engineer,
International Institute of Seismology and Earthquake Engineering (IISEE),
Building Research Institute (BRI)

2

	1923 Great Kanto Earthquake	1995 Great Hanshin Awaji Earthquake	2011 Great East Japan Earthquake
	Kanto Earthquake	Kobe Earthquake	Tohoku Earthquake
Date	1923.09.01	1995.01.17	2011.3.11
Time	11:58	05:46	14:46
Magnitude	7.9	7.2	9.0
Death & missing	Around 105,000	6,434	19,312 as of Dec.2011
Main cause of death	Fire 85%	Build. Collapse 75% Fire 12%	Tsunami 92%

3

Size of earthquake fault



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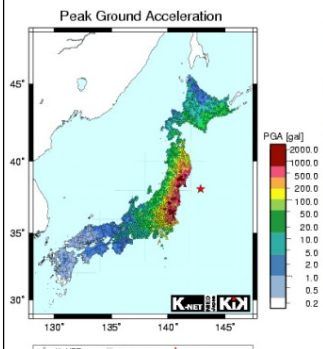
Intensity of Tohoku Earthquake



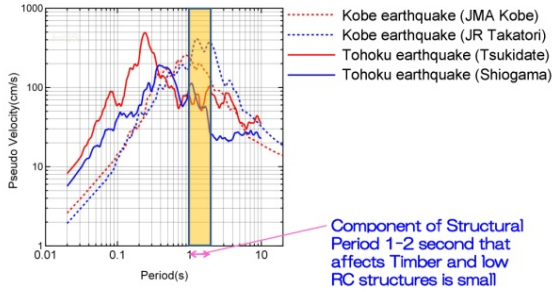
No	Name of station	The maximum acceleration
1	K-NET筑館(MYG004)	2933gal
2	K-NET盐灶(MYG012)	2019gal
3	K-NET日立(IBR003)	1845gal
4	K-NET仙台(MYG013)	1808gal
5	K-NET鉾田(IBR013)	1762gal
6	K-NET今市(TCG009)	1444gal
7	K-NET白河(FKS016)	1425gal
8	KiK-net西乡(FKSH10)	1335gal
9	K-NET大宮(IBR004)	1312gal
10	KiK-net芳賀(TCGH16)	1305gal

2011/03/11-14:46 38.103N 142.860E 24km M9.0

(data from National Research Institute for Earth Science and Disaster Prevention)

5

Comparison between TOHOKU and KOBE Earthquakes



- Component of Short period is dominated at around the epicentre
- Component of the period of 1-2 second that affects structure is small.

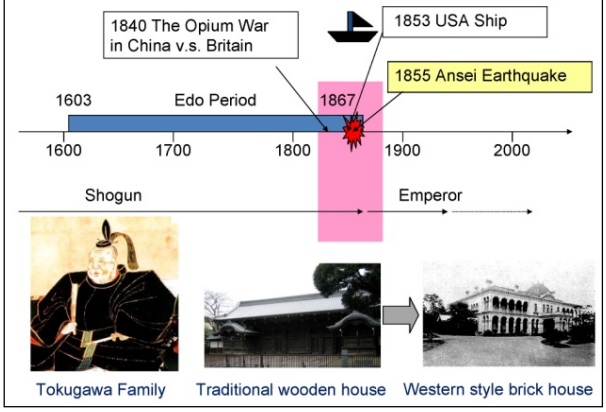
(slide from ATC-JSCA meeting)

6

1923 Great Kanto Earthquake
(Kanto Earthquake)

Transition to western culture

7



Tokugawa Family

Traditional wooden house

Western style brick house

8

Government recommended buildings made of brick.

Ginza Brick Street (1873)

Asakusa Brick Tower (1890)

9

1891 Nobi Earthquake (M8.0)
1923 Great Kanto Earthquake(M7.9)
1924 The first seismic code

Brick → Reinforced Concrete

Ginza Brick Street (1873)

Asakusa Brick Tower (1890)

Lessons from 1923 Kanto Earthquake

- Brick building was introduced as the symbol of western culture and fire resistance structure.
- No scientific study about seismic resistance.
- It was a trigger
  - to develop the first seismic design code in the world,
  - to give up brick structure and shift to RC structure,
  - to develop original structure (SRC, RC shear wall)

Quick and brave decision.

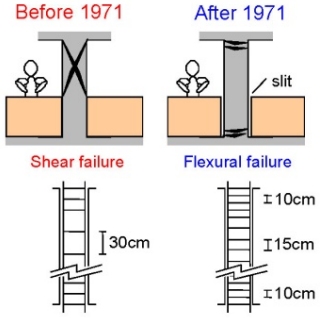
11

1995 Great Hanshin-Awaji Earthquake (Kobe Earthquake)

12

1968 Tokachi-oki Earthquake

1971 Revision of AIJ Standards for RC

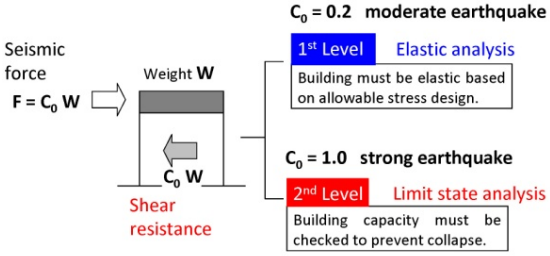


13

1978 Miyagiken-oki Earthquake

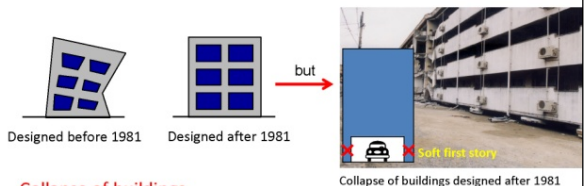
1981 Revision of Building Standard Law

Two stage design procedures



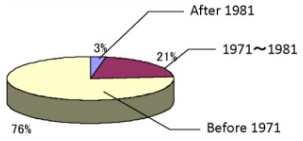
14

1995 Great Hanshin-Awaji Earthquake



Collapse of buildings designed after 1981

Collapse of buildings



1995 Law on the promotion of the earthquake resistance of building

Lessons from 1995 Kobe Earthquake

- Seismic design code was revised every time after severe earthquake damage of buildings.
- The biggest revision was made in 1981 introducing the regulation to check the seismic capacity of a building.
- The building designed after 1981 survived well at the 1995 Kobe earthquake.
- It was a trigger to promote seismic retrofit of existing buildings designed before 1981.

16

2011 Great East Japan Earthquake (Tohoku Earthquake)

17

Introduction

Casualties

Deaths	15,843
Missing	3,469
Injured	5,890

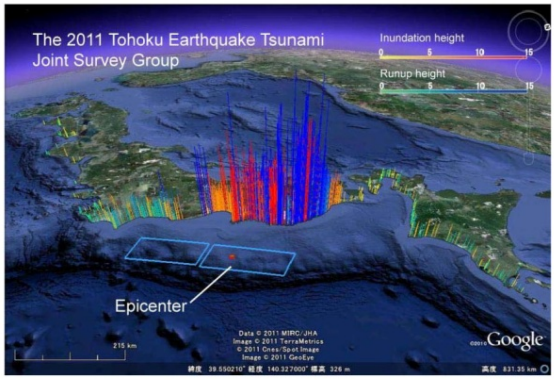
Damage to buildings

Total collapse	126,315
Partial collapse	227,339

More than 92% of casualty was caused by Tsunami induced by the earthquake.
The earthquake shaking was also strong in wide area of Japan; however, the damage of buildings due to shaking was limited.

Source: National Police Agency, as of 22 December 2011

18



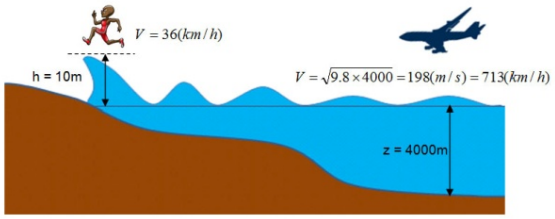
By JSCE Coastal Engineering Committee

19

Tsunami Speed

$V(m/s) = \sqrt{g(m/s^2) \times (z(m) + h(m))}$

Where g : gravity acceleration(=9.8 m/s^2), z : depth of water, h: tsunami height



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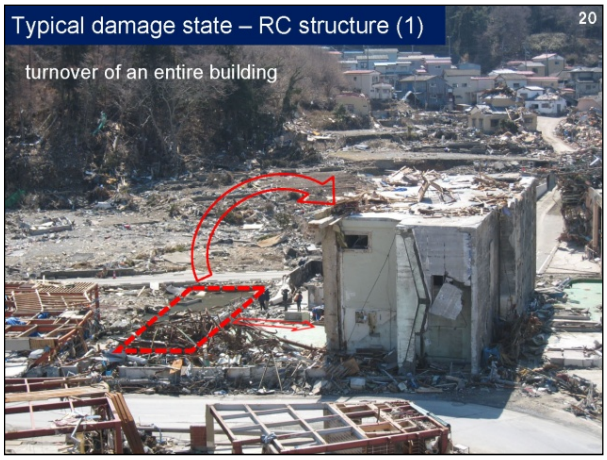
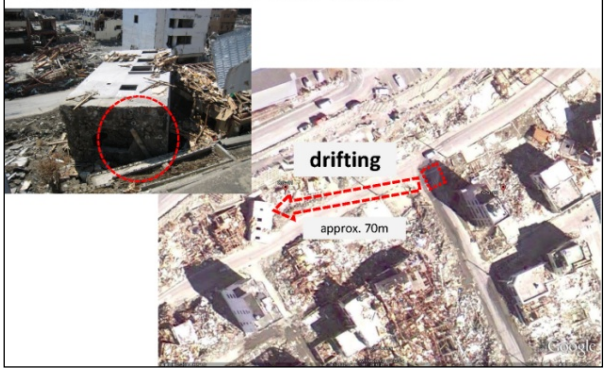


21

Typical damage state – RC structure (2)

- turnover and drift of an entire building



22

Typical damage state – RC structure (3)

Entire building suffered from significant sinking following the effect of erosion in the ground.

Typical damage state – Steel structure (1)

23

Turnover and drift of entire building following the fracture of exposed-type column base

Typical damage state – Steel structure (2)

24

- Turnover and drift of entire building following the fracture of column capital
- This type of damage was observed in the buildings whose columns have concrete encased base or imbedded type base.

Typical damage state – Steel structure (3)

25

Main columns and beams in some buildings are almost intact after all the external claddings were swept away. But they have residual deformation in columns.

Typical damage state – Timber structure (1)

26

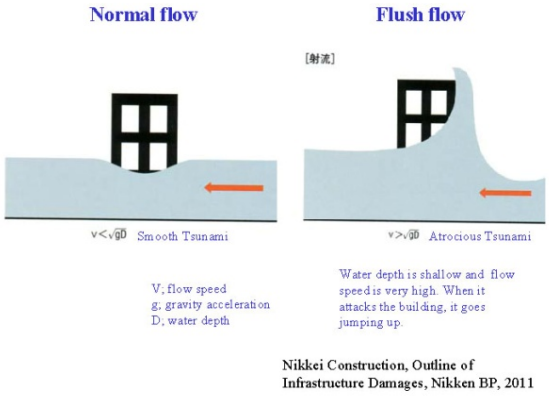
Entire buildings are swept away.

Typical damage state – Timber structure (2)

27

If timber structures are located just behind a relative large-scale building, they were not swept away because of the decrease of direct tsunami effect on them.

28



Nikkei Construction, Outline of Infrastructure Damages, Nikken BP, 2011

Guideline on the structural design of buildings for vertical evacuation from tsunami

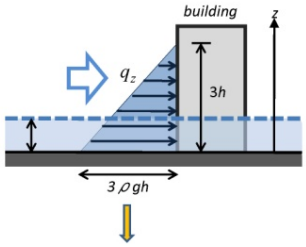
29

2005 guideline

Design wave pressure

$$q_z = \rho g(3h - z)$$

Design water depth: h



2011 guideline

$$q_z = \rho g(\alpha h - z)$$

α (α =1.5 – 3.0)

ρgh

Lessons from 2011 Tohoku Earthquake

- There is a need to consider tsunami force in building design in a tsunami hazard area.
- Building damage due to earthquake shaking was limited to old buildings designed before 1981.
- However, the following problems emerged;
  - Extensive liquefaction occurred,
  - Nonstructural damage such as fall of ceiling panels caused human loss and regulation must be reviewed.
  - Highrise building sufferred large & long time shaking.

Conclusion

- Tsunami has attacked Tohoku regions repeatedly. However, people forgot such lessons and started living again in dangerous areas near the ocean.
- The return period of the gigantic earthquake is too large for human to keep awareness of disaster prevention.
- Therefore, it is important to change regulations or make the new ones reflecting the lessons as soon as possible. Also, sharing such experience with other countries is very important.

Japanese people are deeply grateful of the strong support and encouragement which people in other countries have given us through this difficult time.

Thank you very much for your kind attention.

（４）ジェリー・ヴェラスケス（国際戦略アジア太平洋事務所、タイ）「国際協力、防災・減災、気候変動、復旧、復興」

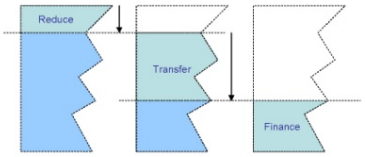
International Cooperation, DRR, CCA, Recovery, & Reconstruction

ACTIVITIES ON EACH STAGE AFTER THE DISASTER

RELIEF	RECOVERY	RECONSTRUCTION
Up to 6 months	Up to 18 months	12 months onwards
OBJECTIVE: To save and preserve lives	OBJECTIVE: Recovery of Minimum Service Standard	OBJECTIVE: Reconstruction of All Systems
• Rescuing the victims • Medical treatment for the wounded • Establishment of Emergency Quick Response Team • Establishment of Services Posts • Logistics & Supplies Distribution • Provision of Temporary Shelters/Tents • Strengthening Distribution Networks • Establishment of Media Center • Psychological Healing • Shifting Development Program to Emergency Program	• Recovery of Governance System • Recovery of Public Services (education, health etc) • Reconstruction of Houses • Recovery of Basic Social Services • Reconstruction of Basic Infrastructures • Recovery of Economic Facilities • Trauma and Psychological Healing • etc	• Economic System (production, trade, banking etc) • Telecommunication System • Recovery of Social and Cultural System • Recovery of Government Institution System • Mainstreaming of Emergency Program to Development Program • etc.

"Building Back Better"

Country Catastrophe Risk Financing Model

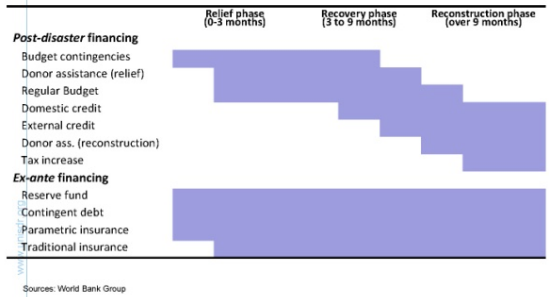


Three pillar model

- Assess and reduce government liability/exposure to natural disasters (disaster risk reduction)
- Promoting risk transfer to private sector (insurance markets, capital market)
  - Increasing cat insurance penetration of homeowners/farmers/SMEs
- Financing sovereign risk
  - Securing immediate liquidity and budget support after a disaster

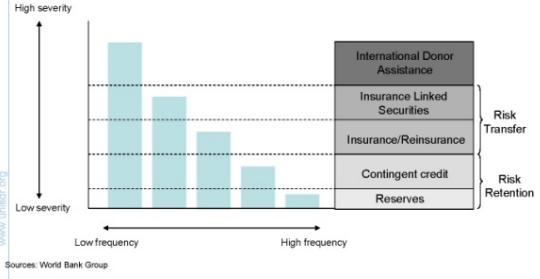
Sources: World Bank Group

Governments have Various Instruments to Finance Natural Disasters



Sources: World Bank Group

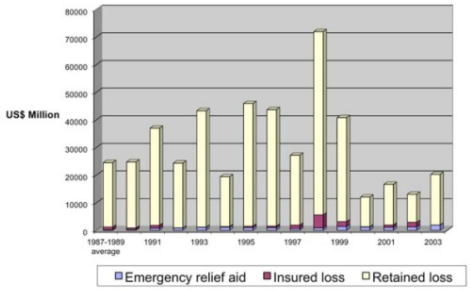
A country catastrophe risk financing strategy relies on an optimal combination of retention and risk transfer to protect fiscal balance



Sources: World Bank Group

Catastrophe losses are mostly borne by governments and households in developing countries…

Financing of catastrophe losses in developing countries



ISDR 7

PRIORITIZATION OF ACTIVITIES – RECOVERY & RECONSTRUCTION STAGES

Article 56 paragraph (2) of Gov Regulation 21/2008:

- To accelerate recovery of community life at post-disaster area, regional government shall set priorities for ***rehabilitation*** activities
- The prioritization shall follow **analysis of loss and damage from disaster (DaLA).**

Article 75 paragraph (2) of Gov Regulation 21/2008:

- To accelerate the rebuilding of all facilities and infrastructure as well as institutions at post-disaster area, Government and/or regional government shall set priorities for ***reconstruction*** activities.
- The prioritization shall follow **analysis of loss and damage from disaster (DaLA).**

www.unisdr.org

ISDR 8

Post Disaster Needs Assessment (PDNA)

- **DaLA** - For Estimation of Disaster Impact and Needs for Recovery and Reconstruction
  - Disaster Impact Assessment at Macro-Economic and Household Levels, and Estimation of Needs for Recovery, Reconstruction and Risk Reduction
- **Damage**
  - Destruction of physical assets
  - Occur at the time of the event
  - Measured in physical units and replacement value
- **Loss**
  - Changes in economic flows
  - Occur over a relatively long time period
  - Expressed in current values
- **Needs**
  - Disaster risk reduction and climate adaptation needs
  - Social needs

www.unisdr.org

ISDR 9

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５．国際ビデオ会議発表資料

（１）フィリッチ・オプラン（ハイチ、公共事業・輸送・通信省建物評価技術室技師）「2010 年ハイチ地震」

12 JANUARY 2010 EVENT

- Typical Earthquake Damage
- Repair Technical

Masonry Shear wall Crack (Window)

Minor Cracks

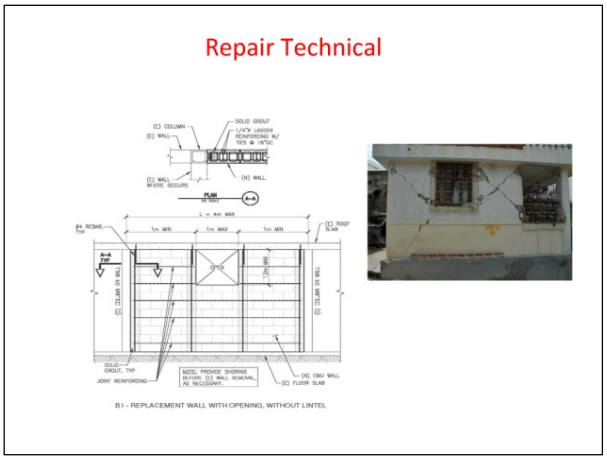
Masonry Shear wall Crack
(X-Crack)

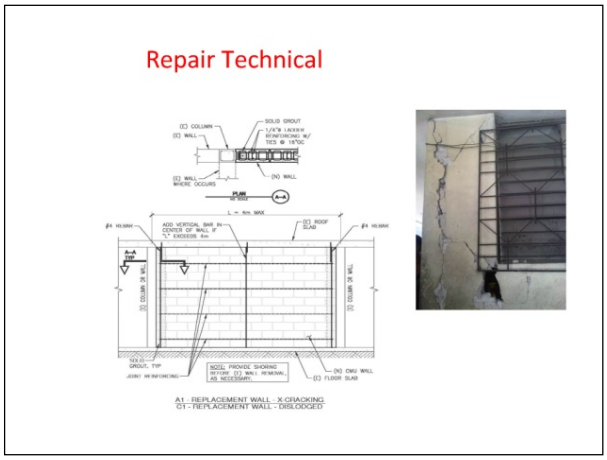
Wall out of plane Failure

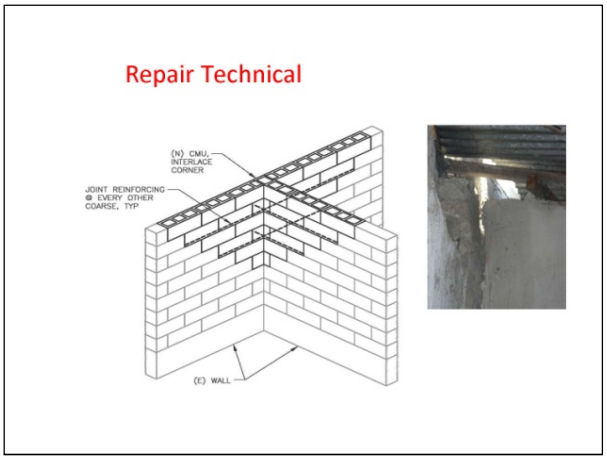
Partially disconnected wall

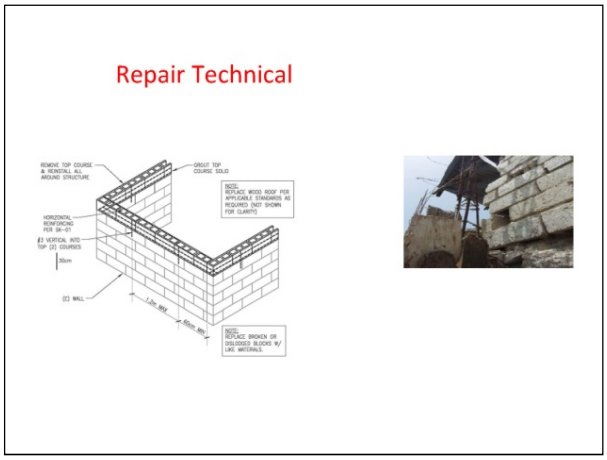
Concrete Column Rupture

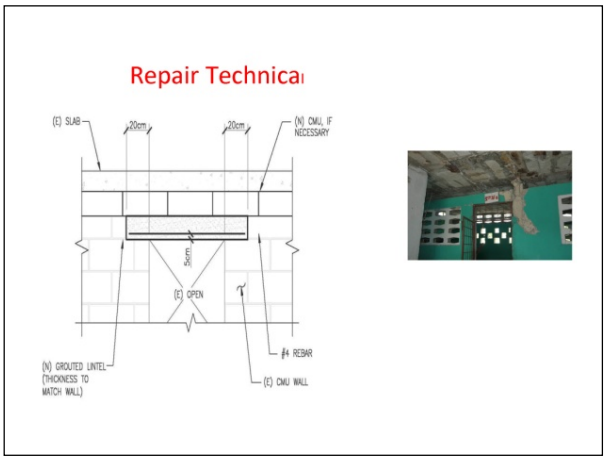
Spalled Concrete Column



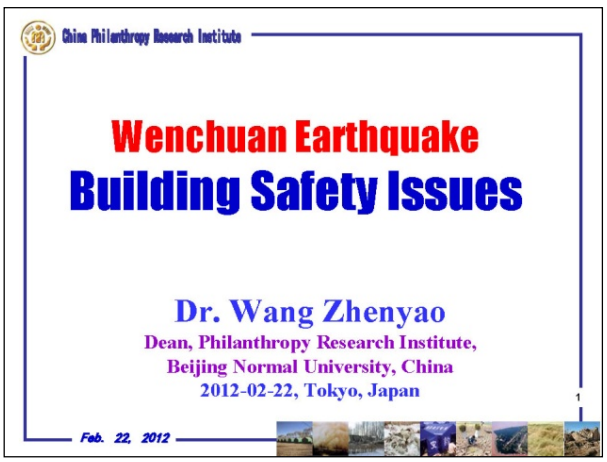








（２）ワン・ツェンヤオ（中国、北京師範大学壺基金公益研究院院長）「2008 年四川地震：建築物の安全の問題」



China Philanthropy Research Institute

First, the construction code or standard should not be lower.

There was too low stansard before earthquake. In rural, the buildings almost were no standard to prevent earthquake.

Feb. 22, 2012

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Aerial photograph: Yingxiu Town of Wenchuan County on May 14

Feb. 22, 2012

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Second, the buildings location should be carefully choiced

especially in mountain district including the coast line

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Tangjiashan Mountain Quake Lake

Feb. 22, 2012

China Philanthropy Research Institute

Third, the terrain of the vast affected area is complex, limiting the efficiency of rescue efforts

A collapsed bridge on the way to Wenchuan on May 16

Collapsed buildings

Feb. 22, 2012

China Philanthropy Research Institute

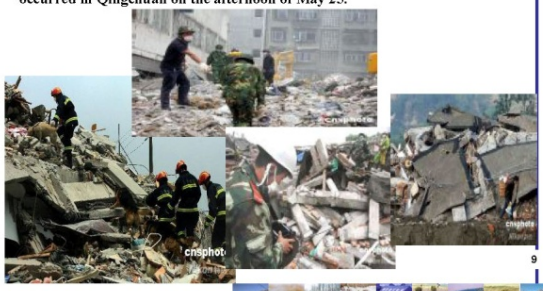
Third, the foundation of building, especially first and second floor are very important.

most buildings collapsed because the first floor was not enough strong.

Feb. 22, 2012

China Philanthropy Research Institute

- According to CDSN, by 12:00, September 1, which was the 112th day after the Earthquake, there had been over 27,000 aftershocks, of which 8 measured above 6 Ms and 39 measured above 5 Ms. The strongest aftershock measure 6.4 Ms and occurred in Qingchuan on the afternoon of May 25.



Feb. 22, 2012

China Philanthropy Research Institute

Fourth, the good training program for evacuation is very important

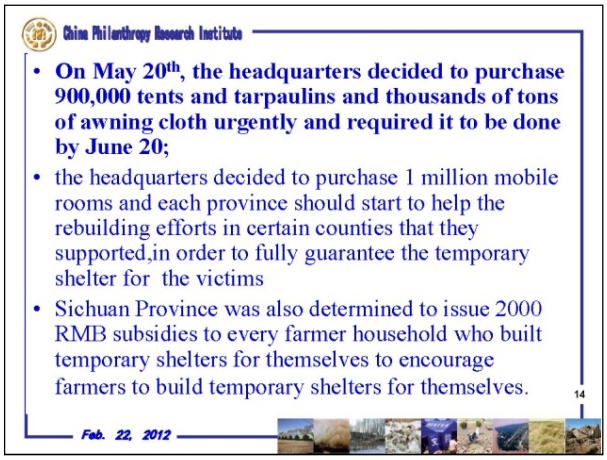
Good case is Sangzao School!
1 minite 38 seconds, more than 2000 students escaped classroom and lined up! No people hurted!

Feb. 22, 2012

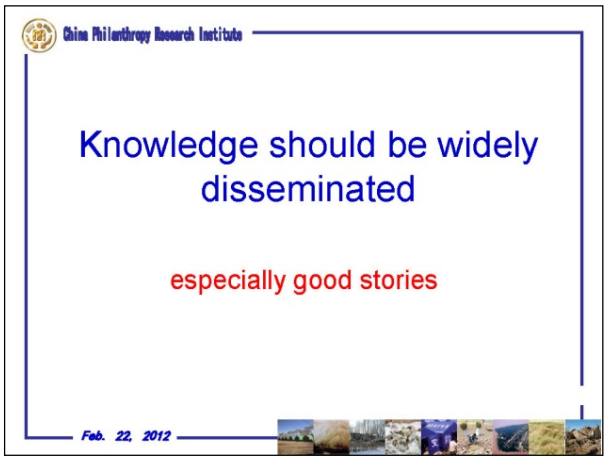

Emergency evacuation from Beichuan
Emergency rescue
A child walking out from Wenchuan
Feb. 22, 2012


China Philanthropy Research Institute
Quake-afflicted people were removed
A bird's-eye view of the affected area
the quake-afflicted people were facing great difficulties
12
Feb. 22,


China Philanthropy Research Institute
Fifth, porvide temporary shelters or tents sould discuss with disaster people!
Feb. 22, 2012

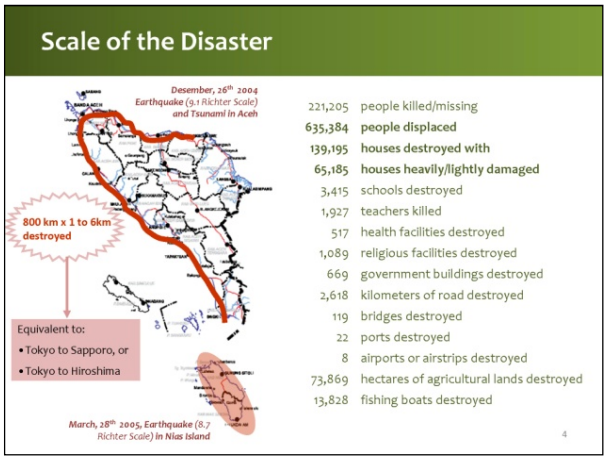

China Philanthropy Research Institute
On May 20th, the headquarters decided to purchase 900,000 tents and tarpaulins and thousands of tons of awning cloth urgently and required it to be done by June 20;
the headquarters decided to purchase 1 million mobile rooms and each province should start to help the rebuilding efforts in certain counties that they supported,in order to fully guarantee the temporary shelter for the victims
Sichuan Province was also determined to issue 2000 RMB subsidies to every farmer household who built temporary shelters for themselves to encourage farmers to build temporary shelters for themselves.
14
Feb. 22, 2012

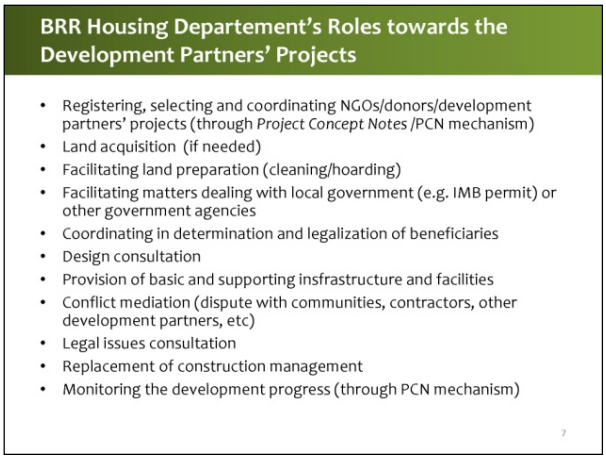

China Philanthropy Research Institute
the relocation were strenuous and pressing with the relocated population exceeding 10 million.
15
Feb. 22, 2012
In Beichuan, 466 officials were dead, accounting for 23% of the total officials and more than two hundred officials were injured

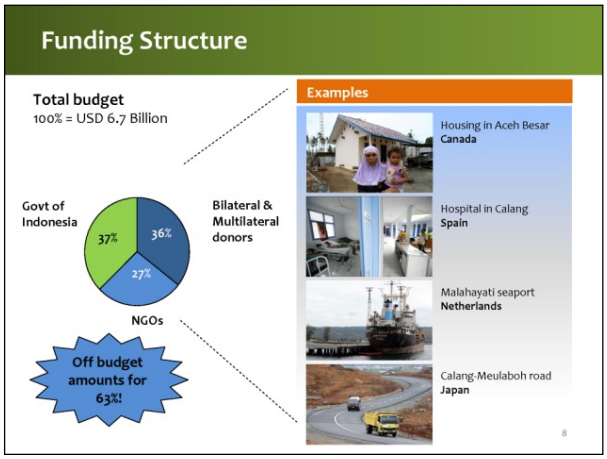

China Philanthropy Research Institute
Knowledge should be widely disseminated
especially good stories
Feb. 22, 2012


谢谢
Thanks

（３）バンバン・スディアトモ（インドネシア、公共事業省水環境衛生訓練センター長）「アチェとニアスにおける災害復旧・復興の調整・管理から得た教訓：住宅・居住部門に注目して」







Composition of the Housing Development

BRR Roles	Financial Resources & Management	Contribution (based on the number of housing build)
Executing and implementing BRR own pojects	GOI Budget ('ON-BUDGET' projects) Implemented by 22 Project Units	Build 90 thousand unit houses ± 61 %
Coordinating , facilitating and monitoring/reporting the partners' projects	Development Partners' Budget ('OFF-BUDGET' projects) Implemented by 144 organizations (NGOs/donors/ other development partners)	Build 57 thousand unit houses ± 39 %

9

Composition of Development Partners

Category of Organization	Number of Organization	Total Committment (in Housing Unit)
BIG Organizations which has committment **> 1000** housing units	24 (16%)	49,601 (58,7%)
MEDIUM Organizations which has committment between **100 – 1000** housing units	72 (49%)	32,796 (38,8%)
SMALL Organizations which has committment **< 100** units	51 (35%)	2,143 (2,5%)
Total	**147** (100%)	**84,540** (100%)

*Note: Big organizations were **very strategic** (only **16%** organizations could contribute **58,7%** houses)*

10

Geographical Distribution of Projects

An example of wall information map

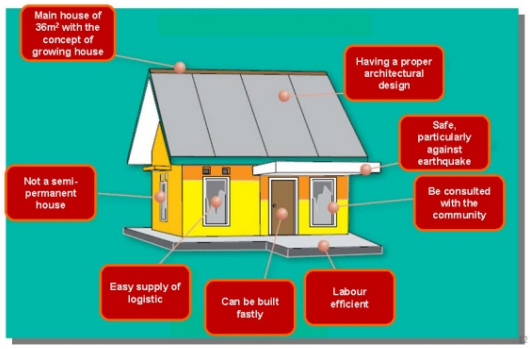
The geographical distribution of the projects was shown on the map

The names and symbols of organizations who build the houses

The data of houses build according to: the districts and 'on-budget – off-budget' category which was updated regularly.

11

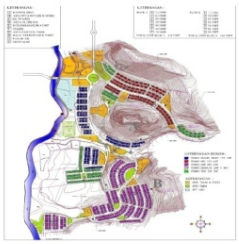
Building new house: core house principle



Examples of Relocation area and BSPT for renters

"Beuramo" Labuy and Neuheun:

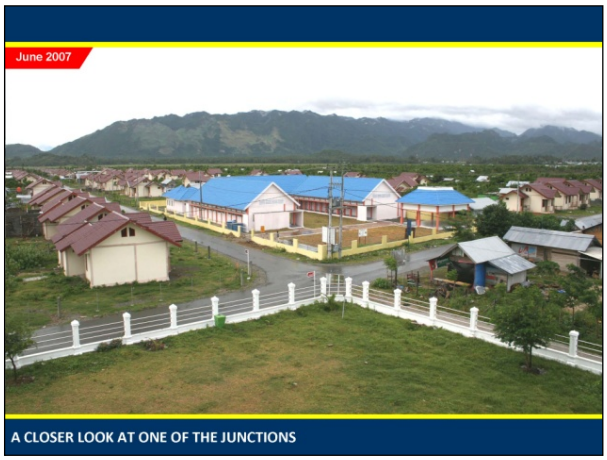
- Houses are built by Islamic Relief, ADB, Australian Red Cross, UNEP and BRR
- Public infrastructure and facilities by BRR



China Charity Federation

Budha Tsu Chi – Neuheun

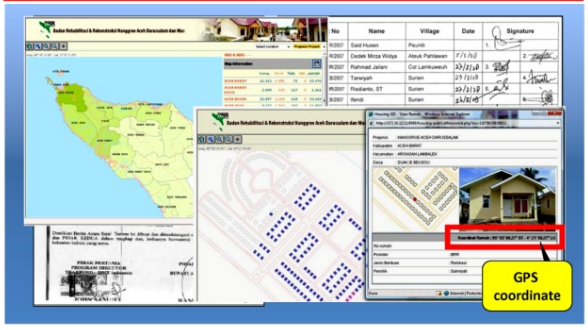
13



15

ASSETS MANAGEMENT IS DONE FULLY ACCOUNTABLY WITH GEOGRAPHIC INFORMATION SYSTEM

FROM THE CONVENTIONAL ASSET MANAGEMENT SYSTEM!



Lesson Learn

- Maintaining "URGENCY" at all time (have crisis mindset)
- Speed vs Quality (continuous evaluation and balancing)
- Shifting of Priorities and Resources (adapt to local needs, readiness and conditions)
- FOCUS on "the beneficiaries", and its participatory devt
- Effective coordination (PCN review, various working groups, Donors meeting, CFAN/NISM, onsite problem solving, joint evaluation, shared information, etc.)
- Don't put a problem into the table, unless you have alternative solutions
- Don't afraid to make mistake, but don't repeated that again (continuous improvement)

（４）斎藤大樹（建築研究所国際地震工学センター上席研究員）「日本における近年の巨大地震災害の教訓」

1

LESSONS OF RECENT GIGANTIC EARTHQUAKE DISASTERS IN JAPAN

Taiki SAITO

Chief Research Engineer,

International Institute of Seismology and Earthquake Engineering (IISEE),

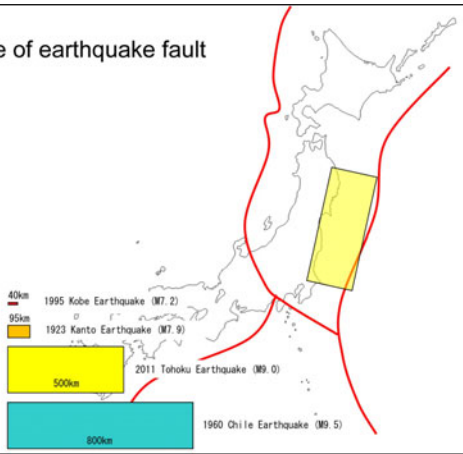
Building Research Institute (BRI)

2

	1923 Great Kanto Earthquake	1995 Great Hanshin Awaji Earthquake	2011 Great East Japan Earthquake
	Kanto Earthquake	Kobe Earthquake	Tohoku Earthquake
Date	1923.09.01	1995.01.17	2011.3.11
Time	11:58	05:46	14:46
Magnitude	7.9	7.2	9.0
Death & missing	Around 105,000	6,434	19,312 as of Dec.2011
Main cause of death	Fire 85%	Build. Collapse 75% Fire 12%	Tsunami 92%

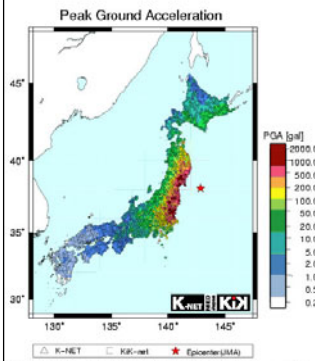
3

Size of earthquake fault



4

Intensity of Tohoku Earthquake



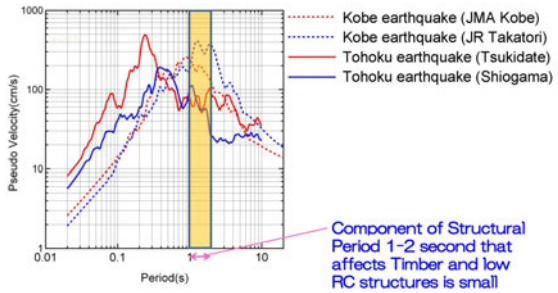
No	Name of station	The maximum acceleration
1	K-NET筑館(MYG004)	2933gal
2	K-NET盐灶(MYG012)	2019gal
3	K-NET日立(IBR003)	1845gal
4	K-NET仙台(MYG013)	1808gal
5	K-NET鉾田(IBR013)	1762gal
6	K-NET今市(TCG009)	1444gal
7	K-NET白河(FKS016)	1425gal
8	KiK-net西乡(FKSH10)	1335gal
9	K-NET大宮(IBR004)	1312gal
10	KiK-net芳賀(TCGH18)	1305gal

2011/03/11-14:46 38.103N 142.860E 24km M9.0

(data from National Research Institute for Earth Science and Disaster Prevention)

5

Comparison between TOHOKU and KOBE Earthquakes



- Component of Short period is dominated at around the epicentre
- Component of the period of 1-2 second that affects structure is small.

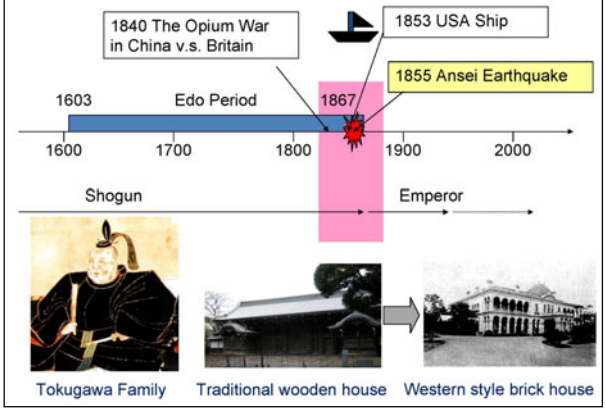
(slide from ATC-JSCA meeting)

6

1923 Great Kanto Earthquake
(Kanto Earthquake)

Transition to western culture

7



Tokugawa Family

Traditional wooden house

Western style brick house

8

Government recommended buildings made of brick.

Ginza Brick Street (1873)

http://www.sice-et.com/f/archives/2010/06/

Asakusa Brick Tower (1890)

http://shigekeura.exblog.jp/15727970/

9

1891 Nobi Earthquake (M8.0)

1923 Great Kanto Earthquake(M7.9)

1924 The first seismic code

Brick → Reinforced Concrete

Ginza Brick Street (1873)

http://www.ginza-machidukuri.jp/column/column2-1.html

Asakusa Brick Tower (1890)

http://shigekeura.exblog.jp/15727970/

Lessons from 1923 Kanto Earthquake

- Brick building was introduced as the symbol of western culture and fire resistance structure.
- No scientific study about seismic resistance.
- It was a trigger
  - to develop the first seismic design code in the world,
  - to give up brick structure and shift to RC structure,
  - to develop original structure (SRC, RC shear wall)

Quick and brave decision.

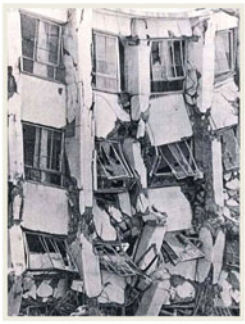
11

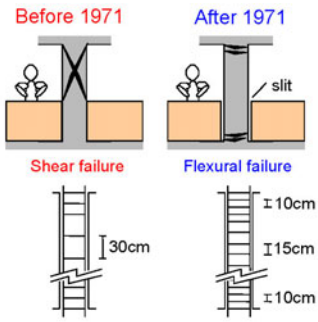
1995 Great Hanshin-Awaji Earthquake
(Kobe Earthquake)

1968 Tokachi-oki Earthquake

12

1971 Revision of AIJ Standards for RC



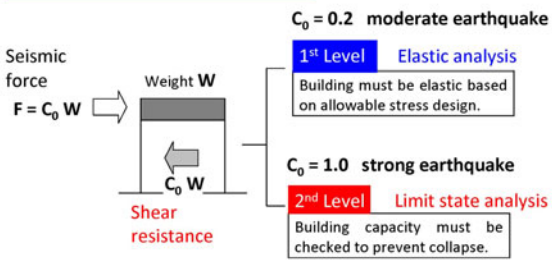


1978 Miyagiken-oki Earthquake

13

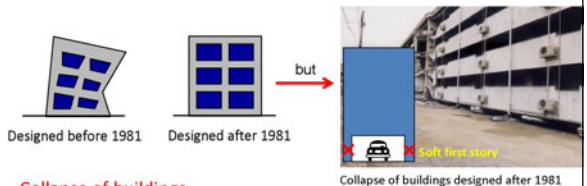
1981 Revision of Building Standard Law

Two stage design procedures



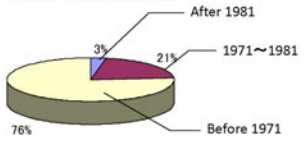
14

1995 Great Hanshin-Awaji Earthquake



Collapse of buildings designed after 1981

Collapse of buildings



1995 Law on the promotion of the earthquake resistance of building

Lessons from 1995 Kobe Earthquake

- Seismic design code was revised every time after severe earthquake damage of buildings.
- The biggest revision was made in 1981 introducing the regulation to check the seismic capacity of a building.
- The building designed after 1981 survived well at the 1995 Kobe earthquake.
- It was a trigger to promote seismic retrofit of existing buildings designed before 1981.

16

2011 Great East Japan Earthquake (Tohoku Earthquake)

17

Introduction

Casualties

Deaths	15,843
Missing	3,469
Injured	5,890

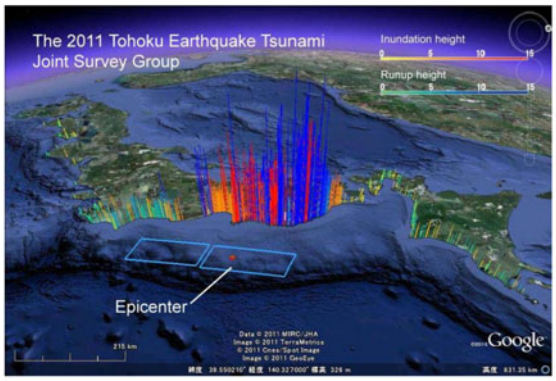
Damage to buildings

Total collapse	126,315
Partial collapse	227,339

More than 92% of casualty was caused by Tsunami induced by the earthquake.
The earthquake shaking was also strong in wide area of Japan; however, the damage of buildings due to shaking was limited.

Source: National Police Agency, as of 22 December 2011

18



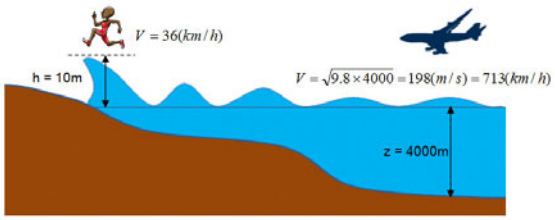
By JSCE Coastal Engineering Committee

19

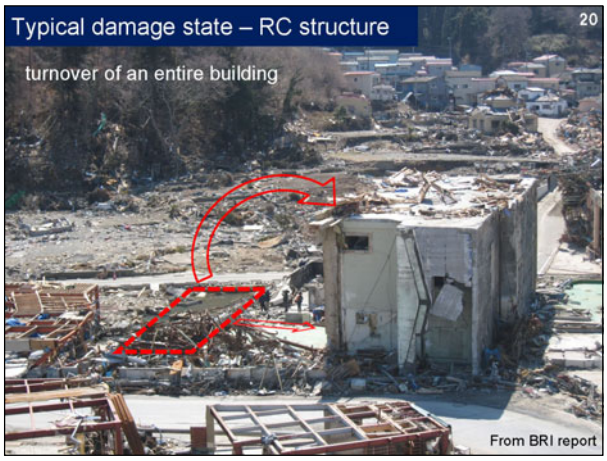
Tsunami Speed

$V(m/s) = \sqrt{g(m/s^2) \times (z(m) + h(m))}$

Where g : gravity acceleration(=9.8 m/s²), z : depth of water, h: tsunami height



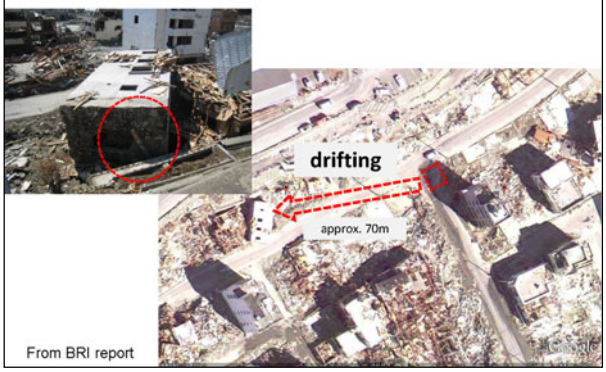
20



21

Typical damage state – RC structure (2)

- turnover and drift of an entire building



22

Typical damage state – RC structure (3)

Entire building suffered from significant sinking following the effect of erosion in the ground.

Typical damage state – Steel structure (1)

23

Turnover and drift of entire building following the fracture of exposed-type column base

Typical damage state – Steel structure (2)

24

- Turnover and drift of entire building following the fracture of column capital
- This type of damage was observed in the buildings whose columns have concrete encased base or imbedded type base.

Typical damage state – Steel structure (3)

25

Main columns and beams in some buildings are almost intact after all the external claddings were swept away. But they have residual deformation in columns.

Typical damage state – Timber structure (1)

26

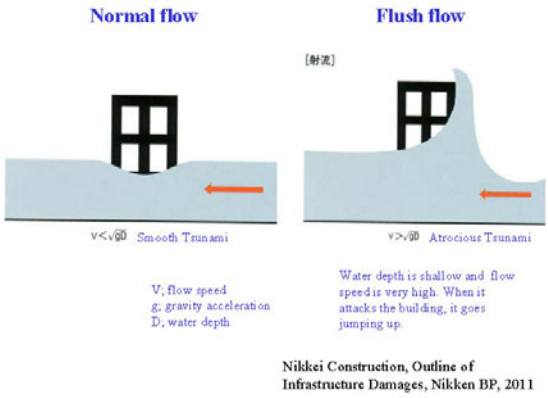
Entire buildings are swept away.

Typical damage state – Timber structure (2)

27

If timber structures are located just behind a relative large-scale building, they were not swept away because of the decrease of direct tsunami effect on them.

28



Nikkei Construction, Outline of Infrastructure Damages, Nikken BP, 2011

Guideline on the structural design of buildings for vertical evacuation from tsunami

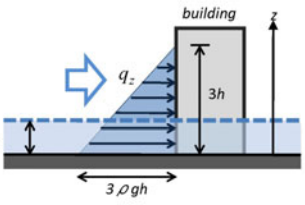
29

2005 guideline

Design wave pressure

$$q_z = \rho g(3h - z)$$

Design water depth: h



2011 guideline

$$q_z = \rho g(\alpha h - z)$$

α (α =1.5 – 3.0)

ρgh

Lessons from 2011 Tohoku Earthquake

- There is a need to consider tsunami force in building design in a tsunami hazard area.
- Building damage due to earthquake shaking was limited to old buildings designed before 1981.
- However, the following problems emerged;
  - Extensive liquefaction occurred,
  - Nonstructural damage such as fall of ceiling panels caused human loss.
  - High-rise building suffered large & long time shaking.

Conclusion

- Tsunami has attacked Tohoku regions repeatedly. However, over the years, people forget such lessons and start living again in dangerous areas near the ocean.
- The return period of the gigantic earthquake is too large for human to keep awareness of disaster prevention.
- Therefore, it is important to change regulations or make the new ones reflecting the lessons as soon as possible.
- Long time effort to keep memory of disaster and educate people not to loose awareness is necessary.
- Sharing such experience with other countries is also important.

Thank you very much for your kind attention.

（５）ナザン・キリク（トルコ、首相府災害緊急時対策庁）「2011 年トルコ・ヴァン地震」

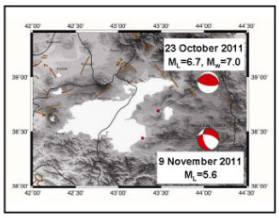
VAN EARTHQUAKE, TURKEY 2011

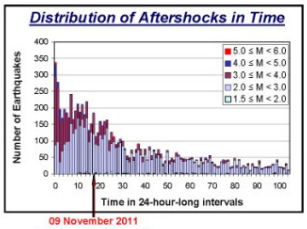
Dr. Nazan KILIÇ
Earthquake Department

AFAD
REPUBLIC OF TURKEY
PRIME MINISTRY
Disaster and Emergency Management Presidency

23 October 2011 Van Earthquake

23 October 2011 Van Earthquake



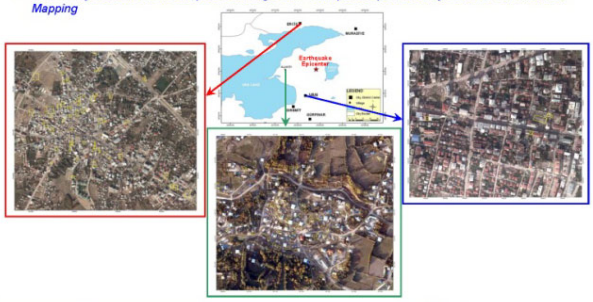


09 November 2011
Van-Edremit Earthquake

As a result of 23 October and 9 November 2011 earthquakes, 644 people lost their lives whereas 252 people were saved alive from the debris.

Collapsed Buildings from 23 October 2011 Van Earthquake

- *Preliminary Evaluation of Collapsed Buildings from Orthophotos produced by General Command of Mapping*



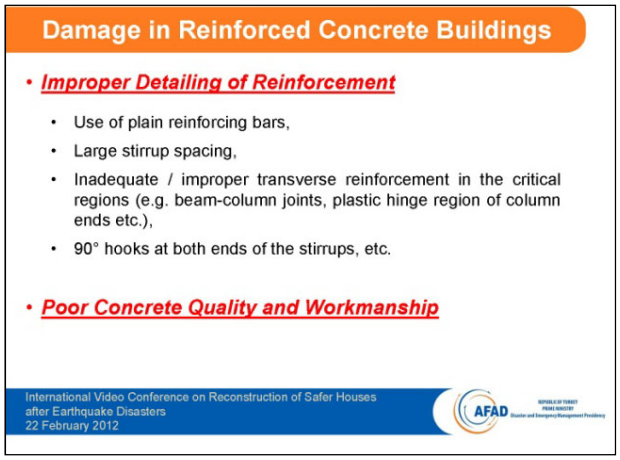
General Characteristics of Buildings

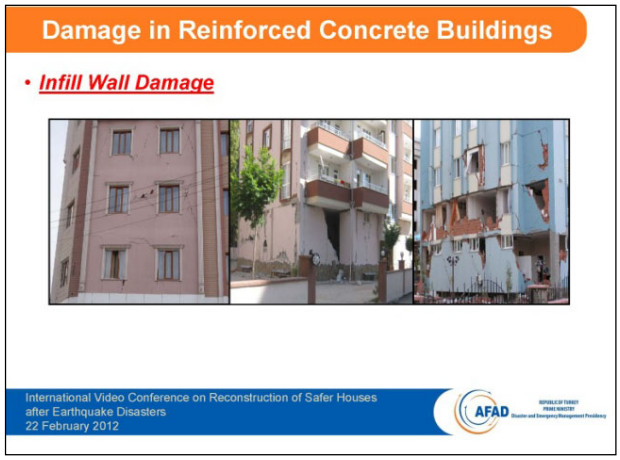
- Building stock in Van city center and Erciş district center generally consists of 4-8 story reinforced concrete structures.
  - In most of the buildings, asmolen slab (infilled joist slab) is used.
  - Particularly, collapsed buildings are observed to have shops in their ground levels with heights that are almost twice the normal story heights.

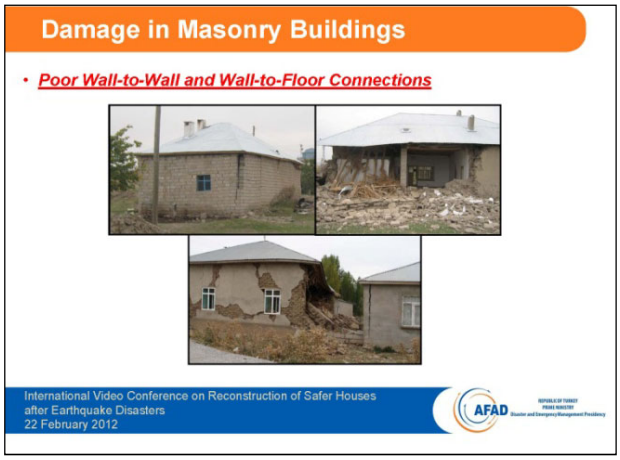
- In villages, most of the existing building stock comprises of one- or two-story rural masonry buildings
  - with adobe, stone and brick walls
  - constructed by local people without taking into consideration any regulation, standard and earthquake resistant design rules
  - that are older than their expected service life.

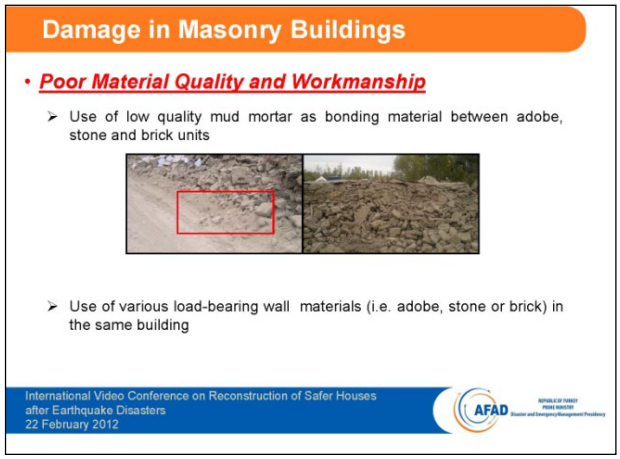
Damage in Reinforced Concrete Buildings

- ***Soft / Weak Story and Asmolen Slab***

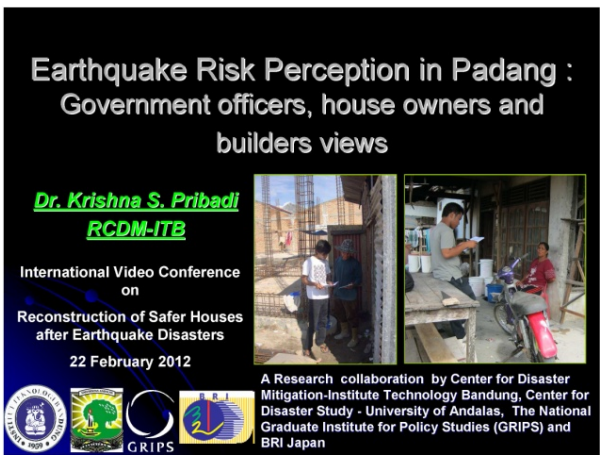


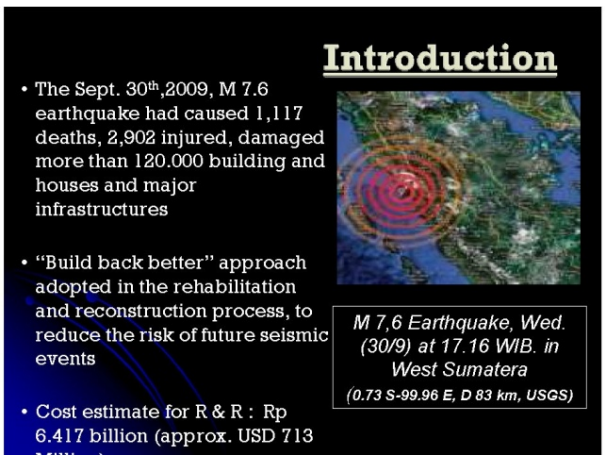






（６）クリシュナ・Ｓ・プリバディ（インドネシア、バンドン工科大学准教授）「パダンにおける地震リスク認識：公務員、住宅所有者、建設業者の見解」





Building Damage Assessment
(Fauzan,2011)

	District/City	Damage Level			Total Damaged
		Heavy	Medium	Light	
1	Padang City	9.635	16.544	23.314	49.493
2	Pariaman City	5.478	3.717	4.382	13.577
3	District of Padang Pariaman	31.113	7.719	6.210	45.042
4	District of Agam	2.112	1.908	1.722	5.742
5	Kabupaten Solok	39	51	175	265
6.	District of Pasaman Barat	1070	667	925	2.662
7	District of Pesisir Selatan	678	1.623	5.195	7.496
TOTAL		50.125	32.229	41.923	124.277

Typical housing damage
(Fauzan,2011)

Mechanism of post 30 September 2009 earthquake rehabilitation and reconstruction in housing sector for West Sumatra Province

Introduction

- Need to assess risk perception of actors within institutions and communities for better risk communication in view of "Build back better" approach
- A perception survey on earthquake risk and on safer housing construction as one component of data collection of non-engineered construction in Padang City has been conducted by CDM ITB, UNAND, GRIPS supported by BRI of Japan in 2010-2011
- Similar surveys have been conducted in Yogyakarta and Bandung, Indonesia by GRIPS and CDM ITB on 2007 and 2008
- Targeted respondents : government officers (province and city level), house owners and house builders/head masons

Objectives

- To better understand how the local government officials, house owners and builders in Padang City perceive seismic risk and earthquake safer housing.
- To find the most effective recommendations for disseminating and supporting the earthquake safer housing in Padang City, in view of "build back better" approach implementation

Survey Implementation

- The surveys were conducted in Padang during the period of 15 to 27 December 2010.
- Method of Survey:
  - *Provincial Government Officers : Direct Interview*
  - *Local Government Officers : Interview and Questionnaire (conducted by UNAND and ITB)*
  - *House Owners : Interview on location*
  - *Housing Builders/Head Masons : Interview on location*
- Collected responses:
  - *Provincial Government Officers : 15 respondents*
  - *Local Government Officers : 15 respondents*
  - *House Owners: 31 respondents*
  - *Housing Builders/Head Masons : 75 respondents*

Respondents' Profile

- Provincial Government Officers :
  - *TPT (Technical Supporting Team), Regional Development Planning Agency (BAPPEDA), Residential and Spatial Plan Agency (Dinas Tarkim), Social Agency, Agency for Community Empowerment- Civil Protection Division (Kesbangpol & Linmas Prop. Sumbar), Regional Disaster Management Agency (BPBD Prov. Sumbar)*
- Local Government Officers (*head of office/secretary level*):
  - *Public Work Agency*
  - *Education Agency*
  - *Agency for Community Empowerment- Civil Protection Division*
  - *Local Development Planning Agency*
  - *Disaster Management Agency (BPBD at City Level)*
  - *Residential and Spatial Plan Agency (Dinas Tarkim)*
- House Owners
- House Builders/Head Masons

Survey Implementation

Findings and Discussion

Provincial Government Officers View

Provincial Government Officers Views

- West Sumatra is prone to earthquakes as well as to tsunamis, floods, landslides and volcanoes.
- Earthquake is an unpredictable hazard and also an important issue but not the only main problem in West Sumatra (WS) and it need to be managed.
- Considering the limitation of human resources and existing seismic risk in WS, DRR initiatives need to be prioritized instead of emergency response
- earthquake safer housing needs to be covered in Regional Regulation.

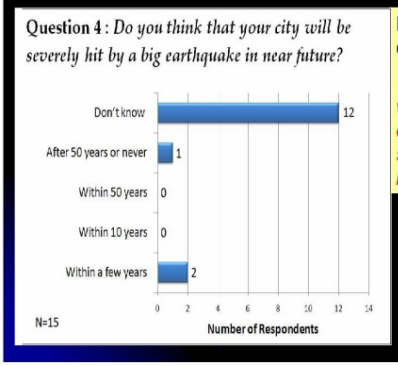
Provincial Government Officers Views

- constructing earthquake safer house is worthy to implement considering the severity of earthquake hazard in the region , but it is probably unaffordable for low-middle income households.
- the current monitoring and control of earthquake resistant building works is not effective, except for government building projects, however situation improves after the 30 September 2009 earthquake.
- Need efforts in order to implement building regulation effectively, such as socialization, monitoring , establishment of building expert teams, and reintroducing traditional house model (*rumah minang*) to the community

Findings and Discussion

Local Government Officers View

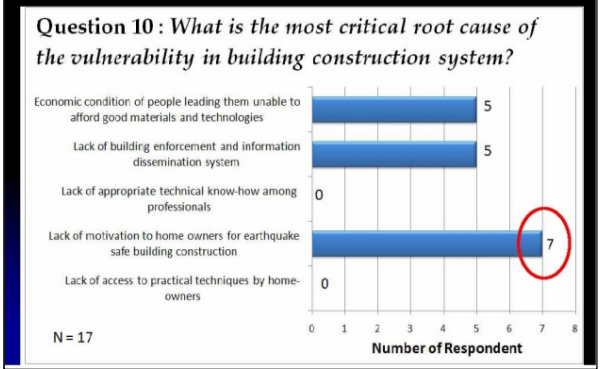
Earthquake hazard



Local government officers' perception :

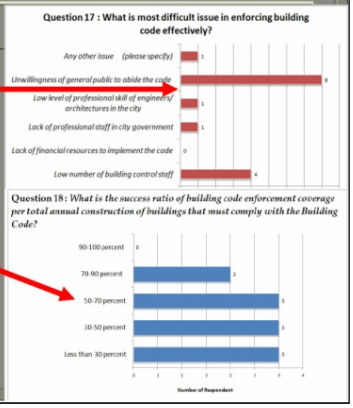
"mostly do not know whether a big earthquake will severely hit the city in near future"

What local government officers think about vulnerability root cause(s)?

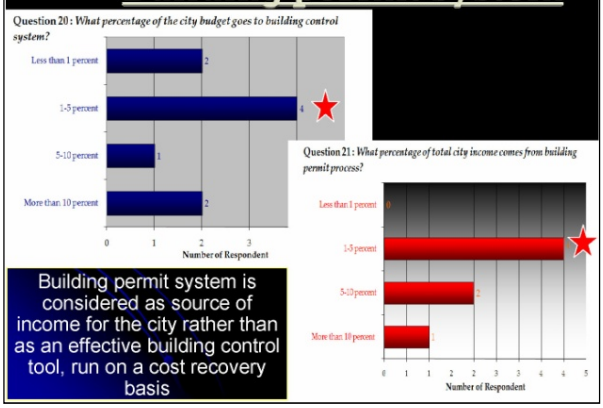


Building Code enforcement

- most difficult issue : unwillingness of general public to abide the code
- existing earthquake building code not well socialized, lack of building control system due to lack of staffs and resources.
- Success ratio of building code enforcement : respondents think less than 70%
- Need to increase public awareness activities for building safety to increase the success ratio of building code enforcement



Building permit system



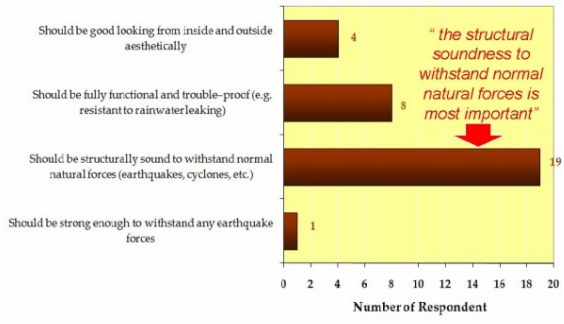
Building permit system is considered as source of income for the city rather than as an effective building control tool, run on a cost recovery basis

Findings and Discussion

House builders/masons view

House builders/head masons' biggest concern for house construction

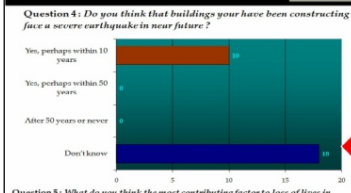
Question 3 : *What is your biggest concern while constructing a house ?*



"the structural soundness to withstand normal natural forces is most important"

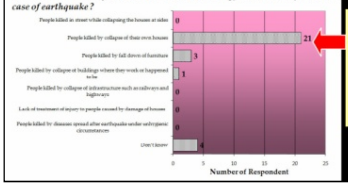
Builders/masons' perception on earthquake hazard

Question 4 : *Do you think that buildings your have been constructing will face a severe earthquake in near future ?*



"Mostly do not know whether severe earthquake will strike in near future"

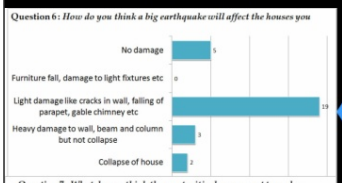
Question 5 : *What do you think the most contributing factor to loss of lives in case of earthquake ?*



"collapse of own house as most contributing factor to loss of lives"

Effect of earthquake, critical component, vulnerability factor

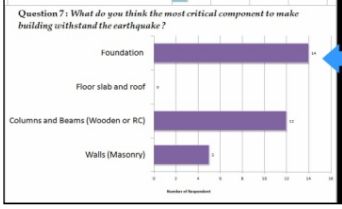
Question 6 : *How do you think a big earthquake will affect the houses you*



Most builders/ masons think :

"only light damage will occur to houses that I built"

Question 7 : *What do you think the most critical component to make building withstand the earthquake ?*

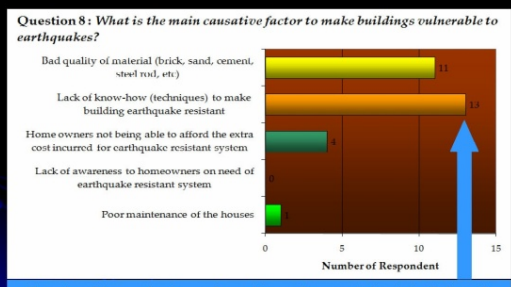


Most builders/ masons think :

"Foundation is the most critical component to make building withstand earthquake"

Effect of earthquake, critical component, vulnerability factor

Question 8 : *What is the main causative factor to make buildings vulnerable to earthquakes?*

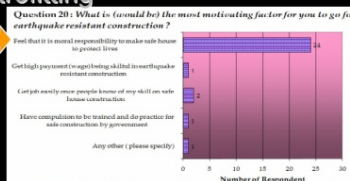


"Lack of knowledge of earthquake resistant building is main cause factor for vulnerability of a house"

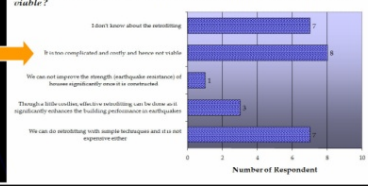
Motivation for EQ resistant construction, viability of retrofitting

- Moral responsibility is my main motive for EQ resistant construction
- retrofitting is too complicated and costly, I can do only retrofitting with simple, not so expensive technique

Question 20 : *What is (would be) the most motivating factor for you to go for earthquake resistant construction ?*



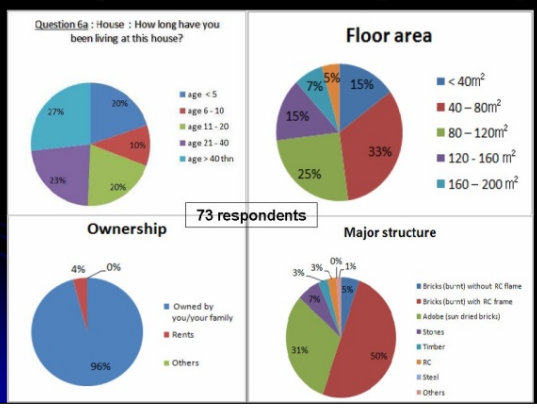
Question 21 : *How do you think that seismic retrofitting of existing houses is viable ?*



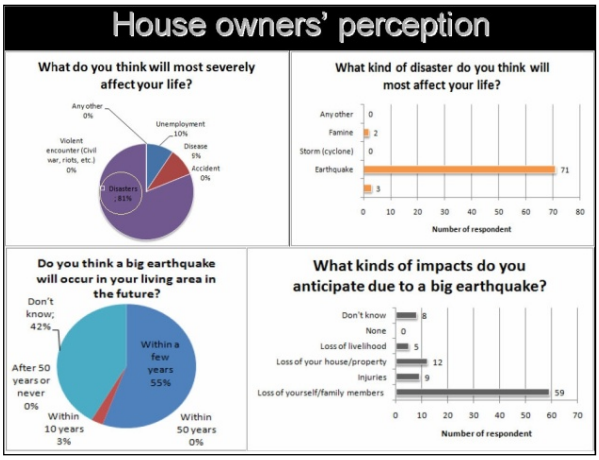
Findings and Discussion

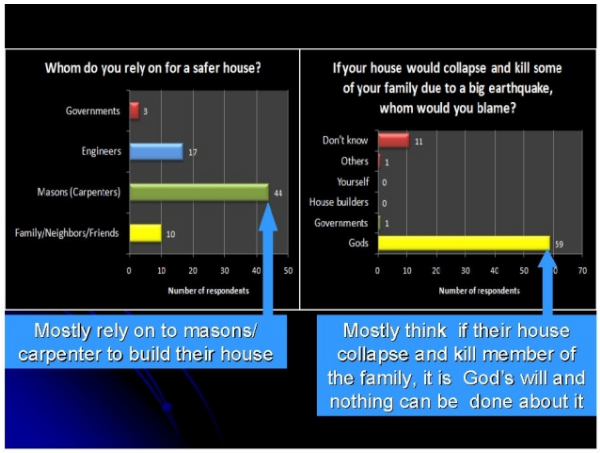
House owners view

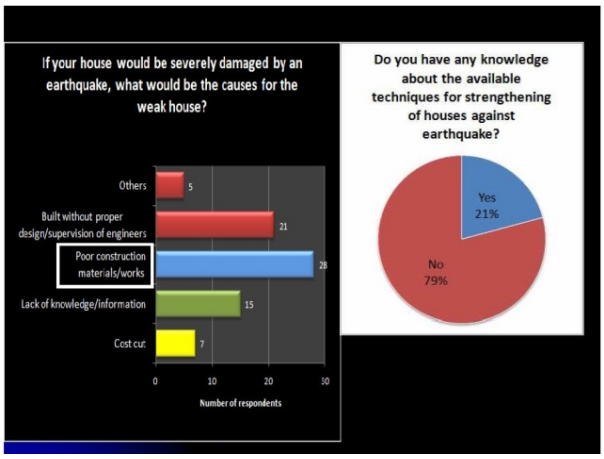
Existing Condition of Housing in Padang



House owners' perception







House owners' concern over neighborhood

Concluding Remarks

- Government officers, house owners and builders consider earthquake in West Sumatra to be a priority compared to other disasters such as flood, landslide and volcanoes.
- Most house owners rely on the masons/carpenters to retrofit or reconstruct their houses in Padang City, but unfortunately, most of the masons are untrained and work only based on their limited experience.
- Earthquake safer housing is still considered as expensive and complicated technology.

Concluding Remarks

- Builders have motivation to become skilled crafts in building earthquake safer housing. They expect government to conduct training programs on earthquake resistant construction more often.
- Several initiatives had been implemented by the local government in order to support the earthquake safer housing in Padang City, such as disseminating information through guidelines, poster, mass media, television and trainings.
- Consultation mechanism for earthquake safer housing such as the one implemented by *Klinik Konstruksi – UNAND* is an effective way to dissemine the knowledge. More outreach program is needed for the wider community .

Thank you....

（７）ナディーム・アモッド（パキスタン、元地震復興庁副長官）「大規模な住宅復興のための戦略：パキスタンの経験」

Build Back Better

Strategy for Large Scale Housing Reconstruction; Pakistan's Experience

Snapshot – The Disaster

- 7.6 Richter Scale Earthquake Hit Pakistan in Oct 2005
- The Quake left 73,000 dead and more than 70,000 severely injured
- 3 million rendered shelter less over 30, 000 sq km
- 600,000 houses destroyed/damaged

Conception to Completion

October 8, 2005	The Earthquake occurs
November 12, 2005	Damage & Needs Assessment Released
November 19, 2005	Around **$ 6 Billion** Pledged at Donors' Conference
December, 2005	Preliminary Rapid Grants Distribution (Transitional Support Grant – 1st Tranche of Housing Subsidy)
Jan-Mar 2006	Multi-stakeholder consultation for Housing Policy Development led by ERRA
December 2010	Project completed

The Initial Response

- Temporary Shelter Support Grant to 550,000 people
- Detailed damage assessment survey carried out, confirming 600,000 affected houses (approx. 80% totally destroyed)
- GoP through ERRA launched housing reconstruction program in 9 affected districts:
  - Rs.175k grant for reconstruction
  - Rs.75k grant for repair/restoration

Salients of the Policy

Policy Pillar 1: Owner-Driven Housing Reconstruction-Homeowners in charge of rebuilding their own homes

Strategies

Providing an enabling environment to homeowners, through:

- **Prior training, information, & communication campaigns**
- **Rebuilding with familiar methods & easily accessible materials – *ensuring cultural preferences in design***
- **Providing technical assistance during construction;**
- **Promoting use of own labor & salvaged materials;**
- **Establishing building materials supply chain;**
- **Facilitating opening of bank accounts.**

Policy Pillar 4: Assisted and Inspected Reconstruction & Restoration

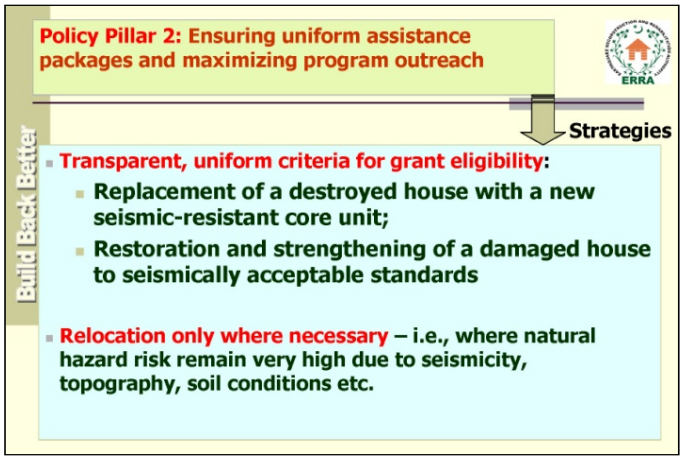
Strategies

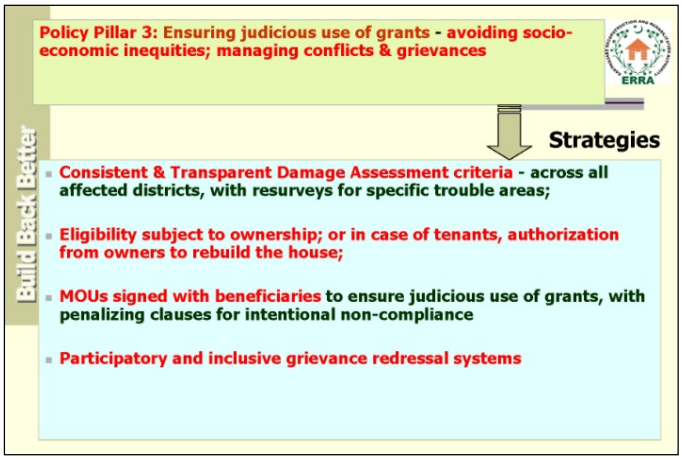
- **Over 600 assistance and inspection (AI) teams mobilized for house-to-house outreach**
- **Disbursements in tranchés linked to stages of construction and compliance with seismic standards**
- **Tranché disbursement through Banks after progress/quality certification based on technical criteria**
- **PMTs provided continuous assistance & advise**

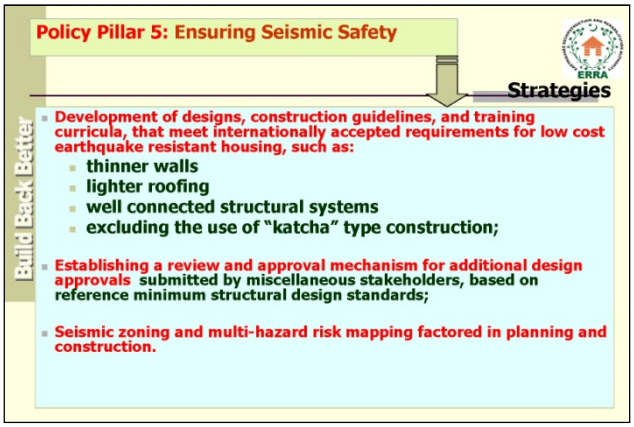
Policy Pillar 2: Ensuring uniform assistance packages and maximizing program outreach

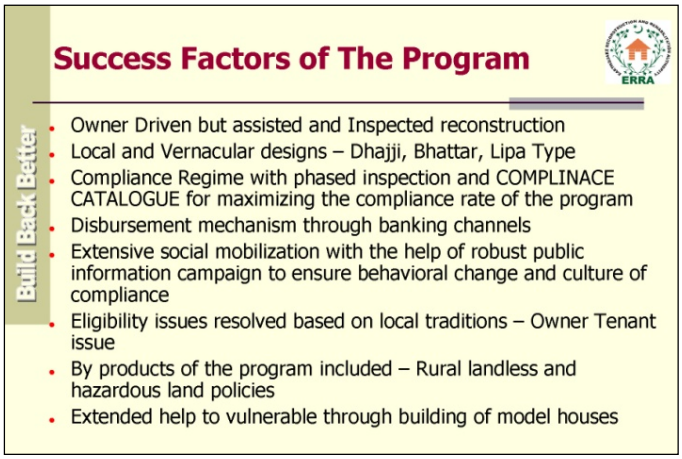
Strategies

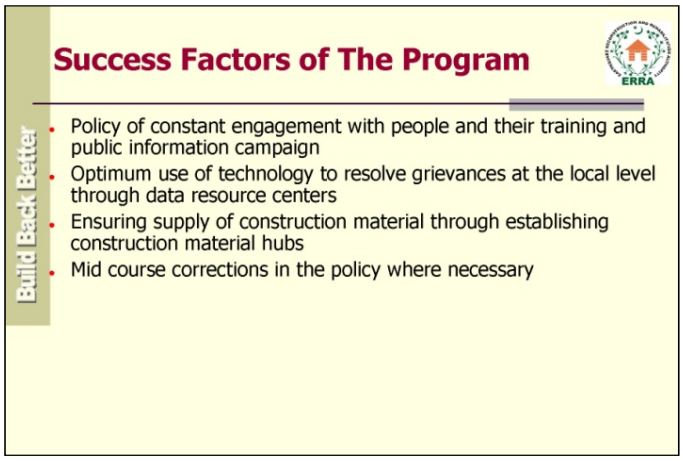
- **Cash SUBSIDY for core housing unit – not replacement of loss;**
- **Coordination of multiple reconstruction initiatives & standards for equity;**
- **application of uniform policies across the board:**
  - **Ascertaining application of seismic design standards**
  - **Ensuring full spatial coverage;**
  - **Reducing risks of beneficiary double counting or being missed;**
- **Rebuilding In-situ - addressing land ownership & availability issues, minimizing relocation costs.**



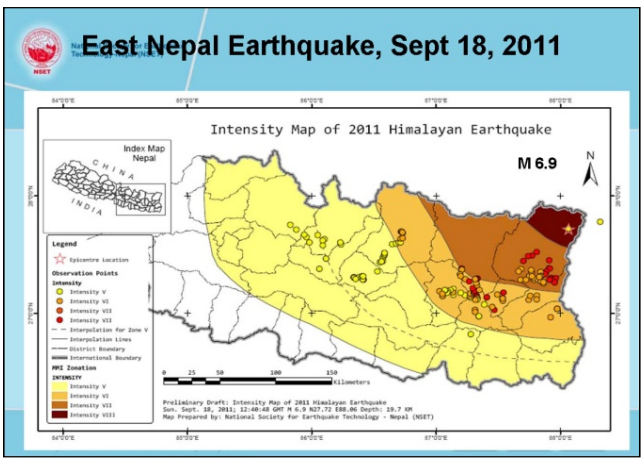








（８）アモッド・ディキシッド（ネパール、地震工学協会事務局長、緊急対応強化プログラム会長）「東ネパール地震の被害、復興のニーズ及び努力：ネパールの経験」



Building Typology / Typical Damage Pattern

GABLE WALL

Stone masonry wall – Wyeth Separation

Stone in Mud Mortar Building

Corner separation and in-plane diagonal cracking in stone masonry walls

Adobe Building

Corner separation, in-plane diagonal cracking, and tilting of walls

Damage to School Buildings

Damage to School Buildings

Damage to Suspension Bridge by EQ Induced Landslide

Extent of Damage

- Definition of damage vis-a-viz acceptable level of risk
  - eg. PDNA by world bank and assessment of local authorities
  - Planning baseline

Extent of Damage

Private Houses

>DG 3 = 7,000 -10,000 * 300,000 (excluding salvaged materials) = 3,000,000,000

DG 2-DG 3 = 15,000 – 20,000 *100,000 = 2,000,000,000

Schools/Colleges

>DG3 = 700 – 1,000 (bldgs) * 1,000,000 = 1,000,000,000

DG 2-DG3 = 1,500 – 2,000 *500,000 = 1,000,000,000

Health Facilities

>DG3= 150 – 200 * 500,000 = 100,000,000

DG2 – DG3 = 150 -200 *200,000 = 40,000,000

Extent of Damage

Govt offices (Police offices, VDC offices)

>DG3 = 100*1000000 = 100,000,000

DG2-DG3 = 100*500000 = 50,000,000

Others =100,000,000

Water Supply Pipelines/Canals

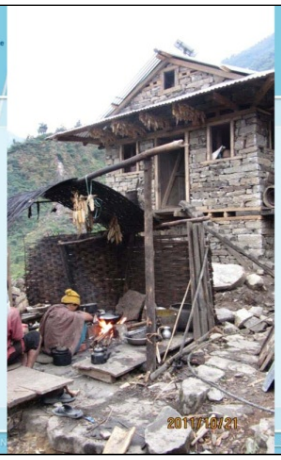
Bridges(Suspension 5-10 numbers >DG3)

Huge Need!

Total = 7,400,000,000
= 7.5 Arab
= $ 100M

Response/rehabilation

Missed BBB and BB Smarter



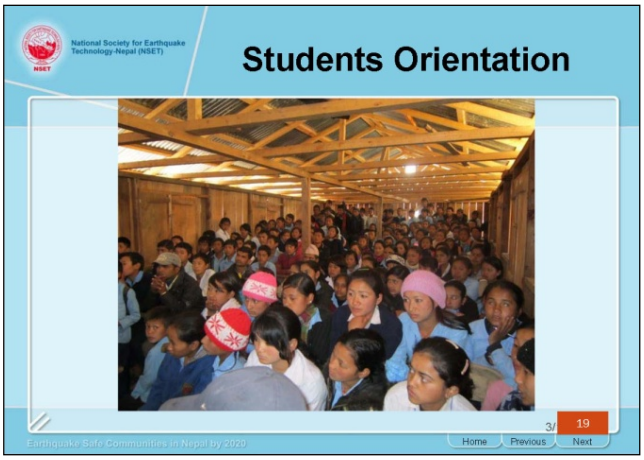
Missed BBB and BB Smarter

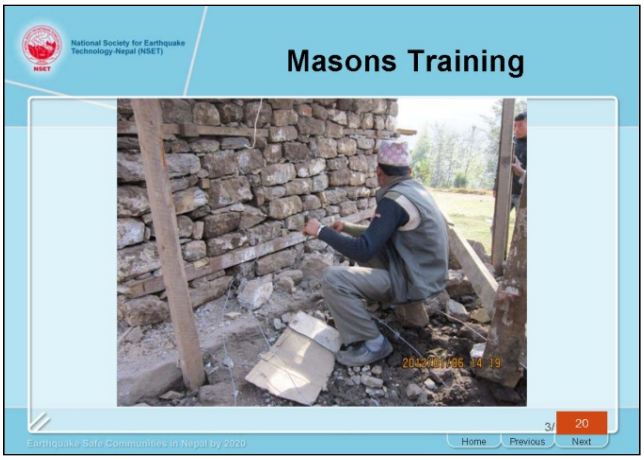
Reconstruction Efforts

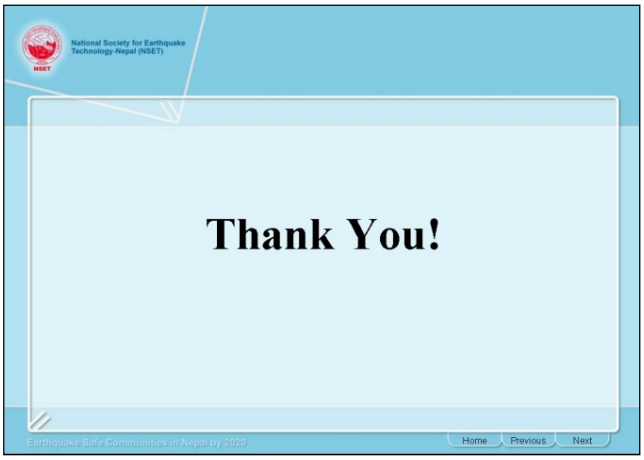
- Government
  - Loans
  - Technology
  - Control mechanism
- NSET
  - Capacity building and awareness for reconstruction
  - Building Code Implementation
  - Long term change of mind set and community based DRR

8 Masons Training are planned from NSET , 4 Completed 4 on the way

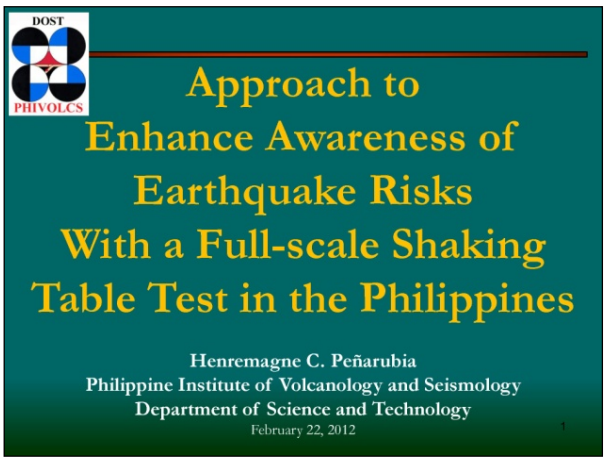
Masons Training

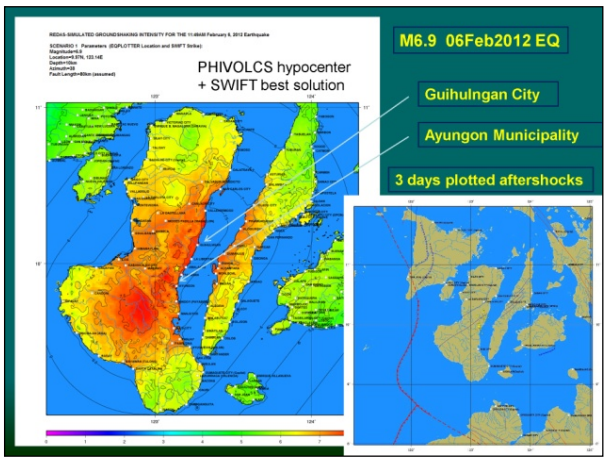


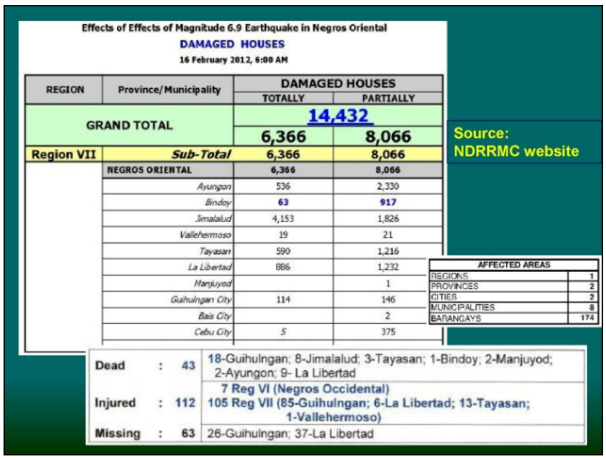




（９）ヘンレマグネ・Ｃ・ペナルビア（フィリピン、火山地震研究所）「フィリピンにおける実大振動台実験地震リスクの認識向上へのアプローチ」







Lessons learned:

- Strict implementation of Building Standards (National Building Code, National Structural Code of the Philippines, etc.) and zoning requirements.
- Establishment of short, medium, and long term preparedness plan for the community and facilities.
- Preparation of an aggressive and practical earthquake preparedness measures such as earthquake drills, information campaigns, activation/strengthening of disaster/emergency units, etc.

Damaged CHB Masonry Houses subjected to a 100% Kobe EQ(1D)
PHIVOLCS-JICA/JST Project 24Feb2011

Video presentation of actual performance in an earthquake of code-compliant and non-compliant structures/residential houses as a tool to enhance awareness

PHIVOLCS - JST-JICA (SATREPS) Project
Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster Mitigation Information in the Philippines

Under Component 4:
Provision of Disaster Mitigation and Promotion of Utilization

Henremagne C. PEÑARUBIA[1],
Hiroshi IMAI[2], Angelito G. LANUZA[1], Ishmael C. NARAG[1], Mylene M. VILLEGAS[1],
Renato U. SOLIDUM Jr.[1], Hiroshi INOUE[2]

[1]Philippine Institute of Volcanology and Seismology – Department of Science and Technology
UP Campus, Diliman, Quezon City, Philippines

[2]National Research Institute for Earth Science and Disaster Prevention
Tsukuba, Ibaraki, Japan

- Development of practical tools for houses

Development of practical tools for houses

Objectives:

The first step to disaster reduction is to understand the risk. In order to attain an effective earthquake disaster reduction, it is critical that the stakeholders such as government officials, contractors, workers, community leaders, and house owners clearly understand the earthquake risk, or damage potential of their house, community and city.
To promote earthquake disaster mitigation one must realize:

(1) the earthquake risk as their own problem, and

(2) The needed action as their own task
(with technical assistance from the professionals).

Development of practical tools for houses

Objectives:

These practical tools shall
(1) raise awareness among the stakeholders,
(2) evaluate in a simplified way the safety/vulnerability of houses as well as an Educational tool.

> The purpose is to raise awareness but not to provide very accurate estimate.
> The programs of the tools could be rough, omitting some minor factors.

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Development of practical tools for houses

Practical tool #1 (STEP1)
1. "Let's check your house" Questionnaire

Following several questions (up to 10) concerning shape of the floor, wall openings, foundation type and condition, roof, age, etc., users
(1) can estimate the safety/vulnerability of their houses, and
(2) can understand which component of the house are important for safety.

User: House owner
Medium: Paper, Web
Target: CHB masonry structure, Wooden structure, (1-2story building)

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Development of practical tools for houses

Practical tool #2 (STEP2)
2. Software to evaluate safety/vulnerability of houses

Focusing on the CHB masonry structure, a practical tool to
(1) understand and evaluate the safety/vulnerability of the house and
(2) help acquire relevant knowledge for retrofitting
shall be developed.

With the input of ground condition, foundation, floor plan, wall dimension, roofing, reinforcement, age, etc. this tool will
(1) show the weaknesses/vulnerability of the design, and
(2) how to improve the safety of the house against earthquakes

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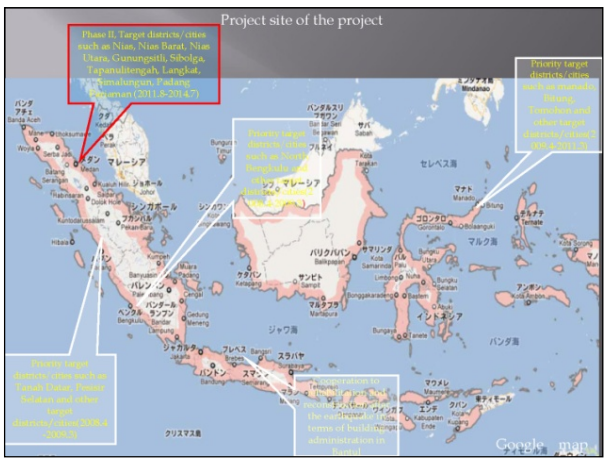
Development of practical tools for houses

Practical tool #2 (STEP2)
2. Software to evaluate safety/vulnerability of houses

A computer simulation program shall be developed based on the data from the field, experimental data and NSCP.
A visual and user-friendly interface shall also be developed, so that any user (house owner) with the assistance of an engineer can use this tool. The output shall include
(1) the scoring of the house, (2) the vulnerability, and (3) suggestions to strengthen the house.

User: House owner with Engineer
Medium: Personal Computer
Target: CHB masonry structure, Wooden structure?, (1-2-3?story building)

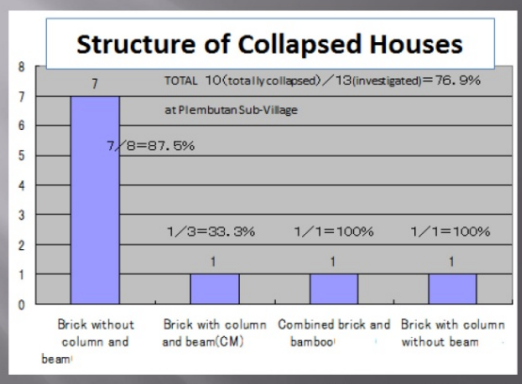
（１０）白川和司（インドネシア、公共事業省 JICA 長期専門家）「インドネシアにおけるノンエンジニアド住宅耐震設計基準の普及活動」



Causes of death and injury

- Falling brick pediment on to the sleeping people
  → death
- Flying brick wall on to the sleeping or escaping people (in bed room, along narrow alley way)
  → death or injury
- Falling roof materials on to the escaping people (in the living room)
  → mainly injury
- Falling brick wall on to the escaping people at the entrance or back door of the house
  → mainly injury
- Locked door of bed room blocked the escape route.

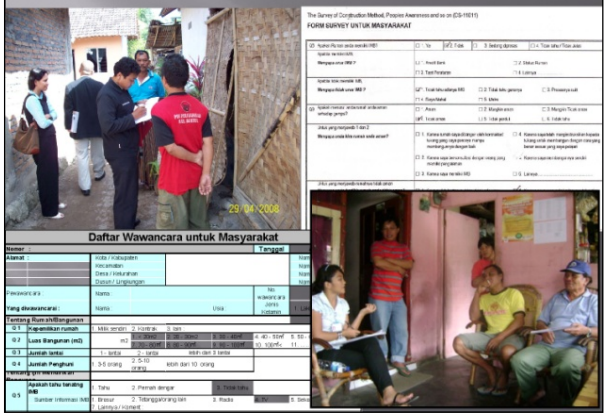
Resource: Mr. HOKUGO's presentation on 31st October 2008



Resource: Mr. HOKUGO's presentation on 31st October 2008

Dissemination activities done by lecturers involved in this project

Interview survey



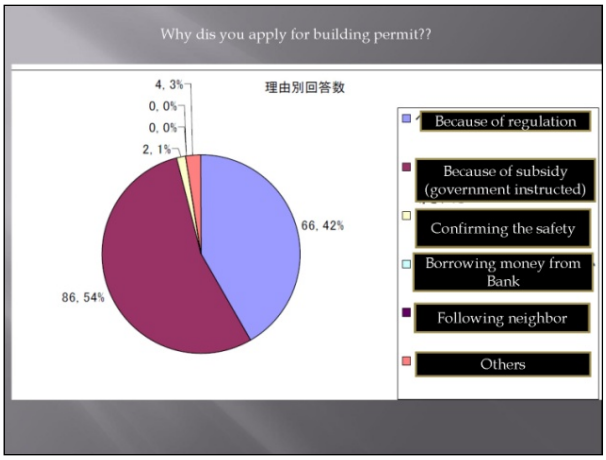
Meeting on local regulation about building administration

Releasing condition of subsidy in Yog yakarta

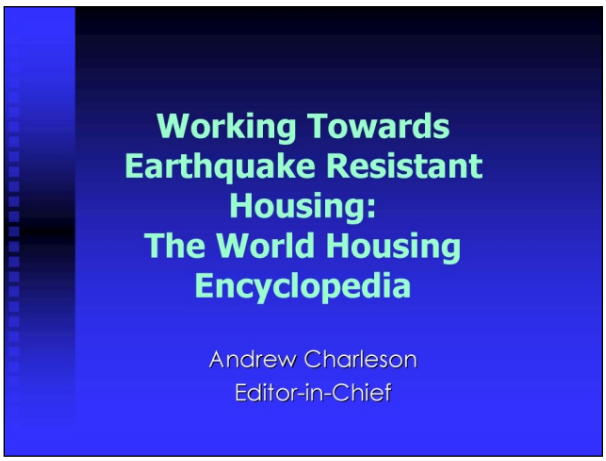
Distribution Phases	Pre- requirements
Phase I: 40% of total financial per house or 3,6 million (to Sleman, Gunung Kidul, and Kulonprogo regency, and Yogyakarta city)	SPPB is signed, Physical progress 0%
Phase II: 60% of total financial per house or the rest of money per house in 2006 (Rp. 15 million to Sleman, Gunung Kidul, and Kulonprogo regency, and Yogyakarta city, and Rp. 10 Million to Baintul Regency	75% of financial on phase 1 has been absorbed Physical progress 30%

Releasing condition of subsidy in West Sematra Province

Distribution Phase	Pre-Condition
Phase 1: 50% or Rp 7, million	1. News Events of forming pokmas 2. Attaching contract with KPA 3. Pokmas Bank Account 4. Activity Planning & Budget Planning
Phase 2: 50% or Rp 7,5 million, remain from the budget allocation per house	1. Physical work of house construction 30 % or material expense 75%, average on the Pokmas level 2. Attaching statement letters of ability to complete the house construction 3. Evidence that proof already applying IMB to the institutions in charge. 4. Activity planning on finishing house construction.



（１１）アンドリュー・チャールソン（ニュージーランド、地震工学研究所世界住宅百科編集長）
「耐震住宅供給に向けた努力：世界住宅百科」



The World Housing Encyclopedia

- Founded in 2000
- Under the auspices of EERI and IAEE
- Responds to the seismic vulnerability of the world's housing stock, particularly in Developing Countries
- Voluntary and international organisation

Project aimed at reducing housing vulnerability

- Web-based encyclopedia of housing types worldwide
- Tutorials (technical guideline documents)
- Other initiatives and resources

www.world-housing.net

The Encyclopedia

- Database of world housing construction practices

The World Housing Encyclopedia

- Database of world housing construction practices
- Over 150 reports from 40 countries or territories

AN EXAMPLE REPORT

Rural mud house with pitched roof

- **Report #** 23
- **Report Date** 06-05-2002
- **Country** INDIA
- **Housing Type** Adobe / Earthen House
- **Housing Sub-Type** Adobe / Earthen House : Mud walls
- **Author(s)** Amit Kumar
- **Reviewer(s)** Ravi Sinha

Report Structure and Sections

1. General Information
2. Architectural Aspects
3. Structural Details
4. Socio-Economic Aspects
5. Seismic Vulnerability
6. Construction
7. Insurance
8. Strengthening

3. Structural Details

3.1 Structural System
This is an Adobe / Earthen House: Mud walls

3.2 Gravity Load-Resisting System
The vertical load resisting system is earthen walls. The roof loads are directly supported by the .....

3.3 Lateral Load-Resisting System
The lateral load resisting system is earthen walls. .....

Tutorials

- Adobe Buildings *(English / Spanish)*
- Confined Masonry Dwellings *(English / Spanish)*
- Reinforced Concrete Frame Buildings *(English / Spanish)*
- *Stone masonry houses*
- Tutorials on straw bale houses and RC houses are under preparation.

Tutorials

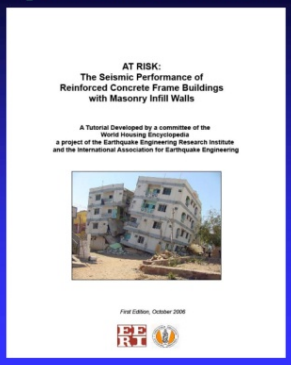
The World Housing Encyclopedia (WHE) Tutorials introduce basic concepts associated with the performance of different buildings types during earthquakes. Each Tutorial addresses a single construction type, and is a collection of field and research experiences from across the world on planning, design and construction of each construction method.

These tutorials, in addition to outlining key factors affecting seismic performance, offer recommendations for improved earthquake-resistant construction practices for new buildings and for strengthening existing buildings at risk. The Tutorials contain links to the relevant publications, web sites and video clips.

Collapse or damage to buildings often contributes to unacceptably high death tolls and economic losses in a large part of the world affected by earthquakes. Countries in which buildings are built to be earthquake-resistant, have successfully reduced losses of life and property. Hence, a better understanding among owners, designers, construction managers and government officials of how various buildings perform will help influence seismic design and construction, saving lives and reducing losses in future earthquakes.

WHE encourages organizations and governments agencies to use these materials in earthquake risk reduction projects.

Example of a Tutorial

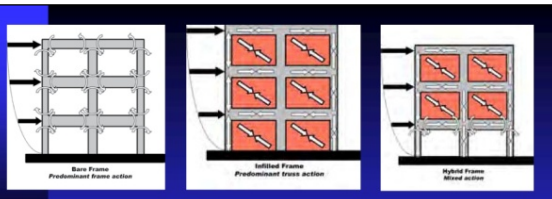


AT RISK:
The Seismic Performance of
Reinforced Concrete Frame Buildings
with Masonry Infill Walls

A Tutorial Developed by a committee of the
World Housing Encyclopedia
a project of the Earthquake Engineering Research Institute
and the International Association for Earthquake Engineering

First Edition, October 2006

Contents



Other Resources

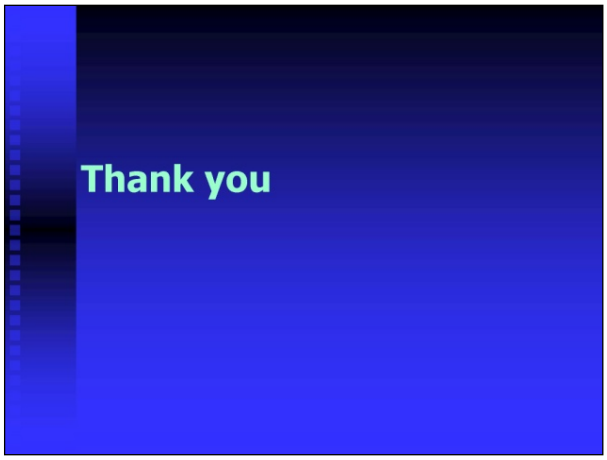
SEISMIC STRENGTHENING OF EARTHEN HOUSES USING STRAPS CUT FROM USED CAR TIRES: A CONSTRUCTION GUIDE

Andrew Charleson

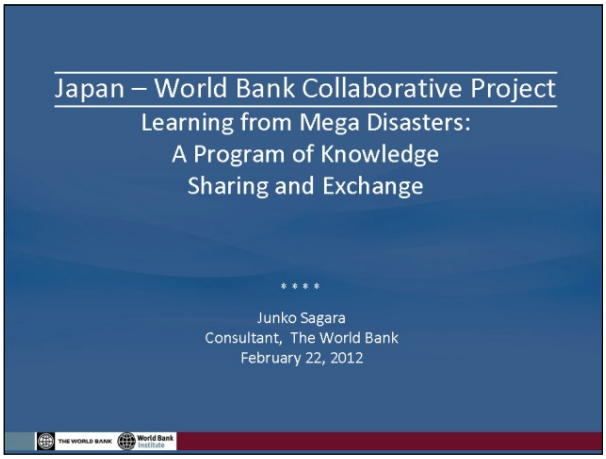
The World Housing Encyclopedia welcomes participation & contributors

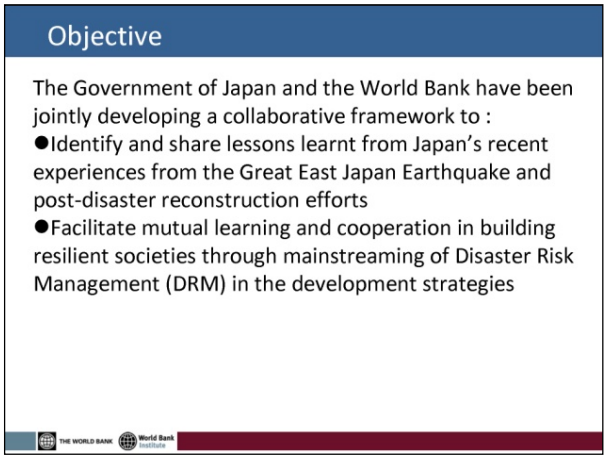
- 40+ countries
- 200+ participants

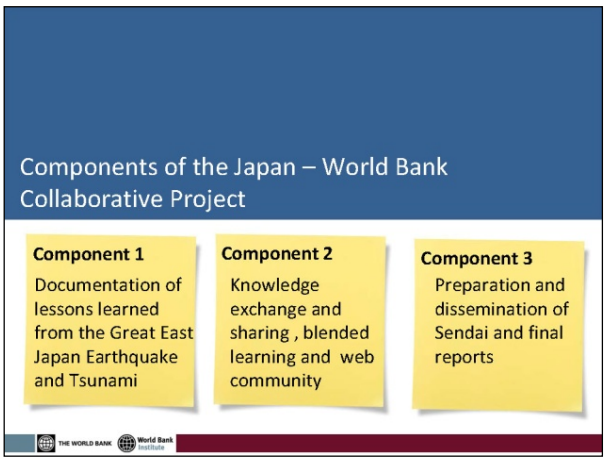
1st meeting in Pavia, 2002

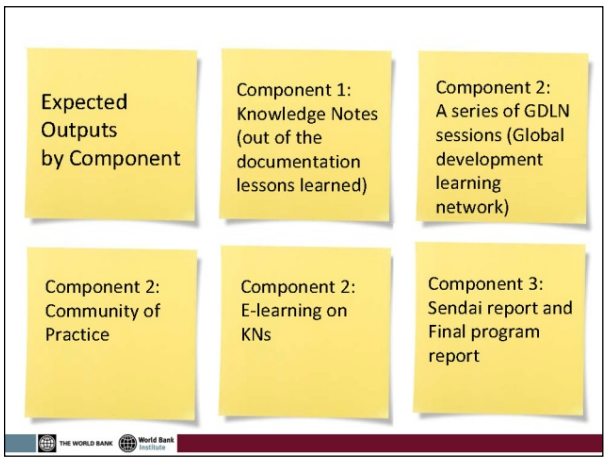


（１２）相良純子（世界銀行コンサルタント）「日本・世界銀行協力プログラム――巨大災害から学ぶ：知識共有・交流プログラム」









（１３）石山祐二（北海道大学名誉教授）「地震によるノンエンジニアド住宅の被害と国際地震工学会のガイドライン」

International Video Conference: Reconstruction of Safer Houses after Earthquake Disasters

Earthquake Damage to Non-Engineered Houses and the Guidelines by IAEE

Yuji Ishiyama
Professor Emeritus, Hokkaido University

Non-Engineered Construction

- Non-engineered buildings are spontaneously and informally constructed in the traditional manner without intervention by qualified architects and engineers in their design.
- Non-engineered construction is most common construction technique in the world and also most vulnerable against earthquakes.

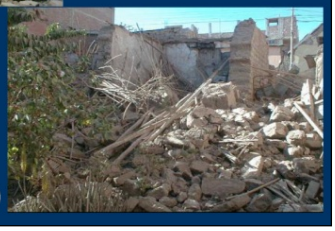
Un-reinforced brick masonry

Un-reinforced brick masonry with no columns and beams (Java, Indonesia)

Confined masonry
Un-reinforced brick wall farmed with RC columns and beams

Wood frame for door sash can support brick wall.

Damage to Adobe (sundried mud block) construction (1996 Nazca, Peru EQ)

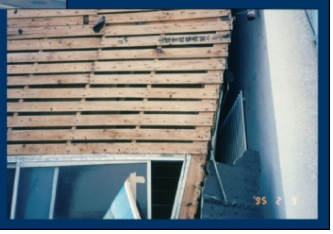


Damage to Adobe (2001 Atico, Peru EQ)

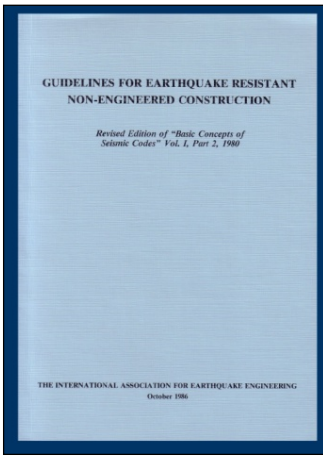
Damage to Tapial construction (1990 Peru EQ)

Tapial is cast-in-place mud (rammed earth) construction (1990 Peru EQ)

Damage to Japanese traditional wooden houses (1995 Kobe EQ)



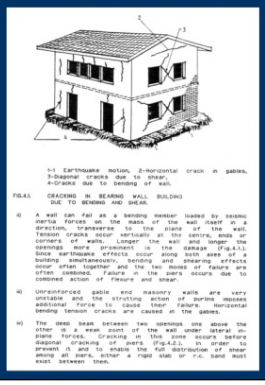
Narrow boards nailed to frame cannot resist lateral forces (1995 Kobe EQ)

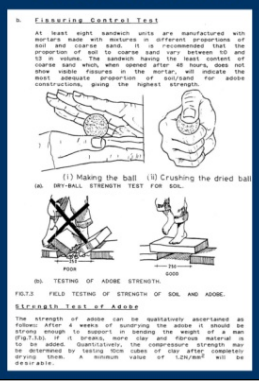


International Association for Earthquake Engineering (IAEE)
Guidelines for Earthquake Resistant Non-Engineered Construction
(1986 Edition)

Easy to understand with many illustrations

Applicable at construction site





GUIDELINES FOR EARTHQUAKE RESISTANT NON-ENGINEERED CONSTRUCTION

Revised Edition of "Basic Concepts of Seismic Codes" Vol. 1, Part 2, 1980

IAEE COMMITTEE

ANAND S. ARYA (*India, Chairman*)
TEDDY BOEN (*Indonesia*)
YUJI ISHIYAMA (*Japan*)
A.I. MARTEMIANOV (*USSR*)
ROBERTO MELI (*Mexico*)
CHARLES SCAWTHORN (*USA*)
VARGAS JULIO N. (*Peru*)
YE YAOXIAN (*China*)

THE INTERNATIONAL ASSOCIATION FOR EARTHQUAKE ENGINEERING

General Office
KENCHIKU KAIKAN 3rd Floor, 5-26-20, Shiba, Minato-ku, Tokyo, 108, Japan
Cable Address: INTERQUAKE TOKYO

October 1986

Anand S. Arya (India)
Teddy Boen (Indonesia)
Yuji Ishiyama (Japan)
A. I. Martemianov (USSR)
Roberto Meli (Mexico)
Charles Scawthorn (USA)
Vargas Julio N. (Peru)
Ye Xaoxian (China)

In 1984 during WCEE in San Francisco

Revision for 2012 Version

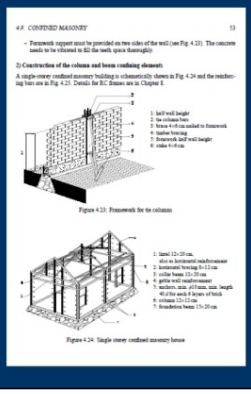
26 and 27 years after the previous picture

Anand S. Arya
Teddy Boen
Yuji Ishiyama

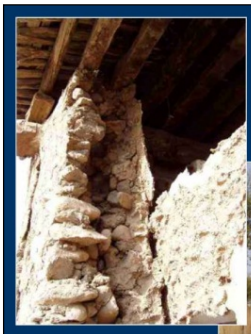
Singapore in 2011

New Delhi in 2010

Latest version (Feb. 2012)

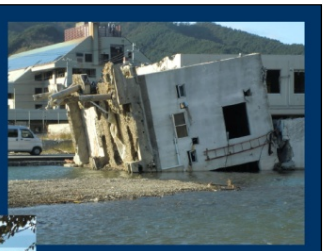


Pictures of various types of earthquake damage



Damage to Stone Masonry

Damage caused by Tsunami of 2011 Great East Japan Earthquake



New Figures to be understood easily

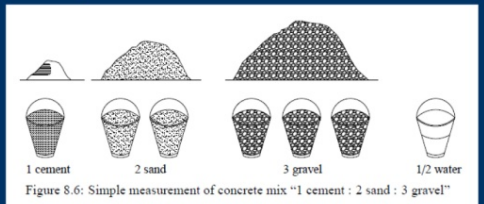


Figure 8.6: Simple measurement of concrete mix "1 cement : 2 sand : 3 gravel"

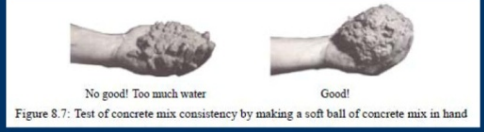
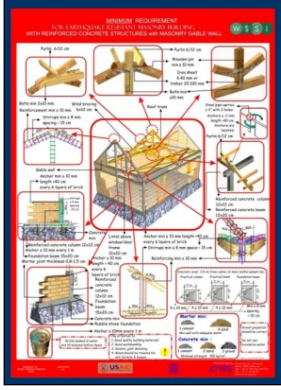


Figure 8.7: Test of concrete mix consistency by making a soft ball of concrete mix in hand

Poster for Minimum Requirements



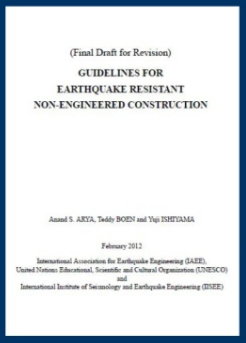
- Quality of materials
- Structural members
- Connection of structural members

(After 2006 Central Java, Indonesia EQ)

Latest version (Feb.2012)

1. Problems, Objective & Scope
2. Structural Performance during EQs
3. General Concept of EQ Resistant Design
4. Masonry Buildings in Fired-Brick and Other Materials
5. Stone Buildings
6. Wooden Buildings
7. Earthen Buildings
8. Non-Eng. RC Buildings
9. Repair, Restoration and Strengthening
10. Appendices

Latest version (Feb.2012)



(Final Draft for Revision)
GUIDELINES FOR
EARTHQUAKE RESISTANT
NON-ENGINEERED CONSTRUCTION

Anand S. ARYA, Teddy BOEN and Yuji ISHIYAMA

February 2012

International Association for Earthquake Engineering (IAEE),
United Nations Educational, Scientific and Cultural Organization (UNESCO)
and
International Institute of Seismology and Earthquake Engineering (IISEE)

You can download the pdf file through IISEE, BRI, Japan web:
http://iisee.kenken.go.jp

If you have interest, please contact
Anand S. Arya : asarun3155@gmail.com
Teddy Boen : tedboen@cbn.net.id
Yuji Ishiyama : to-yuji@nifty.com

Thank you for your attention

（１４）楢府龍雄（国際協力機構国際協力専門員）「安全なノンエンジニアド建物へ向けた包括的アプローチの提案」

Proposal of a Comprehensive Approach for Safer Non-engineered Houses

International Video Conference
Reconstruction of Safer Houses after Earthquake Disasters

February 22, 2012
at Tokyo Development Learning Center (TDLC), the World Bank,
Chiyoda, Tokyo, Japan and 12 sub-venues in 9 countries

Tatsuo Narafu
Senior Advisor,
Japan International Cooperation Agency (JICA)

Background

- Earthquakes cause serious damages to human societies

Background
Serious Damages of Human Casualties

- Collapse of Houses and Buildings is the main cause of human casualties
- Most of them are non-engineered

Engineer community pays little attention to non-engineered houses stated by UNISDR

"It remains something of a paradox that the failure of non-engineered buildings that kill most people in earthquake attracts the least attention from the engineering profession."

UNISDR (United Nations International Strategy for Disaster Reduction)
"Living with Risk" 2004 version

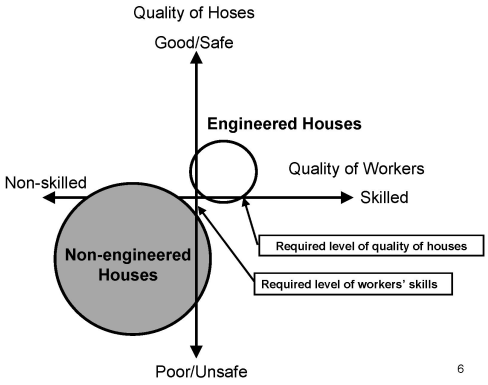
Comparison of two types of structures non-engineered and engineered

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 both in Technical solution and Dissemination of technologies

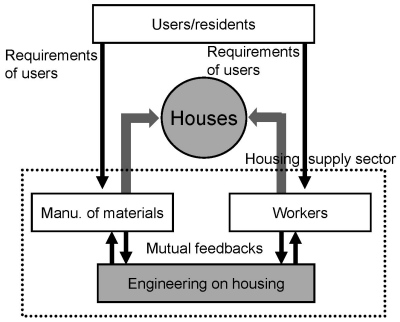
5

Comparison of two types of structures



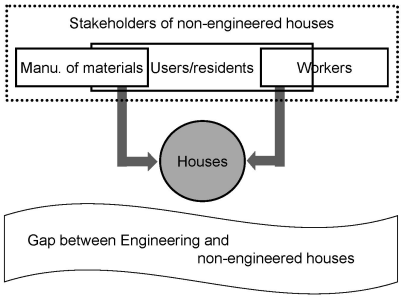
6

Relations between stakeholders <Engineered Houses>



7

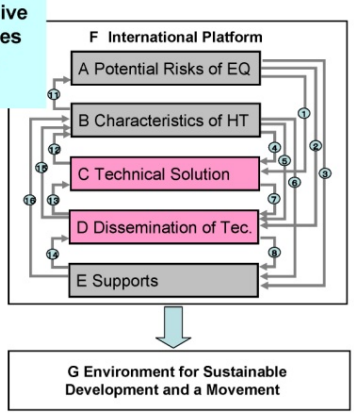
Relations between stakeholders <No-engineered Houses>



Engineering on Housing
Usually applied to engineered houses

8

Comprehensive Approaches is needed



Relations between items

	Inputs for other items
1	Anticipated risks of earthquakes
2	Inputs for enhancing risk ricognition
3	Inputs for enhancing risk ricognition
4	Technical information for research
5	Technical information for dissemination activities
6	Technical information for designing encouragement
7	Technical contents to be disseminated
8	Inputs for designing encouragemnet
11	Information of vulnerability of each house type
12	Feedback for verification of technical solution
13	Feedback for verification of dissemination methods
14	Feedback for verification of encouragement
15	Feedback for verification of dissemination methods
16	Feedback for verification of encouragement

10

Conclusion

- Reduction of disasters of non-engineered houses is very urgent
- Difficulties: it contains technical and also social and economical aspects
- Several initiatives and many enthusiastic people are tackling the tough issue
- Collaboration to share knowledge and lessons is necessary
- Comprehensive approach is highly recommended

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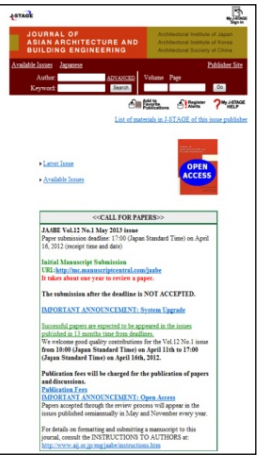
A paper on the comprehensive approach

- A paper was written by 10 co-authors from 5 countries and submitted to an international journal "Journal of Asian Architecture and Building Engineering (JAABE)"
- Title: "A Proposal for a Comprehensive Approach to Safer Non-engineered Houses"
- Available at: http://www.jstage.jst.go.jp/article/jaabe/9/2/315/_pdf



（１４）池田恵子（静岡大学教授）「安全な住宅の社会・経済的側面」

Socio-economic Aspects for Safer Housing

Video Conference

2012 /02/22

Keiko Ikeda
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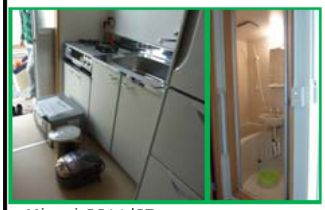
1. Women and vulnerable people must be involved in the design and location of new housing, and management of newly settled community.



Miyagi 2011/05

Bangladesh, Cox's Bazar 2008/02

2. Women's and vulnerable people's safety must be a priority in housing, e.g. through adequate lighting, provisions to protect privacy, etc.

Miyagi 2011/05

Bangladesh, Gaibandha 2005/08

3. Housing security for women through registering houses in the name of both husbands and wives.

4. Priorities should be given in occupancy of new housing, targeting vulnerable people including single mothers, widows, the poor and unemployed men/women….

Simple legal procedures and access to information …….

5. The aged, the disabled, boys and girls and their care givers (mostly women) should be consulted about location and design of their welfare faculties (public space).

Miyagi 2011/09

6. Construction-related employment and training must be equally shared by men and women.

7. Technically qualified female engineers, architects and site overseers should be employed. Participation of women professionals in the construction industry and related fields will empower affected women.

8. Local women's / disabled organizations should be invited to evaluate and monitor the process of housing reconstruction, to ensure including sense of 'safe housing' from their viewpoints.

Fukushima 2011/06

Bangladesh, Gaibandha 2005/08

Point

'Safer housing' can further reduce social vulnerability when you …..

- **Engage with all stakeholders, ensure their participation in decision-making**
- **Gather and utilize gender and socio-economic disaggregated data, and respond women/men's different needs (Household based information gathering is not sufficient)**